

Department of Oncology and Metabolism

**Urinary Incontinence & Impact of Management on
Sexual Function in Women**

In Support of submission for the degree of Doctor of
Medicine (MD)

Dr Swati Jha
Sheffield University
September 2017

Table of Contents

1. Acknowledgements.....	3
2. Abstract.....	4
3. List of Abbreviations.....	8
4. List of Papers together with contribution to Publications leading to MD thesis.....	9
5. Commentary.....	12
5.1 Literature Review: Introduction and Background	12
5.1.1 Female Sexual Dysfunction (FSD).....	12
5.1.2 Urinary Incontinence.....	13
5.1.3 Pelvic Floor dysfunction and Sexual dysfunction.....	14
5.1.4 Urinary Incontinence and Sexual dysfunction.....	17
5.2 The association of different types of urinary incontinence with sexual function..	18
5.3 Pelvic Floor Muscle training (PFMT)	19
5.3.1 Types of Physiotherapy.....	19
5.3.2 PFMT and Sexual Function.....	20
5.4 Surgical Treatment of stress incontinence and Sexual dysfunction	21
5.4.1 Types of surgery for Stress urinary incontinence.....	21
5.4.2 Colposuspension/Fascial Sling and Sexual Function.....	22
5.4.3 Midurethral tapes and Sexual function.....	23
5.5 Impact of treatment of OAB on sexual function:.....	24
6. Bibliography.....	26
7. Published Papers	
7.1 Paper 1	33
7.2 Paper 2(Book Chapter).....	62
7.3 Paper 3	101
7.4 Paper 4	116
7.5 Paper 5	128
7.6 Paper 6	152
7.7 Paper 7.....	163
8. Conclusions and areas for future research	186
Appendix 1: Journal Permissions.....	CD
Appendix 2: Co Author permissions.....	CD
Appendix 3. Protocol and ethics for paper 6 and 7.....	CD

1. Acknowledgements

I would firstly like to thank Professor Ledger who encouraged me to undertake the mammoth task of completing an MD whilst in full time NHS employment. He gave valuable advice, support and guidance as my supervisor prior to immigrating to Australia. I am also truly grateful to my current supervisor Mr Lashen for his continued support whilst undertaking the various projects and work which comprise my thesis and for having an open door policy to my various queries and concerns.

I thank all the women who have participated in the various studies for their time and contribution. I would also like to thank them for giving permission to use the data they have submitted regarding a very intimate and personal aspect of their personal lives.

I thank all my co-workers (Dr Thakar, Dr Gopinath, Dr Strelly, Dr Radley, Dr Metwally, Dr Ammembal, Dr Walters, Dr Dixon, Dr Bortolami, Dr Alshreef) and research nurses (Claire Pye and Hilary Wood) who have helped with data collection in the various studies each of which was an individual project in itself.

But the three people I would like to thank the most are my husband, Pravin, and children, Shashwat and Sakshi, because I feel the time spent in completing this MD was time I took from them. They made me believe that I could complete the work I had undertaken in spite of my busy schedule and clinical work load. The patience, support and encouragement I had from them has made this work possible.

2. Abstract

Aims and Objectives: It was hypothesized that urinary incontinence has an impact on sexual function in women though the exact impact and its mechanism remains unproven. I also noted that patients who underwent treatment for urinary incontinence had an improvement in sexual function. This thesis aimed to analyze the association between urinary incontinence and sexual function in women. The impact of different treatment modalities for urinary incontinence and their effect on sexual function was measured. This was through a series of separate experiments.

Methods: It is widely accepted that urinary incontinence impacts on sexual function but the pathophysiology remains unclear. A review of female sexual dysfunction (Paper 1) and the impact of pelvic floor problems on sexual function (Paper 2) was undertaken.

As studies analyzing sexual function in women with pelvic floor disorders tend to cluster women with prolapse and incontinence it has been difficult to identify which of these has a greater impact on sexual function. A study was undertaken to compare sexual function in these 2 main disorders of the pelvic floor, prolapse and incontinence (Paper 3). The incidence of sexual dysfunction and comparison of symptoms in both groups were done using Mann-Whitney U test.

The two most common causes for urinary incontinence are sphincter weakness and involuntary detrusor contractions, which usually manifest clinically as stress incontinence and overactive bladder. Traditional teaching has been that both are responsible for coital incontinence but there remains considerable controversy on the exact impact different types of urinary incontinence has. This was further explored in another study (Paper4). Data were collected as part of routine clinical care using an electronic pelvic floor questionnaire (ePAQ) and correlated with urodynamic findings. By correlating the different types of incontinence based on urodynamic diagnosis to sexual

function, the exact incidence of coital incontinence, penetration and orgasm incontinence were estimated.

Various treatment modalities for both types of urinary incontinence were assessed and the impact these treatments have on sexual function studied. The chief forms of treatment for Stress incontinence are Pelvic Floor Muscle Training (PFMT) and surgical treatment. To assess the former a prospective cohort randomized controlled trial was conducted looking at the impact of electrical stimulation compared to standard PFMT alone in women with urinary incontinence and the impact this has on sexual function (Paper 7). This was a single centre two arm parallel group randomised controlled trial. The interventions compared were electric stimulation versus standard pelvic floor muscle training. Outcome measures included Prolapse and Incontinence Sexual function Questionnaire (PISQ) physical function dimension at post-treatment (primary); other dimensions of PISQ, SF-36; EQ-5D, EPAQ, resource use, adverse events and cost-effectiveness (secondary outcomes).

The impact of all continence surgery including the Tension free vaginal tape (TVT) on sexual function was evaluated by conducting a systematic review and meta-analysis (Paper 5). Observational studies and randomised controlled trials investigating the impact of surgical correction of stress urinary incontinence on sexual function were included. Surgical interventions included TVT, TVT-O, TOT, Burch and AFS. Studies which included patients undergoing concurrent prolapse surgery were excluded from the analysis. Coital incontinence was analyzed separately and OR with 95% CI calculated. The data were analysed in Review Manager 5 software. In addition to analyzing various treatment options we also compared the different types of midurethral tapes and their overall impact on sexual function.

The mainstay of treatment for women with overactive bladder symptoms (OAB) is anticholinergics and this was assessed in a separate study. Women identified to have OAB and sexual dysfunction being commenced on anticholinergics were followed up to

observe the impact of medical treatment on their sexual function (Paper 6). The ePAQ-PF, PISQ 12 and PGI-I for Overactive bladder and Sexual function. Sexually active women with overactive bladder were included in the study and assessed using the ePAQ-PF, PISQ 12 and PGI-I for Overactive bladder and Sexual function. Prolapse and voiding dysfunction were exclusion criteria for the study. All women were followed up for 6 months and were treatment naïve. Sexual function before and after treatment was compared. The data were analysed using SPSS.

Results: The individual impact of pelvic organ prolapse (POP) and urinary incontinence on sexual function was found to be similar. Patient and partner avoidance in women with POP was greater than those with stress urinary incontinence (Paper 3).

Worsening urinary incontinence has a deleterious effect on sexual function. However the type of urinary incontinence as established on Urodynamic diagnosis does not correlate with the nature of underlying sexual problems, orgasm or penetration incontinence (Paper 4).

PFMT improved sexual function, but when comparing standard PFMT to electrical stimulation there was no difference in the outcomes (Paper 7).

Surgical correction of SUI resulted in coital incontinence being significantly reduced. An analysis of overall impact on sexual function with all surgical continence procedures demonstrated an improvement, no change and deterioration in 31.9%, 55.5% and 13.1% respectively. These were similar when analyzing overall sexual function following mid urethral tapes in isolation (Paper 5).

Anticholinergics and cure of overactive bladder did not however correlate to an improvement in sexual function (Paper 6).

Conclusions: Sexual dysfunction is complex and multifactorial. The prevalence of sexual dysfunction is greater in women with pelvic floor disorders and the various interventions for urinary incontinence have a variable impact.

3. List of Abbreviations

BAUS	British Association of Urological Surgeons
BSUG	British Society of Urogynaecology
DOA	Detrusor Over activity
ePAQ-PF	Electronic Pelvic Floor Assessment Questionnaire-Pelvic Floor
ES	Electrical Stimulation
FSD	Female Sexual Dysfunction
IRAS	Integrated Research Application System
OAB	Overactive Bladder
PFMT	Pelvic Floor Muscle Training
POP	Pelvic Organ Prolapse
PTNS	Percutaneous Tibial Nerve Stimulation
PVS	Pubo-Vaginal Sling
QoL	Quality of Life
SD	Sexual Dysfunction
SNS	Sacral Nerve Stimulation
STH	Sheffield Teaching Hospitals
SUI	Stress Urinary Incontinence
TOT	Trans Obturator Tape
TVT	Tension free vaginal tape
UI	Urinary Incontinence
USI	Urodynamic Stress Incontinence

4. List of Papers together with contribution to Publications leading to MD thesis

Paper 1. Jha S, Thakar R. Female Sexual dysfunction. Eur. J. Obstet. Gynecol. Reprod.Biol.2010; 153:117-23¹.

As first author I did an extensive review of literature to identify studies relevant to the subject and extrapolated data which formed the basis of the review I then wrote. This formed the basis of my literature review.

My Coauthor edited the paper, checked it for factual accuracy and contributed to writing sections of the paper.

Paper 2. Jha S. Problems associated with sexual activity. Volume I Section VI Associated Disorders. For Cardozo and Staskin. Textbook of Female Urology. Fourth Edition. 2017. ²

As the only author I did an extensive literature search to identify studies relevant to the problem in question. This formed the basis of my Literature Review for my Minithesis submitted in January 2011 for conversion from an MPhil to an MD. This review highlighted the gaps in existing knowledge and formed the basis of the various experiments I performed.

I have since revised this chapter for the subsequent edition of the book and I have included the more recent edition for my thesis.

Paper 3. Jha S, Gopinath D· Prolapse or incontinence: what affects sexual function the most? Int Urogynecol J. 2016. 27 (4), 607-611³.

As first author I conceived the study, collected the data, analysed the data and wrote the paper. I was also responsible for providing direct clinical care or clinical advice to many of the patients included in the study.

My Coauthor contributed to writing sections of the paper and assisted with data analysis and collection.

Paper 4. Jha S, Strelley K, Radley S. Incontinence during intercourse: myths unravelled. *Int Urogynecol J.* 2012 May; 23(5):633-7⁴.

As first author, I wrote the paper. I also conceived the study, collected and analysed the data. I was responsible for providing direct clinical care or clinical advice to many of the patients included in the study.

My coauthor, Dr Strelley assisted with data collection and Dr Radley assisted with analysis of the ePAQ database.

Paper 5. Jha S, Ammenbal M, Metwally M. Impact of incontinence surgery on sexual function: a systematic review and meta-analysis. *J Sex Med.* 2012 Jan;9(1):34-43⁵.

As first author, I wrote the paper. This was funded by the Small Grants Scheme of the Jessop Wing, Sheffield Teaching Hospitals. I conceived the systematic review and wrote a grant application to fund the Literature review so that this could be undertaken methodologically and extensively. I then read all the papers, extracted data from the papers, analysed all data through RevMan and created the Forrest Plots.

My Coauthor Dr Ammembal read all the papers for the data extraction and Dr Metwally assisted with analysis of data on Revman.

Paper 6. Jha S. Impact of treatment of overactive bladder with anticholinergics on sexual function. *Arch Gynecol Obstet.* 2016 Feb;293(2):403-6⁶.

This study was funded by a joint Grant from BSUG and BAUS. I was the chief investigator and I conceived the study and wrote the protocol for the study. I also obtained ethical approval from the South Yorkshire Research and Ethics Committee through IRAS and registered the study with STH Research and Development (STH 15315) before commencing the study.

I was responsible for providing direct clinical care or clinical advice to many of the patients included in the study. I obtained consent from patients to participate in the study, collected the data, analysed the data and wrote the paper.

Paper 7. Jha S, Walters S, Bortolami O, Dixon S, Alshreef A. Impact of Pelvic Floor Muscle Training on Sexual function of women with Urinary Incontinence and a comparison of electrical stimulation versus standard treatment (IPSU Trial): a randomised controlled trial. DOI: <http://dx.doi.org/10.1016/j.physio.2017.06.003>.

I conceived the idea for this study, wrote the grant application which funded the study and wrote the protocol for the study with assistance from my co- authors. I also obtained ethical approval from the South Yorkshire Research and Ethics Committee through IRAS (REC (11/YH/0170)). This paper presents independent research funded by the National Institute for Health Research (NIHR) under its Research for Patient Benefit (RfPB) Programme (Grant Reference Number PB-PG-0110-19276 ; Trial registration: ISRCTN09586238). The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

I was responsible for providing direct clinical care or clinical advice patients included in the study. I obtained consent from patients to participate in the study, collected the data and wrote the paper.

My Coauthors Prof Walters and Dr Bortolami conducted the data analysis and provided the statistics presented in this paper. My coauthors Professor Dixon and Dr Alshreef conducted the cost effectiveness analysis.

5. Commentary

5.1 Literature Review: Introduction and Background

5.1.1 Female Sexual Dysfunction (FSD)

Sexual problems are common among women but they become a dysfunction when they cause distress as opposed to a normal physiological response due to difficult circumstances. FSD is defined as a disorder of sexual desire, arousal, orgasm or sexual pain that results in significant personal distress. It is more prevalent in women (43%) than in men (31%)⁷. Furthermore it is associated with various psychodemographic characteristics, e.g. age, education, and poor physical and emotional health. FSD appears to be more common in women who have a history of sexual abuse or coercion⁸. It is believed that in the general population up to 60% of women aged less than 60 have some degree of sexual dysfunction⁹. An international survey (The Global Study of Sexual Attitude and Behaviours) investigated behaviours, attitudes, beliefs, and satisfaction regarding sex, intimacy, and relationships among men and women aged 40-80 years. In women, 34% of respondents had decreased sexual interest and 19% did not consider sexual intercourse to be pleasurable. In this same survey 23% of women reported reduced lubrication with a significant increase between 50 and 69 years¹⁰. Surveys of patients in physicians' offices suggest that each year, family practitioners will see several women or couples who present with sexual problems, and even more if the physician enquires about patients' sexual health. Surveys have also shown a very high prevalence of sexual concerns in women seeking routine gynaecological care¹¹. Nusbaum et al questioned 1500 women attending a gynaecology clinic and found that 98% of the respondents reported one or more sexual concerns. The most frequent was hypoactive sexual desire (87%) followed by orgasmic disorders (83%) inadequate lubrication (5%) and dyspareunia indicative of a sexual pain disorder (72%)⁸.

Paper 1¹ of this thesis is a review of Female Sexual dysfunction and looks at the underlying mechanisms and classification as well as the diagnosis and management of this condition.

Since the publication of this paper there continues to be considerable debate into the classification of FSD but there has not been any updated classification universally accepted in clinical practice.

Following the success of Sildenafil in male sexual dysfunction attempts to develop a similar drug for FSD have been ongoing. Flibanserin, a multifunctional serotonin agonist/antagonist, was developed as a non hormonal option designed specifically for the treatment of Hypo active sexual desire disorder but has failed to be established due to the marginal efficacy and side effect profile. The use of SSRI for the management of Persistent Genital arousal disorder described in this chapter seems counterintuitive as they cause severe sexual side effects including suppression of libido. However they may have a role where the condition is causing depression and in such cases it is necessary to weigh the pros and cons of such treatment. Another proposed treatment discussed in this chapter is the use of Alprostadil (Prostaglandin E1). Its use locally has been hypothesized to improve vulvar blood flow and may lead to an increase in overall sexual arousal and sexual satisfaction¹².

5.1.2 Urinary Incontinence

Urinary incontinence (UI) is defined by the International Continence Society as the “complaint of involuntary leakage of urine”. It is a common condition and epidemiological studies suggest that it affects up to 41% of the adult female population. UI impacts on different aspects of a woman’s life including social, psychological, occupational, domestic, physical and sexual well-being¹³⁻¹⁶. The two most common pathophysiologies underlying urinary incontinence are sphincter weakness and involuntary detrusor contractions, which usually manifest clinically as stress urinary incontinence (SUI) and overactive bladder (OAB). Stress (urinary) incontinence is defined as the complaint of involuntary loss of urine on effort or physical exertion (e.g. sporting activities), or on sneezing or coughing. Urgency (urinary) incontinence on the other

hand is the complaint of involuntary loss of urine associated with urgency. The corresponding urodynamic diagnosis are urodynamic stress incontinence (USI) and detrusor overactivity (DOA). USI is the involuntary leakage of urine during filling cystometry, associated with increased intra-abdominal pressure, in the absence of a detrusor contraction. DOA on the other hand is the occurrence of involuntary detrusor contractions during filling cystometry. These contractions, which may be spontaneous or provoked, produce a wave form on the cystometrogram, of variable duration and amplitude. The contractions may be phasic or terminal. If a relevant neurological cause is present, then neurogenic detrusor overactivity is noted, otherwise idiopathic detrusor overactivity should be the term used¹⁷. Women who have features of both have mixed incontinence¹⁸.

Compared to the general population, women with UI complain of a deteriorating quality of life (QoL) both social and psychological problems, and sexual dysfunction in significantly greater numbers.

Paper 2² of this thesis formed the literature review and analysed the previous reported literature of common urogynaecology conditions (prolapse and urinary incontinence) and their impact on sexual function.

5.1.3 Pelvic Floor dysfunction and Sexual dysfunction

Different problems of the pelvic floor can also impact on sexual activity in different ways. It is however difficult to tease out the exact relationship of pelvic floor dysfunction to sexual dysfunction specially since there is a high baseline prevalence. In recent years there has been an increasing interest in pelvic floor dysfunction and associated sexual problems particularly related to urinary incontinence.

Prolapse and Urinary incontinence are both common pathologies affecting the pelvic floor however the issue of which of the two impacts on sexual function more remains unresolved. In women with prolapse there is considerable debate about the impact of prolapse per se on sexual function. A review of literature shows conflicting results, with some studies showing a deterioration of function and others showing no impact¹⁹. In

their observational study Handa et al looked at 1299 participants, of whom 495 (38.1%) had evidence of pelvic floor disorders. Sexual complaints were significantly more common among women with pelvic floor disorders (53.2% vs 40.4%, $P < .01$) and when a multiple regression model, urinary incontinence was significantly associated with low libido (odds ratio [OR] 1.96), vaginal dryness (OR 2.11), and dyspareunia (OR 2.04), independent of age, educational attainment, and race. In contrast, pelvic organ prolapse was not associated with any sexual complaint. A study by Weber et al²⁰ comparing 80 women with prolapse with or without incontinence and 30 controls (women with no prolapse) showed no difference in global sexual function score, vaginal dryness, dyspareunia, interest in sexual activity or satisfaction with their sexual relationship. They concluded that women with prolapse and urinary incontinence do not differ from continent women without prolapse in measures of sexual function and age is the most important predictor of sexual function. Burrows et al²¹ came to similar conclusions in their retrospective study of 352 women with prolapse. They also found that prolapse severity did not impact on sexual function.

The study by Barber et al²² comparing the impact of prolapse and incontinence on sexual function found completely the opposite results. In their review of 343 community dwelling women with either symptomatic prolapse or incontinence, they found that prolapse was more likely to influence sexual function than urinary incontinence. This study also demonstrated that treatment of prolapse was less likely to impact on change in sexual function whereas treatment of incontinence resulted in a mild improvement in sexual function. The impact of pelvic organ prolapse and its treatment is beyond the remit of this work.

In women with UI, the symptoms per se, along with fear of odour, shame, embarrassment, loss of self-esteem and fear of, or actual occurrence of, incontinence are contributory factors to deteriorating sexual function. The most common sexual complaints in women with urinary incontinence are low desire, vaginal dryness, and

dyspareunia¹⁹. However the problem with assessment of sexual function in the different studies reported in literature is that:

1. Different tools have been used in different studies
2. Studies cluster prolapse and incontinence under the same umbrella
3. Study groups are small
4. Different types of incontinence and varying severity of incontinence are clumped together
5. Few studies make an attempt to establish what proportion of the sexual problems is related to urinary leakage.
6. Even fewer studies look at the impact of either incontinence or its treatment on different aspects of the sexual cycle.

Paper 3³ of this thesis aims to test which of the pelvic floor disorders ie prolapse or urinary incontinence impacts on sexual function more and what aspects of sexual function are affected in each of these conditions. The electronic Pelvic floor assessment questionnaire (ePAQ PF) was used to compare the different aspect of sexual function in women with either prolapse or incontinence. This questionnaire is routinely administered to patients attending the Urogynaecology clinic as part of routine clinical care. The ePAQ PF is a 129-item, interactive computer-based self-administered questionnaire which measures urinary, bowel, vaginal and sexual symptoms. It also assesses the impact of these individually. The questionnaire has four dimensions: urinary, bowel, vaginal and sexual. Responses to screening questions determine whether or not subsequent items are skipped. When patients are asymptomatic, sub-questions on impact are hidden, thus minimising the burden of items not relevant. Patients can omit an entire dimension or decline to answer individual items if they so wish. It has been validated as a web-based clinical assessment system. It has been specifically designed to provide detailed, reliable and meaningful self-reported symptoms & quality of life data in women with pelvic floor disorders^{23;24}. Although designed initially as a clinical tool to facilitate patient assessment, ePAQ has been recognised by the British Society of Urogynaecology (BSUG) and the National Institute of

Clinical excellence (NICE) as a responsive & meaningful patient reported outcome measure (PROM).

All questionnaire data are stored on a password protected secure server located with the NHS firewall & fully compliant with UK data protection regulation. The questionnaire asks patients if they are willing for their data to be used in anonymized research in approved and registered research. Patients who declined consent did not have their data used. This study was a retrospective review of the ePAQ database assessing patients on the waiting list for either prolapse or incontinence surgery. As key demographic data is not collected in the database, this was missing in the analysis and is a weakness of this study, but it remains the single largest study comparing sexual function in patients with prolapse or incontinence.

5.1.4 Urinary Incontinence and Sexual dysfunction

It is widely accepted that urinary incontinence impacts on sexual function but there remains considerable controversy on the pathophysiology of this impact on sexual function. Complaints of SUI, OAB, and lower urinary tract symptoms have negative impact on various domains of sexual function^{13;25}. This was reported in a cross-sectional study by Salonia et al²⁵. Sexual dysfunction was diagnosed in 99 out of 216 patients (46%) with urinary incontinence or lower urinary tract symptoms. Of these, 34 (34%) reported hypoactive sexual desire, 23 (23%) reported sexual arousal disorder; 11 patients (11%) complained of orgasmic deficiency, and 44 (44%) suffered from sexual pain disorder (e.g., dyspareunia or non-coital genital pain). Women reporting low sexual desire commonly suffered from stress incontinence (47%). Forty-six percent of those complaining of orgasmic phase difficulties also reported troublesome urge incontinence. A group of 102 age-matched women (mean age 54; age range 19-63) not complaining of urinary symptoms were enrolled as cross-sectional controls and investigated in accordance with the Female Sexual Function Index (FSFI). The FSFI values in both groups scored as follows (patients versus controls; median value; p value): desire: 2.0 vs. 3.2 (p<0.01); arousal: 2.8 vs. 3.6 (p=n.s.); lubrication: 3.2 vs. 4.4 (p=0.01); orgasm: 4.1 vs. 4.4

(p=not significant); sexual satisfaction: 2.7 vs. 4.0 (p<0.01); sexual pain: 1.8 vs. 4.0 (p<0.001).

In a recent Case control study by Filippa²⁶ women with urinary incontinence were more likely to be sexual abstinent than continent women and had less sexual desire, sexual comfort, and sexual satisfaction. Sexual dysfunction is therefore highly prevalent in women attending urogynaecological services²⁷.

5.2 The association of different types of urinary incontinence with sexual function

Traditional teaching has been that urodynamic stress incontinence (USI) is associated with penetration incontinence and detrusor over activity with orgasm incontinence²⁸, however subsequent studies by Moran et al²⁹ have failed to confirm this association. In their observational study USI was associated with high rates of penetration incontinence (80%), orgasm incontinence (93%) and a combination of the two (92%). In women with SUI prevalence of coital incontinence ranges from 11-70%²⁸⁻³¹. Among the different types of urinary incontinence, OAB has a particularly high association with sexual dysfunction in various studies^{32 33}, which could be indicative of an underlying psychosomatic disorder³⁴. However studies assessing overall prevalence of sexual dysfunction in women with OAB and the impact on Quality of life remains controversial³⁵ whereas menopausal and partner status have been shown to be the better predictors³⁶.

Paper 4⁴ of this thesis compares the various types of urinary incontinence based on urodynamic diagnosis and the association with leakage at different phases of the sexual cycle. To ensure the results were valid a sample size calculation was undertaken even though this was a retrospective study. The sample size used for the analysis was in excess of the numbers required hence making the results valid. Assessment of correlation of the results of the e-PAQ and UDS was performed retrospectively from the e-PAQ database.

5.3 Pelvic Floor Muscle Training (PFMT)

5.3.1 Types of PFMT

PFMT was defined as a programme of repeated voluntary pelvic floor muscle contraction with or without supervision by health care professionals. First described by Kegel in 1948 with a cure rate of 84% it became more popular as a treatment option for urinary incontinence in the 1980s. PFMT is now accepted as the first line treatment for urinary incontinence³⁷ and the National Institute of Clinical Excellence (NICE) recommend that a trial of supervised pelvic floor muscle training of at least 3 months' duration should be offered to all women with stress or mixed UI prior to any surgical intervention³⁸. There is Grade 1A evidence that daily pelvic floor muscle training continued for 3 months is safe and effective with an improvement in urinary incontinence expected in 40–60% of women. The exact mechanism by which PFMT improves incontinence is unknown; however the aim of therapy is to improve the strength and efficacy of pelvic floor contraction.

All types of PFMT are undertaken in conjunction with education regarding anatomy of the pelvic floor and lower urinary tract its physiology and the continence mechanisms. PFMT can be performed with or without adjunctive treatments such as electrical stimulation(ES), vaginal cones or biofeedback. In a single blind randomised control trial comparing standard physiotherapy to ES and vaginal cones, Bo³⁹ demonstrated that standard physiotherapy was as effective as ES or vaginal cones if not better. Other studies have shown ES to be safe and effective in the treatment of women with urinary incontinence both stress^{40;41} and urgency^{41;42}. In a recent Systematic review ES was shown to be as effective as a treatment option for different types of urinary incontinence⁴³.

5.3.2 PFMT and Sexual function

The current available limited evidence suggests that supervised PFMT has a beneficial effect on overall sexual function. The study by Zahariou et al⁴⁴ was an observational study assessing the effectiveness of PFMT on sexual function and showed all domains of sexual function to be improved. Women included in the study had received supervised PFMT for 12 months. Beji⁴⁵ showed similar results with an improvement in sexual desire, performance during coitus and achievement of orgasm in women who received pelvic floor muscle rehabilitation. Bo⁴⁶ also showed physiotherapy improved some aspects of sex life, though various domains of sexual function were not assessed.

Rivalta et al⁴⁷ looked at the impact of biofeedback, electrical stimulation, PFMT and vaginal cones in combination in 3 women with urinary incontinence and associated sexual dysfunction. Benefits were demonstrated however numbers were too small and the benefit of individual interventions difficult to assess.

In patients with sexual dysfunction electrical stimulation has been shown to be of benefit particularly those with vulval pain disorders^{48;49}. Giuseppe et al⁵⁰ demonstrated that in women with UI and who scored low on the Female Sexual Function Index (FSFI) showed an improvement in urinary leakage and also in their sexual life following treatment by neuromuscular electrical stimulation. This was an observational study with relatively small numbers and made no comparisons with alternative forms of physiotherapy.

There are different hypothesis as to why PFMT may improve sexual function. The pelvic floor muscles are directly responsible for the amount of sensation a woman feels during intercourse, and for the amount of grip felt by her partner. Rhythmic contractions of the pelvic floor contribute to arousal and a woman's ability to achieve orgasm. Women may be able to reach orgasm more easily, after a pelvic floor exercise program. Exercise improves muscle tone which means that the muscle is tighter, so is stretched more by an erect penis. Strong, firm muscles have more nerve endings, and more nerve endings mean

more sensations during coitus. Exercise improves circulation, and this is particularly important for the smaller muscles of the pelvic floor, which are responsible for engorging the clitoris when women are aroused.

Paper 7 of this thesis was a randomised control trial (RCT) comparing the clinical and cost effectiveness of electric stimulation plus standard pelvic floor muscle training to standard pelvic floor muscle training (PFMT) alone in women with urinary incontinence and sexual dysfunction.

The sample size recruited to the study was adequate however the number of women who completed the study with adequate follow up was insufficient. There was a lack of compliance to appointments and as a consequence patient number required for study completion were not met. As the missing outcomes would seriously impede the ability to make correct inferences from the RCT, multiple imputation was undertaken. Multiple imputation is an advanced method of dealing with missing data in statistical analysis, which can be a common problem of medical research. This allowed the sample size to be preserved. This was in preference to Complete case (CC) analysis as this would have reduced sample size and led to reduced statistical efficiency of estimates while increasing the potential for bias.

Interestingly even though no clinical benefit was identified in comparing standard PFMT to electric stimulation plus standard PFMT, the health economics evaluations demonstrated that the electrical intervention was cost effective. This conclusion is driven by a very small incremental cost associated with the addition of electrical stimulation. There is also a small and statistically significant gain in QALYs measured via the EQ-5D.

The protocol and ethics approval are attached in appendix 3.

5.4 Surgical Treatment of stress incontinence and Sexual dysfunction:

5.4.1 Types of surgery for Stress urinary incontinence

The chief forms of surgical treatment for Stress urinary incontinence (SUI) include colposuspension, autologous fascial slings, midurethral tapes and bulking agents. Burch Colposuspension was described in 1961⁵¹. The initial description was attachment of the paravaginal fascia to the arcus tendineus. However, this was later changed to attachment to Cooper's ligaments.

The autologous fascial sling also known as the pubovaginal sling (PVS) was popularized by McGuire and Lytton in 1978⁵². They reported an 80% success rate in patients with intrinsic sphincter deficiency. Though this was shown to have a greater success than the Burch colposuspension the morbidity associated with this procedure was greater⁵³. In 1996 Ulmsten⁵⁴ first described the Tension Free vaginal tape (TVT) and this has revolutionised the management of stress incontinence. This operation was followed some years later⁵⁵ by another midurethral sling operation which utilises the obturator route ie Transobturator tape described by de Leval in 2003 .

Following a multicentre RCT comparing the Colposuspension to TVT⁵⁶⁻⁵⁸, the former is now very infrequently performed. The most common surgical procedure for SUI is the midurethral sling of which the 'gold standard' is the retropubic sling.

Bulking agents or Injectables have also been used to manage SUI. Their application has been limited by placement, durability, antigenicity, and other compatibility issues. In women with SUI, the impact of treating incontinence on sexual function is controversial. Surgical treatment in these patients may be curative of their coital incontinence but has the potential to cause undesired effects on sensation, blood flow, and the anatomy. These effects can affect sexual arousal and orgasm or cause dyspareunia.

5.4.2 Colposuspension/Fascial Sling and Sexual Function

Before the introduction of minimally invasive suburethral sling procedures, Burch colposuspension was regarded as the “gold standard” for the surgical correction of SUI. There is some data regarding the impact of colposuspension on sexual health. Moran⁵⁹ evaluated 55 women with SUI who reported coital incontinence before undergoing colposuspension. Preoperative coital leakage occurred in 65% with penetration, in 16% with orgasm, and 18% with both. After surgery, 81% of the women reported no coital incontinence. This study did not assess other aspects of sexual health and did not use a questionnaire to assess other components of sexual function. Baessler et al³⁰ showed similar improvements in coital incontinence following a colposuspension. In the study by Baessler et al questionnaires were used for more formal assessment of women however patients underwent both prolapse surgery and continence surgery concomitantly hence it is difficult to say what proportion of symptoms were contributed to by resolution of prolapse and what proportion were related to the incontinence symptoms. There are very few studies assessing the impact of fascial slings on sexual function. In their RCT comparing colposuspension to autologous fascial slings, Brubaker et al¹⁴ did not find a difference with either of the two surgeries in terms of outcomes for sexual function but did find that the improvements in sexual function were directly related to the success of surgery.

5.4.3 Midurethral tapes and Sexual function

The impact of midurethral slings, specifically tension-free vaginal tape (TVT) on female sexual function is variable. Different studies have shown different outcomes, with some suggesting deterioration⁶⁰⁻⁶³ of sexual function, some an improvement^{31;64-66} whereas others were equivocal⁶⁷⁻⁷⁰. Deterioration in function may be associated with dyspareunia⁶¹, loss of libido or partner associated discomfort. There have also been anecdotal reports of anorgasmia after TVT probably related to passage of the trochar and subsequent injury to the dorsal nerve of the clitoris⁷¹. However, there seems to be a consensus that TVT reduces coital incontinence rates by three - to sixfold^{56;61;67}.

The alternative approach ie the obturator may adopt the inside out or the outside in approach. The Obturator approach appears to have a similar beneficial effect^{71;72} on sexual function comparable to the retropubic approach (TVT)⁷³. In a comparison of the outside in and the inside out technique of the Obturator sling, reports are conflicting with one study suggesting the inside out (TVT-O) to be better⁷² and another study showing the outside in technique (TOT) to be superior⁷¹ for stress incontinence but no difference has been demonstrated on sexual function in the largest randomised control trial comparing the two methods by Abdel Fatatah et al⁷⁴.

Paper 5⁵ of this thesis is a systematic review analysing all procedures used for SUI and their impact on sexual function followed by analysis of midurethral slings ie Tension Free Vaginal Tapes (TVT) and Obturator tapes (TOT/TVT-O) analysed separately as these are now the gold standard. A comparison of the different midurethral slings ie retropubic (TVT) versus the obturator approach was also made and meta-analysis conducted. As most studies were observational studies the MOOSE guidelines for conducting a meta-analysis of observational studies was followed⁷⁵. The MOOSE checklist contains specifications for reporting of these studies. To assess the quality of the non-randomised studies included in the meta-analysis the Newcastle Ottawa Scale was used to rate each observational study included. The results need to be viewed with caution as there was significant heterogeneity of the studies.

5.5 Impact of treatment of OAB on sexual function:

For urgency incontinence, the main treatment includes bladder retraining and pharmacotherapy (anticholinergics). In sexually active women with overactive bladder and concurrent sexual dysfunction, sexual quality of life, PISQ (Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire) scores, and anxiety states were all improved with corresponding improvement in OAB scores by treatment with anticholinergics^{33;36;76}. In the study by Sand et al³³ 2878 subjects with overactive bladder were treated with transdermal oxybutynin for 6 months or less. The impact of overactive

bladder on sexual function before and after treatment was assessed via item responses from the King's Health Questionnaire and Beck Depression Inventory-II. 586 (23.1%) women at baseline, reported that overactive bladder had an impact on their sex life. Coital incontinence in 569 (22.8%) decreased after treatment to 438 (19.3%). Effects of overactive bladder on subjects' sex lives improved in 19.1% (worsened in 11.2%), and the effect on relationships with partners improved in 19.6% (worsened in 11.9%). Reduced interest in coitus, reported by 52.1% at baseline, improved significantly. (all $P < .0001$). In a similar study by Rogers⁷⁶ overactive bladder (OAB) symptoms and sexual and emotional health in sexually active women with OAB/urgency urinary incontinence treated with tolterodine extended release was assessed. Sexually active women with OAB symptoms were randomized to placebo or tolterodine ER. Tolterodine ER ($n = 201$; mean \pm SD age, 49 \pm 12 years) reduced UUI episodes ($P = 0.0029$), total ($P = 0.0006$) and OAB ($P < 0.0001$) micturitions, and pad use per 24 h ($P = 0.0024$), and was associated with improvements in SQOL-F ($P = 0.004$), PISQ total ($P = 0.009$), and HAD Anxiety ($P = 0.03$) scores versus placebo ($n = 210$; mean \pm SD age, 47 \pm 12 years). OAB symptoms improved with tolterodine ER as did the scores of sexual health and anxiety measures in sexually active women with OAB

Paper 6 of this thesis assesses the impact of anticholinergics on sexual function in women with urgency symptoms. A range of anticholinergics were used and the changes in sexual function compared to alteration in OAB symptoms. The main shortcoming of this study was that the sample size failed to be achieved. This was because the inclusion criteria was women who were treatment naïve but it was subsequently realized that in secondary care this was very unlikely to be the case as patients had already trialed one and sometimes more lots of anticholinergics before being referred to the hospital. So the study had to be conducted as a pilot feasibility study and remains underpowered to answer the whether anticholinergics impact on sexual function of women with overactive bladder symptoms. It was recognized that if conducted again this study would be better carried out in primary care.

The protocol and ethics approval are attached in appendix 3.

6. Bibliography

(1) Jha S, Thakar R. Female sexual dysfunction. *Eur J Obstet Gynecol Reprod Biol* 2010;153:117-123.

(2) Jha S. Problems associated with Sexual Activity. 59. Cardozo and Staskin. Textbook of Female Urology. **Volume I Section VI Associated Disorders.** 687-699. 2017. Fourth edition, Informa healthcare.

Ref Type: Generic

(3) Jha S, Gopinath D. Prolapse or incontinence: what affects sexual function the most? *Int Urogynecol J* 2016;27:607-611.

(4) Jha S, Strelley K, Radley S. Incontinence during intercourse: myths unravelled. *Int Urogynecol J* 2012;23:633-637.

(5) Jha S, Ammenbal M, Metwally M. Impact of incontinence surgery on sexual function: a systematic review and meta-analysis. *J Sex Med* 2012;9:34-43.

(6) Jha S. **Impact of treatment of overactive bladder with anticholinergics on sexual function.** *Arch Gynecol Obstet.* 293[2], 403-406. 2016.

Ref Type: Generic

(7) Laumann EO, Paik A, Rosen RC. Sexual dysfunction in the United States: prevalence and predictors. *JAMA* 1999;281:537-544.

(8) Nusbaum MR, Gamble G, Skinner B, Heiman J. The high prevalence of sexual concerns among women seeking routine gynecological care. *J Fam Pract* 2000;49:229-232.

(9) Frank E, Anderson C, Rubinstein D. Frequency of sexual dysfunction in "normal" couples. *N Engl J Med* 1978;299:111-115.

(10) Nicolosi A, Laumann EO, Glasser DB, Brock G, King R, Gingell C. Sexual activity, sexual disorders and associated help-seeking behavior among mature adults in five Anglophone countries from the Global Survey of Sexual Attitudes and Behaviors (GSSAB). *J Sex Marital Ther* 2006;32:331-342.

(11) Nazareth I, Boynton P, King M. Problems with sexual function in people attending London general practitioners: cross sectional study. *BMJ* 2003;327:423.

(12) Costabile RA. Topical alprostadil for the treatment of female sexual arousal disorder. *Womens Health (Lond)* 2006;2:331-340.

- (13) Aslan G, Koseoglu H, Sadik O, Gimen S, Cihan A, Esen A. Sexual function in women with urinary incontinence. *Int J Impot Res* 2005;17:248-251.
- (14) Brubaker L, Chiang S, Zyczynski H et al. The impact of stress incontinence surgery on female sexual function. *Am J Obstet Gynecol* 2009.
- (15) Fultz NH, Burgio K, Diokno AC, Kinchen KS, Obenchain R, Bump RC. Burden of stress urinary incontinence for community-dwelling women. *Am J Obstet Gynecol* 2003;189:1275-1282.
- (16) Moller LA, Lose G, Jorgensen T. The prevalence and bothersomeness of lower urinary tract symptoms in women 40-60 years of age. *Acta Obstet Gynecol Scand* 2000;79:298-305.
- (17) Haylen BT, de RD, Freeman RM et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Int Urogynecol J* 2010;21:5-26.
- (18) Abrams P, Artibani W, Cardozo L, Dmochowski R, van Kerrebroeck P, Sand P. Reviewing the ICS 2002 terminology report: the ongoing debate. *Neurourol Urodyn* 2009;28:287.
- (19) Handa VL, Harvey L, Cundiff GW, Siddique SA, Kjerulff KH. Sexual function among women with urinary incontinence and pelvic organ prolapse. *Am J Obstet Gynecol* 2004;191:751-756.
- (20) Weber AM, Walters MD, Schover LR, Mitchinson A. Sexual function in women with uterovaginal prolapse and urinary incontinence. *Obstet Gynecol* 1995;85:483-487.
- (21) Burrows LJ, Meyn LA, Walters MD, Weber AM. Pelvic symptoms in women with pelvic organ prolapse. *Obstet Gynecol* 2004;104:982-988.
- (22) Barber MD, Visco AG, Wyman JF, Fantl JA, Bump RC. Sexual function in women with urinary incontinence and pelvic organ prolapse. *Obstet Gynecol* 2002;99:281-289.
- (23) Jones GL, Radley SC, Lumb J, Jha S. Electronic pelvic floor symptoms assessment: tests of data quality of ePAQ-PF. *Int Urogynecol J Pelvic Floor Dysfunct* 2008;19:1337-1347.
- (24) Radley SC, Jones GL, Tanguy EA, Stevens VG, Nelson C, Mathers NJ. Computer interviewing in urogynaecology: concept, development and psychometric testing of an electronic pelvic floor assessment questionnaire in primary and secondary care. *BJOG* 2006;113:231-238.

- (25) Salonia A, Zanni G, Nappi RE et al. Sexual dysfunction is common in women with lower urinary tract symptoms and urinary incontinence: results of a cross-sectional study. *Eur Urol* 2004;45:642-648.
- (26) Felipe MR, Zambon JP, Girotti ME et al. What Is the Real Impact of Urinary Incontinence on Female Sexual Dysfunction? A Case Control Study. *Sex Med* 2017;5:e54-e60.
- (27) Geiss IM, Umek WH, Dungal A, Sam C, Riss P, Hanzal E. Prevalence of female sexual dysfunction in gynecologic and urogynecologic patients according to the international consensus classification. *Urology* 2003;62:514-518.
- (28) Hilton P. Urinary incontinence during sexual intercourse: a common, but rarely volunteered, symptom. *Br J Obstet Gynaecol* 1988;95:377-381.
- (29) Moran PA, Dwyer PL, Ziccone SP. Urinary leakage during coitus in women. *J Obstet Gynaecol* 1999;19:286-288.
- (30) Baessler K, Stanton SL. Does Burch colposuspension cure coital incontinence? *Am J Obstet Gynecol* 2004;190:1030-1033.
- (31) Jha S, Radley S, Farkas A, Jones G. The impact of TVT on sexual function. *Int Urogynecol J Pelvic Floor Dysfunct* 2009;20:165-169.
- (32) Coyne KS, Margolis MK, Jumadilova Z, Bavendam T, Mueller E, Rogers R. Overactive bladder and women's sexual health: what is the impact? *J Sex Med* 2007;4:656-666.
- (33) Sand PK, Goldberg RP, Dmochowski RR, McIlwain M, Dahl NV. The impact of the overactive bladder syndrome on sexual function: a preliminary report from the Multicenter Assessment of Transdermal Therapy in Overactive Bladder with Oxybutynin trial. *Am J Obstet Gynecol* 2006;195:1730-1735.
- (34) Frewen WK. An objective assessment of the unstable bladder of psychosomatic origin. *Br J Urol* 50, 246-249. 1978.

Ref Type: Generic

- (35) Shaw C. A systematic review of the literature on the prevalence of sexual impairment in women with urinary incontinence and the prevalence of urinary leakage during sexual activity. *Eur Urol* 2002;42:432-440.
- (36) Patel AS, O'Leary ML, Stein RJ et al. The relationship between overactive bladder and sexual activity in women. *Int Braz J Urol* 2006;32:77-87.
- (37) Berghmans LC, Hendriks HJ, de Bie RA, van Waalwijk van Doorn ES, Bo K, van Kerrebroeck PE. Conservative treatment of urge urinary incontinence in women: a systematic review of randomized clinical trials. *BJU Int* 2000;85:254-263.

- (38) NICE CG171. The Management of Urinary Incontinence in Women. 10-9-2013.
Ref Type: Generic
- (39) Bo K, Talseth T, Holme I. Single blind, randomised controlled trial of pelvic floor exercises, electrical stimulation, vaginal cones, and no treatment in management of genuine stress incontinence in women. *BMJ* 1999;318:487-493.
- (40) Sand PK, Richardson DA, Staskin DR et al. Pelvic floor electrical stimulation in the treatment of genuine stress incontinence: a multicenter, placebo-controlled trial. *Am J Obstet Gynecol* 1995;173:72-79.
- (41) Smith JJ, III. Intravaginal stimulation randomized trial. *J Urol* 1996;155:127-130.
- (42) Siegel SW, Richardson DA, Miller KL et al. Pelvic floor electrical stimulation for the treatment of urge and mixed urinary incontinence in women. *Urology* 1997;50:934-940.
- (43) Schreiner L, Santos T, Souza A, Nygaard C, Filho I. Electrical Stimulation for Urinary Incontinence in Women: A Systematic Review. *Int.Braz J Urol* 39. 2013.
Ref Type: Generic
- (44) Zahariou AG, Karamouti MV, Papaioannou PD. Pelvic floor muscle training improves sexual function of women with stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2008;19:401-406.
- (45) Beji NK, Yalcin O, Erkan HA. The effect of pelvic floor training on sexual function of treated patients. *Int Urogynecol J Pelvic Floor Dysfunct* 2003;14:234-238.
- (46) Bo K, Talseth T, Vinsnes A. Randomized controlled trial on the effect of pelvic floor muscle training on quality of life and sexual problems in genuine stress incontinent women. *Acta Obstet Gynecol Scand* 2000;79:598-603.
- (47) Rivalta M, Sighinolfi MC, De Stefani S et al. Biofeedback, electrical stimulation, pelvic floor muscle exercises, and vaginal cones: a combined rehabilitative approach for sexual dysfunction associated with urinary incontinence. *J Sex Med* 2009;6:1674-1677.
- (48) Dionisi B, Anglana F, Inghirami P, Lippa P, Senatori R. [Use of transcutaneous electrical stimulation and biofeedback for the treatment of vulvodynia (vulvar vestibular syndrome): result of 3 years of experience]. *Minerva Ginecol* 2008;60:485-491.
- (49) Nappi RE, Ferdeghini F, Abbiati I, Vercesi C, Farina C, Polatti F. Electrical stimulation (ES) in the management of sexual pain disorders. *J Sex Marital Ther* 2003;29 Suppl 1:103-110.

- (50) Giuseppe PG, Pace G, Vicentini C. Sexual function in women with urinary incontinence treated by pelvic floor transvaginal electrical stimulation. *J Sex Med* 2007;4:702-707.
- (51) BURCH JC. Urethrovaginal fixation to Cooper's ligament for correction of stress incontinence, cystocele, and prolapse. *Am J Obstet Gynecol* 1961;81:281-290.
- (52) Mcguire EJ, Lytton B. Pubovaginal sling procedure for stress incontinence. *J Urol* 1978;119:82-84.
- (53) Albo ME, Richter HE, Brubaker L et al. Burch colposuspension versus fascial sling to reduce urinary stress incontinence. *N Engl J Med* 2007;356:2143-2155.
- (54) Ulmsten U, Henriksson L, Johnson P, Varhos G. An ambulatory surgical procedure under local anesthesia for treatment of female urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 1996;7:81-85.
- (55) de LJ. Novel surgical technique for the treatment of female stress urinary incontinence: transobturator vaginal tape inside-out. *Eur Urol* 2003;44:724-730.
- (56) Ward K, Hilton P. Prospective multicentre randomised trial of tension-free vaginal tape and colposuspension as primary treatment for stress incontinence. *BMJ* 2002;325:67.
- (57) Ward KL, Hilton P. A prospective multicenter randomized trial of tension-free vaginal tape and colposuspension for primary urodynamic stress incontinence: two-year follow-up. *Am J Obstet Gynecol* 2004;190:324-331.
- (58) Ward KL, Hilton P. Tension-free vaginal tape versus colposuspension for primary urodynamic stress incontinence: 5-year follow up. *BJOG* 2008;115:226-233.
- (59) Moran P, Dwyer PL, Ziccone SP. Burch colposuspension for the treatment of coital urinary leakage secondary to genuine stress incontinence. *J Obstet Gynaecol* 1999;19:289-291.
- (60) Lemack GE, Zimmern PE. Sexual function after vaginal surgery for stress incontinence: results of a mailed questionnaire. *Urology* 2000;56:223-227.
- (61) Mazouni C, Karsenty G, Bretelle F, Bladou F, Gamerre M, Serment G. Urinary complications and sexual function after the tension-free vaginal tape procedure. *Acta Obstet Gynecol Scand* 2004;83:955-961.
- (62) Rogers RG, Kammerer-Doak D, Darrow A et al. Sexual function after surgery for stress urinary incontinence and/or pelvic organ prolapse: a multicenter prospective study. *Am J Obstet Gynecol* 2004;191:206-210.

- (63) Yeni E, Unal D, Verit A, Kafali H, Ciftci H, Gulum M. The effect of tension-free vaginal tape (TVT) procedure on sexual function in women with stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2003;14:390-394.
- (64) Elzevier HW, Venema PL, Nijeholt AA. Sexual function after tension-free vaginal tape (TVT) for stress incontinence: results of a mailed questionnaire. *Int Urogynecol J Pelvic Floor Dysfunct* 2004;15:313-318.
- (65) Ghezzi F, Serati M, Cromi A, Uccella S, Triacca P, Bolis P. Impact of tension-free vaginal tape on sexual function: results of a prospective study. *Int Urogynecol J Pelvic Floor Dysfunct* 2006;17:54-59.
- (66) Jha S, Moran P, Greenham H, Ford C. Sexual function following surgery for urodynamic stress incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2007;18:845-850.
- (67) Glavind K, Tetsche MS. Sexual function in women before and after suburethral sling operation for stress urinary incontinence: a retrospective questionnaire study. *Acta Obstet Gynecol Scand* 2004;83:965-968.
- (68) Maaita M, Bhaumik J, Davies AE. Sexual function after using tension-free vaginal tape for the surgical treatment of genuine stress incontinence. *BJU Int* 2002;90:540-543.
- (69) Shah SM, Bukkapatnam R, Rodriguez LV. Impact of vaginal surgery for stress urinary incontinence on female sexual function: is the use of polypropylene mesh detrimental? *Urology* 2005;65:270-274.
- (70) Weber AM, Walters MD, Piedmonte MR. Sexual function and vaginal anatomy in women before and after surgery for pelvic organ prolapse and urinary incontinence. *Am J Obstet Gynecol* 2000;182:1610-1615.
- (71) Spinosa JP, Dubuis PY, Riederer BM. Transobturator surgery for female stress incontinence: a comparative anatomical study of outside-in vs inside-out techniques. *BJU Int* 2007;100:1097-1102.
- (72) Elzevier HW, Putter H, Delaere KP, Venema PL, Nijeholt AA, Pelger RC. Female sexual function after surgery for stress urinary incontinence: transobturator suburethral tape vs. tension-free vaginal tape obturator. *J Sex Med* 2008;5:400-406.
- (73) Murphy M, van RH, Mercurio E, Haff R, Wiseman B, Lucente VR. Incontinence-related quality of life and sexual function following the tension-free vaginal tape versus the "inside-out" tension-free vaginal tape obturator. *Int Urogynecol J Pelvic Floor Dysfunct* 2008;19:481-487.

- (74) Abdel-Fattah M, Ramsay I, Pringle S et al. Randomised prospective single-blinded study comparing 'inside-out' versus 'outside-in' transobturator tapes in the management of urodynamic stress incontinence: 1-year outcomes from the E-TOT study. *BJOG* 2010;117:870-878.
- (75) Stroup DF, Berlin JA, Morton SC et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA* 2000;283:2008-2012.
- (76) Rogers RG, Bachmann G, Scarpero H et al. Effects of tolterodine ER on patient-reported outcomes in sexually active women with overactive bladder and urgency urinary incontinence. *Curr Med Res Opin* 2009;25:2159-2165.

7. Published Papers

7.1 Paper 1: Female Sexual Dysfunction

Swati Jha, Ranee Thakar

Abstract

In recent years, Female Sexual Dysfunction (FSD) which has a detrimental effect on a woman's quality of life is increasingly being recognised. It includes a range of disorders and therefore, adequate screening and diagnosis of patients is necessary before appropriate treatment can be commenced. As the etiology of FSD is often multifactorial, arising from a multitude of organic pathologies in addition to having an underlying psychological basis, the treatment is often multidisciplinary. An understanding of the etiopathogenesis is therefore imperative to management. In the past 20 years major changes have occurred in our understanding, conceptualization and treatment of sexual dysfunction. In this article we look at the prevalence, classification, etiology and management of FSD.

Introduction

Female sexual dysfunction (FSD) is a common problem which has detrimental effects on a woman's quality of life. Sexual problems are common among women but they become a dysfunction when they cause distress as opposed to a normal physiological response due to difficult circumstances. Laumann et al (1) found that SD is more prevalent in women (43%) than in men (31%). Furthermore it is associated with various psychodemographic characteristics, e.g. age, education, and poor physical and emotional health. FSD appears to be more common in women who have a history of sexual abuse or coercion(2). It is believed that in the general population up to 60% of women aged less than 60 have some degree of sexual dysfunction(3). A recently conducted international survey (The Global Study of Sexual Attitude and Behaviors) investigated behaviors, attitudes, beliefs, and satisfaction regarding sex, intimacy, and relationships among men and women aged 40-80 years. In women, 34% of respondents had

decreased sexual interest and 19% did not consider sexual intercourse to be pleasurable (4). In this same survey 23% of women reported reduced lubrication with a significant increase between 50 and 69 years. Surveys of patients in physicians' offices suggest that each year, family practitioners will see several women or couples who present with sexual problems, and even more if the physician inquires about patients' sexual health(5). Surveys have also shown a very high prevalence of sexual concerns in women seeking routine gynecological care. Nusbaum et al (2) questioned 1500 women attending a gynaecology clinic and found that 98% of the respondents reported one or more sexual concerns. The most frequent was hypoactive sexual desire (87%) followed by orgasmic disorders (83%) inadequate lubrication (5%) and dyspareunia indicative of a sexual pain disorder (72%).

The articles which form the basis of this review were identified by an electronic search of the Cochrane Library (2010), MEDLINE (1966-2010) and EMBASE (1980-2010) using a combination of medical subject headings and text words. Keywords included, 'female sexual dysfunction; difficulty with orgasm; female pain syndromes; loss of desire; sexual problems; vaginismus; psychosexual counseling'. Studies were evaluated if they assessed the definition, incidence, aetiology, diagnosis and management of FSD.

Definition and classification

FSD is defined as a disorder of sexual desire, orgasm, arousal and sexual pain that results in significant personal distress. In 1966 Masters and Johnson(6) reported that the normal female sexual response cycle consists of four successive phases -excitement, plateau, orgasm and resolution. This hypothesis was subsequently modified by Kaplan and the excitement phase was further subdivided into desire and arousal, thereby eliminating the plateau phase. These models assume a linear progression from an initial awareness of sexual desire to one of arousal with a focus on genital swelling and lubrication, to orgasmic release and resolution.

More recently the Diagnostic and Statistical Manual of Mental Disorders, 4th edition

(DSM – IV) classified FSD into 4 groups (7). The resulting diagnostic categories which included 4 groups ie sexual desire disorder, sexual arousal disorder, orgasmic disorder and pain disorders, reflected this linear and rather genitally focused model of sexual function. Each of these diagnoses is independent of the others e.g a patient with sexual desire may still be arousable and capable of orgasm. Thus, relatively discrete, non-overlapping phases of sexual response were portrayed and discrete dysfunctions defined.

However, evidence to date shows that many facets of women's sexual function are at variance with this model. Basson et al described a nonlinear model of the sex response cycle, showing overlapping phases of the sexual response in a variable sequence that blends the responses of the mind and the body(8). An international committee was convened by the American Foundation of Urological Disease to revise and expand definitions of women's sexual dysfunction (9). The committee relied on empirical and clinical research as well as clinical experience. Literature searches provided the background to extensive collaboration from September 2002 to February 2003. Informal pilot testing of the committee's conclusions in clinical practice, plus presentation to a large international audience, led to further revisions over the next 6 months, acceptance by the Second International Consensus of Sexual Medicine(10). This revised and new classification (DSM IV TR [Text revision]) is shown in Table 1 and includes 5 main groups.

Sexual Interest/Desire Disorder

There are absent or diminished feelings of sexual interest or desire, absent sexual thoughts or fantasies and a lack of responsive desire. Motivations (here defined as reasons/incentives) for attempting to have sexual arousal are scarce or absent. The lack of interest is considered to be beyond the normative lessening with life cycle and relationship duration.

Arousal Disorder

Subjective Sexual Arousal Disorder: Absence of or markedly diminished feelings of sexual arousal (sexual excitement and pleasure) from any type of sexual stimulation. Vaginal lubrication or other physical response still occur.

Combined Genital and Subjective Arousal Disorder: Absence of or markedly diminished feelings of sexual arousal (sexual excitement and pleasure) from any type of sexual stimulation as well as complaints of absent or impaired genital sexual arousal (vulval swelling, lubrication).

Genital Sexual Arousal Disorder: Complaints of absent or impaired genital sexual arousal. Self report may include minimal vulval swelling or vaginal lubrication from any type of sexual stimulation and reduced sexual sensations from caressing genitalia. Subjective sexual excitement still occurs from nongenital stimuli.

Orgasmic Disorder

Despite the self-report of high sexual arousal/excitement, there is either lack of orgasm, marked diminished intensity of orgasmic sensations or marked delay of orgasm of any kind of stimulation.

Sexual Pain disorder

Dyspareunia

Recurrent or persistent pain with attempted or complete vaginal entry and/or penile vaginal intercourse

Vaginismus

Persistent or recurrent difficulties of the woman to allow vaginal entry of a penis, a finger, and/ or any object, despite the woman's expressed wish to do so. There is often (phobic) avoidance and anticipation/fear/experience of pain, along with variable involuntary pelvic muscle contraction.

Persistent Sexual Arousal Disorder

Spontaneous intrusive and unwanted genital arousal (eg tingling, throbbing, pulsating) in the absence of sexual interest and desire. The arousal is unrelieved by one or more orgasms and the feelings of arousal persist for hours or days.

Constant modifications in the classification have resulted in confusion amongst different bodies and make it difficult to compare studies looking at FSD due to these changing criteria. In addition any system of classification attempts to classify FSD into distinct groups though quite often clinically they are very difficult to categorise as such.

Etiology

Throughout a woman's life changes in sexual function occur. These normative changes are related to age and the menopause, pregnancy, parturition and breastfeeding. There are longitudinal studies showing a decline in desire and interest in sex with both the menopause and aging(11;12). Despite this the actual frequency of any partnered sexual activity may or may not change given that women have many reasons to engage in sex other than desire(1;13). It has also been shown that even years after menopause, an increase in desire and interest is consistently reported with a new relationship (14).

There is also a reduction in sexual desire and frequency of intercourse related to pregnancy (15). These have been linked to women's fear of causing a miscarriage or harm to the fetus. Fatigue, physical discomfort, and feeling less attractive are other reasons. The latter reasons have also been implicated in breastfeeding mothers (15). Data on the impact of childbirth on sexual function is conflicting. There is a dearth of scientifically reliable data about the impact of childbirth on sexual function and the association with the different modes of delivery. It is widely reported that postpartum dyspareunia is associated with the mode of delivery with assisted vaginal delivery being predominantly incriminated with at least a twofold increase in dyspareunia when compared to spontaneous vaginal delivery(16;16). Though a study by Buhling et al(17) found the highest dyspareunia after operative vaginal delivery, and least with elective C/S, this decreased uniformly in each group by 6 months. Operative vaginal deliveries had a persistent rate of dyspareunia of 14%, but there was no difference between the

spontaneous vaginal delivery group with an intact perineum and C/S (3.4% dyspareunia at 6 months). Interestingly, at 3 months postpartum, all of the patients reported “enjoyment at sexual intercourse” regardless of the mode of delivery. Women with an intact perineum or first-degree perineal tear 6 months postpartum were more likely to experience orgasm(17;18) than those with either second, third, or fourth-degree perineal tear.

Emotions for the partner and the relationship with their partner during intercourse together with general emotional well being were identified as the strongest predictors of sexual health by Bancroft et al (19). They conducted a telephone survey of 987 white or black/African American women aged 20-65 years, with English as first language, living for at least 6 months in a heterosexual relationship. The participation rate was 53.1%. Weighting was applied to increase the representativeness of the sample. A total of 24.4% of women reported marked distress about their sexual relationship and/or their own sexuality. Feeling emotionally close to their partner during sexual activity decreased the odds of ‘slight distress’ by 33% relative to ‘no distress’ and ‘marked distress’ by 43%. Physical aspects of sexual response in women, including arousal, vaginal lubrication, and orgasm, were poor predictors. In general, the predictors of distress about sex did not fit well with the original DSM-IV (7) criteria for the diagnosis of sexual dysfunction in women.

Traditionally psychological and interpersonal factors have been implicated and non sexual distractions of daily life may preclude arousal (20). Sexual distractions also play an important role and include concerns related to being insufficiently aroused, reaching orgasm, male partners delayed ejaculation, fear of unwanted pregnancy or STD and lack of privacy (19-21). Mental well being has been shown to be a robust predictor of sexual desire and responsivity in longitudinal (11) and cross sectional (22) studies of menopausal women. Women who defined themselves as being in good mental health were much less likely to report distress about their sexual relationship compared to women who had lower self rated mental health scores(19). Healthier women were 59% less likely to report distress about their relationship. Studies have shown a high

correlation of desire complaints with measures of low self image, mood instability and tendency towards worry and anxiety (23). Differences between a group of women with a desire disorder without clinical depression and a control group of healthy women with no problems was significant for most scales in the Narcissism Inventory(23). Women with desire disorders had anxiety issues, low self esteem, emotional instability and neuroticism. Sexual arousal and orgasm problems on the other hand were more prevalent in women who could not tolerate loss of control generally.(23)

Recent studies have shown that socioeconomic factors place a person at higher risk too. A particular risk factor is poor educational background or low socioeconomic class (1). Memories of past negative sexual experiences, including coercive or abusive relationships and expectations of negative outcome from dyspareunia or partner sexual dysfunction all adversely impact on sexual function (24).

With advancing research on FSD it has been identified that the primary medical conditions causing FSD can be a hormonal, anatomical, vascular and neural. During sexual arousal, blood flow to the clitoris and labia increase, leading to engorgement of these organs which in turn results in protrusion of the glans clitoris and eversion and engorgement of the labia minora. This is associated with increased blood flow to the vagina and uterus leading to increased secretion from the uterus and Bartholins glands, which lubricates the vagina. Further lubrication comes from transudate from the vaginal walls. As intact sensation is therefore important in arousal, poorer levels of sexual functioning may be expected in diabetic women with peripheral neuropathy. Vascular compromise may result in decreased lubrication and/ or subsequent dyspareunia. Sexual Dysfunction after pelvic surgery may be due to either interruption of the vascular supply or neurological innervations. Orgasm on the other hand requires an intact sympathetic nervous system hence orgasmic disorders are common in women with spinal cord injuries. Commonly associated causes are shown in Table 2. Therefore though psychological and interpersonal factors can not be undermined, with a better understanding of the condition it is now known that a number of illnesses can cause FSD too. Chronic diseases such as diabetes mellitus, chronic kidney disease, cancer, spinal

cord injury, lupus, rheumatic diseases, Parkinson's disease, fibromyalgia and chronic pain have all been identified to impact on sexual function adversely. A number of drugs have also been implicated in the causation of FSD and are shown in Table 3.

Hormonal balance is essential to maintaining sexual function. Estradiol, Nitric Oxide(NO) and Vasointestinal polypeptides (VIPs) (25) have all been identified as playing a role and helping to maintain integrity of vaginal mucosal epithelium and promote lubrication. There appears to be a lack of direct correlation between estrogen levels and sexual symptoms(26) and estrogen at baseline levels is required to make vasointestinal peptides and NO effective. NO is a major neurotransmitter allowing the congestion of clitoral tissue(27). VIPs have a similar mechanism of action and increase blood flow through the vagina(25). Generation of NO and VIPs is impaired in postmenopausal women(28) and estrogen therapy causes up regulation of vascular estrogen receptors(29). Endothelial dependent flow mediated vasodilatation in healthy women, which is mostly mediated by these neurotransmitters is enhanced by even short term administration of estrogen. This is achievable with even local estrogen therapy which can not only prevent but also reverse mild to moderate atrophy. Estrogen replacement therapy in postmenopausal women has therefore been shown to improve vaginal lubrication and sexual desire(30;31).

Testosterone is the predominant androgen in women. The adrenal glands and ovaries are the major source for testosterone synthesis. Circulating androstenedione, which is also a major source of testosterone, is derived from the adrenal glands and ovaries. Decreasing levels of testosterone are associated with decreased libido, arousal, sexual response, sensation and orgasm and therefore declines after the menopause(32;33). Testosterone also influences the central nervous system and affects sexual behaviour and is also believed to be beneficial in improving sexual desire in women who go through a surgical menopause(34). Of concern however is the lack of long term safety data for testosterone supplementation in premenopausal women and results from randomized controlled trails have been conflicting(35). The hormone tests which may be

considered in women with FSD depending on the underlying condition are shown in Table 4.

Clinical Evaluation

Gynaecologists have varying levels of experience and expertise both in the identification of and subsequent management of FSD. Occasionally women present directly with sexual dysfunction. However, more often women present with more covert symptoms of pelvic pain, distress about menses, general dissatisfaction with a contraceptive precaution, and expression of distaste for the genital area or dissociation at the time of genital examination. A sympathetic doctor will be alert to these clues and will ask open-ended questions to explore these issues. A series of screening questions(36) as shown in table 5 help identify women wishing further treatment for underlying dysfunction. Women expect their doctors to be able to discuss sexual problems, but some doctors feel uncomfortable talking about sex and may not see it as part of their clinical role. Taking even a brief sexual history during a new patient visit is very effective and indicates to the patient that the discussion of sexual concerns is appropriate and is a routine component of an office visit. Many health-related conditions, life events, or developmental milestones put patients at higher risk for sexual problems and provide opportunity to inquire about associated changes in sexual function. Urogynaecology surgeries or problems, menopause and depression, for example, are risks for the development of sexual problems, and physicians can normalize the frequency with which women find that medical issues give rise to sexual issues. It can be helpful to link a woman's current reproductive stage or presenting issue such as surgery to her sexual function. (37).

Physician discomfort in broaching issues of FSD may be related to a number of reasons and has been detailed in the study by Humphery et al(38) and Roos et al(39). Table 6 lists a few causes. The decision to treat depends very much on the level of individual expertise and the complexity of the dysfunction as well as underlying pathophysiology. Some sexual problems are best treated by specialists such as a sex or marital therapist,

alone or in the context of a multidisciplinary approach. Referrals are more likely to be accepted by patients when the physician normalizes both the nature of the patient's problem and the process of referral to a specialist(37). When a sexual problem is identified during initial screening, it should be determined whether (a) the concern can be addressed during the current appointment, (b) a follow-up visit is needed to allow more time to address the concern adequately, or (c) the sexual problem is beyond the physician's scope of training and the patient should be referred to a specialist. It is always helpful to legitimize the sexual problem and to attend to patient discomfort by deferring sensitive questions to a subsequent visit or by supplying alternative terminology for patients who seem too embarrassed to provide explicit sexual details(40).

A thorough sexual history should include medical, reproductive, surgical, psychiatric, social, and sexual information(41-43). Relevant content would include a past medical history, current health status, reproductive history, endocrine system review, thyroid conditions, and psychiatric illness. The current use of medicines, including prescription drugs, over-the-counter medications, and alternative medicines should also be identified. A detailed clinical examination is important to making a diagnosis and establishing the cause of FSD. Physical examination should include a pelvic examination to search for evidence of vaginal atrophy, dryness, and pain triggering spots. For professionals working in a clinical environment, time is of the essence. There may not be time to practically include sexual function in a clinical encounter. To help with the time issue, some clinicians use validated research instruments designed to define the degree of sexual dysfunction. This monitors baseline sexual problems and the response to treatment. One such questionnaire is the Female Sexual Function questionnaire which assesses desire lubrication and orgasmic potential(44) though there are several others routinely used in clinical practice(45) (38;46-50). Some patient reported outcomes (PROs) assess all phases of sexual function (e.g., Female Sexual Function Index), while others focus on specific dysfunctions such as female sexual desire disorders and arousal disorders. Sexuality questionnaires play an integral role in the diagnosis and treatment

of male and female sexual dysfunctions. They are used to (1) identify/diagnose individuals with a particular dysfunction, (2) assess the severity of the dysfunction, (3) measure improvement or satisfaction with treatment, (4) examine the impact of the dysfunction on the individual's quality of life (e.g., relationship satisfaction, mood, sexual confidence), and (5) study the impact of the dysfunction on the partner and his or her quality of life(51).

When obtaining a sexual history, depending on the environment and time constraints, it is important to collect relevant information in a timely manner. If the patient has seen a clinician prior to the appointment, and the clinician seems concerned about the patient's sexual wellness, has a professional demeanor, and seems comfortable and understanding, it will make the sexual interview much more relaxing, honest, and helpful. Assessment of sexual function can be a part of the review of systems and should take place in a private setting in which confidentiality is assured. Establishing a rapport and putting patients at ease helps to make the environment conducive for discussion of sexual problems as the patient is being asked the most intimate, detailed questions of private life. It is important to ensure the patient is in a comfortable position, relaxed, face-to-face to the clinician, and in a private setting. The patient should be clothed to eliminate the anxiety and sense of vulnerability that are commonly experienced when sitting in an examination gown(36;52). It is imperative that physicians not assume the gender of sexual partners, nor that the woman's sexual behavior is limited to an identified partner or spouse. The implication that the physician does not hold pre-conceived notions may give patients the courage to discuss a sexual concern at a later time. The practitioner should feel comfortable using sexual terminology, and be ready to listen actively as patients are more likely in turn to feel comfortable reporting their sexual concerns. The use of eye contact is vital in gaining the woman's trust and confidence. Physicians may benefit by practicing the use of explicit sexual terminology in order to reduce embarrassment, hesitation in delivery, or other signs of discomfort. A balance can be found between terminology that is not so formal as to be distancing and so informal as to be offensive or inappropriate.

While speaking to women with FSD, it is best to mirror the patient's sexual vocabulary so she can relate and understand the discussion. Wherever possible, the patient should be permitted to set the pace and the tone of conversation. Often, a question may need to be asked several times, in different ways, to get an accurate answer. It is important to ask the patient if she would like to speak with the clinician about these issues. For some women this is not a concern, and for others it is a major life event. Giving the patient permission to discuss the issues is the first step in problem solving. Some general leading questions may be necessary to initiate the conversation, and are shown in table 7(10). More specific questions can follow, once the conversation is initiated. It may be worth asking the patient her thoughts as to why she may be experiencing these problems. Educating patients about sex and correcting any myths or misconceptions they may have is time well spent. If these suggestions do not correct the situation, the issues may be more deeply rooted, or combined with other psychopathology, and may not be treated easily in the medical office setting.

Management

Management requires an understanding of psychosexual function and an ability to communicate about sexual matters. The clinician should be alert to non-verbal communications that indicate anxiety. Treatment should be individualised for each couple and to the underlying cause of FSD. Educating the patient and the partner about normal physiological response and anatomy is often necessary. In addition, physiological changes with aging and or disability and vascular dysfunction should be explained as well as the clear correlation between the patient's general health and sexual function. Prescription medication may need to be tapered or even avoided where possible. Cessation of smoking and excessive alcohol consumption may also be beneficial.

Disorders of desire are difficult to treat as and one reason that desire disorders remain elusive is that desire is a relatively complex concept that requires delineating the components for the patient and the clinician. Treatments include individual and/or couples psychotherapy/sex therapy, hormone therapy (e.g., exogenous testosterone

replacement or Tibolone, a synthetic steroid with selective estrogenic, androgenic, and progestogenic properties for postmenopausal women), and centrally acting pharmacologic agents that may have a positive impact on sexual function inhibiting serotonergic activity, facilitating dopaminergic activity, or binding to melanocyte receptors. To date, there are no pharmacologic treatments that are approved for the treatment of any female sexual disorder except the testosterone patch (Intrinsa; Warner Chilcott) which has been approved and used in but only in postmenopausal women. However, a number of treatments are currently in clinical trials. Postmenopausal women on the other hand may benefit from estrogen replacement therapy as this increases clitoral stimulation, decreases coital pain and treats vaginal atrophy. The literature on the use of testosterone in postmenopausal women remains controversial but it may have a beneficial role in women who have been through a surgical menopause following a hysterectomy and bilateral salpingoopherectomy(53;54). Sildenafil(Viagra) which has been of such great benefit in men with sexual dysfunction is beneficial in only a select group of women(55). The use of Sildenafil in women is however an unlicensed use as it does not yet have FDA approval. Where the cause of FSD is surgically correctable, this should be considered.

Although there has been little evidence-based research on treatment for female sexual arousal disorder, treatment generally follows the work of Masters and Johnson(6) who taught patients to attend adequately to sexual sensations (sensate focus) using masturbation training while working to improve communication with their partners. Success rates using these strategies are reportedly quite good. Estrogen therapy, systemic or local, is often an effective treatment for arousal disorder that is acquired after menopause and can improve vaginal blood flow and lubrication. Over-the-counter lubricants and/or long-acting vaginal moisturizers may also be helpful when lubrication has been diminished. Other topical pharmacologic treatments that are being studied include the use of androgens, alprostadil, L-arginine, and Zestra.

Disorders of orgasm are often 'situational'. These women can achieve orgasm readily and reliably with some specific forms of stimulation. For example, women are often reliably orgasmic with manual stimulation, but not with intercourse. In fact, intercourse is not a particularly reliable method for many women to achieve an orgasm. The most effective treatment is a cognitive-behavioral approach in which a woman learns to be comfortable with her body and then her own sexuality by altering negative attitudes and decreasing anxiety. The behavioral treatments include directed masturbation, sensate focus exercises, and systematic desensitization (56). Homework assignments that women can do in the privacy of their own homes are given with the goal of helping them to discover what stimulation is pleasing and effective. Eliminating myths that masturbation is bad is an important theme in treatment. Masturbation is an extremely effective way for the woman who has never achieved orgasm to experience her first climax. In privacy, without the pressure of performing for, or pleasing a partner, the woman is free to explore her own body and responsiveness. Another effective component of treatment is permission-giving by a clinician.

Identification of the initiating and maintaining factors is fundamental to the diagnosis of dyspareunia. The differential diagnoses include vaginismus, atrophy, inadequate lubrication, and vulvodynia. Urethral disorders, cystitis, and interstitial cystitis can also present with painful intercourse. Less common etiologies are adhesions, infections, endometriosis, and pelvic congestion. Dyspareunia can be described as involving pain on entry or deep pain. Painful entry is most typical of vulvodynia, inadequate lubrication, and vaginismus. A physical examination often reproduces the pain when the vagina is touched with a cotton swab or insertion of a finger. The psychobiology of sexual pain should be addressed with a comprehensive, integrated, and patient-centered perspective.

For vaginismus, the most effective treatment is a combination of cognitive and behavioral psychotherapeutic approaches. The goal is to desensitize a woman to her panic and help achieve a sense of control over a sexual encounter or a pelvic exam and

an understanding that she is in no danger of experiencing pain, thereby feeling safe and calm. In response, her body can then learn to relax and the vaginal muscle contractions will no longer be a necessary automatic defense; essentially, she will feel in more control of her muscles. One of the most commonly used treatment techniques is systematic desensitization. In this case, women are first taught deep muscle relaxation and then to very gradually insert objects (usually dilators) of increasing diameter into the vagina. Refractory vaginismus may respond to botox injections into the puborectalis(57).

The management of Persistent Sexual Arousal Disorder is unclear though there are anecdotal reports of treatment with high dose SSRIs(58). As patients feel isolated and embarrassed, the knowledge that the clinician is aware of the condition can be of help. With complex cases, it may be appropriate to refer the patient to a sex therapist or other clinician that specializes in FSD.

Psychosexual counseling

Sex therapists are trained to identify situations that require intensive therapy and to make appropriate medical referrals when necessary. On the first visit, a comprehensive interview will be conducted. An extensive history is recorded, with questions about upbringing and memories of family and social life(36). Because religious beliefs are connected closely with sexual attitudes, religious beliefs will be discussed. Questions regarding overall health, medications, and past medical history will also be included. Social issues, in reference to relationships, self-esteem, history of sexual abuse and trauma will be discussed. A comprehensive psychiatric history and assessment are conducted to help determine if psychiatric issues need to be addressed. After the evaluation is completed, the therapist will suggest what might be contributing to the problem and suggest a treatment plan. The treatment plan can be altered on a regular basis, depending on what is happening in treatment. Usually treatment is conducted with the partner unless circumstances dictate differently. Treatment focuses on

identification and examination of feelings, both from past and present experiences. The goal is to gain insight into maladaptive behaviors, improving communication between partners, and teaching new ways to deal with issues. Because most sexual dysfunctions are regarded as a couple's issue, the therapist might focus on the couple's strengths rather than weakness. If the patient is not in a current relationship, the therapist may work on individual strengths. "Homework" assignments are given at the end of a therapy session in order for the couple, or individual, to practice what was discussed in session. Assignments are geared towards teaching patients new skills. Some examples of these may be teaching the art of giving and receiving pleasure, extending mutual pleasuring (abandoning self-to-self pleasure), turning the idea of sexual obligation into pleasure, learning to focus on sensations rather than anxieties and fears, discovering harmful patterns in sexual relationships, and encouraging the patient to be open and honest about needs and frustrations in the relationship. Couples may even be asked to deliberately avoid orgasm, penetration, or even touching sexual organs for a period of time.

Further details of psychosexual counseling are beyond the scope of this review.

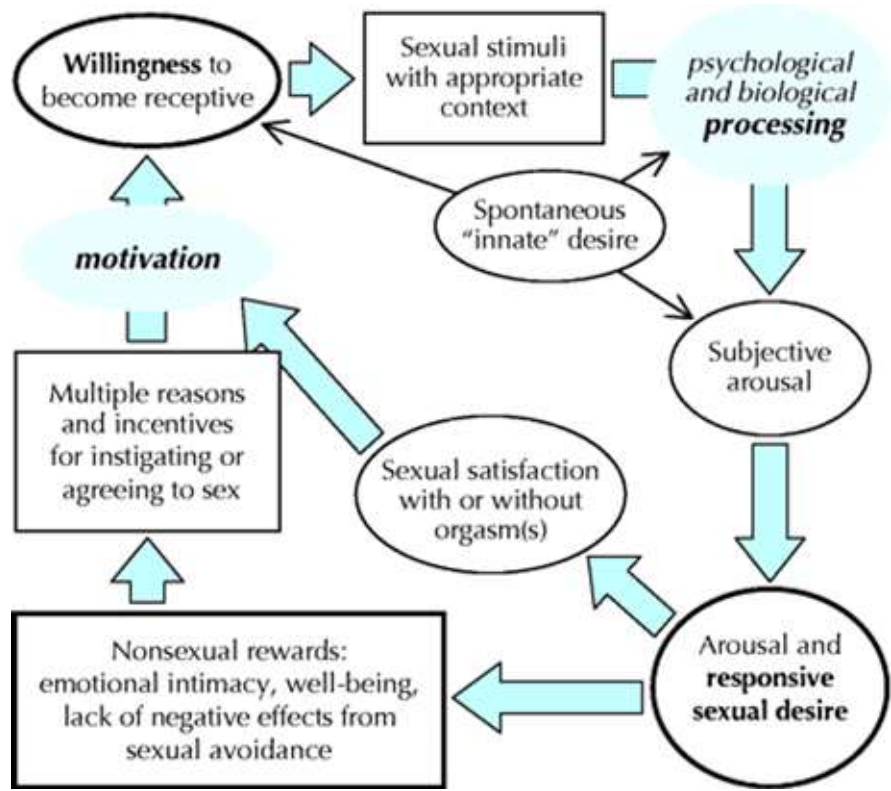
Conclusion

Female sexual dysfunction is a common problem. Most dysfunctions are thought to be psychogenic, but our understanding increases as more studies are completed, providing new outlook on the etiology of FSD. The initial discussion with the patient is of utmost importance, as some problems can be handled without referral. With more complex issues, referral to a qualified sex therapist can help deal with the problem (19)

There continue to be gaps in the body of information that clinicians need to diagnose and classify the condition hence the condition remains underreported and poorly managed. The new revised expanded definitions of FSD aim to emphasise the contextual nature of the condition and identification of the overlap of the phases. It is hoped in

future that with a further understanding of how psychological states affect biological responses we will have a greater understanding of the condition.

Figure 1. Sex response cycle, showing responsive desire experienced during the sexual experience as well as variable initial (spontaneous) desire(56).
 (published with the permission of the American College of Obstetricians and Gynecologists)



Tables

Table 1 DSM-IV classification of FSD

1. Sexual Desire Disorders
-Hypoactive sexual desire disorders
-Sexual aversion disorder
2 Female sexual arousal disorder
3 Orgasmic disorder
4 Sexual pain disorders
- Dyspareunia
- Vaginismus
- Other sexual pain disorders

Table 2. Risk factors contributing to FSD

Genital Tract atrophy
Genital surgery
Neurological disease
Stroke
Spinal Cord injury
Parkinsonism
Endocrinopathies
Diabetes
Hyperprolactinemia
Liver and adrenal failure
Sexual abuse
Peripheral Vascular Disease
Psychological factors, life stressors
Interpersonal, relationship disorders
Medications

Table 3 Suggested Hormonal investigations for FSD

Estradiol or FSH if symptoms of deficiency
Serum testosterone
DHEAS (Dehydroepiandrosterone acetate sulphate)
Free Testosterone
TFT
Prolactin

Table 4 Drugs causing FSD

Alkylating agents
Cyclophosphamide
Antiandrogens
Cimetidine
Spironolactone
Anticonvulsants
Anticholinergics
Antiestrogens
Tamoxifen
Raloxifen
GnHR analogues
Antihistamines
Antihypertensives
Diuretics
B blockers
Calcium Channel Blockers
Drugs of Abuse
Alcohol
Sedatives and hypnotics
Metoclopramide
Metronidazole
Oral contraceptives
Sympathomimetic amines

Table 5 Medical reluctance to obtain a sexual History

Lack of training
Lack of practice
Fear of 'opening the flood gates'
Covert presentation of the problem
Lack of time
Lack of effective treatments
Associated stigma
Embarrassment of doctor, patient or both
Sensitive subject
Difficult subject
Gender
Age
Culture

Table 6 Frequently asked questions to establish FSD

Are you having any sexual difficulties at this time?"

Are you having difficulties with desire for sex?"

Do you feel a sense of arousal when engaging in sexual behavior or when thinking about sexual matters?"

Do you have difficulties with lubrication, either be coming wet or staying wet?"

Do you have difficulties achieving orgasms?"

Do you have pain during or after sex?"

Do you have problems when your partner attempts penetration?"

It is not uncommon for women with hypertension, diabetes, or heart disease to experience difficulty with sexual functioning. Is this a problem for you?"

Reference List

- (1) Laumann EO, Paik A, Rosen RC. Sexual dysfunction in the United States: prevalence and predictors. *JAMA* 1999; 281(6):537-544.
- (2) Nusbaum MR, Gamble G, Skinner B, Heiman J. The high prevalence of sexual concerns among women seeking routine gynecological care. *J Fam Pract* 2000; 49(3):229-232.
- (3) Frank E, Anderson C, Rubinstein D. Frequency of sexual dysfunction in "normal" couples. *N Engl J Med* 1978; 299(3):111-115.
- (4) Brock G, Laumann E, Glasser DB, Nicolosi A, Gingell C, King R. Prevalence of sexual dysfunction among mature men and women in USA, Canada, Australia and New Zealand. *J Urol* 2003; 169((Suppl.)):315.
- (5) Nazareth I, Boynton P, King M. Problems with sexual function in people attending London general practitioners: cross sectional study. *BMJ* 2003; 327(7412):423.
- (6) Masters WH, Johnson V. *Human sexual response*. Boston: Little, Brown & Co. 1966.
Ref Type: Generic
- (7) Basson R, Berman J, Burnett A, Derogatis L, Ferguson D, Fourcroy J et al. Report of the international consensus development conference on female sexual dysfunction: definitions and classifications. *J Urol* 2000; 163(3):888-893.
- (8) Basson R. Female sexual response: the role of drugs in the management of sexual dysfunction. *Obstet Gynecol* 2001; 98(2):350-353.
- (9) Basson R, Leiblum S, Brotto L, Derogatis L, Fourcroy J, Fugl-Meyer K et al. Definitions of women's sexual dysfunction reconsidered: advocating expansion and revision. *J Psychosom Obstet Gynaecol* 2003; 24(4):221-229.
- (10) Basson R, Althof S, Davis S, Fugl-Meyer K, Goldstein I, Leiblum S et al. Summary of the recommendations on sexual dysfunctions in women. *J Sex Med* 2004; 1(1):24-34.
- (11) Dennerstein L, Lehert P, Burger H, Dudley E. Factors affecting sexual functioning of women in the mid-life years. *Climacteric* 1999; 2(4):254-262.
- (12) Dennerstein L, Hayes RD. Confronting the challenges: epidemiological study of female sexual dysfunction and the menopause. *J Sex Med* 2005; 2 Suppl 3:118-132.

- (13) Ventegodt S. Sex and the quality of life in Denmark. *Arch Sex Behav* 1998; 27(3):295-307.
- (14) Dennerstein L, Dudley E, Burger H. Are changes in sexual functioning during midlife due to aging or menopause? *Fertil Steril* 2001; 76(3):456-460.
- (15) Byrd JE, Hyde JS, Delamater JD, Plant EA. Sexuality during pregnancy and the year postpartum. *J Fam Pract* 1998; 47(4):305-308.
- (16) Barrett G, Pendry E, Peacock J, Victor C, Thakar R, Manyonda I. Women's sexual health after childbirth. *BJOG* 2000; 107(2):186-195.
- (17) Buhling KJ, Schmidt S, Robinson JN, Klapp C, Siebert G, Dudenhausen JW. Rate of dyspareunia after delivery in primiparae according to mode of delivery. *Eur J Obstet Gynecol Reprod Biol* 2006; 124(1):42-46.
- (18) Signorello LB, Harlow BL, Chekos AK, Repke JT. Postpartum sexual functioning and its relationship to perineal trauma: a retrospective cohort study of primiparous women. *Am J Obstet Gynecol* 2001; 184(5):881-888.
- (19) Bancroft J, Loftus J, Long JS. Distress about sex: a national survey of women in heterosexual relationships. *Arch Sex Behav* 2003; 32(3):193-208.
- (20) Hartmann U, Philippsohn S, Heiser K, Ruffer-Hesse C. Low sexual desire in midlife and older women: personality factors, psychosocial development, present sexuality. *Menopause* 2004; 11(6 Pt 2):726-740.
- (21) Heiser K, Ruffer-Hesse C, Kloth G, Hartmann U. [Female sexuality and its disorders from the psychological viewpoint]. *Zentralbl Gynakol* 2000; 122(11):566-570.
- (22) Avis NE, Stellato R, Crawford S, Johannes C, Longcope C. Is there an association between menopause status and sexual functioning? *Menopause* 2000; 7(5):297-309.
- (23) Hartmann U, Heiser K, Ruffer-Hesse C, Kloth G. Female sexual desire disorders: subtypes, classification, personality factors and new directions for treatment. *World J Urol* 2002; 20(2):79-88.
- (24) Graham CA, Sanders SA, Milhausen RR, McBride KR. Turning on and turning off: a focus group study of the factors that affect women's sexual arousal. *Arch Sex Behav* 2004; 33(6):527-538.
- (25) Palle C, Bredkjaer HE, Ottesen B, Fahrenkrug J. Peptide histidine methionine (PHM) increases vaginal blood flow in normal women. *Peptides* 1990; 11(3):401-404.

- (26) Van Lunsen RH, Laan E. Genital vascular responsiveness and sexual feelings in midlife women: psychophysiologic, brain, and genital imaging studies. *Menopause* 2004; 11(6 Pt 2):741-748.
- (27) Burnett AL, Calvin DC, Silver RI, Peppas DS, Docimo SG. Immunohistochemical description of nitric oxide synthase isoforms in human clitoris. *J Urol* 1997; 158(1):75-78.
- (28) Taddei S, Viridis A, Ghiadoni L, Mattei P, Sudano I, Bernini G et al. Menopause is associated with endothelial dysfunction in women. *Hypertension* 1996; 28(4):576-582.
- (29) Mendelsohn ME, Karas RH. The protective effects of estrogen on the cardiovascular system. *N Engl J Med* 1999; 340(23):1801-1811.
- (30) Berman JR, Goldstein I. Female sexual dysfunction. *Urol Clin North Am* 2001; 28(2):405-416.
- (31) Palle C, Bredkjaer HE, Fahrenkrug J, Ottesen B. Vasoactive intestinal polypeptide loses its ability to increase vaginal blood flow after menopause. *Am J Obstet Gynecol* 1991; 164(2):556-558.
- (32) Sherwin BB, Gelfand MM. Differential symptom response to parenteral estrogen and/or androgen administration in the surgical menopause. *Am J Obstet Gynecol* 1985; 151(2):153-160.
- (33) Basson R. Androgen replacement for women. *Can Fam Physician* 1999; 45:2100-2107.
- (34) Alexander JL, Kotz K, Dennerstein L, Kutner SJ, Wallen K, Notelovitz M. The effects of postmenopausal hormone therapies on female sexual functioning: a review of double-blind, randomized controlled trials. *Menopause* 2004; 11(6 Pt 2):749-765.
- (35) Barnhart KT, Freeman E, Grisso JA, Rader DJ, Sammel M, Kapoor S et al. The effect of dehydroepiandrosterone supplementation to symptomatic perimenopausal women on serum endocrine profiles, lipid parameters, and health-related quality of life. *J Clin Endocrinol Metab* 1999; 84(11):3896-3902.
- (36) Kingsberg SA, Janata JW. Female sexual disorders: assessment, diagnosis, and treatment. *Urol Clin North Am* 2007; 34(4):497-4vi.
- (37) Kingsberg SA. Taking a sexual history. *Obstet Gynecol Clin North Am* 2006; 33(4):535-547.
- (38) Humphery S, Nazareth I. GPs' views on their management of sexual dysfunction. *Fam Pract* 2001; 18(5):516-518.

- (39) Roos AM, Thakar R, Sultan AH, Scheer I. Female sexual dysfunction: are urogynecologists ready for it? *Int Urogynecol J Pelvic Floor Dysfunct* 2009; 20(1):89-101.
- (40) Basson R. Introduction to special issue on women's sexuality and outline of assessment of sexual problems. *Menopause* 2004; 11(6 Pt 2):709-713.
- (41) Berman JR, Berman L, Goldstein I. Female sexual dysfunction: incidence, pathophysiology, evaluation, and treatment options. *Urology* 1999; 54(3):385-391.
- (42) Hatzichristou D, Rosen RC, Broderick G, Clayton A, Cuzin B, Derogatis L et al. Clinical evaluation and management strategy for sexual dysfunction in men and women. *J Sex Med* 2004; 1(1):49-57.
- (43) Clayton AH. Sexual function and dysfunction in women. *Psychiatr Clin North Am* 2003; 26(3):673-682.
- (44) Kaplan SA, Reis RB, Kohn IJ, Ikeguchi EF, Laor E, Te AE et al. Safety and efficacy of sildenafil in postmenopausal women with sexual dysfunction. *Urology* 1999; 53(3):481-486.
- (45) Rosen RC. Measurement of male and female sexual dysfunction. *Curr Psychiatry Rep* 2001; 3(3):182-187.
- (46) Rogers RG, Coates KW, Kammerer-Doak D, Khalsa S, Qualls C. A short form of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12). *Int Urogynecol J Pelvic Floor Dysfunct* 2003; 14(3):164-168.
- (47) Rogers RG, Kammerer-Doak D, Villarreal A, Coates K, Qualls C. A new instrument to measure sexual function in women with urinary incontinence or pelvic organ prolapse. *Am J Obstet Gynecol* 2001; 184(4):552-558.
- (48) Derogatis L, Rust J, Golombok S, Bouchard C, Nachtigall L, Rodenberg C et al. Validation of the profile of female sexual function (PFSF) in surgically and naturally menopausal women. *J Sex Marital Ther* 2004; 30(1):25-36.
- (49) McGahuey CA, Gelenberg AJ, Laukes CA, Moreno FA, Delgado PL, McKnight KM et al. The Arizona Sexual Experience Scale (ASEX): reliability and validity. *J Sex Marital Ther* 2000; 26(1):25-40.
- (50) Meston CM. Validation of the Female Sexual Function Index (FSFI) in women with female orgasmic disorder and in women with hypoactive sexual desire disorder. *J Sex Marital Ther* 2003; 29(1):39-46.
- (51) Althof SE, Symonds T. Patient reported outcomes used in the assessment of premature ejaculation. *Urol Clin North Am* 2007; 34(4):581-9, vii.

- (52) Tomlinson J. ABC of sexual health: taking a sexual history. *BMJ* 1998; 317(7172):1573-1576.
- (53) Shifren JL. The role of androgens in female sexual dysfunction. *Mayo Clin Proc* 2004; 79(4 Suppl):S19-S24.
- (54) Shifren JL, Braunstein GD, Simon JA, Casson PR, Buster JE, Redmond GP et al. Transdermal testosterone treatment in women with impaired sexual function after oophorectomy. *N Engl J Med* 2000; 343(10):682-688.
- (55) Caruso S, Intelisano G, Lupo L, Agnello C. Premenopausal women affected by sexual arousal disorder treated with sildenafil: a double-blind, cross-over, placebo-controlled study. *BJOG* 2001; 108(6):623-628.
- (56) Meston C, Levin R. Female orgasmic dysfunction. 2005. *Handbook of sexual dysfunction*. Balon R and Segraves R.
Ref Type: Generic
- (57) Ghazizadeh S, Nikzad M. Botulinum toxin in the treatment of refractory vaginismus. *Obstet Gynecol* 2004; 104(5 Pt 1):922-925.
- (58) Leiblum SR, Goldmeier D. Persistent genital arousal disorder in women: case reports of association with anti-depressant usage and withdrawal. *J Sex Marital Ther* 2008; 34(2):150-159.

7.2 Paper 2: Problems associated with sexual activity

Swati Jha

Female sexual dysfunction (FSD) is defined as a sexual desire, sexual arousal, orgasm and/or sexual pain disorder which causes personal distress (Table 1). FSD is a relatively common health issue for women with a community prevalence of 30% to 50% (1). The wide range of the reported percentages depends on the impact of different concomitant factors on sexual function, such as interpersonal, emotional relationship and well-being, and psychological factors. Studies have shown that FSD and other sexual problems have been linked to a “diminished quality of life, low physical satisfaction, low emotional satisfaction, and low general happiness”(2). Women’s sexuality and sexual function are very complex issues, strongly modulated by psychosocial situation and this necessitates a biopsychosocial approach for understanding the basis of dysfunction which has been dealt with elsewhere in this text book. Physiological events such as pregnancy, childbirth, menopause, aging as well as gynecological conditions like infertility, prolapse, urinary incontinence, and gynecological cancers, have an impact on sexual well-being. The interaction of these conditions with sexual health needs to be better understood to deal effectively with the problems as a whole.

Sexual dysfunction is highly prevalent in women attending urogynaecological services with a prevalence of 50% -64%(3-5). Furthermore, urogynaecological surgery represents an important but underestimated cause of FSD. Different problems of the pelvic floor can impact on sexual activity in different ways. Interest in and publications about female sexual dysfunction (FSD) are very recent (3).

In this chapter we review the correlation of common urogynaecological conditions on sexual activity and the impact of their treatment.

URINARY INCONTINENCE (UI)

Urinary incontinence is a common condition and epidemiological studies suggest that it affects up to 41% of the adult female population(6). It is a health burden, and impacts on social, psychological, occupational, domestic, physical and sexual well being (7-10). Women reporting LUTS or urinary incontinence (UI) complain of a deteriorating quality of life (QoL) in terms of social and psychological problems, and also of sexual dysfunctions in significantly greater numbers than the general healthy population, as reported in a recent cross-sectional study(11). Table 2 shows the prevalence of urinary incontinence during sexual activity as shown in different population groups.

Complaints of stress urinary incontinence (SUI), overactive bladder (OAB), and lower urinary tract symptoms have negative impact on all domains of sexual function(7;11). In this population of women, the symptoms per se, along with fear of odour, embarrassment, shame, loss of self-esteem and fear of, or actual occurrence of, incontinence are contributory factors. The most common sexual complaints in women with urinary incontinence are low desire, vaginal dryness, and dyspareunia(12).

Even in community dwelling women aged over 55, 5% were not sexually active due to urinary incontinence, and 25% of these sexually active women reported a negative influence of urine loss on their sex life(13).

In women with SUI prevalence of coital incontinence ranges from 11-70%(14-18). Traditional teaching has been that urodynamic stress incontinence(USI) is associated with penetration incontinence and detrusor overactivity with orgasm incontinence(16), however subsequent studies by Moran et al(17)have failed to confirm this association. In their observational study USI was associated with high rates of penetration incontinence(80%), orgasm incontinence (93%) and a combination of the two(92%). Jha et al(18) co-related different urodynamic diagnosis to orgasm or penetration incontinence and found no association.

Among the different types of urinary incontinence, OAB has a particularly high association with sexual dysfunction in various studies(19-21), which could be indicative of an underlying psychosomatic disorder(22). However studies assessing overall prevalence of sexual dysfunction in women with OAB and the impact on Quality of life remains controversial(23) whereas menopausal and partner status have been shown to be the better predictors(24).

Till recently the impact of treating incontinence on sexual function has been controversial. Before the introduction of minimally invasive suburethral sling procedures, Burch colposuspension was regarded as the “gold standard” for the surgical correction of SUI. There is some data regarding the impact of colposuspension on sexual health. Moran et al.(25) evaluated 55 women with SUI who reported coital incontinence before undergoing colposuspension. Preoperative coital leakage occurred in 65% with penetration, in 16% with orgasm, and 18% with both. After surgery, 81% of the women reported no coital incontinence. Baessler et al (14) showed similar improvements in coital incontinence following a colposuspension.

The impact of midurethral slings, specifically tension-free vaginal tape (TVT) on female sexual function has been unclear. Different studies have shown different outcomes, with some suggesting deterioration(26-29) of sexual function, some an improvement (30-32) whereas others were equivocal(33-36). Deterioration in function may be associated with dyspareunia(29), loss of libido or partner associated discomfort. There have also been anecdotal reports of anorgasmia after TVT probably related to passage of the trocar and subsequent injury to the dorsal nerve of the clitoris (37). However, there seemed to be a consensus that TVT reduces coital incontinence rates by three - to sixfold(29;33;38).

The Obturator approach appeared to have an overall beneficial effect (37;39) on sexual function comparable to the retropubic approach (TVT) (40). In a comparison of the

outside in and the inside out technique, reports are conflicting with one study suggesting the inside out (TVT-O) to be better (39) and another study showing the outside in technique (TOT) to be superior(37).

Jha et al(41) conducted a systematic review of all continence procedures and the impact of treating urinary incontinence on sexual function. They found that coital incontinence was significantly reduced following continence surgery. However though the pooled results suggest a 2 to 3 times greater likelihood of improvement compared to deterioration in sexual function, at least half of all women undergoing surgery for stress incontinence are likely to experience no change in sexual function. There was no difference in sexual function following the two most commonly performed procedures for SUI ie the TVT and TOT/TVT-O.

In sexually active women with overactive bladder and concurrent sexual dysfunction, sexual quality of life, PISQ (Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire) scores, and anxiety states were all improved with corresponding improvement in OAB scores by treatment with anticholinergics (42;43). Treatment of OAB has also been shown to improve with both percutaneous tibial nerve stimulation(44) and Sacral nerve stimulation too(45).

PELVIC ORGAN PROLAPSE (POP)

Pelvic organ prolapse (POP) is a common medical problem in parous women and particularly with advancing age. As life expectancy increases, this is acquiring greater significance, and 20% of women on Gynecology waiting lists in the UK are awaiting prolapse surgery demonstrating the enormity of this virtual pandemic. The incidence of prolapse requiring surgical correction in women who have had a hysterectomy is 3.6 per 1000 person years of risk; the cumulative risk is 1% at 3 years and 5% at 17 years after a hysterectomy(46).

A review of literature shows conflicting results on the impact of prolapse on sexual function, with some studies showing a deterioration of function and others showing no impact (12). In their observational study looking at 1299 participants, 495 (38.1%) had evidence of pelvic floor disorders. Sexual complaints were significantly more common among women with pelvic floor disorders (53.2% vs 40.4%, $P < .01$) and when a multiple regression model, urinary incontinence was significantly associated with low libido (odds ratio [OR] 1.96), vaginal dryness (OR 2.11), and dyspareunia (OR 2.04), independent of age, educational attainment, and race. In contrast, pelvic organ prolapse was not associated with any sexual complaint. A study by Weber et al (47) comparing 80 women with prolapse with or without incontinence and 30 controls (women with no prolapse) showed no difference in Global sexual function score, vaginal dryness, dyspareunia, interest in sexual activity or satisfaction with their sexual relationship. They concluded that women with prolapse and urinary incontinence do not differ from continent women without prolapse in measures of sexual function and age is the most important predictor of sexual function. Burrows et al (48) came to similar conclusions in their retrospective study of 352 women with prolapse. They also found that prolapse severity did not impact on sexual function. The study by Barber et al(49) comparing the impact of prolapse and incontinence on sexual function found completely the opposite results. In their review of 343 community dwelling women with either symptomatic prolapse or incontinence, they found that prolapse was more likely to influence sexual function than urinary incontinence. This study also demonstrated that treatment of prolapse was less

likely to impact on change in sexual function whereas treatment of incontinence resulted in a mild improvement in sexual function.

Other studies have shown prolapse causes several problems with sexual function including discomfort, urinary incontinence (40%) (both orgasm and penetration), obstruction and dryness during intercourse. Women with prolapse were more likely to have urinary and or fecal incontinence during sexual activity, more dyspareunia and fewer orgasms. They were also more likely to report negative emotional reactions associated with sex and higher rates of embarrassment leading to avoidance of sex (50). Presence of both prolapse and incontinence has a cumulative negative effect on sexual function, with libido, sexual excitement, and orgasm being significantly affected. Increasing severity of prolapse is associated with symptoms related to urinary incontinence, voiding, defecatory, and sexual dysfunction, which do not necessarily correlate with the location of prolapse and therefore are not compartment-specific(51).

The problem with assessment of sexual function in the different studies reported in literature is that

1. Different tools have been used in different studies
2. Studies cluster prolapse and incontinence under the same umbrella
3. Study groups are small
4. Different types of prolapse clumped together (different compartments, diff grades)

There are a multitude of studies reporting on the impact of prolapse surgery on sexual function but the results are very conflicting with some being equivocal reporting no impact of prolapse correction on sexual function and others demonstrating a deterioration of sexual function following prolapse treatment. The cause of sexual dysfunction following vaginal surgery may be classified as organic and/or psychosocial(52). Organic causes are anatomical, physiological, vascular, neural and hormonal. Psychosocial factors on the other hand such as life stressors, anxiety and

depression must be borne in mind. Altered perception of genital health after surgery, both by the woman and her partner, with associated apprehension and fear of damage to the internal organs, can also be contributory factors for a negative impact on sexual function.

The verdict is still open on the impact that prolapse has on sexual function, and larger epidemiological studies are required to substantiate or refute the currently available conflicting evidence. This will also be partly achieved by the long term follow up of randomized controlled trials. When counseling women with a prolapse and particularly before treatment, these factors should feature in the discussion and aid decision making. This allows more realistic expectations from the treatments available, and avoids disappointment when those goals are not met. There remain many unanswered questions, but it is important to remember that the presence of anatomical defect does not imply dysfunction. The goal of pelvic surgery should be restoration of anatomic support without deleterious effects on visceral and sexual function. Data is currently limited on quality of life and sexual function following both traditional and graft-reinforced anterior vaginal prolapse surgery and further research is required to determine whether surgical technique and type of graft used impact surgical outcome and complications before introduction into routine clinical practice. Women should be counselled and managed depending on current best available evidence.

Current treatment options for vaginal wall prolapse include pelvic floor muscle training (Physiotherapy), use of topical HRT, use of mechanical devices (ring or shelf pessaries) and surgery, with or without mesh reinforcement. The impact of these different forms of treatment for prolapse on sexual function are discussed here.

Physiotherapy

In their Systematic Review looking at the benefits of pelvic floor muscle training (PFMT), Hagen et al(53) identified some benefit on sexual function in women with mild prolapse. But even more reassuringly women who were currently performing PFMT scored

significantly better on several aspects of sexual function (54;55). and is therefore to be encouraged in women.

Oestrogen therapy

There are no studies looking at the impact of oestrogen therapy in women with prolapse or its impact on sexual function. However several studies have shown an individual improvement in symptoms of atrophic vaginitis which may negatively impact on sexual function even in the absence of prolapse, hence may be considered for that indication.

Pessaries

There are a variety of pessaries available, made of rubber, plastic, or silicone-based material. The commonest pessaries are the rings and shelf, but other types being increasingly used are the inflatable, the doughnut and the Gellhorn all of which have slightly different uses and specifications. A recent study by Kuhn et al (56), demonstrated desire, lubrication, and sexual satisfaction significantly improved with pessary use, though orgasm remained unchanged (Figure 1).

A comparison of sexual function in women with pessaries or surgery(57) for the treatment of POP found a significant improvement in sexual function in both groups though there was increased frequency of intercourse in the surgery group (54% vs 46%; $p = 0.028$), which was not significant when controlled for age.

Lowenstein et al (58) on the other hand found greater improvement following surgery than use of pessaries and this appeared to be related to altered self-perceived body image.

Surgery

Richard TeLinde said, "Every surgeon of extensive and long experience will have to admit that he is not entirely and absolutely satisfied with the long term results of all his operations for prolapse and allied conditions" and this is further substantiated by the

repeat surgery rates for recurrent prolapse being in the region of 30 %(59). White in 1908 said “Plastic gynaecology remains the last unsolved problem of surgical gynaecology” and this remains true even in the 21st century.

Surgical correction of prolapse depends largely on the compartment which is affected. So for vaginal wall prolapse it may involve an anterior colporrhaphy/ anterior vaginal wall repair, posterior colporrhaphy/ posterior vaginal wall repair or a vaginal hysterectomy. For a vaginal vault prolapse surgical correction may require a sacro-spinous fixation, an abdominal sacro-colpopexy or an Infracoccygeal procedures which may involve the use of trocar systems (eg Apogee, Post I-Stop).

Though Weber et al(35) identified a decrease in the vaginal dimensions after surgery for prolapse, this was associated with either no alteration in sexual function or a mild improvement. Dua et al had similar conclusions following Anterior or posterior repair(60). When an anterior repair was combined with a posterior repair Anterior vaginal repair does not appear to impact adversely on postoperative sexual function or cause dyspareunia. Nevertheless, there are very few data confirming this paradigm. Weber (61) compared three surgical techniques for cystocele repair, the dyspareunia rate reduced from 30% preoperatively to 22% postoperatively.

An anterior repair (with or without a vaginal hysterectomy for prolapse does not impact adversely on sexual function (60;62). Both Colombo (63) and Van Geelen (64) found that anterior repair when compared to a Burch colposuspension for a cystocele did not predispose to dyspareunia. Though it was associated with significant vaginal shortening when compared to the Burch, this did not appear to impact on function unless combined with a posterior repair.

Combining a posterior vaginal wall repair with anterior colporrhaphy may however increase dyspareunia rates and there may be a place for doing the two procedures separately where feasible. This would also indicate that a prophylactic posterior repair

should be avoided at the time of an anterior repair in sexually active women. This was also shown in the study by Dua et al(60).

Studies looking at posterior vaginal wall defect are more confusing and whereas earlier studies suggest dyspareunia and problems with intercourse (65) with a posterior repair this is not substantiated in more recent studies and this could be due to a recognition of the problem and a change in technique(66). Levator ani plication is frequently implicated as the cause for dyspareunia due to post operative mid-vaginal narrowing (65;67;68). In contrast, improvement in dyspareunia have been reported with site-specific defect or midline plication procedures (69-71). In sexually active women therefore levator plication should be avoided where possible and surgical techniques aimed at avoiding narrowing of vaginal introitus adopted.

Vault prolapse surgery may be associated with postoperative dyspareunia and FSD. However, as this procedure often involves a concomitant repair, it is methodologically difficult to ascertain which specific procedure is causing sexual dysfunction. . Maher et al(72) in their systematic review comparing sacrocolpopexy to sacrospinous fixation showed lower dyspareunia rates with the abdominal approach but a longer operating time, a longer time for recover),and greater expense. Baessler and Schuessler found that sacrocolpopexy was actually curative in women with dyspareunia and ceased in all but one of the nine patients among 33 consecutive women presenting with prolapse-related dyspareunia preoperatively(73). Postoperative dyspareunia is reported to be between 8% and 16% after sacrospinous fixation(74-76). When combined with a repair vaginal narrowing, excessive colectomy occurring due to a concomitant repair procedures was identified as the most common cause of postoperative dyspareunia(77) but vaginal narrowing and pudendal nerve injury have also been implicated. A sacrocolpopexy has also been shown to be superior to a vaginal mesh. Kuhn et al (78) demonstrated that following a sacrocolpopexy the domains of sexual desire, arousal, lubrication, satisfaction, and pain improved significantly but orgasm remained unchanged. There

was no vaginal shortening postoperatively. Therefore in sexually active women a sacrocolpopexy is the preferred procedure.

Ileococcygeal fixation is also performed for vault prolapse. In a matched case-control study comparing sacrospinous to ileococcygeal fixation, Maher et al(79) found no significant difference in the percentage of women who were sexually active (58% vs 55%), who had dyspareunia (14% vs 10%), or buttock pain (19% vs 14%). It is well recognized that bilateral ileococcygeal fixation may result in shortening of the vagina by 2–3 cm. In sexually active women with vault prolapse and a short vagina, bilateral ileococcygeal fixation is contraindicated, as it may cause severe postoperative dyspareunia.

Mesh

The aims of using mesh in the repair of vaginal wall prolapse are to add additional support and to reduce the risk of recurrence, particularly for women with recurrent prolapse or with congenital connective tissue disorders (such as Ehlers–Danlos or Marfan’s syndromes). A study by Abdel Fatah et al(80) looking at the complications of mesh reinforcement identified some very severe complications and therefore the need for caution when using synthetic materials in the absence of clear cut indications. Further reports on problems with the use of meshes have resulted in a distinct decline in mesh usage.

Some studies have shown very high dyspareunia rates following mesh reinforcement for prolapse surgery. Milani, R. et al. (81) also demonstrated that though the use of mesh was associated with high success rates there was a very high rate of dyspareunia of 20% when used for anterior repair and 63% when used for posterior repair. This warrants extensive counseling and caution when using meshes in women who are sexually active. These results are further borne out by other studies though some studies are equivocal and some even demonstrate an improvement following the use of mesh in vaginal repair.

Maher et al in their systematic review(72) analysed sexual function and dyspareunia in women undergoing surgery in the anterior compartment, posterior compartment and apical compartment using mesh. The studies included in their systematic review were women who had mesh reinforced colporrhaphy versus standard repair. They found no difference in the dyspareunia rates for native tissue anterior or posterior repair and mesh reinforced anterior or posterior repairs. However the commonest cause of complaints following mesh reinforced repair according to the FDA report of 2011(82;83) was pain or dyspareunia (590/1503,38.6%). This has resulted in withdrawal from the market of some of the products including those by Bard and Ethicon.

URINARY TRACT INFECTIONS (UTI)

The association of lower urinary tract symptoms (LUTS) and sexual dysfunction is widely accepted. The incidence of urinary tract infections (UTIs) in women who become sexually active is about 3% per annum and about 4% of all LUT infections in this group are thought to be related to sexual activity and 60% in recurrent cases(84).Honeymoon Cystitis refers to LUTS occurring after sexual intercourse. Bacteria are often pushed mechanically up the urethra and into the bladder during coitus. If they are not voided soon after, they multiply and may cause infection. The relative risk of UTI increased from 1.0 for unmarried women who had not been sexually active in the previous week to 9.0 for women who had had intercourse seven times during that period(85). The term 'honeymoon' was applied because, in the past, this was expected to be the time of first intercourse. The male urethra, being substantially longer, is not susceptible to the same problem. Some women are particularly sensitive to postcoital urinary tract dysfunction due to the development of a relatively high urethral pressure following intercourse. Of course, the condition of post-coital female lower urinary tract infection occurs at many times beyond the traditional 'honeymoon' - from the onset of sexual activity into old age. This is further illustrated by the fact that nuns have a lower prevalence of bacteriuria than other populations of women in early adult life(86). Following intercourse urinary bacterial count is significantly raised in 30% of women(87) and Nicolle et al(88) reported that both symptomatic and asymptomatic bacteriuria was more frequent the day after intercourse. Several behavioral factors have been shown to enhance the risk of UTI following sexual intercourse. These include deferred voiding after intercourse (89), frequent intercourse (84), low fluid intake (90), and deferred voiding after the initial urge to micturate (91). In addition reduced lubrication and the use of spermicide coated condoms, and spermicides either alone or in conjunction with diaphragm have also been incriminated (92). Contraceptive diaphragms by reducing urinary flow and spermicidal cream and the use of spermicidal-lubricated condoms can sometimes result in vaginal and urethral irritation hence the association. These risk factors were shown to have a detrimental effect in a large prospective study by Hooton and co-workers who examined a variety of risk factors

for UTI in young women (93).

The initial management of postcoital UTIs includes several simple measures which may be effective. Close attention to perineal hygiene, change of coital technique, use of a vaginal lubricant, and avoidance of the contraceptive diaphragm may all be successful first-line measures. Women should be encouraged to drink fluid before anticipated sex to facilitate postcoital voiding. Ingestion of products containing cranberry (as juice or a supplement) has long been thought to afford protection against UTIs (94). Cranberries contain two substances (proanthocyanidines and fructose) which are thought to inhibit adhesion of infecting bacteria, particularly type 1 and type P fimbriated *Escherichia coli*, to the uroepithelium(95). A systematic review of the literature considered the role of cranberry in the setting of recurrent UTIs and found the relative risk of developing a UTI over 6 months while taking cranberry to be reduced to 0.61 (CI 0.4–0.91) compared to 1.0 for placebo or no treatment(96). The role of cranberry in prophylaxis against infection following intercourse, however, has yet to be established.

For women who do not respond to simple measures, regular or intermittent antibiotic prophylaxis is usually effective(97;98). A recent systematic review of the literature found evidence that in women with recurrent UTIs associated with sexual activity, postcoital ciprofloxacin is equally as effective as a continuous daily prescription and should be considered in this setting(99). There is evidence that local application of estrogen could be protective against infection in the context of recurrent UTIs in young women who are on oral contraceptives (100). When simple measures fail to alleviate postcoital cystitis, further investigation including investigation for atypical organisms such as *Mycoplasma hominis* and *Ureaplasma urealyticum*, is often worthwhile. Chlamydia causing acute urethritis should also be ruled out. Underlying abnormalities such as voiding difficulties and vesicoureteric reflux should always be considered, and imaging of the renal tract with ultrasonography, intravenous urography or videocystourethrography may be necessary. It is also sometimes appropriate to perform a cysto-urethroscopy and or magnetic resonance imaging to exclude a urethral diverticulum or an intravesical foreign body such

as a calculus.

BLADDER PAIN SYNDROME (BPS)

Bladder pain syndrome previously known as Interstitial cystitis/painful bladder syndrome (IC/PBS) is a chronic, debilitating disease of unknown etiology characterized by urinary frequency, urgency, nocturia, suprapubic pressure, and pain. The true prevalence of the condition ranges from 10 to 500 cases/100,000 women depending on the strictness of the criteria used for the diagnosis (101;102). Studies suggest that most women with IC experience not only pelvic pain, but also dyspareunia, sexually related distress, and significant declines in desire and orgasm frequency (103-107). The prevalence of sexual dysfunction in these women is higher than previously estimated and substantially affects quality of life and sexuality (108). Sacco et al (105) showed that BPS was associated with the greatest impairment of FSF among women with LUTS. Because multiple factors contributing to sexual dysfunction (including biopsychosocial comorbidities such as stress, abuse, or chronic illness) can be present in women with IC, a variety of treatments might be required. It is also important to consider that some typical IC treatments, such as antidepressants and opioids used to manage pelvic pain, can exacerbate sexual dysfunction. Hypertonic pelvic floor dysfunction is prevalent in patients with IC (104) and contracted muscles can result in dyspareunia, vulvodynia, and vaginismus. The association between IC and syndromes such as vestibulodynia and spontaneous or provoked vulvodynia is commonly reported (109). The magnitude of the association between vulvar and bladder symptoms is variable. This has obvious negative implications on sexual function and sexual functioning is in fact one of the strongest predictors of poorer quality of life (QOL) in patients diagnosed with refractory interstitial cystitis/painful bladder syndrome (IC/PBS) (110).

Several studies have demonstrated an improvement in the dyspareunia and other levels of sexual function when PBS symptoms are alleviated either by intravesical injections of lidocaine, heparin, and sodium bicarbonate (111) or other pharmacological treatments (112) such as pentosan polysulfate and hyaluronic acid (113). The pelvic floor muscles play an important role in female responsiveness and sexual function; thus, therapies

aimed at treating the pelvic floor might be even more efficacious in improving sexual function, the woman's self-esteem, and her relationship with her partner. Some therapies that have been reported to be helpful include pelvic floor therapy, biofeedback, neuromodulation, and botulinum toxin type A(114).

FAECAL INCONTINENCE (FI)

Anal incontinence is reported to affect 8% of women in the general population (115). Faecal incontinence is known to cause sexual dysfunction and this may be associated with anal sphincter injury related to birth trauma (116;117) or due to other causes such as neurological disorders. Fecal incontinence of solid stool and depression related to fecal incontinence were correlated with poorer sexual function but does not prevent women from engaging in sexual activity thereby demonstrating that it is an important aspect of their lives(118).

Corrections of faecal incontinence irrespective of the mode of repair was associated with an improvement in sexual function in most studies (117;119). But patients who had undergone an overlapping sphincteroplasty versus an end-to-end sphincteroplasty reported pain during intercourse 24% vs 4% of subjects (P = .04). Sacral nerve stimulation which is increasingly being used for the treatment of fecal incontinence has been shown to be of benefit(120;121). However some studies actually suggest an equivocal impact on sexual function following a repair(122). Trowbridge (123) in his study showed that sexual function scores were not correlated with continence scores.

PREGNANCY CHILDBIRTH AND PERINEAL TRAUMA

Data on the impact of childbirth on sexual function is conflicting. There is a dearth of scientifically reliable data about the impact of childbirth on sexual function and the association with the different modes of delivery.

It is generally accepted that pregnancy itself is associated with reduced interest in sex, ranging from 57% to 75%(124-128). Sexual interest usually improves postpartum, but

23–57% of women still report reduced sexual interest at 3 months, and 21–37% at 6 months (125;129). Generally speaking women are less likely to be sexually active during pregnancy, particularly in advanced pregnancy(125) with only 26% having intercourse in the third trimester. This could be due to a reduction in the ability to reach orgasm with 60% of women experiencing orgasm through the second trimester (126) declining to 50% in the third trimester (125). Sexual function, which declined through pregnancy was not recovered postpartum ($P = 0.017$). The main predictor for poor sexual function in early pregnancy, was impaired body image, while in the postpartum period, worse urinary symptoms correlated with poor sexual function scores (130). Interestingly though sexual practices changed during pregnancy they returned to early pregnancy levels in the postpartum period.

It is widely reported that postpartum dyspareunia is associated with the mode of delivery with assisted vaginal delivery being predominantly incriminated (117;131-133) with at least a twofold increase in dyspareunia when compared to spontaneous vaginal delivery. Barret et al. reported that women delivered by C/S were significantly less likely to report dyspareunia at 3 months postpartum than those with vaginal delivery(129). However, the same authors in a subsequent study, by employing a larger cohort with longer follow-up found dyspareunia was equivalent in both groups(134). This has been further substantiated in other studies which have failed to show that a CS has a protective effect on sexual function(135;136). Though a study by Buhling et al (137) found the highest dyspareunia after operative vaginal delivery, and least with elective C/S, this decreased uniformly in each group by 6 months. Operative vaginal deliveries had a persistent rate of dyspareunia of 14%, but there was no difference between the spontaneous vaginal delivery group with an intact perineum and C/S (3.4% dyspareunia at 6 months). Interestingly, at 3 months postpartum, all of the patients reported “enjoyment at sexual intercourse” regardless of the mode of delivery (137). Perineal trauma with or without operative instrumental delivery was an important precursor of dyspareunia and the greater the tear even, with spontaneous vaginal delivery, the lower the sexual desire (138;139). Women with an intact perineum or first-degree perineal

tear 6 months postpartum were more likely to experience orgasm (117) than those with either second-, third-, or fourth-degree perineal tear.

Postpartum, sexual desire and the ability to reach orgasm do improve but the main problems encountered and impacting on sexual function are sexual arousal, excitement and lubrication (129). The risk of vaginal dryness and lubrication problems is increased with prolonged breast-feeding, which results in vaginal atrophy secondary to hypo-oestrogenism. The latter is easily corrected with topical estrogens or nonhormonal lubricants.

Owing to the inconsistencies in the definition of FSD and use of heterogeneous and invalid tools for evaluation in most of the studies, it is difficult to draw a scientifically sound conclusion about the impact of mode of delivery on sexual health. Reports on the negative effect of vaginal childbirth on sexual health led to the concept of elective Caesarean section (C/S) to preserve sexual function. Many health care professionals also advocate this approach with 7–24% of obstetricians and 4.4% of midwives preferring elective C/S for themselves or their partner (140-142). Interestingly, urogynaecologists scored even higher, with 45.5% opting for primary elective C/S (142).

HYSTERECTOMY

Hysterectomy is the commonest major gynaecological operation in the UK. Theoretically it poses a risk not only to the intricate pelvic nerve plexus and damage to the autonomic nerve endings of the cervico-vaginal fascia hence impacting on orgasm or sensation during intercourse, but may also cause distortion of pelvic anatomy by shortening the vagina thereby resulting in dyspareunia. Historically, the uterus, “hystero”, was believed to be the center of female sexuality and may also have culture-dependent psychological effects leading to loss of self-esteem, female identity, and consequent FSD.

Following hysterectomy an overall improvement (143) in the different aspects of sexual function ie frequency of sexual relations, dyspareunia, orgasm, vaginal dryness, and sexual desire were noted. The route of hysterectomy appears to play no role. A prospective study by El-Thouky et al (144) compared hysterectomies performed abdominally, vaginally or laparoscopically found that patients reported significantly lower rates of deep dyspareunia (18.8%, 19.7%, and 26.3% reduction respectively) after surgery than before the operation, regardless of the routes and technique used. This was not substantiated in the study by Ayoubi et al (145) who found greater postoperative delay in resuming sexual activity after abdominal hysterectomy (62.4+/- 9.3 days) than after vaginal (45.2+/-6.7 days) hysterectomy. They also found deterioration of sexual function occurred more frequently after abdominal hysterectomy (24%) than after vaginal (13.5%) or laparoscopic (8.5%) hysterectomy.

The belief that the cervix is necessary to achieve orgasm or that total abdominal hysterectomy (TAH) leads to local innervation damage with subsequent impairment of sexual function is not supported by current evidence. This belief was held for several years following a study by Kilcku et al which found women had a lower libido and orgasm following a TAH (146) when compared to a STAH. However the same group subsequently reported an improvement in dyspareunia rates irrespective of the type of hysterectomy. Subsequent larger studies specifically comparing subtotal (STAH) and

total abdominal hysterectomy(147) have also failed to identify a difference in sexual function. A study(148) looking at the long term follow up of women following a vaginal hysterectomy versus a Manchester Fothergill repair showed no difference in sexual function between the two groups which further dispels this myth.

CONCLUSION

In spite of the common presentation of sexual dysfunction in association with pelvic floor disorders, overall assessment by clinicians remains low and a recent survey of the members of the British Society of Urogynaecology (BSUG) demonstrated that only half of all clinicians routinely asked about FSD in the clinic and similar numbers at the postoperative follow up visit(149). Similar trends have been seen amongst the US clinicians and a recent survey of members of the American Urogynecologic Society (AUGS) has shown that 77% and 76% of AUGS members enquired of FSD, respectively in similar situations (150). Lack of time, uncertainty about therapeutic options and older age of the patient were cited as potential reasons for failing to address sexual complaints as part of routine history. Clinicians dealing with women with these conditions need greater training to manage FSD in association with the underlying pathology.

Currently available evidence of pelvic floor problems and their impact on sexual function is conflicting. Greater and more robust research into different urogynaecology conditions impacting on sexual function and their treatment is required. Assessment of patients with urogynaecology problems firstly requires a history and direct enquiry into sexual function, but also requires the development of standardized tools with well defined end point to assess the severity of the problem.

Figure 1: Ring Pessary in situ: No interference with sexual activity



Table 1 Classification of Female Sexual Dysfunction (DSM IV TR {Text revision})
(151)

1. Sexual Desire/Interest Disorders
2. Sexual Arousal Disorders
 - Genital Arousal disorder
 - Subjective Arousal disorder
 - Combined Arousal disorder
3. Orgasmic Disorder
4. Dyspareunia and Vaginismus
5. Persistent Sexual Arousal Disorder

Table 2 Studies showing prevalence of urinary incontinence during sexual intercourse

Authors	Design and setting	Symptoms analysed	% with UI during intercourse
Bo et al(152)	RCT of women with SUI; Norway	Urinary Incontinence during intercourse using BFLUTS	33%
Clark et al(153)	48 women undergoing UDS;USA	Incontinence and other urinary symptoms during intercourse	56%
Espuna, Pons M et al(154)	633 Sexually active women	Coital incontinence.	36.2%
Gordon et al(155)	100 consecutive women attending a clinic; Israel	Psychiatric assessment of sexual function	16%
Hilton(16)	324 sexually active women; UK	Standardised Questionnaire	24%
Jackson et al(156)	RCT of HRT in women with SUI; UK	Urinary Incontinence during intercourse using BFLUTS	10%
Jha et al(15)	Women with Urodynamic Stress Incontinence undergoing TVT; UK	ePAQ questionnaire	68%
Jha et al (18)	Women with Urinary incontinence undergoing urodynamics	ePAQ questionnaire	60%
Lam et al(157)	2631 (random) women selected: 511 had SUI; Denmark	When they have SUI	2% of general group; 12% of women with SUI
Lemack et al(26)	56 women; USA	UI with intercourse	11%
Moller et al(158)	4000 randomly selected women from the community; Denmark	UI with intercourse	8%= sometimes 1.7%=weekly 0.4%=daily
Nygaard et al(159)	224 random women: Gynaecology outpatient; USA	UI with penetration/ orgasm	12.9%
Weber et al(35)	81 sexually active women undergoing surgery; USA	UI with intercourse	22%

Vierhout et al(160)	196 sexually active women attending clinic	UI with intercourse	34%
Visser et al (13)	Community dwelling women	UI with intercourse	26%
Xu et al (161)	55 women with USI undergoing TVT	UI with intercourse	21.8%

Reference List

- (1) Mercer CH, Fenton KA, Johnson AM, Wellings K, Macdowall W, McManus S, et al. Sexual function problems and help seeking behaviour in Britain: national probability sample survey. *BMJ* 2003 Aug 23;327(7412):426-7.
- (2) Sadovsky R, Nusbaum M. Sexual health inquiry and support is a primary care priority. *J Sex Med* 2006 Jan;3(1):3-11.
- (3) Pauls RN, Segal JL, Silva WA, Kleeman SD, Karram MM. Sexual function in patients presenting to a urogynecology practice. *Int Urogynecol J Pelvic Floor Dysfunct* 2006 Nov;17(6):576-80.
- (4) Geiss IM, Umek WH, Dungal A, Sam C, Riss P, Hanzal E. Prevalence of female sexual dysfunction in gynecologic and urogynecologic patients according to the international consensus classification. *Urology* 2003 Sep;62(3):514-8.
- (5) Roos AM, Sultan AH, Thakar R. Sexual problems in the gynecology clinic: are we making a mountain out of a molehill? *Int Urogynecol J* 2012 Feb;23(2):145-52.
- (6) Jolleys JV. Reported prevalence of urinary incontinence in women in a general practice. *Br Med J (Clin Res Ed)* 1988 May 7;296(6632):1300-2.
- (7) Aslan G, Koseoglu H, Sadik O, Gimen S, Cihan A, Esen A. Sexual function in women with urinary incontinence. *Int J Impot Res* 2005 May;17(3):248-51.
- (8) Fultz NH, Burgio K, Diokno AC, Kinchen KS, Obenchain R, Bump RC. Burden of stress urinary incontinence for community-dwelling women. *Am J Obstet Gynecol* 2003 Nov;189(5):1275-82.
- (9) Kelleher CJ, Cardozo LD, Khullar V, Salvatore S. A new questionnaire to assess the quality of life of urinary incontinent women. *Br J Obstet Gynaecol* 1997 Dec;104(12):1374-9.
- (10) Kizilkaya BN, Yalcin O, Ayyildiz EH, Kayir A. Effect of urinary leakage on sexual function during sexual intercourse. *Urol Int* 2005;74(3):250-5.
- (11) Salonia A, Zanni G, Nappi RE, Briganti A, Deho F, Fabbri F, et al. Sexual dysfunction is common in women with lower urinary tract symptoms and urinary incontinence: results of a cross-sectional study. *Eur Urol* 2004 May;45(5):642-8.
- (12) Handa VL, Harvey L, Cundiff GW, Siddique SA, Kjerulff KH. Sexual function among women with urinary incontinence and pelvic organ prolapse. *Am J Obstet Gynecol* 2004 Sep;191(3):751-6.

- (13) Visser E, de Bock GH, Berger MY, Dekker JH. Impact of Urinary Incontinence on Sexual Functioning in Community-Dwelling Older Women. *J Sex Med* 2014 Apr 16.
- (14) Baessler K, Stanton SL. Does Burch colposuspension cure coital incontinence? *Am J Obstet Gynecol* 2004 Apr;190(4):1030-3.
- (15) Jha S, Radley S, Farkas A, Jones G. The impact of TVT on sexual function. *Int Urogynecol J Pelvic Floor Dysfunct* 2009 Feb;20(2):165-9.
- (16) Hilton P. Urinary incontinence during sexual intercourse: a common, but rarely volunteered, symptom. *Br J Obstet Gynaecol* 1988 Apr;95(4):377-81.
- (17) Moran PA, Dwyer PL, Ziccone SP. Urinary leakage during coitus in women. *J Obstet Gynaecol* 1999 May;19(3):286-8.
- (18) Jha S, Strelley K, Radley S. Incontinence during intercourse: myths unravelled. *Int Urogynecol J* 2012 May;23(5):633-7.
- (19) Field SM, Hilton P. The prevalence of sexual problems in women attending for urodynamic investigation. *Int Urogynecol J Pelvic Floor Dysfunct* 1993;4:212-5.
- (20) Cohen BL, Barboglio P, Gousse A. The impact of lower urinary tract symptoms and urinary incontinence on female sexual dysfunction using a validated instrument. *J Sex Med* 2008 Jun;5(6):1418-23.
- (21) Coyne KS, Sexton CC, Thompson C, Kopp ZS, Milsom I, Kaplan SA. The impact of OAB on sexual health in men and women: results from EpiLUTS. *J Sex Med* 2011 Jun;8(6):1603-15.
- (22) Frewen WK. An objective assessment of the unstable bladder of psychosomatic origin. *Br J Urol* 1978 Jun;50(4):246-9.
- (23) Shaw C. A systematic review of the literature on the prevalence of sexual impairment in women with urinary incontinence and the prevalence of urinary leakage during sexual activity. *Eur Urol* 2002 Nov;42(5):432-40.
- (24) Patel AS, O'Leary ML, Stein RJ, Leng WW, Chancellor MB, Patel SG, et al. The relationship between overactive bladder and sexual activity in women. *Int Braz J Urol* 2006 Jan;32(1):77-87.
- (25) Moran P, Dwyer PL, Ziccone SP. Burch colposuspension for the treatment of coital urinary leakage secondary to genuine stress incontinence. *J Obstet Gynaecol* 1999 May;19(3):289-91.

- (26) Lemack GE, Zimmern PE. Sexual function after vaginal surgery for stress incontinence: results of a mailed questionnaire. *Urology* 2000 Aug 1;56(2):223-7.
- (27) Rogers RG, Kammerer-Doak D, Darrow A, Murray K, Olsen A, Barber M, et al. Sexual function after surgery for stress urinary incontinence and/or pelvic organ prolapse: a multicenter prospective study. *Am J Obstet Gynecol* 2004 Jul;191(1):206-10.
- (28) Yeni E, Unal D, Verit A, Kafali H, Ciftci H, Gulum M. The effect of tension-free vaginal tape (TVT) procedure on sexual function in women with stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2003 Dec;14(6):390-4.
- (29) Mazouni C, Karsenty G, Bretelle F, Bladou F, Gamerre M, Serment G. Urinary complications and sexual function after the tension-free vaginal tape procedure. *Acta Obstet Gynecol Scand* 2004 Oct;83(10):955-61.
- (30) Elzevier HW, Venema PL, Nijeholt AA. Sexual function after tension-free vaginal tape (TVT) for stress incontinence: results of a mailed questionnaire. *Int Urogynecol J Pelvic Floor Dysfunct* 2004 Sep;15(5):313-8.
- (31) Ghezzi F, Serati M, Cromi A, Uccella S, Triacca P, Bolis P. Impact of tension-free vaginal tape on sexual function: results of a prospective study. *Int Urogynecol J Pelvic Floor Dysfunct* 2006 Jan;17(1):54-9.
- (32) Jha S, Moran P, Greenham H, Ford C. Sexual function following surgery for urodynamic stress incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2007 Aug;18(8):845-50.
- (33) Glavind K, Tetsche MS. Sexual function in women before and after suburethral sling operation for stress urinary incontinence: a retrospective questionnaire study. *Acta Obstet Gynecol Scand* 2004 Oct;83(10):965-8.
- (34) Maaita M, Bhaumik J, Davies AE. Sexual function after using tension-free vaginal tape for the surgical treatment of genuine stress incontinence. *BJU Int* 2002 Oct;90(6):540-3.
- (35) Weber AM, Walters MD, Piedmonte MR. Sexual function and vaginal anatomy in women before and after surgery for pelvic organ prolapse and urinary incontinence. *Am J Obstet Gynecol* 2000 Jun;182(6):1610-5.
- (36) Shah SM, Bukkapatnam R, Rodriguez LV. Impact of vaginal surgery for stress urinary incontinence on female sexual function: is the use of polypropylene mesh detrimental? *Urology* 2005 Feb;65(2):270-4.

- (37) Spinosa JP, Dubuis PY, Riederer BM. Transobturator surgery for female stress incontinence: a comparative anatomical study of outside-in vs inside-out techniques. *BJU Int* 2007 Nov;100(5):1097-102.
- (38) Ward K, Hilton P. Prospective multicentre randomised trial of tension-free vaginal tape and colposuspension as primary treatment for stress incontinence. *BMJ* 2002 Jul 13;325(7355):67.
- (39) Elzevier HW, Putter H, Delaere KP, Venema PL, Nijeholt AA, Pelger RC. Female sexual function after surgery for stress urinary incontinence: transobturator suburethral tape vs. tension-free vaginal tape obturator. *J Sex Med* 2008 Feb;5(2):400-6.
- (40) Murphy M, van Raalte H, Mercurio E, Haff R, Wiseman B, Lucente VR. Incontinence-related quality of life and sexual function following the tension-free vaginal tape versus the "inside-out" tension-free vaginal tape obturator. *Int Urogynecol J Pelvic Floor Dysfunct* 2008 Apr;19(4):481-7.
- (41) Jha S, Ammenbal M, Metwally M. Impact of incontinence surgery on sexual function: a systematic review and meta-analysis. *J Sex Med* 2012 Jan;9(1):34-43.
- (42) Rogers R, Bachmann G, Jumadilova Z, Sun F, Morrow JD, Guan Z, et al. Efficacy of tolterodine on overactive bladder symptoms and sexual and emotional quality of life in sexually active women. *Int Urogynecol J Pelvic Floor Dysfunct* 2008 Nov;19(11):1551-7.
- (43) Hajebrahimi S, Azaripour A, Sadeghi-Bazargani H. Tolterodine immediate release improves sexual function in women with overactive bladder. *J Sex Med* 2008 Dec;5(12):2880-5.
- (44) van Balken MR, Vergunst H, Bemelmans BL. Sexual functioning in patients with lower urinary tract dysfunction improves after percutaneous tibial nerve stimulation. *Int J Impot Res* 2006 Sep;18(5):470-5.
- (45) Signorello D, Seitz CC, Berner L, Trenti E, Martini T, Galantini A, et al. Impact of sacral neuromodulation on female sexual function and his correlation with clinical outcome and quality of life indexes: a monocentric experience. *J Sex Med* 2011 Apr;8(4):1147-55.
- (46) Mant J, Painter R, Vessey M. Epidemiology of genital prolapse: observations from the Oxford Family Planning Association Study. *Br J Obstet Gynaecol* 1997 May;104(5):579-85.
- (47) Weber AM, Walters MD, Schover LR, Mitchinson A. Sexual function in women with uterovaginal prolapse and urinary incontinence. *Obstet Gynecol* 1995 Apr;85(4):483-7.

- (48) Burrows LJ, Meyn LA, Walters MD, Weber AM. Pelvic symptoms in women with pelvic organ prolapse. *Obstet Gynecol* 2004 Nov;104(5 Pt 1):982-8.
- (49) Barber MD, Visco AG, Wyman JF, Fantl JA, Bump RC. Sexual function in women with urinary incontinence and pelvic organ prolapse. *Obstet Gynecol* 2002 Feb;99(2):281-9.
- (50) Novi JM, Jeronis S, Morgan MA, Arya LA. Sexual function in women with pelvic organ prolapse compared to women without pelvic organ prolapse. *J Urol* 2005 May;173(5):1669-72.
- (51) Ellerkmann RM, Cundiff GW, Melick CF, Nihira MA, Leffler K, Bent AE. Correlation of symptoms with location and severity of pelvic organ prolapse. *Am J Obstet Gynecol* 2001 Dec;185(6):1332-7.
- (52) Srivastava R, Thakar R, Sultan A. Female sexual dysfunction in obstetrics and gynecology. *Obstet Gynecol Surv* 2008 Aug;63(8):527-37.
- (53) Hagen S, Stark D, Maher C, Adams E. Conservative management of pelvic organ prolapse in women. *Cochrane Database Syst Rev* 2004;(2):CD003882.
- (54) Beji NK, Yalcin O, Erkan HA. The effect of pelvic floor training on sexual function of treated patients. *Int Urogynecol J Pelvic Floor Dysfunct* 2003 Oct;14(4):234-8.
- (55) Dean N, Wilson D, Herbison P, Glazener C, Aung T, Macarthur C. Sexual function, delivery mode history, pelvic floor muscle exercises and incontinence: a cross-sectional study six years post-partum. *Aust N Z J Obstet Gynaecol* 2008 Jun;48(3):302-11.
- (56) Kuhn A, Bapst D, Stadlmayr W, Vits K, Mueller MD. Sexual and organ function in patients with symptomatic prolapse: are pessaries helpful? *Fertil Steril* 2008 Apr 12.
- (57) Abdool Z, Thakar R, Sultan AH, Oliver RS. Prospective evaluation of outcome of vaginal pessaries versus surgery in women with symptomatic pelvic organ prolapse. *Int Urogynecol J* 2011 Mar;22(3):273-8.
- (58) Lowenstein L, Gamble T, Sanses TV, van RH, Carberry C, Jakus S, et al. Changes in sexual function after treatment for prolapse are related to the improvement in body image perception. *J Sex Med* 2010 Feb;7(2 Pt 2):1023-8.
- (59) Olsen AL, Smith VJ, Bergstrom JO, Colling JC, Clark AL. Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. *Obstet Gynecol* 1997 Apr;89(4):501-6.

- (60) Dua A, Jha S, Farkas A, Radley S. The effect of prolapse repair on sexual function in women. *J Sex Med* 2012 May;9(5):1459-65.
- (61) Weber AM, Walters MD, Piedmonte MR, Ballard LA. Anterior colporrhaphy: a randomized trial of three surgical techniques. *Am J Obstet Gynecol* 2001 Dec;185(6):1299-304.
- (62) Fayyad AM, Redhead E, Awan N, Kyrgiou M, Prashar S, Hill SR. Symptomatic and quality of life outcomes after site-specific fascial reattachment for pelvic organ prolapse repair. *Int Urogynecol J Pelvic Floor Dysfunct* 2008 Feb;19(2):191-7.
- (63) Colombo M, Vitobello D, Proietti F, Milani R. Randomised comparison of Burch colposuspension versus anterior colporrhaphy in women with stress urinary incontinence and anterior vaginal wall prolapse. *BJOG* 2000 Apr;107(4):544-51.
- (64) van Geelen JM, Theeuwes AG, Eskes TK, Martin CB, Jr. The clinical and urodynamic effects of anterior vaginal repair and Burch colposuspension. *Am J Obstet Gynecol* 1988 Jul;159(1):137-44.
- (65) Kahn MA, Stanton SL. Posterior colporrhaphy: its effects on bowel and sexual function. *Br J Obstet Gynaecol* 1997 Jan;104(1):82-6.
- (66) Paraiso MF, Barber MD, Muir TW, Walters MD. Rectocele repair: a randomized trial of three surgical techniques including graft augmentation. *Am J Obstet Gynecol* 2006 Dec;195(6):1762-71.
- (67) Amias AG. Sexual life after gynaecological operations--II. *Br Med J* 1975 Jun 21;2(5972):680-1.
- (68) Jeffcoate TN. Posterior colpoperineorrhaphy. *Am J Obstet Gynecol* 1959 Mar;77(3):490-502.
- (69) Maher CF, Qatawneh AM, Baessler K, Schluter PJ. Midline rectovaginal fascial plication for repair of rectocele and obstructed defecation. *Obstet Gynecol* 2004 Oct;104(4):685-9.
- (70) Glavind K, Madsen H. A prospective study of the discrete fascial defect rectocele repair. *Acta Obstet Gynecol Scand* 2000 Feb;79(2):145-7.
- (71) Kenton K, Shott S, Brubaker L. Outcome after rectovaginal fascia reattachment for rectocele repair. *Am J Obstet Gynecol* 1999 Dec;181(6):1360-3.
- (72) Maher C, Feiner B, Baessler K, Schmid C. Surgical management of pelvic organ prolapse in women. *Cochrane Database Syst Rev* 2013;4:CD004014.

- (73) Baessler K, Schuessler B. Abdominal sacrocolpopexy and anatomy and function of the posterior compartment. *Obstet Gynecol* 2001 May;97(5 Pt 1):678-84.
- (74) Colombo M, Milani R. Sacrospinous ligament fixation and modified McCall culdoplasty during vaginal hysterectomy for advanced uterovaginal prolapse. *Am J Obstet Gynecol* 1998 Jul;179(1):13-20.
- (75) Goldberg RP, Tomezsko JE, Winkler HA, Koduri S, Culligan PJ, Sand PK. Anterior or posterior sacrospinous vaginal vault suspension: long-term anatomic and functional evaluation. *Obstet Gynecol* 2001 Aug;98(2):199-204.
- (76) Paraiso MF, Ballard LA, Walters MD, Lee JC, Mitchinson AR. Pelvic support defects and visceral and sexual function in women treated with sacrospinous ligament suspension and pelvic reconstruction. *Am J Obstet Gynecol* 1996 Dec;175(6):1423-30.
- (77) Holley RL, Varner RE, Gleason BP, Apffel LA, Scott S. Sexual function after sacrospinous ligament fixation for vaginal vault prolapse. *J Reprod Med* 1996 May;41(5):355-8.
- (78) Kuhn A, Hausermann A, Brandner S, Herrmann G, Schmid C, Mueller MD. Sexual function after sacrocolpopexy. *J Sex Med* 2010 Dec;7(12):4018-23.
- (79) Maher CF, Murray CJ, Carey MP, Dwyer PL, Ugoni AM. Iliococcygeus or sacrospinous fixation for vaginal vault prolapse. *Obstet Gynecol* 2001 Jul;98(1):40-4.
- (80) Abdel-Fattah M, Ramsay I. Retrospective multicentre study of the new minimally invasive mesh repair devices for pelvic organ prolapse. *BJOG* 2008 Jan;115(1):22-30.
- (81) Milani R, Salvatore S, Soligo M, Pifarotti P, Meschia M, Cortese M. Functional and anatomical outcome of anterior and posterior vaginal prolapse repair with prolene mesh. *BJOG* 2005 Jan;112(1):107-11.
- (82) Steinberg AC. Use of vaginal mesh in the face of the recent FDA warnings and litigation. *Am J Obstet Gynecol* 2011 Jun;204(6):e10-e11.
- (83) Committee Opinion no. 513: vaginal placement of synthetic mesh for pelvic organ prolapse. *Obstet Gynecol* 2011 Dec;118(6):1459-64.
- (84) Stamatiou C, Bovis C, Panagopoulos P, Petrakos G, Economou A, Lycoudt A. Sex-induced cystitis--patient burden and other epidemiological features. *Clin Exp Obstet Gynecol* 2005;32(3):180-2.
- (85) Hooton TM, Stapleton AE, Roberts PL, Winter C, Scholes D, Bavendam T, et al. Perineal anatomy and urine-voiding characteristics of young women with and

- without recurrent urinary tract infections. *Clin Infect Dis* 1999 Dec;29(6):1600-1.
- (86) Kunin CM, McCormack RC. An epidemiologic study of bacteriuria and blood pressure among nuns and working women. *N Engl J Med* 1968 Mar 21;278(12):635-42.
- (87) Buckley RM, Jr., McGuckin M, MacGregor RR. Urine bacterial counts after sexual intercourse. *N Engl J Med* 1978 Feb 9;298(6):321-4.
- (88) Nicolle LE, Harding GK, Preiksaitis J, Ronald AR. The association of urinary tract infection with sexual intercourse. *J Infect Dis* 1982 Nov;146(5):579-83.
- (89) Strom BL, Collins M, West SL, Kreisberg J, Weller S. Sexual activity, contraceptive use, and other risk factors for symptomatic and asymptomatic bacteriuria. A case-control study. *Ann Intern Med* 1987 Dec;107(6):816-23.
- (90) Ervine C, Komaroff AL, Pass TM. Behavioural factors and urinary incontinence. *J Am Med Assoc* 1980;243:330-1.
- (91) Adatto K, Doebele KG, Galland L, Granowetter L. Behavioral factors and urinary tract infection. *JAMA* 1979 Jun 8;241(23):2525-6.
- (92) Handley MA, Reingold AL, Shiboski S, Padian NS. Incidence of acute urinary tract infection in young women and use of male condoms with and without nonoxynol-9 spermicides. *Epidemiology* 2002 Jul;13(4):431-6.
- (93) Hooton TM, Scholes D, Hughes JP, Winter C, Roberts PL, Stapleton AE, et al. A prospective study of risk factors for symptomatic urinary tract infection in young women. *N Engl J Med* 1996 Aug 15;335(7):468-74.
- (94) Ronald AR. Sex and urinary tract infections. *N Engl J Med* 1996;335(Editorial):511-2.
- (95) Zafiri D, Ofek I, Adar R, Pocino M, Sharon N. Inhibitory activity of cranberry juice on adherence of type 1 and type P fimbriated *Escherichia coli* to eucaryotic cells. *Antimicrob Agents Chemother* 1989 Jan;33(1):92-8.
- (96) Jepson RG, Craig JC. A systematic review of the evidence for cranberries and blueberries in UTI prevention. *Mol Nutr Food Res* 2007 Jun;51(6):738-45.
- (97) Pfau A, Sacks T, Engelstein D. Recurrent urinary tract infections in premenopausal women: prophylaxis based on an understanding of the pathogenesis. *J Urol* 1983 Jun;129(6):1153-7.
- (98) Stapleton A. Prevention of recurrent urinary-tract infections in women. *Lancet* 1999 Jan 2;353(9146):7-8.

- (99) Albert X, Huertas I, Pereiro II, Sanfelix J, Gosalbes V, Perrota C. Antibiotics for preventing recurrent urinary tract infection in non-pregnant women. *Cochrane Database Syst Rev* 2004;(3):CD001209.
- (100) Pinggera GM, Feuchtner G, Frauscher F, Rehder P, Strasser H, Bartsch G, et al. Effects of local estrogen therapy on recurrent urinary tract infections in young females under oral contraceptives. *Eur Urol* 2005 Feb;47(2):243-9.
- (101) Diokno AC, Homma Y, Sekiguchi Y, Suzuki Y. Interstitial cystitis, gynecologic pelvic pain, prostatitis, and their epidemiology. *Int J Urol* 2003 Oct;10 Suppl:S3-S6.
- (102) Parsons M, Tooze-Hobson P. The investigation and management of interstitial cystitis. *J Br Menopause Soc* 2005 Dec;11(4):132-9.
- (103) Ottem DP, Carr LK, Perks AE, Lee P, Teichman JM. Interstitial cystitis and female sexual dysfunction. *Urology* 2007 Apr;69(4):608-10.
- (104) Peters KM, Killinger KA, Carrico DJ, Ibrahim IA, Diokno AC, Graziottin A. Sexual function and sexual distress in women with interstitial cystitis: a case-control study. *Urology* 2007 Sep;70(3):543-7.
- (105) Sacco E, D'Addessi A, Racioppi M, Pinto F, Totaro A, Bassi P. Bladder pain syndrome associated with highest impact on sexual function among women with lower urinary tract symptoms. *Int J Gynaecol Obstet* 2012 May;117(2):168-72.
- (106) Schmid C, Berger K, Muller M, Silke J, Mueller MD, Kuhn A. Painful bladder syndrome: management and effect on sexual function and quality of life. *Ginekol Pol* 2011 Feb;82(2):96-101.
- (107) Yoon HS, Yoon H. Correlations of interstitial cystitis/painful bladder syndrome with female sexual activity. *Korean J Urol* 2010 Jan;51(1):45-9.
- (108) Temml C, Wehrberger C, Riedl C, Ponholzer A, Marszalek M, Madersbacher S. Prevalence and correlates for interstitial cystitis symptoms in women participating in a health screening project. *Eur Urol* 2007 Mar;51(3):803-8.
- (109) Gardella B, Porru D, Nappi RE, Dacco MD, Chiesa A, Spinillo A. Interstitial cystitis is associated with vulvodynia and sexual dysfunction--a case-control study. *J Sex Med* 2011 Jun;8(6):1726-34.
- (110) Nickel JC, Tripp D, Teal V, Propert KJ, Burks D, Foster HE, et al. Sexual function is a determinant of poor quality of life for women with treatment refractory interstitial cystitis. *J Urol* 2007 May;177(5):1832-6.

- (111) Welk BK, Teichman JM. Dyspareunia response in patients with interstitial cystitis treated with intravesical lidocaine, bicarbonate, and heparin. *Urology* 2008 Jan;71(1):67-70.
- (112) Nickel JC, Parsons CL, Forrest J, Kaufman D, Evans R, Chen A, et al. Improvement in sexual functioning in patients with interstitial cystitis/painful bladder syndrome. *J Sex Med* 2008 Feb;5(2):394-9.
- (113) Hung MJ, Su TH, Lin YH, Huang WC, Lin TY, Hsu CS, et al. Changes in Sexual Function of Women with Refractory Interstitial Cystitis/Bladder Pain Syndrome after Intravesical Therapy with a Hyaluronic Acid Solution. *J Sex Med* 2014 Mar 17.
- (114) Peters KM, Carrico DJ. Frequency, urgency, and pelvic pain: treating the pelvic floor versus the epithelium. *Curr Urol Rep* 2006 Nov;7(6):450-5.
- (115) Melville JL, Fan MY, Newton K, Fenner D. Fecal incontinence in US women: a population-based study. *Am J Obstet Gynecol* 2005 Dec;193(6):2071-6.
- (116) Lewicky CE, Valentin C, Saclarides TJ. Sexual function following sphincteroplasty for women with third- and fourth-degree perineal tears. *Dis Colon Rectum* 2004 Oct;47(10):1650-4.
- (117) Signorello LB, Harlow BL, Chekos AK, Repke JT. Postpartum sexual functioning and its relationship to perineal trauma: a retrospective cohort study of primiparous women. *Am J Obstet Gynecol* 2001 Apr;184(5):881-8.
- (118) Imhoff LR, Brown JS, Creasman JM, Subak LL, Van den Eeden SK, Thom DH, et al. Fecal incontinence decreases sexual quality of life, but does not prevent sexual activity in women. *Dis Colon Rectum* 2012 Oct;55(10):1059-65.
- (119) Thornton MJ, Kennedy ML, Lubowski DZ, King DW. Long-term follow-up of dynamic graciloplasty for faecal incontinence. *Colorectal Dis* 2004 Nov;6(6):470-6.
- (120) Caremel R, Nouhaud FX, Leroi AM, Ruffion A, Michot F, Damon H, et al. [Results of sacral neuromodulation on the urinary and fecal incontinence and sexuality in 20 women suffering from a double incontinence]. *Prog Urol* 2012 Jun;22(7):424-32.
- (121) van Voskuilen AC, Oerlemans DJ, Gielen N, Lansen-Koch SM, Weil EH, van Lankveld JJ, et al. Sexual response in patients treated with sacral neuromodulation for lower urinary tract symptoms or fecal incontinence. *Urol Int* 2012;88(4):423-30.

- (122) Pauls RN, Silva WA, Rooney CM, Siddighi S, Kleeman SD, Dryfhout V, et al. Sexual function following anal sphincteroplasty for fecal incontinence. *Am J Obstet Gynecol* 2007 Dec;197(6):618-6.
- (123) Trowbridge ER, Morgan D, Trowbridge MJ, DeLancey JO, Fenner DE. Sexual function, quality of life, and severity of anal incontinence after anal sphincteroplasty. *Am J Obstet Gynecol* 2006 Dec;195(6):1753-7.
- (124) Bogren LY. Changes in sexuality in women and men during pregnancy. *Arch Sex Behav* 1991 Feb;20(1):35-45.
- (125) Robson KM, Brant HA, Kumar R. Maternal sexuality during first pregnancy and after childbirth. *Br J Obstet Gynaecol* 1981 Sep;88(9):882-9.
- (126) Sayle AE, Savitz DA, Thorp JM, Jr., Hertz-Picciotto I, Wilcox AJ. Sexual activity during late pregnancy and risk of preterm delivery. *Obstet Gynecol* 2001 Feb;97(2):283-9.
- (127) Serati M, Salvatore S, Siesto G, Cattoni E, Zanirato M, Khullar V, et al. Female sexual function during pregnancy and after childbirth. *J Sex Med* 2010 Aug;7(8):2782-90.
- (128) Yeniel AO, Petri E. Pregnancy, childbirth, and sexual function: perceptions and facts. *Int Urogynecol J* 2014 Jan;25(1):5-14.
- (129) Barrett G, Pendry E, Peacock J, Victor C, Thakar R, Manyonda I. Women's sexual health after childbirth. *BJOG* 2000 Feb;107(2):186-95.
- (130) Pauls RN, Occhino JA, Dryfhout VL. Effects of pregnancy on female sexual function and body image: a prospective study. *J Sex Med* 2008 Aug;5(8):1915-22.
- (131) Brown S, Lumley J. Maternal health after childbirth: results of an Australian population based survey. *Br J Obstet Gynaecol* 1998 Feb;105(2):156-61.
- (132) Glazener CM. Sexual function after childbirth: women's experiences, persistent morbidity and lack of professional recognition. *Br J Obstet Gynaecol* 1997 Mar;104(3):330-5.
- (133) Lydon-Rochelle M, Holt VL, Martin DP, Easterling TR. Association between method of delivery and maternal rehospitalization. *JAMA* 2000 May 10;283(18):2411-6.
- (134) Barrett G, Peacock J, Victor CR, Manyonda I. Cesarean section and postnatal sexual health. *Birth* 2005 Dec;32(4):306-11.

- (135) Hosseini L, Iran-Pour E, Safarinejad MR. Sexual function of primiparous women after elective cesarean section and normal vaginal delivery. *Urol J* 2012;9(2):498-504.
- (136) Lurie S, Aizenberg M, Sulema V, Boaz M, Kovo M, Golan A, et al. Sexual function after childbirth by the mode of delivery: a prospective study. *Arch Gynecol Obstet* 2013 Oct;288(4):785-92.
- (137) Buhling KJ, Schmidt S, Robinson JN, Klapp C, Siebert G, Dudenhausen JW. Rate of dyspareunia after delivery in primiparae according to mode of delivery. *Eur J Obstet Gynecol Reprod Biol* 2006 Jan 1;124(1):42-6.
- (138) Persico G, Vergani P, Cestaro C, Grandolfo M, Nespoli A. Assessment of postpartum perineal pain after vaginal delivery: prevalence, severity and determinants. A prospective observational study. *Minerva Ginecol* 2013 Dec;65(6):669-78.
- (139) Rogers RG, Borders N, Leeman LM, Albers LL. Does spontaneous genital tract trauma impact postpartum sexual function? *J Midwifery Womens Health* 2009 Mar;54(2):98-103.
- (140) MacDonald C, Pinion SB, MacLeod UM. Scottish female obstetricians' views on elective caesarean section and personal choice for delivery. *J Obstet Gynaecol* 2002 Nov;22(6):586-9.
- (141) Wright JB, Wright AL, Simpson NA, Bryce FC. A survey of trainee obstetricians preferences for childbirth. *Eur J Obstet Gynecol Reprod Biol* 2001 Jul;97(1):23-5.
- (142) Wu JM, Hundley AF, Visco AG. Elective primary cesarean delivery: attitudes of urogynecology and maternal-fetal medicine specialists. *Obstet Gynecol* 2005 Feb;105(2):301-6.
- (143) Rhodes JC, Kjerulff KH, Langenberg PW, Guzinski GM. Hysterectomy and sexual functioning. *JAMA* 1999 Nov 24;282(20):1934-41.
- (144) El-Toukhy TA, Hefni M, Davies A, Mahadevan S. The effect of different types of hysterectomy on urinary and sexual functions: a prospective study. *J Obstet Gynaecol* 2004 Jun;24(4):420-5.
- (145) Ayoubi JM, Fanchin R, Monrozies X, Imbert P, Reme JM, Pons JC. Respective consequences of abdominal, vaginal, and laparoscopic hysterectomies on women's sexuality. *Eur J Obstet Gynecol Reprod Biol* 2003 Dec 10;111(2):179-82.
- (146) Kilkku P. Supravaginal uterine amputation vs. hysterectomy. Effects on coital frequency and dyspareunia. *Acta Obstet Gynecol Scand* 1983;62(2):141-5.

- (147) Thakar R, Ayers S, Clarkson P, Stanton S, Manyonda I. Outcomes after total versus subtotal abdominal hysterectomy. *N Engl J Med* 2002 Oct 24;347(17):1318-25.
- (148) Thys SD, Coolen A, Martens IR, Oosterbaan HP, Roovers J, Mol B, et al. A comparison of long-term outcome between Manchester Fothergill and vaginal hysterectomy as treatment for uterine descent. *Int Urogynecol J* 2011 Sep;22(9):1171-8.
- (149) Roos AM, Thakar R, Sultan AH, Scheer I. Female sexual dysfunction: are urogynecologists ready for it? *Int Urogynecol J Pelvic Floor Dysfunct* 2009 Jan;20(1):89-101.
- (150) Pauls RN, Kleeman SD, Segal JL, Silva WA, Goldenhar LM, Karram MM. Practice patterns of physician members of the American Urogynecologic Society regarding female sexual dysfunction: results of a national survey. *Int Urogynecol J Pelvic Floor Dysfunct* 2005 Nov;16(6):460-7.
- (151) Basson R, Althof S, Davis S, Fugl-Meyer K, Goldstein I, Leiblum S, et al. Summary of the recommendations on sexual dysfunctions in women. *J Sex Med* 2004 Jul;1(1):24-34.
- (152) Bo K, Talseth T, Vinsnes A. Randomized controlled trial on the effect of pelvic floor muscle training on quality of life and sexual problems in genuine stress incontinent women. *Acta Obstet Gynecol Scand* 2000 Jul;79(7):598-603.
- (153) Clark A, Romm J. Effect of urinary incontinence on sexual activity in women. *J Reprod Med* 1993 Sep;38(9):679-83.
- (154) Espuna PM, Puig CM. Coital urinary incontinence: impact on quality of life as measured by the King's Health Questionnaire. *Int Urogynecol J Pelvic Floor Dysfunct* 2008 May;19(5):621-5.
- (155) Gordon D, Groutz A, Sinai T, Wiezman A, Lessing JB, David MP, et al. Sexual function in women attending a urogynecology clinic. *Int Urogynecol J Pelvic Floor Dysfunct* 1999;10(5):325-8.
- (156) Jackson S, Shepherd A, Brookes S, Abrams P. The effect of oestrogen supplementation on post-menopausal urinary stress incontinence: a double-blind placebo-controlled trial. *Br J Obstet Gynaecol* 1999 Jul;106(7):711-8.
- (157) Lam GW, Foldspang A, Elving LB, Mommsen S. Social context, social abstention, and problem recognition correlated with adult female urinary incontinence. *Dan Med Bull* 1992 Dec;39(6):565-70.

(158) Moller LA, Lose G, Jorgensen T. The prevalence and bothersomeness of lower urinary tract symptoms in women 40-60 years of age. *Acta Obstet Gynecol Scand* 2000 Apr;79(4):298-305.

(159) Nygaard I, Milburn A. Urinary Incontinence during sexual activity. 4, 83-86. 1995.

Ref Type: Generic

(160) Vierhout ME, Gianotten WL. Mechanisms of urine loss during sexual activity. *Eur J Obstet Gynecol Reprod Biol* 1993 Nov;52(1):45-7.

(161) Xu Y, Song Y, Huang H. Impact of the tension-free vaginal tape obturator procedure on sexual function in women with stress urinary incontinence. *Int J Gynaecol Obstet* 2011 Mar;112(3):187-9.

7.3 Paper 3. Prolapse or incontinence, what affects sexual function the most?

Swati Jha, Deepa Gopinath

Abstract

Introduction and Hypothesis

Pelvic organ prolapse (POP) and stress urinary incontinence (SUI) adversely affect sexual function in women. Comparative studies between the two subgroups are few and results are conflicting. The aim of this study was to compare the effect of POP and SUI on sexual function of women undergoing surgery for these conditions.

Methods

The study population comprised women with POP or SUI in a tertiary referral hospital in UK. Women who underwent SUI surgery had no symptoms of POP and had urodynamically proven stress incontinence. Patients with POP had \geq stage 2 prolapse, without bothersome urinary symptoms. Pre-operative data on sexual function were collected and compared using an electronic pelvic floor assessment questionnaire (ePAQ). The incidence of sexual dysfunction and comparison of symptoms in both groups were done using Mann-Whitney U test.

Results:

343 women undergoing surgery either for SUI or POP were included. Patients were age matched with 184 undergoing SUI surgery (age range 33-77years) and 159 POP surgery (age range 27-78years) ($p= 0.869$). The overall impact of POP and SUI was not significantly different in the two subgroups ($p=0.703$). However, both patients (73% vs

36%; $p=0.00$) and partners (50% vs 24%; $p= 0.00$) avoid intercourse significantly more in cases with POP compared to SUI. This did not have a significant impact on quality of life.

Conclusions:

The impact of bothersome SUI or POP on sexual function was found to be similar but patient and partner avoidance in women with POP was greater than those with SUI.

Introduction

Pelvic organ prolapse (POP) and stress urinary incontinence (SUI) are disorders of the pelvic floor that affect about a third of community dwelling women with significant impact on woman's quality of life [1, 2]. Sexual problems have been well known in women attending a urogynaecology clinic ranging from 37%- 64% [3, 4]. Sexual problems commonly described in women with POP or SUI include disorders of desire, arousal, orgasm and dyspareunia. Disorders in the male partner are also seen including premature ejaculation and erectile dysfunction [5]. A community based survey found no difference between sexual activity and satisfaction compared to women without pelvic floor dysfunction [6].

There is conflicting evidence in literature regarding the effect of POP and SUI on sexual function. Patients with prolapse may have coexistent urinary symptoms and vice versa due to the close anatomical relationship and also similar underlying pathophysiology. Most studies therefore report on women with mixed symptoms of both POP and SUI. Some studies report no difference in the sexual function in women with prolapse or

incontinence [7], others report prolapse is more likely to affect sexual relations than incontinence[8] [9]. whereas some studies found women with urinary incontinence were more likely to report low libido, vaginal dryness and dyspareunia [10]. All these studies have been in patients with both prolapse and urinary symptoms making it difficult to differentiate if there are any actual differences in sexual function in these two subgroups. Also, most studies failed to use validated questionnaires casting doubt on the validity of findings.

The aim of this study was to evaluate female sexual function in two subsets of patients bothered by POP and stress urinary incontinence, without overlap of symptoms in order to reduce the confounding bias due to these factors.

Materials and methods

This was a retrospective cohort questionnaire based study conducted at a tertiary hospital in the UK. All patients attending the urogynaecology department complete an electronic pelvic floor assessment questionnaire as part of routine clinical care prior to being reviewed by a clinician. The electronic pelvic floor assessment questionnaire (ePAQ), a validated symptom specific and quality of life questionnaire was used for this purpose [11]. Pre-operative data on sexual function were collected on all sexually active women who underwent surgery for SUI or POP, in the period from January 2008 to December 2012. A post hoc power analysis was performed and the available sample size had a greater than 80% power of detecting 3 point differences at the 5% (two-sided)

level with standard deviation of 5 points. This instrument provides symptoms assessment in four dimensions: urinary, bowel, vaginal and sexual. Patients who had concurrent prolapse and urinary incontinence were excluded from the study. Women scheduled for surgery were selected rather than those opting for conservative treatment (physiotherapy or ring pessary) as it identified a cohort of women who were more bothered or were likely to have greater severity of prolapse or incontinence. All ePAQ data were collected preoperatively. Women undergoing SUI surgery had no symptoms of POP on clinical examination. This was further confirmed by the ePAQ scores which showed a negative screen for the prolapse item in these patients. They all had urodynamically proven SUI without any detrusor overactivity. Patients with POP had a stage 2 prolapse or more (Ba or C at or beyond 0 on POP-Q), without any bothersome urinary symptoms including urinary incontinence. These patients were screened as negative for the impact of stress urinary incontinence on urinary domain related quality of life item on ePAQ. It is not routine practice in our unit to do a stress reduction test, so data on occult stress incontinence was not available.

The sexual dimension on ePAQ has five domains which include urinary, bowel, vaginal, dyspareunia and general sex life. Within both groups, both item and bother scores from ePAQ were collected for domains urinary and vaginal for analysis. These scored on an ordinal scale from 0 to 3, where 0 represents “Never” and 3 represents “All the time”. SUI and POP have been shown to impact on sexual function in different ways[12]. In the SUI group, scores were collected for the items including overall impact due to incontinence, penetration and orgasm incontinence as well as post coital urinary tract

infections (UTI). In the POP group, the items dryness of the vagina, discomfort and pain, lack of sensation, tightness and obstruction were measured. A comparison of the two subgroups in terms of overall impact, avoidance of intercourse by patient and partner and patient anxiety were done. All analysis was done on SPSS version 19 and non-parametric data was compared using Mann-Whitney U test and demographic data was compared using student's t-test.

This project was registered as a service evaluation project with Sheffield Teaching Hospitals NHS Foundation Trust. Data used for this study were only from patients who answered "Yes" to the final two items of the questionnaire:

"(D2a) Are you willing to allow confidential use of your answers in order to evaluate the care you receive?"

(D2b) Are you willing to allow confidential use of your answers in order to check how this questionnaire is working?"

Results

One hundred and eighty four women who underwent a mid-urethral sling (TVT) procedure and were sexually active, completed ePAQ preoperatively. The age range was between 33 to 77 years with a median age of 49. One hundred and fifty nine women in the prolapse group who underwent pelvic floor repair which included anterior repair and or posterior repair, with or without a hysterectomy were sexually active and completed ePAQ. The age range of these women was 27y to 78y with a median age of

59. Though the median age of patients with prolapse appeared to be higher than patients with stress urinary incontinence, this was not found to be statistically significant ($p=0.869$).

On comparison of the overall incidence of interference of sexual activity due to POP and SUI symptoms, the incidence was found to be higher in the POP group ($n=113;71\%$) compared to SUI group ($n=98;53\%$). However the mean ePAQ scores were similar for POP (1.56 ± 1.05) and SUI (1.62 ± 1.07) and did not reach any statistical significance ($p = 0.703$). On comparing the avoidance of sexual activity, 116 patients with POP avoided sexual activity (73%) compared to 66 women with SUI (36%) ($p=0.000$). However, the mean impact scores for avoidance of sexual activity were similar in these two groups ($p=0.609$). With respect to avoidance of sexual activity by the partner due to patient's symptoms, the incidence was higher in the POP group ($n=80, 50\%$) compared to SUI group ($n=44, 24\%$). This again did not reach statistical significance with respect to impact on quality of life ($p=0.820$). Patient anxiety was found to be similar in POP ($n=121, 76\%$) and SUI ($n=116, 63\%$) groups respectively. These results are shown in table: 1.

In the SUI group, 40% (74/ 184) complained of orgasm incontinence and 31 % (57/184) complained of penetration incontinence. Thirty per cent (55/184) women reported post-coital UTIs. With respect to the impact of specific items, the impact of urinary leakage during sex (1.62 ± 1.07) was the highest, followed by impact of post coital UTI (1.42 ± 0.94). In the POP group, 53% (84/159) complained of dryness in the vagina, 60%

(95/159) complained of lack of sensation, 56% (89/159) had vaginal discomfort, 18% (29/159) complained of tightness and 59% (94/159) complained of obstruction. Out of the specific vagina items, the highest impact score(1.36 ± 1.18) was for the feeling of vaginal obstruction due to POP and the tightness of the vagina caused the least impact on sexual activity(0.42 ± 0.84). Specific symptoms in the subgroup affecting sexual function are shown in Table 2.

Discussion

Women with bothersome POP and SUI have a similar impact of their pelvic floor symptoms on sexual function. Patient and partner avoidance of intercourse was greater in women with POP compared to women with SUI but this did not impact on quality of life.

This is the largest study looking at specific pelvic floor problems and their comparative impact on sexual function. The study by Barber et al[8] only had 32 patients with prolapse and 29 patients reporting lower urinary tract symptoms including urinary incontinence. Similarly the study by Weber[7] only reported on 80 women. They reported that when prolapse interfered with sexual intercourse, women had significantly more advanced prolapse and more incontinence episodes than when POP did not interfere with intercourse. Other studies with larger sample sizes [6, 9, 10, 13, 14] had a mixed population looking at women with both pelvic organ prolapse and urinary incontinence to varying degrees, and sometimes not needing any treatment. It is

difficult to therefore extrapolate from these studies the exact effect of these individual symptoms on sexual function or indeed compare the two. Another strength of our study is that all patients included had significant symptoms, as they were on a waiting list for surgery and therefore were significantly bothered by their pelvic floor symptoms.

A study by Ozel[15] looked at patients who suffered SUI with and without POP. This study found that women with POP in conjunction with SUI are more likely to report decreased libido, decreased sexual excitement, and difficulty achieving orgasm during intercourse when compared to women with UI alone impact on sexual function. Sample size was significantly less than in our study and this study presupposes that SUI causes a baseline level of sexual dysfunction.

Our data was similar to that reported by Ellerkmann [16]and Barber [8] which found that women with bothersome POP avoided intercourse. This could be because POP causes objective symptoms during intercourse which is apparent both to the patient and the partner hence why they are more reluctant to engage in sexual activity. In addition the presence of prolapse may affect a woman's self-image resulting in a reluctance to be intimate with her partner. For partners the avoidance may be related to a fear of causing worsening of the prolapse and their partner's symptoms.

The main weakness of our study is that this was a retrospective study so it is difficult to comment on other factors that may impact on sexual function such as the number of women who were menopausal, proportion of women on HRT or local oestrogen

replacement therapy. In addition we did not have any data on the partner and their sexual status with regard to inherent problems that may impact on sexual function. In the POP group we excluded women with stress urinary incontinence, we did not exclude women with micturition or urgency symptoms as this data was not available, This may be considered a shortcoming however we feel these symptoms were more likely to be related to the prolapse. There is also the absence of a control group to compare the baseline incidence of sexual dysfunction in the general population compared to our study group. It could be argued that the sexual problems patients in the study group suffered may not be linked exclusively to their pelvic floor problems.

The results of our study enhances the understanding of sexual dysfunction in women with pelvic floor dysfunction. It also dispels several myths related to these conditions including the fact that POP per se results in a greater impact of various aspects of sexual function to a greater degree than SUI, and this does not appear to be the case. Our study allows better counselling of women deciding to proceed with surgery for these conditions and allows us to give them more realistic expectations of what symptoms are related to individual pelvic floor problems. The role of conservative treatments such as pelvic floor muscle training cannot be underestimated[17]. We have previously reported on the impact of surgical treatment of POP [18, 19] and SUI [20, 21] on sexual function and results are very reassuring and similar to those reported by other authors[22]. This study also emphasizes the need for healthcare professionals to assess sexual health in women with bothersome POP and SUI. It has been demonstrated that there is definite

scope for improvement in this regard [23]. Irrespective of age, patients are bothered to varying degrees by the impact of these conditions on their sexual function.

Sexual dysfunction is very complex and the impact of pelvic floor problems is unlikely to be a linear effect. Natural history of sexual dysfunction in these women needs to be further explored taking into account all the variables that might affect sexual function.

Larger well designed studies looking at demographic and childbirth data as well as hormone status are required to understand the pathophysiology of sexual dysfunction in women with pelvic floor disorders and identify preventative as well as therapeutic strategies.

Figures

Figure: 1 Items in the sexual dimension section of ePAQ

SEX LIFE			
Willing to answer?	Yes	Reconsider?	..
Sexually active?	Yes	Importance?	Quite
SEX & BLADDER Overall impact	0 1 2 3	Impact	0 1 2 3
Avoids	0 1 2 3	Impact	..
Partner avoids	0 1 2 3	Impact	..
Anxiety	0 1 2 3		
Incontinence	0 1 2 3	Impact	..
Orgasm inco	0 1 2 3	Impact	..
Penetration inco	0 1 2 3	Impact	..
Post coital UTI	0 1 2 3	Impact	..
SEX & BOWEL Overall impact	0 1 2 3	Impact	..
Avoids	0 1 2 3	Impact	..
Partner avoids	0 1 2 3	Impact	..
Anxiety	0 1 2 3		
Flatus inco	0 1 2 3	Impact	0 1 2 3
Faecal inco	0 1 2 3	Impact	..
SEX & VAGINA Overall impact	0 1 2 3	Impact	..
Avoids	..	Impact	..
Partner avoids	..	Impact	..
Anxiety	..		
Dryness	..	Impact	..
Lack of sensation	..	Impact	..
Discomfort & pain	..	Impact	..
Tightness	..	Impact	..
Obstruction	..	Impact	..
SEX & HEALTH Overall problems	0 1 2 3	Impact	..
Loss of libido	0 1 2 3	Impact	..
Satisfied overall	0 1 2 3		
Own health & sex	0 1 2 3	Impact	..
Partner hith & sex	0 1 2 3	Impact	..

Tables

Table: 1 Impact of urinary incontinence and POP on sexual function.

Item	POP(n=159) Incidence (%)	SUI(n=184) Incidence (%)	POP ePAQ scores Mean \pm SD	SUI ePAQ scores Mean \pm SD	<i>p</i> value ePAQ scores
Incidence and overall impact on sexual activity	71%	53%	1.56(1.05)	1.62(1.07)	0.703
Patient avoids intercourse	73%	36%	1.34(1.09)	0.90(0.92)	0.000
Impact of patient avoidance	67%	51%	1.55(1.07)	1.61(1.00)	0.609
Partner avoids intercourse	50%	24%	0.85(1.01)	0.42(0.76)	0.000
Impact of partner avoidance	45%	24%	1.11(1.11)	1.18(1.20)	0.820
Patient anxiety	76%	63%	1.43(1.11)	1.33(1.13)	0.4114

Mann-Whitney U test for calculation of p value

Table: 2 Incidence of bladder specific and prolapse specific symptoms that influences sexual function.

Subgroup	Symptom	Incidence (%)	Mean impact score
SUI (n=184)	Orgasm incontinence	40%	0.79 ± 1.18
	Penetration incontinence	31%	0.66 ± 1.16
	Post-coital urinary tract infections	30%	1.42 ± 0.94
POP (n=159)	Dryness in the vagina	53%	1.05 ± 0.97
	Lack of sensation	60%	1.21 ± 1.03
	Discomfort	56%	1.19 ± 1.04
	Tightness	18%	0.42 ± 0.84
	Obstruction	59%	1.36 ± 1.18

Reference List

1. Rohr G, Stovring H, Christensen K, Gaist D, Nybo H, Kragstrup J. Characteristics of middle-aged and elderly women with urinary incontinence. *Scand J Prim Health Care* 2005 Dec;23(4):203-8.
2. Samuelsson EC, Victor FT, Tibblin G, Svardsudd KF. Signs of genital prolapse in a Swedish population of women 20 to 59 years of age and possible related factors. *Am J Obstet Gynecol* 1999 Feb;180(2 Pt 1):299-305.
3. Roos AM, Sultan AH, Thakar R. Sexual problems in the gynecology clinic: are we making a mountain out of a molehill? *Int Urogynecol J* 2012 Feb;23(2):145-52.
4. Pauls RN, Silva WA, Rooney CM, et al. Sexual function after vaginal surgery for pelvic organ prolapse and urinary incontinence. *Am J Obstet Gynecol* 2007 Dec;197(6):622-7.
5. Celik DB, Kizilkaya BN, Yalcin O. Sexual function in women after urinary incontinence and/or pelvic organ prolapse surgery. *J Clin Nurs* 2014 Sep;23(17-18):2637-48.
6. Lukacz ES, Whitcomb EL, Lawrence JM, Nager CW, Contreras R, Luber KM. Are sexual activity and satisfaction affected by pelvic floor disorders? Analysis of a community-based survey. *Am J Obstet Gynecol* 2007 Jul;197(1):88-6.
7. Weber AM, Walters MD, Schover LR, Mitchinson A. Sexual function in women with uterovaginal prolapse and urinary incontinence. *Obstet Gynecol* 1995 Apr;85(4):483-7.
8. Barber MD, Visco AG, Wyman JF, Fantl JA, Bump RC. Sexual function in women with urinary incontinence and pelvic organ prolapse. *Obstet Gynecol* 2002 Feb;99(2):281-9.
9. Handa VL, Cundiff G, Chang HH, Helzlsouer KJ. Female sexual function and pelvic floor disorders. *Obstet Gynecol* 2008 May;111(5):1045-52.
10. Handa VL, Harvey L, Cundiff GW, Siddique SA, Kjerulff KH. Sexual function among women with urinary incontinence and pelvic organ prolapse. *Am J Obstet Gynecol* 2004 Sep;191(3):751-6.
11. Radley SC, Jones GL, Tanguy EA, Stevens VG, Nelson C, Mathers NJ. Computer interviewing in urogynaecology: concept, development and psychometric testing of an electronic pelvic floor assessment questionnaire in primary and secondary care. *BJOG* 2006 Feb;113(2):231-8.
12. Roos AM, Thakar R, Sultan AH, Burger CW, Paulus AT. Pelvic floor dysfunction: women's sexual concerns unraveled. *J Sex Med* 2014 Mar;11(3):743-52.

13. Kammerer-Doak D. Assessment of sexual function in women with pelvic floor dysfunction. *Int Urogynecol J Pelvic Floor Dysfunct* 2009 May;20 Suppl 1:S45-S50.
14. Rogers RG. Sexual function in women with pelvic floor disorders. *Can Urol Assoc J* 2013 Sep;7(9-10 Suppl 4):S199-S201.
15. Ozel B, White T, Urwitz-Lane R, Minaglia S. The impact of pelvic organ prolapse on sexual function in women with urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2006 Jan;17(1):14-7.
16. Ellerkmann RM, Cundiff GW, Melick CF, Nihira MA, Leffler K, Bent AE. Correlation of symptoms with location and severity of pelvic organ prolapse. *Am J Obstet Gynecol* 2001 Dec;185(6):1332-7.
17. Braekken IH, Majida M, Ellstrom EM, Bo K. Can pelvic floor muscle training improve sexual function in women with pelvic organ prolapse? A randomized controlled trial. *J Sex Med* 2015 Feb;12(2):470-80.
18. Jha S, Gray T. A systematic review and meta-analysis of the impact of native tissue repair for pelvic organ prolapse on sexual function. *Int Urogynecol J* 2015 Mar;26(3):321-7.
19. Dua A, Jha S, Farkas A, Radley S. The effect of prolapse repair on sexual function in women. *J Sex Med* 2012 May;9(5):1459-65.
20. Jha S, Ammenbal M, Metwally M. Impact of incontinence surgery on sexual function: a systematic review and meta-analysis. *J Sex Med* 2012 Jan;9(1):34-43.
21. Jha S, Radley S, Farkas A, Jones G. The impact of TVT on sexual function. *Int Urogynecol J Pelvic Floor Dysfunct* 2009 Feb;20(2):165-9.
22. Ulrich D, Dwyer P, Rosamilia A, Lim Y, Lee J. The effect of vaginal pelvic organ prolapse surgery on sexual function. *Neurourol Urodyn* 2015 Apr;34(4):316-21.
23. Roos AM, Thakar R, Sultan AH, Scheer I. Female sexual dysfunction: are urogynecologists ready for it? *Int Urogynecol J Pelvic Floor Dysfunct* 2009 Jan;20(1):89-101.

7.4 Paper 4 Incontinence during intercourse: myths unravelled.

Swati Jha, Katie Strelley, Stephen Radley

ABSTRACT

Introduction

This study aimed to establish the prevalence of urinary leakage during intercourse, the extent to which urinary leakage impacts on sex life and the correlation between different urodynamic diagnosis and coital leakage.

Methods

480 women attending between 1st January 2006 & December 2010 with urinary incontinence and subsequently undergoing urodynamic assessment were included. Data were collected as part of routine clinical care using the electronic Pelvic floor Assessment Questionnaire (ePAQ) and correlated with urodynamic findings.

Results

60% of women with urinary incontinence reported leakage during intercourse. Overall quality of life in women with urinary incontinence was strongly correlated to the impact of urinary symptoms on sex life. Parameters of sexual function were no different in women with different urodynamic diagnosis.

Conclusion

Worsening urinary incontinence has a deleterious effect on sexual function. Urodynamic diagnosis does not correlate with the nature of underlying sexual problems, orgasm or penetration incontinence.

Introduction

The association between different types of urinary incontinence and coital incontinence is poorly understood. Past studies[1] have demonstrated that detrusor overactivity (DOA) is associated with orgasm incontinence and urodynamic stress incontinence (USI) is associated with penetration incontinence. Subsequent studies failed to demonstrate

this association. However these later studies included small numbers[2], were observational, used non validated outcomes[3] and were based on symptoms rather than urodynamic findings which have a poor correlation to underlying diagnosis.

The aim of this study was to establish the prevalence of urinary leakage during intercourse in women presenting with a complaint of urinary incontinence and the extent to which urinary leakage impacts on sex life. We also established the impact and association of different types of urinary incontinence ie USI, DOA and mixed incontinence on different parameters of sexual function.

Methods

Patients attending the Urogynaecology Unit between 1st January 2006 & July 2010 referred with urinary incontinence and subsequently undergoing urodynamics formed the study group. Patients with prolapse on clinical examination (POP- Q Aa -2 or less and Ap -2 or less), and those with voiding dysfunction or hypersensitivity on urodynamic studies were excluded from the analysis. Patients who had had previous prolapse or incontinence surgery were also excluded. All patients had a bladder capacity in excess of 350 mls, and patients with low compliance were excluded as this could be an indicator of underlying detrusor overactivity. As part of unit policy none of the patients undergoing urodynamics were on anticholinergics for at least 2 weeks preceding the investigation. Patients with UTI were also excluded as patients with evidence of UTI on a mid-stream urine did not undergo the test.

Data were collected as part of routine clinical care using a standardised, validated pelvic floor questionnaire and were analysed and correlated with urodynamic outcomes. The Electronic Pelvic Floor Assessment Questionnaire (ePAQ)[4] is a comprehensive web-based pelvic floor questionnaire which includes 4 dimensions (Urinary, Bowel, Vaginal and Sexual). Each dimension has questions on frequency and severity of various symptoms and their associated bother and provides 19 psychometrically robust &

clinically meaningful domain scores (Figure 1). Each score is transformed on a range from 0 (indicating best health status) to 100 (worst health status). The domain score is calculated using the simple formula: Domain Score = total of raw scores for each item in the domain / maximum possible score × 100. ePAQ items record symptoms on a 4 point scale (Never=0, Occasionally=1, Most of the time=2 & All of the time=3). The impact attributed to these symptoms is also recorded on a 4-point scale: (Not a problem=1, A bit of a problem=1, Quite a problem=2, A serious problem=3).

The sexual dimension of this questionnaire identifies the impact of different pelvic floor problems individually on sexual function. The sexual dimension provides 3 domain scores for the different aspects of pelvic floor symptomatology that may impact on sexual function: (1) Urinary, (2) Bowel & (3) Vaginal. The 2 final sexual domain scores are (4) Dyspareunia and (5) General sex life (Figure 1). For the purposes of this study we were interested in the impact of urinary symptoms and their impact on sexual function.

The score for the urinary domain of the sexual dimension is derived from 4 items shown below. Each item is scored on an ordinal scale from 0-3, where 0 represents 'Never' and 3 represent 'All of the time'. These 4 items included;

- (1) Overall impact of bladder problems on sex life
- (2) Anxiety related to bladder problems during sex
- (3) Avoidance of sex by the patient because of her bladder problems
- (4) Partners avoiding sex because of the patient's bladder problems

Items not contributing to this score also included incontinence during intercourse, orgasm incontinence, penetration incontinence & post-coital UTI. For the purposes of this study the association of different urodynamic diagnosis on each of these 8 parameters was evaluated.

Sample size calculations were done. 480 women were identified as fulfilling the inclusion and exclusion criteria. Assuming a 5% margin of error and 95% confidence intervals with unknown responses, 218 responses were required to make this a valid study. As data was available for a larger number ie 350 we used all the data available.

Women were given the opportunity of completing ePAQ, prior to their outpatient consultation. Only women who gave consent for their data to be used for non clinical purposes were included. Data were anonymised and exported to SPSS for analysis.

Urodynamic investigations were performed in accordance with the guidelines for Good Urodynamic Practice proposed by the International Continence Society (ICS)[5]. The diagnosis of DOA, USI, Mixed incontinence and normal urodynamics were in keeping with the terminology recommended by the ICS[6].

Pearson's Rank Correlation was used to establish the association between severity of urinary incontinence and its impact on sex life. Kruskal-Wallis test was used to compare the different parameters of sexual function with different urodynamic diagnoses ie Urodynamic stress incontinence(USI), detrusor overactivity (DOA), Mixed incontinence (USI + DOA) and normal urodynamics. Chi square test was used to compare orgasm and penetration incontinence in different urodynamic diagnosis.

This study had approval as a service evaluation project by Sheffield Teaching Hospitals. As data was obtained from a database and all data used had patient approval formal ethical approval was not required.

Results

480 women attending the Urogynaecology Unit between 1st January 2006 & July 2010 referred with urinary incontinence and subsequently undergoing urodynamics formed

the study group. 350 women completed the sexual domain of the ePAQ questionnaire and fulfilled the inclusion criteria and data from their ePAQ and UDS was analysed. The overall frequency of different urodynamic diagnosis is shown in table 1. 211/350 (60%) of women undergoing urodynamics and 12/31 (38%) of women with normal urodynamics had leakage during intercourse. Pearsons rank correlation demonstrated that overall quality of life in women with urinary incontinence was strongly correlated to the impact of urinary symptoms on sex life ($r = 0.659$, $p < 0.01$).

The 130 women who did not complete the sexual dimension of the questionnaire were older than those who did and the most commonly cited reason was sexual inactivity. The frequency of the different urodynamic diagnoses was no different in those who did not complete the sexual dimension compared to those who did. The mean age of women who completed the questionnaire was 48.3 years (Standard deviation = 9.62).

The parameters of sexual function were no different with different urodynamic diagnosis. Table 2 shows the results of the Kruskal-Wallis test comparing different parameters of sexual function in the different UDS diagnosis (USI, DOA and mixed). In women clinically presenting with incontinence but normal urodynamic diagnoses, all parameters were equally affected except incontinence with intercourse. In women with normal urodynamics incontinence with intercourse was less likely ($p = 0.035$).

The prevalence of orgasm incontinence alone with no penetration incontinence ($n = 56$) was not significantly different in women with USI (34/201; 16%), DOA (11/67; 16%), mixed incontinence (7/51; 14%) and normal urodynamics (4/31, 13%). Likewise there was no significant difference in the prevalence of penetration incontinence with no orgasm incontinence ($n = 51$) in women with underlying USI (30/201; 15%), DOA (11/67; 16%) and Mixed incontinence (9/51; 18%). In women with normal urodynamics penetration incontinence alone was unlikely (1/31; 3%; $P < 0.005$).

Comparisons of the underlying urodynamic diagnosis of USI, DOA mixed incontinence and normal urodynamics in women with coital incontinence, orgasm incontinence and penetration incontinence in women is shown in table 3.

Discussion and Conclusions

Incontinence during intercourse is a common problem in women with urinary incontinence and in our study is reported in 60%. The different parameters of sexual function ie, overall impact on sexual function, incontinence with intercourse, penetration incontinence, orgasm incontinence, patient avoidance, partner avoidance, anxiety and postcoital infections are not influenced by the underlying urodynamic diagnosis. The presence of specific symptoms ie orgasm or penetration incontinence in isolation is not prognostic of underlying urodynamic diagnosis. Worsening urinary incontinence significantly impacts on and causes a deterioration in sex life.

This is the largest study looking at sexual symptoms using a validated questionnaire and underlying urodynamic diagnosis. In addition to orgasm and penetration incontinence other parameters of sexual function were also analysed. Data were collected as part of routine clinical care[7] using an electronic questionnaire hence patients were likely to volunteer symptoms rather than be too embarrassed to discuss them. Other factors that might impact on sexual function ie prolapse, painful bladder syndrome, previous surgery and voiding dysfunction were excluded from the analysis.

The chief weakness of our study is that we do not have demographic data on the parity or ethnicity and therefore it is difficult to establish the impact if any of these variables.

The main study cited when discussing coital incontinence in women with urinary incontinence is the paper by Hilton[1] in 1988. The prevalence of coital leakage in our study was significantly higher (60%vs 24%). This could be because patients are more willing to discuss this symptom. Also as this complaint was elicited by an electronic

questionnaire rather than during the face to face consultation it is likely patients would be more willing to divulge this information[8]. As with the Hilton study we found that USI was found in the majority of women presenting with coital, penetration or orgasm incontinence. This is probably related to the fact that this is the most common indication for urodynamics and, as with the Hilton study, most women with abnormal urodynamics had USI. However the overall prevalence of the different symptoms in the individual groups in our study was not different. This is in contradiction to the Hilton study which showed orgasm incontinence in the absence of penetration incontinence to be more strongly associated with DOA and the converse to be true for USI. The study we present has much larger numbers and uses a validated questionnaire for symptom assessment.

A subsequent study by Moran et al [3] showed a much lower incidence of coital incontinence ie 10.6% compared with our study. They showed genuine stress incontinence (previously used terminology for urodynamic stress incontinence) was present in 79.8% of women with urinary leakage during penetration, in 93.2% with leak on orgasm and in 92.0% who leaked on both. The weakness of this study was its failure to use a validated questionnaire and failure to identify/exclude other confounding variables such as prolapse, previous surgery, voiding problems and a sensory bladder.

A more recent study by El Azab et al [2] found a similar prevalence of coital incontinence in women with urinary incontinence to our study (66 % vs 60). As in our study, they did not find an association with orgasm incontinence and DOA. Their study was however much smaller (90 patients) and included patients with prolapse which may have influenced their results as prolapse can independently impact on sexual function[9,10]. Unlike our study, ElAzab et al only asked about coital, penetration and orgasm incontinence rather than other parameters of sexual function.

Our study further substantiates the importance of asking women about sexual problems when they present with urinary incontinence as it is a very common symptom, but

unless asked women will not volunteer this information[11]. Our study also dispels the belief traditionally held in relation to coital incontinence and found that urodynamic diagnosis is not linked to underlying sexual problems, orgasm or penetration incontinence.

The exact mechanism of coital incontinence remains unclear. It has been hypothesised that the absence of smooth muscle sphincter seen in men and known to prevent reflux ejaculation predisposes women to coital incontinence if they suffer from urinary incontinence. The mechanism of coital leakage in women with normal urodynamics is poorly understood however in view of the limitations of the test it is likely that women [12] with normal investigations had a mild underlying urodynamic diagnosis rather than a negative one.

The prevalence of coital incontinence in women without urinary incontinence has been poorly studied and further research into this area may shed more light on the exact pathophysiology of this condition and its treatment. Another area of considerable controversy is the impact of treatment of urinary incontinence on coital incontinence and this also requires further research.

Table 1 Incidence of UDS Dx in study population (Total 350)

Urodynamic Diagnosis	N	(%)
Urodynamic stress incontinence	201	(58)
Detrusor overactivity	67	(19)
Mixed incontinence	51	(14)
Normal	31	(9)

Table 2: Comparison of different parameters of sexual function with different Urodynamic Diagnosis. (Kruskal-Wallis test)

	USI/DOA/Mixed (Significance)
Overall impact	.575
Incontinence with sex	.698
Orgasm incontinence	.718
Penetration incontinence	.406
Patient avoids intercourse	.084
Partner avoids intercourse	.125
Anxiety	.871
Postcoital infections	.802

USI= urodynamic stress incontinence; DOA= detrusor overactivity

Table 3 Underlying urodynamic diagnosis in women with specific symptoms

Urodynamic Dx	Penetration 147 (%)	Orgasm 153 (%)	No leakage 139 (%)	Leakage with intercourse 211 (%)
USI	85 (58%)	89 (58%)	73 (53%)	128 (61%)
DOA	28 (19%)	28 (18%)	31 (22%)	36 (17%)
Mixed	27 (18%)	25 (16%)	16 (11%)	35 (16%)
Normal	7 (5%)	11 (8%)	19 (14%)	12 (6%)

Figure 1: Summary of e-PAQ response

Urinary			
Domain	Score (0 - 100)		Impact
Pain	11		<input type="radio"/>
Voiding	0		<input type="radio"/>
Overactive bladder	17		<input type="radio"/>
Stress incontinence	67		<input checked="" type="radio"/>
Quality of life	67		<input type="radio"/>
Bowel			
Domain	Score (0 - 100)		Impact
Irritable bowel	13		<input type="radio"/>
Constipation	78		<input checked="" type="radio"/>
Evacuation	14		<input type="radio"/>
Continence	5		<input type="radio"/>
Quality of life	11		<input type="radio"/>
Vaginal			
Domain	Score (0 - 100)		Impact
Pain & sensation	8		<input type="radio"/>
Capacity	X	Screen negative	<input type="radio"/>
Prolapse	X	Screen negative	<input type="radio"/>
Quality of life	0		<input type="radio"/>
Sexual			
Domain	Score (0 - 100)		Impact
Urinary	83		<input checked="" type="radio"/>
Bowel	0		<input type="radio"/>
Vaginal	8		<input type="radio"/>
Dyspareunia	20		<input type="radio"/>
General sex life	42		<input checked="" type="radio"/>

Reference List

- [1] Hilton P. Urinary incontinence during sexual intercourse: a common, but rarely volunteered, symptom. *Br J Obstet Gynaecol* 1988; 95(4):377-381.
- [2] El Azab AS, Yousef HA, Seifeldein GS. Coital incontinence: Relation to detrusor overactivity and stress incontinence. *Neurourol Urodyn* 2011.
- [3] Moran PA, Dwyer PL, Ziccone SP. Urinary leakage during coitus in women. *J Obstet Gynaecol* 1999; 19(3):286-288.
- [4] Radley SC, Jones GL, Tanguy EA, Stevens VG, Nelson C, Mathers NJ. Computer interviewing in urogynaecology: concept, development and psychometric testing of an electronic pelvic floor assessment questionnaire in primary and secondary care. *BJOG* 2006; 113(2):231-238.
- [5] Schafer W, Abrams P, Liao L, Mattiasson A, Pesce F, Spangberg A *et al.* Good urodynamic practices: uroflowmetry, filling cystometry, and pressure-flow studies. *Neurourol Urodyn* 2002; 21(3):261-274.
- [6] Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U *et al.* The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *Neurourol Urodyn* 2002; 21(2):167-178.
- [7] Valderas JM, Kotzeva A, Espallargues M, Guyatt G, Ferrans CE, Halyard MY *et al.* The impact of measuring patient-reported outcomes in clinical practice: a systematic review of the literature. *Qual Life Res* 2008; 17(2):179-193.
- [8] Benoit A, Dykes P, Chang F, Gertman P, Vandever W, Li Q *et al.* Using electronic questionnaires to collect patient reported history. *AMIA Annu Symp Proc* 2007;871.
- [9] Ellerkmann RM, Cundiff GW, Melick CF, Nihira MA, Leffler K, Bent AE. Correlation of symptoms with location and severity of pelvic organ prolapse. *Am J Obstet Gynecol* 2001; 185(6):1332-1337.
- [10] Novi JM, Jeronis S, Morgan MA, Arya LA. Sexual function in women with pelvic organ prolapse compared to women without pelvic organ prolapse. *J Urol* 2005; 173(5):1669-1672.
- [11] Roos AM, Thakar R, Sultan AH, Scheer I. Female sexual dysfunction: are urogynecologists ready for it? *Int Urogynecol J Pelvic Floor Dysfunct* 2009; 20(1):89-101.

- [12] Dokmeci F, Seval M, Gok H. Comparison of ambulatory versus conventional urodynamics in females with urinary incontinence. *Neurourol Urodyn* 2010; 29(4):518-521.

7.5 Paper 5. Impact of Incontinence surgery on Sexual Function: a Systematic Review and meta-analysis

Swati Jha, Mostafa Metwally, Manjunath Ammembal

Abstract

Introduction: Urinary incontinence has an adverse impact on sexual function. The reports on sexual function following the treatment of urinary incontinence are confusing.

Aims: To investigate the impact of surgery for stress incontinence on coital incontinence and overall sexual function.

Outcome Measures: Changes in sexual function and coital incontinence following surgery for urinary incontinence.

Methods: Cochrane Incontinence Group Specialized Register of Controlled Trials, The Cochrane Central Register of Controlled Trials, MEDLINE, and EMBASE were searched for trials of incontinence surgery assessing sexual function and coital incontinence before and after surgery.

Observational studies and randomised controlled trials investigating the impact of surgical correction of stress urinary incontinence on sexual function were included. Surgical interventions included TVT, TVT-O, TOT, Burch and AFS. Studies which included patients undergoing concurrent prolapse surgery were excluded from the analysis. Data extraction and analysis was performed independently by two authors. Coital incontinence was analysed separately and OR with 95% CI calculated. The data were analysed in Review Manager 5 software.

Results:

21 articles were identified which assessed sexual function and/or coital incontinence following continence surgery in the absence of prolapse. Results suggest evidence for a significant reduction in coital incontinence post surgery (OR 0.11; 95% CI 0.07, 0.17).

Conclusions

Coital incontinence is significantly reduced following continence surgery. There were several methodological problems with the quality of the primary research particularly related to heterogeneity of studies, use of different outcome measures and the absence of well-designed randomised controlled trials.

Introduction

It is now widely accepted that Urinary incontinence has an adverse impact on sexual function resulting in coital incontinence (1-4) and a variety of other symptoms with a negative impact on all domains of sexual function(5;6). In this population of women, the symptoms per se, along with fear of odour, embarrassment, shame, loss of self-esteem and fear of, or actual occurrence of, incontinence are contributory factors. Studies have found that women with Urinary incontinence report less frequent sexual activity (5;7) and this may restrict sexual activity for fear of incontinence. Amongst the most common sexual complaints in women with urinary incontinence are low desire, vaginal dryness, and dyspareunia (8). These are similar to the problems seen in women with sexual dysfunction in the absence of urinary incontinence.

The reports on response of sexual function following the treatment of urinary incontinence are confusing. Some studies suggest deterioration (9-12) of sexual function, some an improvement (3;13-16) whereas others are equivocal(17-20).

The aim of this review was to assess the impact of surgery for stress incontinence on coital incontinence and overall sexual function. Women undergoing surgery for stress incontinence may be bothered by the impact it has on different aspects of their life. Sexual function is an important aspect of well-being and some women undergoing surgery for stress incontinence do so in the hope it will improve their sexual function. These may be unrealistic expectations. The current evidence is confusing and does not guide clinicians on the advice they should be giving women prior to incontinence surgery to predict future outcome with regard to sexual function. This study will assist in

counselling women about more realistic expectations of changes in sexual function following surgery. It also provides information on the aspects of sexual function that is likely to be altered by surgery as well as those that will probably remain unchanged.

Methods

The methods followed the guidelines issued by the Meta-analysis of Observational Studies in Epidemiology (MOOSE)(21).

Inclusion and Exclusion Criteria

Sexually active women with stress incontinence either in isolation or in combination with detrusor overactivity (mixed incontinence) proven on Urodynamic studies and undergoing surgery for their stress incontinence were included. Studies where sexual function was assessed were included. Patients acted as their own controls. Articles which included patients with concurrent prolapse were excluded from the review.

Search strategy

A systematic computerized search was conducted on published literature from eight databases in May 2009. The databases searched (inclusive dates) were Medline (1950–2009), Embase (1980–2009), Cochrane library (1991–2009), Science Citation Index (1900–2007), Social Science Citation Index (1900–2009), CINAHL (1982–2009) and Medline In-Process and Other Non-Indexed Citations.

No date or language restrictions were used. The search strategy used combinations of search terms related to sexual function, interventions for incontinence and outcomes for sexual function. Search terms used related to sexual function were 'sexual function' and 'coital incontinence'. Terms relating to the intervention were 'TVT', 'TVT-O', 'Colposuspension' and 'Autologous fascial sling'. Terms related to outcome measures

were 'change', 'improvement' and 'deterioration'. The following databases were searched: Cochrane Incontinence Group Specialized Register of Controlled Trials, The Cochrane Central Register of Controlled Trials, MEDLINE, and EMBASE for trials of incontinence surgery assessing sexual function and coital incontinence before and after surgery. The search was conducted by the SchARR.

Assessment of methodological quality

Studies were predominantly cohort studies. Two randomised controlled trials were identified which analysed sexual function in different continence procedures. The RCTs however used change in SUI as the primary outcome measure rather than sexual function, hence these studies were analysed for the purposes of this systematic review based on the individual procedures performed and outcome with regards to sexual function. We carried out crude event rate analysis of the RCTs by treating each arm as a case series.

Interventions

The type of interventions included commonly performed procedures for Urodynamic stress incontinence ie Tension free vaginal tape (TVT), transobturator tape (TOT), colposuspension and autologous fascial sling as these are approved as being evidence based in their efficacy. Studies looking at procedure no longer in use and not proven to be beneficial were excluded ie bulking agents and minitapes were not included in the analysis.

Outcomes

The studies varied significantly in the reporting of sexual function. Whereas some studies used a Sexual function questionnaire some reported on the change in overall status as a binary outcome ie better, worse or no change and other studies reported on

specific symptoms of sexual function. Questionnaires used included the PISQ 31 and 12 (Prolapse and Incontinence Sexual Function Questionnaire), FSFI (Female Sexual Function Index), Lemack, BFLUTS (Bristol Female Lower Urinary Tract Symptoms questionnaire) and the ePAQ (electronic - Pelvic floor assessment Questionnaire). To combine the results from the different studies it was agreed that using a binary outcome ie improvement, no change and deterioration was appropriate as this data could be extracted from all studies including those that used both validated and non validated questionnaires for assessment of sexual function.

Some studies did not report on the impact of incontinence on sexual function preoperatively. Studies which reported on pre and postoperative data formed part of the meta analysis.

Data Extraction and analysis

Two authors (SJ and KA) independently screened the titles and abstracts of the papers resulting from the initial search to determine if they met the inclusion and exclusion criteria. Where there was doubt the full paper was reviewed. The methodological quality of each study was assessed using the Newcastle-Ottawa scale. All relevant raw data were extracted from each eligible study by both the reviewers independently and disagreements were resolved through verification and discussion as well as by review by the third author (MM). Where necessary, we contacted the researchers to obtain additional information about study methods or outcome measures.

Data were analysed using Review Manager (RevMan) 5.0 (the Cochrane Collaboration, 2008; The Nordic Cochrane Centre, Copenhagen, Denmark) Coital incontinence as a specific outcome was analysed separately by generating two-by-two tables and expressed as odds ratios (OR) with 95% confidence intervals (CI) by comparing pre and postoperative results using the patients as their own controls.. Overall probability of improvement, no change and deterioration was calculated for all procedure and for

midurethral tapes. For continuous outcomes ie where a questionnaire was used for assessment of sexual function a standardised mean difference was used. TVT and TVT-O/TOT were compared as they are the most commonly performed continence procedures and a meta-analysis conducted. Statistical heterogeneity was measured using the the chi squared and I^2 statistics. A chi squared statistic larger than its degree of freedom, and an I^2 statistic > 50% indicated the presence of significant heterogeneity in which case a random effects model for data analysis was used

Results

One hundred and sixty two publications evaluating the effect of continence surgery on sexual function were identified. Discussion with experts and a hand search of the references of the primary articles or specialist reviews/publications failed to retrieve any further studies. No relevant systematic reviews were identified.

These 162 references were reviewed for inclusion and exclusion criteria. Figure 1 summarises the process of literature identification as well as inclusion and exclusion. None of the articles in foreign languages (4) were suitable for inclusion as they were either review articles, abstract with insufficient information, commentaries. 46 articles were initially identified as being potentially suitable for the inclusion. Of these 3 were review articles, 7 included patients with prolapse or other procedures, 10 were abstracts or had insufficient data and 5 studies were repeat data from studies included in the review.

21 articles were identified which assessed sexual function and/or coital incontinence following continence surgery in the absence of prolapse and formed the basis of this systematic review. These studies looked at several different interventions including TVT TOT and TVTO, Burch and autologous fascial sling. Table 1 shows the characteristics of the studies included in the review.

Overall Sexual function following Continence surgery

18 studies which analysed 1578 women, assessed improvement, no change and deterioration in sexual function (Table 2). The combined analysis of all studies showed that in just over half of all women there was no change of overall sexual symptoms after surgery (55.5%). Combined the analysis of all studies also suggested significant albeit small odds of improvement of sexual problems (31.9%). The odds of improvement were at least twice as likely as the odds of deterioration (13.1%).

16 studies (1252 women) out of the 21 looked at changes following midurethral tapes either alone or in comparison with other procedures. Data was extracted for midurethral tapes and overall improvement, no change and deterioration estimated. The interventions included ie TVT, TOT and/or TVTO. With Midurethral tapes the probability of no change was 56.7%. There was a 33.9 % chance of improvement and 9.4% of deterioration. The chances of improvement were 3 times as likely as the chances of deterioration

7 studies used a questionnaire for symptom assessment pre and postoperatively. By comparing the pre and postoperative scores for sexual function of all procedures pooled together there was no significant improvement of sexual function following surgery and the standardized mean difference was 0.62, 95% CI 0.00 ,1.24. The results are shown in Figure 2. Cayan et al (22) reported on 2 different procedures hence outcomes for the 2 procedures are shown as 2 separate entries.

For midurethral tapes alone there was a no significant improvement of sexual function with a standardized mean difference of 0.95, 95% CI 0.34, 1.56.

Comparison of TVT vs TOT/TVTO

4 studies compared TVT (246 women) and TOT/TVT-O (290 women). These were all cohort studies with considerable heterogeneity of studies. The odds of improvement were similar for both procedures (OR 0.97; 95% CI 0.63, 1.49) (Figure 3).

Coital incontinence following continence surgery

11 out of 21 studies which analysed 1271 women assessed coital incontinence before and after surgery. The results suggest evidence for significant reduction in coital incontinence post surgery (OR 0.12; 95% CI 0.08, 0.17) (Figure 4). When assessing the reduction in coital incontinence following midurethral tapes alone the results were similar (OR 0.13; 95% CI 0.09, 0.17).

Discussion and Conclusion

Coital incontinence is significantly reduced following continence surgery (OR 0.11; 95% CI 0.07, 0.17). The current evidence for stress incontinence surgery and its impact of sexual function is limited. Despite the fact that the pooled results suggest a 2 to 3 times greater likelihood of improvement compared to deterioration in sexual function, at least half of all women undergoing surgery for stress incontinence are likely to experience no change in sexual function. There is no difference in sexual function following the two most commonly performed procedures for SUI ie the TVT and TOT/TVT-O (OR 0.97; 95% CI 0.63, 1.49).

We need to be cautious when interpreting these results as there were several methodological problems with the quality of the primary research particularly related to heterogeneity of studies, use of different outcome measures and the absence of well designed randomised controlled trials. The heterogeneity of the studies was related to the variations in age as well as the inclusion and exclusion criteria and the previous surgical history of the participants. The variations in age alone is likely to have a considerable impact⁽¹³⁾ and is associated with a reduced inclination to respond to the

sexual function questions than younger women. In addition increasing age is also known to be an independent risk factor for worsening sexual function(35). None of the studies comment on the impact of complications of surgery may have had on sexual function ie tape erosion, bladder injury, denovo detrusor overactivity or failure of the procedure.

One of the biggest problems with the primary studies that formed the basis of the review is that the cohort studies have looked at an intervention for a problem (ie stress incontinence) and the outcome of interest (sexual function/coital incontinence) is separate to what the intervention is used for. This makes it difficult to establish the association between the outcome and the primary pathology in the individual series. Though two RCTs (31;32) were included in the review they were designed to assess primarily SUI following surgery as opposed to sexual function. As with the other studies they did not assess what proportion of the sexual dysfunction was associated with urinary incontinence, hence it is difficult to confirm that the response to surgery was a result of curing of the SUI. Only one study established the sexual dysfunction related to urinary incontinence and the subsequent response (3). However this study used a questionnaire (ePAQ(36)) which though validated for urinary incontinence is not currently validated for sexual dysfunction in women with pelvic floor problems.

The analysis of sexual function in the different studies was done by different methods. Some assessed improvement, no change and deterioration however most studies do not clarify which aspects contributed to this difference. Very few studies correlated the failure of the procedure to deterioration in sexual function however in those that did, the more successful the surgery the greater the improvement in sexual function. This suggests deterioration in sexual function could be related to a failure of the procedure to treat the actual incontinence. However this does not explain the 'no change' following surgery. This is possibly because other factors contribute to 'worsening' or 'no change' in sexual function even with improvement in SUI such as an alteration of vaginal anatomy by manipulation of vaginal mucosa, narrowing and elevation of the vaginal

walls, dyspareunia, lack of libido, reduced sensation, anorgasmia, high post void residuals and de novo urgency post surgery.

In addition for those studies where a questionnaire was used this was variable and most were not validated for use in pelvic floor dysfunction. The International Continence Society (ICS) in its 3rd Consultation on Incontinence (37) created a grading system of patient reported outcome measures for urinary and faecal incontinence and pelvic organ prolapse. The ICS graded commonly used questionnaires into grade A (highly recommended), Grade B (recommended) and grade C (with potential). Interestingly the Golombok Rust Inventory of Sexual Satisfaction (GRISS), the only grade A questionnaire was not used in any of the studies included in the review. A few studies used a Grade B Questionnaire such as PISQ which is a validated condition specific questionnaire (13;14;31). However others used a grade C (FSFI, BFLUTS) or other questionnaire. Aside from the PISQ, questionnaires are not designed to assess changes in sexual health specifically caused by pelvic floor dysfunction. The use of non validated tools for assessment of sexual function may not reliably describe the changes in sexual function after continence surgery including midurethral tapes. None of the studies took into account the DSM classification of sexual dysfunction when assessing the impact of SUI or its treatment.

The studies by Abdel Fatah(31), Pace(28) and El Enen(23) appear to show more significant improvement in sexual function compared to the other studies. However all three studies are well conducted, use a validated questionnaire for assessment of sexual function and have appropriate follow up of greater than 3 months. The study by Abdel Fatah is the largest single series and follow up was appropriate at 12 months. The average age of participants was 51.8. Pace et al also had a relatively large series of 101 patients but follow up was at 3 months and the mean age of participants was higher at 57. In the study by El Enen mean age of participants was younger (40.5 years) and follow up was at 12 months.

For conducting the meta-analysis of coital incontinence and change in overall sexual function, as there were no controls hence the patients' preoperative results were used as controls for the postoperative outcomes. This is not an ideal situation and it is not therefore possible to obtain information on individual patients, but provides information for the group as a whole.

When counselling women undergoing surgery for stress incontinence and concurrent sexual dysfunction they may be told that coital incontinence is likely to improve. Overall sexual function is likely to remain unchanged though there is a small possibility of improvement or even deterioration following surgery. The retropubic or obturator approach does not influence the impact on sexual function.

Female sexuality is complex and multi factorial. To establish the accurate impact of surgery for stress incontinence it is important to establish the impact of SUI on sexual dysfunction in the individual studies and alterations following surgery by using questionnaires that assess both function and activity. Adequately powered Randomised controlled trials of interventions targeting sexual dysfunction and using validated questionnaires are needed to assess the clinical relevance of continence surgery in patients with urinary incontinence and associated sexual problems.

Figure 1 Flow chart of literature search and data extraction

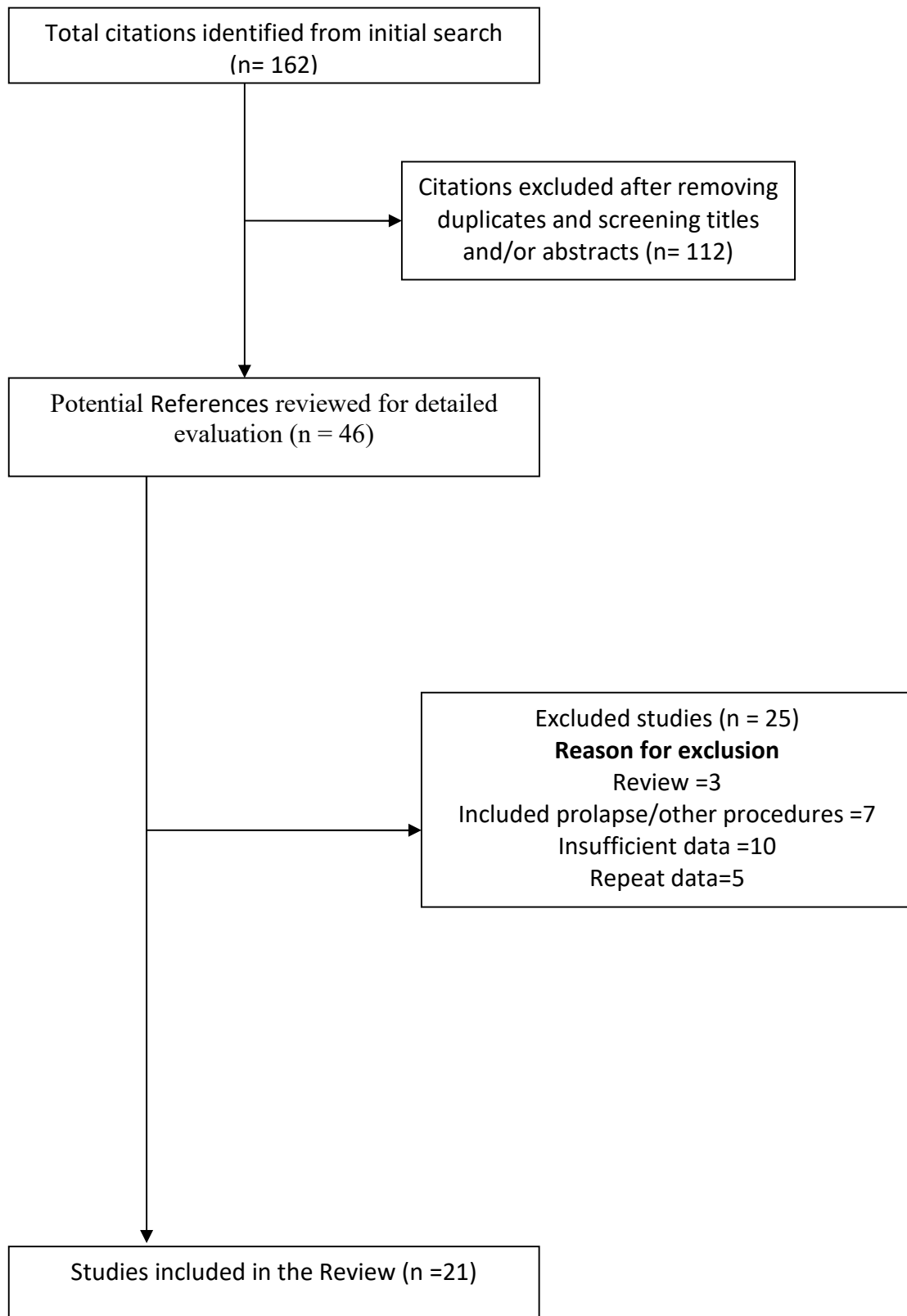


Figure 2. Meta-analysis of impact of incontinence surgery on Sexual function

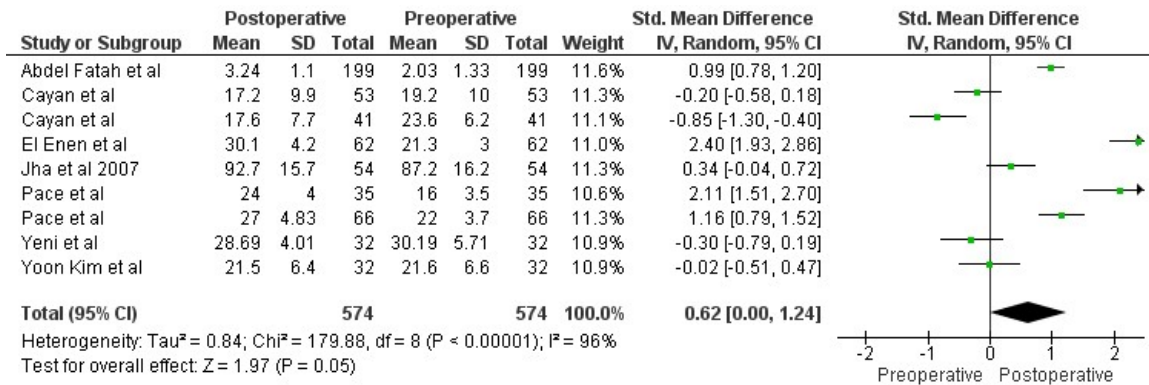


Figure 3. Comparison of TVT vs TOT/TVT-O for improvement

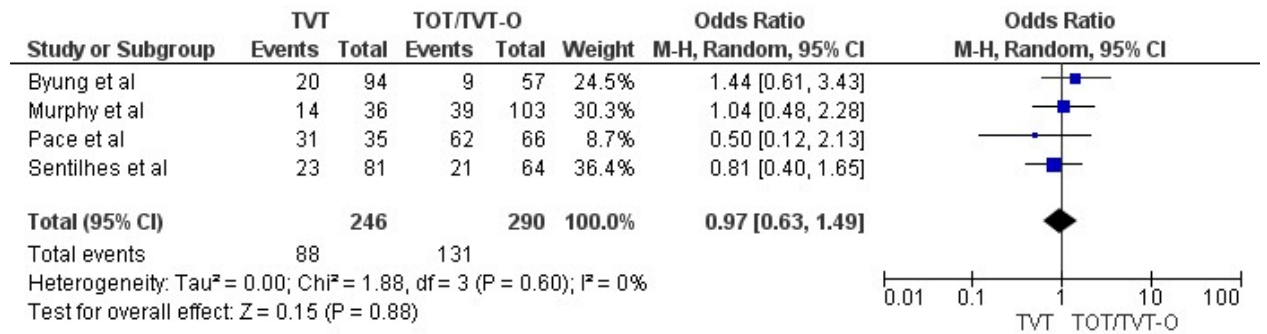


Figure 4. Meta-analysis of Impact of incontinence surgery on Coital Incontinence

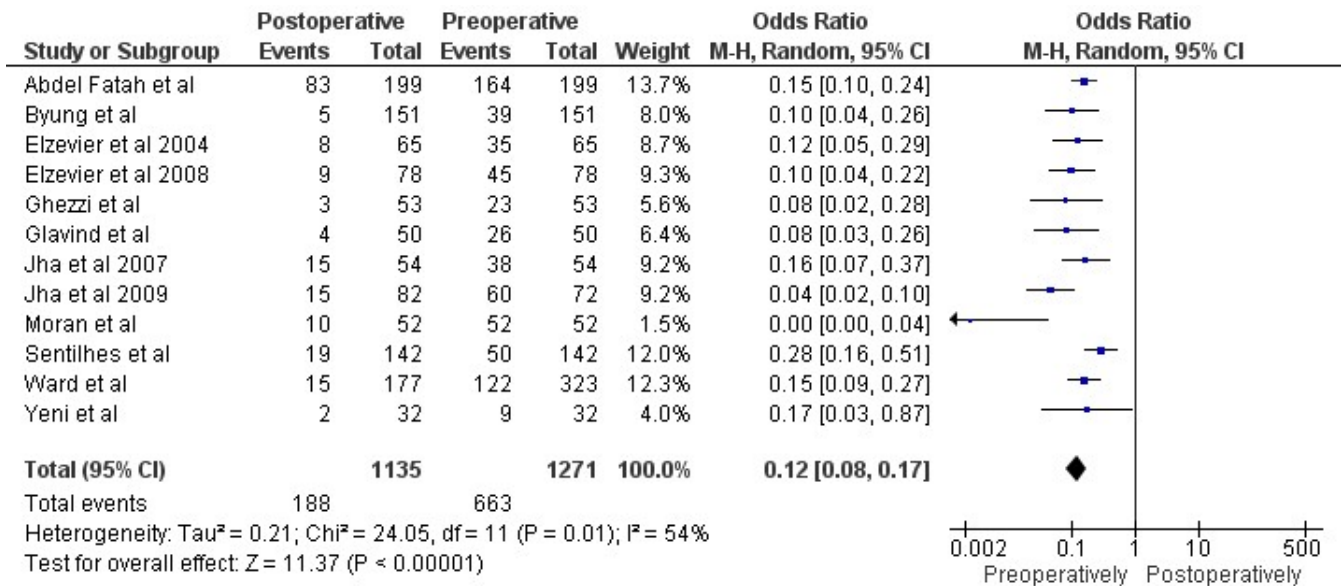


Table 1. Characteristics of studies reviewed (n=21)

	Study	Characteristics	Study design	Intervention	Sample size	Outcome	Follow up (mean)
1	El Enen et al 2009(23)	Inclusion: SUI, neurologically intact, no other surgical diseases Exclusion: UI Age mean : 40.5 Parity:2.1 Operative success:84%	Prospective Cohort	TOT	62	FSFI Improvement, no change deterioration in sexual function	12 months
2	Sentilhes et al 2008(24)	Inclusion: USI Exclusion-prolapse, mixed incontinence Age Mean-TVT 54.4; TOT 54.3. Parity:2 Operative success-not stated	Retrospective cohort	TVT (81) TOT (64)	145	Lemack Q Improvement, no change deterioration in sexual function Coital incontinence	42 months
3	Jha et al 2009(3)	Inclusion: USI, Mixed incontinence Exclusion-prolapse Age Range-49.1 Operative success:not stated	Prospective cohort	TVT	62	ePAQ Improvement, no change deterioration in sexual function Coital incontinence	3 months
4	Moran et al 1999(25)	Inclusion: USI Exclusion: not specified Age Range-46.1 Parity:2 Operative success:84%	Prospective cohort	Burch	52	Coital incontinence	18 months
5	Murphy et al 2008(26)	Inclusion: USI Exclusion:prolapse, concomitant surgery Age Range-54.8 Parity:2.2 Operative success:82.1	Retrospective cohort	TVT(36) TVTO (103)	139	Improvement, no change, deterioration in sexual function	14.7 months
6	Elzevier et al	Inclusion: SUI Exclusion: prolapse Age Mean-TOT 52	Prospective Cohort	TOT (44) TVTO (34)	78	Lemack Q	3 months

	2008(27)	TVTO 52 Operative success: not stated				Improvement, no change, deterioration in sexual function Coital incontinence	
7	Pace et al 2008(28)	Inclusion: USI Exclusion: prolapse, Urge incontinence Age Range-TVT-55 TOT 59 Parity: 2 Operative success:97.1%	Prospective Cohort	TVT (35) TOT (66)	101	FSFI Improvement, no change deterioration in sexual function	3 months
8	Cayan et al 2007(22)	Inclusion: SUI Exclusion: prolapse Age Mean-48.1 sling 48.3 burch Parity: 3 Operative success:Sling 84.9% Burch 69.3%	Prospective	Sling (53) Burch (41)	94	FSFI Improvement, no change deterioration in sexual function	6 months
9	Jha et al 2007(13)	Inclusion:USI Exclusion: prolapse, DOA Age Range-54.2 Parity :3 Operative success:97%	Prospective Cohort	TVT/TVT-O	54	PISQ 31 Improvement, no change deterioration in sexual function Coital incontinence	6 months
10	Ghezzi et al 2005(14)	Inclusion: USI Exclusion: prolapse, DOA Age Range-51 Parity : 2 Operative success:98%	Prospective Cohort	TVT	53	PISQ 12 Improvement, no change deterioration in sexual function Coital incontinence	6 months
11	Elzevier et al 2004(15)	Inclusion: USI Exclusion: prolapse, DOA Age Range-50.5 Operative success: Not stated	Retrospective	TVT	65	Lemack Improvement, no change deterioration in sexual function Coital incontinence	3 months
12	Yeni et al 2003(12)	Inclusion: SUI Exclusion: Prolapse surgery Age Range-38.34 Operative success:90.6%	Prospective	TVT	32	FSFI Coital incontinence	6 months

13	Glavind et al 2004(17)	Inclusion: SUI Exclusion: Not stated Age Range-Not stated Operative success:92%	Retrospective Cohort	TVT IVS	48	Improvement, no change deterioration in sexual function Coital incontinence	3 months
14	Mazouni et al 2004(10)	Inclusion: SUI Exclusion: Not stated Age Range-57.8 Operative success:87.2%	Prospective cohort	TVT	55	Improvement, no change deterioration in sexual function	> 6 weeks
15	Maaita et al 2002(18)	Inclusion:USI Exclusion: prolapse Age Range-52.6 Operative success:93.5%	Prospective	TVT	43	Improvement, no change deterioration in sexual function	6 months
16	Byung et al 2009(29)	Inclusion: USI Exclusion: DOA, Prolapse Age : 52.4 Parity : 2.5 Operative success:82.8%	Retrospective	TVT (94) TOT (57)	151	Improvement, no change deterioration in sexual function Coital incontinence	>8 weeks
17	Hasse et al 1988(30)	Inclusion:USI Exclusion: concomitant surgery Age Range-49 Operative success:87.7%	Prospective	Burch	14	Improvement, no change deterioration in sexual function	6 months
18	Abdel Fatah 2010(31)	Inclusion:USI Exclusion: Prolapse, comorbidities Age Range: 51.8 Operative success:91%	RCT	TOT TVT-O	199	PISQ 12 Improvement, no change deterioration in sexual function	12 months
19	Ward et al 2008(32)	Inclusion: USI Exclusion: DOA, prolapse , previous surgery for prolapse or incontinence, voiding dysfunction Age Range-50	RCT	TVT (98) Colposuspension (79)	177	BFLUTS Improvement in sexual function Coital incontinence	60 months

		Parity:2 Operative success: TVT 75% Colposuspension 69%					
20	Yoon Kim et al 2008(33)	Inclusion: SUI, Exclusion: Prolapse Age mean : 44.9 Parity:2.8 Operative success:91.4%	Prospective cohort	TVT/TOT/Monarc/SPARC	32	FSFI	6 months
21	Marszałek et al 2007(34)	Inclusion: SUI, Exclusion: not stated Age mean : 59.9 Parity:2.1 Operative success:82.7%	Prospective cohort	TVT	52	Improvement, no change deterioration in sexual function	18 months

SUI: Stress urinary incontinence; USI: urodynamic stress incontinence; DOA: detrusor overactivity; OAB: overactive bladder; FSFI: Female Sexual Function Index; PISQ 12: Prolapse and Incontinence Sexual Function Questionnaire (short form) ; PISQ 31: Prolapse and Incontinence Sexual Function Questionnaire; ePAQ: electronic pelvic floor assessment Questionnaire; BFLUTS: Bristol

Table 2. Change in sexual function following all Incontinence surgery

S No	Study	Procedure (Total cases)	Improvement % (n)	No change % (n)	Deterioration % (n)
1	El Enen et al	TOT (62)	11 (7)	86 (53)	3 (2)
2	Sentilhes et al	TVT/TOT (145)	31.2 (45)	53.9 (78)	14.9 (22)
3	Jha et al 2009	TVT (62)	50 (31)	42 (26)	8 (5)
4	Murphy et al	TVT (36) TVT-O (103)	38.9 (14) 37.1 (38)	52.8 (19) 61 (63)	8.3 (3) 1.9 (2)
5	Elzevier et al 2008	TOT (44) TVT-O (34)	18.2 (8) 20.6 (7)	68.2 (30) 73.5 (25)	13.6 (6) 5.9 (2)
6	Pace et al	TVT/TOT (101)	90.1 (91)	--	9.9 (10)
7	Cayan et al	Sling (53) Burch (41)	24.5 (13) 12.2 (5)	28.3 (15) 24.4 (10)	47.2 (25) 63.4 (26)
8	Jha et al 2007	TVT/TVT-O (54)	37 (20)	53.7 (29)	9.3 (5)
9	Ghezzi et al	TVT (53)	34 (18)	62.2 (33)	3.8 (2)
10	Elzevier et al 2004	TVT (65)	26.1 (17)	72.3 (47)	1.6 (1)
11	Glavind et al	TVT/IVS (48)	25 (12)	60.4 (29)	6.6 (7)
12	Mazouni et al	TVT (55)	1.8 (1)	74.4 (41)	23.8 (13)
13	Maaita et al	TVT (43)	5 (6)	71 (31)	14 (6)
14	Byung et al	TVT (94) TOT (57)	21.3 (20) 15.8 (9)	64.9 (61) 66.7 (38)	13.8 (13) 17.5 (10)
15	Hasse et al	Burch (14)	7 (1)	93 (13)	--
16	Abdel Fatah et al	TOT/ TVT-O (199)	94 (188)	1.4 (3)	4.3 (8)
17	Ward et al	Burch (79) TVT (98)	47 (37) 54 (53)	-- --	-- --
18	Marszalek et al	TVT (52)	33.3 (17)	52.4 (28)	14.3 (7)

Reference List

- (1) Baessler K, Stanton SL. Does Burch colposuspension cure coital incontinence? *Am J Obstet Gynecol* 2004; 190(4):1030-1033.
- (2) Hilton P. Urinary incontinence during sexual intercourse: a common, but rarely volunteered, symptom. *Br J Obstet Gynaecol* 1988; 95(4):377-381.
- (3) Jha S, Radley S, Farkas A, Jones G. The impact of TVT on sexual function. *Int Urogynecol J Pelvic Floor Dysfunct* 2009; 20(2):165-169.
- (4) Wehbe SA, Kellogg S, Whitmore K. Urogenital complaints and female sexual dysfunction. Part 2. *J Sex Med* 2010; 7(7):2304-2317.
- (5) Aslan G, Koseoglu H, Sadik O, Gimen S, Cihan A, Esen A. Sexual function in women with urinary incontinence. *Int J Impot Res* 2005; 17(3):248-251.
- (6) Salonia A, Zanni G, Nappi RE, Briganti A, Deho F, Fabbri F et al. Sexual dysfunction is common in women with lower urinary tract symptoms and urinary incontinence: results of a cross-sectional study. *Eur Urol* 2004; 45(5):642-648.
- (7) Achtari C, Dwyer PL. Sexual function and pelvic floor disorders. *Best Pract Res Clin Obstet Gynaecol* 2005; 19(6):993-1008.
- (8) Handa VL, Harvey L, Cundiff GW, Siddique SA, Kjerulff KH. Sexual function among women with urinary incontinence and pelvic organ prolapse. *Am J Obstet Gynecol* 2004; 191(3):751-756.
- (9) Lemack GE, Zimmern PE. Sexual function after vaginal surgery for stress incontinence: results of a mailed questionnaire. *Urology* 2000; 56(2):223-227.
- (10) Mazouni C, Karsenty G, Bretelle F, Bladou F, Gamerre M, Serment G. Urinary complications and sexual function after the tension-free vaginal tape procedure. *Acta Obstet Gynecol Scand* 2004; 83(10):955-961.
- (11) Rogers RG, Kammerer-Doak D, Darrow A, Murray K, Olsen A, Barber M et al. Sexual function after surgery for stress urinary incontinence and/or pelvic organ prolapse: a multicenter prospective study. *Am J Obstet Gynecol* 2004; 191(1):206-210.
- (12) Yeni E, Unal D, Verit A, Kafali H, Ciftci H, Gulum M. The effect of tension-free vaginal tape (TVT) procedure on sexual function in women with stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2003; 14(6):390-394.

- (13) Jha S, Moran P, Greenham H, Ford C. Sexual function following surgery for urodynamic stress incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2007; 18(8):845-850.
- (14) Ghezzi F, Serati M, Cromi A, Uccella S, Triacca P, Bolis P. Impact of tension-free vaginal tape on sexual function: results of a prospective study. *Int Urogynecol J Pelvic Floor Dysfunct* 2006; 17(1):54-59.
- (15) Elzevier HW, Venema PL, Nijeholt AA. Sexual function after tension-free vaginal tape (TVT) for stress incontinence: results of a mailed questionnaire. *Int Urogynecol J Pelvic Floor Dysfunct* 2004; 15(5):313-318.
- (16) Wehbe SA, Whitmore K, Kellogg-Spadt S. Urogenital complaints and female sexual dysfunction (part 1). *J Sex Med* 2010; 7(5):1704-1713.
- (17) Glavind K, Tetsche MS. Sexual function in women before and after suburethral sling operation for stress urinary incontinence: a retrospective questionnaire study. *Acta Obstet Gynecol Scand* 2004; 83(10):965-968.
- (18) Maaita M, Bhaumik J, Davies AE. Sexual function after using tension-free vaginal tape for the surgical treatment of genuine stress incontinence. *BJU Int* 2002; 90(6):540-543.
- (19) Shah SM, Bukkapatnam R, Rodriguez LV. Impact of vaginal surgery for stress urinary incontinence on female sexual function: is the use of polypropylene mesh detrimental? *Urology* 2005; 65(2):270-274.
- (20) Weber AM, Walters MD, Schover LR, Mitchinson A. Sexual function in women with uterovaginal prolapse and urinary incontinence. *Obstet Gynecol* 1995; 85(4):483-487.
- (21) Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA* 2000; 283(15):2008-2012.
- (22) Cayan F, Dilek S, Akbay E, Cayan S. Sexual function after surgery for stress urinary incontinence: vaginal sling versus Burch colposuspension. *Arch Gynecol Obstet* 2008; 277(1):31-36.
- (23) El Enen MA, Ragb M, El Gamasy A, El Ashry O, El Sharaby M, Elbadawy A et al. Sexual function among women with stress incontinence after using transobturator vaginal tape, and its correlation with patient's expectations. *BJU Int* 2009; 104(8):1118-1123.

- (24) Sentilhes L, Berthier A, Caremel R, Loisel C, Marpeau L, Grise P. Sexual function after transobturator tape procedure for stress urinary incontinence. *Urology* 2008; 71(6):1074-1079.
- (25) Moran P, Dwyer PL, Ziccone SP. Burch colposuspension for the treatment of coital urinary leakage secondary to genuine stress incontinence. *J Obstet Gynaecol* 1999; 19(3):289-291.
- (26) Murphy M, van Raalte H, Mercurio E, Haff R, Wiseman B, Lucente VR. Incontinence-related quality of life and sexual function following the tension-free vaginal tape versus the "inside-out" tension-free vaginal tape obturator. *Int Urogynecol J Pelvic Floor Dysfunct* 2008; 19(4):481-487.
- (27) Elzevier HW, Putter H, Delaere KP, Venema PL, Nijeholt AA, Pelger RC. Female sexual function after surgery for stress urinary incontinence: transobturator suburethral tape vs. tension-free vaginal tape obturator. *J Sex Med* 2008; 5(2):400-406.
- (28) Pace G, Vicentini C. Female sexual function evaluation of the tension-free vaginal tape (TVT) and transobturator suburethral tape (TOT) incontinence surgery: results of a prospective study. *J Sex Med* 2008; 5(2):387-393.
- (29) Byung HLS. Changes in sexual function after mid-urethral tape sling operations for stress urinary incontinence in Korean women. *9. Korean Journal of Urology* 50, 908-915. 2009.

Ref Type: Generic

- (30) Haase PS. Influence of operations for stress incontinence and/or genital descensus on sexual life. *Acta Obstetricia et Gynecologica Scandinavica* 67[7], 659-661. 1988.

Ref Type: Generic

- (31) Abdel-Fattah M, Ramsay I, Pringle S, Hardwick C, Ali H, Young D et al. Randomised prospective single-blinded study comparing 'inside-out' versus 'outside-in' transobturator tapes in the management of urodynamic stress incontinence: 1-year outcomes from the E-TOT study. *BJOG* 2010; 117(7):870-878.
- (32) Ward KL, Hilton P. Tension-free vaginal tape versus colposuspension for primary urodynamic stress incontinence: 5-year follow up. *BJOG* 2008; 115(2):226-233.
- (33) Kim DY, Choi JD. Change of sexual function after midurethral sling procedure for stress urinary incontinence. *Int J Urol* 2008; 15(8):716-719.
- (34) Marszalek M, Roehlich M, Racz U, Metzenbauer M, Ponholzer A, Rauchenwald M et al. Sexual function after tension-free vaginal tape procedure. *Urologia Internationalis* 78[2], 126-129. 2007.

Ref Type: Generic

- (35) Tunuguntla HS, Gousse AE. Female sexual dysfunction following vaginal surgery: a review. *J Urol* 2006; 175(2):439-446.
- (36) Radley SC, Jones GL, Tanguy EA, Stevens VG, Nelson C, Mathers NJ. Computer interviewing in urogynaecology: concept, development and psychometric testing of an electronic pelvic floor assessment questionnaire in primary and secondary care. *BJOG* 2006; 113(2):231-238.
- (37) Donovan J, Bosch R, Gotoh M. Symptom and Quality of Life Assessment. 3rd International Consultation on Incontinence. Abrams P, Cardozo L, Khoury S, Wein A, editors. *Incontinence Volume 1 Basics and Evaluation*, 521-584. 2005. Health Publication, Plymouth.

Ref Type: Report

7.6 Paper 6 Impact of treatment of Overactive Bladder with anticholinergics on Sexual Function.

Swati Jha

Abstract:

Purpose

To establish if an improvement in OAB symptoms by treatment with anticholinergics is associated with a corresponding improvement in sexual function.

Methods

This was a prospective observational Questionnaire study using ePAQ – PF (electronic Pelvic assessment questionnaire- pelvic floor), PISQ 12 and PGI-I for Overactive bladder and Sexual function. Sexually active women with overactive bladder were included in the study. Prolapse and voiding dysfunction were exclusion criteria for the study. All women were followed up for 6 months and were treatment naïve. Sexual function before and after treatment was compared. The data were analysed using SPSS. Formal ethical approval was obtained.

Results

34 women were included in the study. Only 8% of women commenced on anticholinergics had an improvement in sexual function, compared to 66% who experienced an improvement in OAB symptoms. Women who did experience a benefit in sexual function did so in the first 3 months of treatment of their overactive bladder and always noted an improvement in OAB symptoms.

Conclusions

Treatment of the overactive bladder symptoms does not guarantee improvement in sexual function.

Introduction

Overactive bladder (OAB) has a prevalence of 20 % in the general population and an increasing prevalence with advancing age. It significantly affects health-related quality of life and daily functioning. OAB with or without incontinence negatively affects women's sexual health, reducing sexual desire and ability to achieve orgasm [1] and several studies have shown an adverse effect on sexual function[2-7]. However there is limited knowledge about the impact of treatment of overactive bladder on sexual function. Given the profound effect of OAB on sexual health, this should be routinely assessed by clinicians treating this condition, and addressed by researchers.

This study aims to identify if treatment with anticholinergics and a corresponding improvement in OAB symptoms is associated with an alteration in sexual function, and if so what aspects of sexual function are changed/improved.

Methods

This study had formal ethical approval by the Yorkshire and Humber Research and Ethic committee and was registered with the host institution (Sheffield Teaching hospitals) Research and development department (STH 15315). The study was funded by a joint grant from BAUS and BSUG which was sponsored by Pfizer.

This was a prospective observational Questionnaire study. This research followed a quantitative methodology. Women were recruited to the study for 24 month. They were then followed up for 6 months. The total duration of the study was 30 months.

Power calculations were done and assuming 20% improvement in PISQ scores to be clinically significant, would require 74 responders (assuming a 20% drop out rate) on any one anticholinergic followed up for a one year period. Given there were approximately 10 different anticholinergics in use this would need a multicenter study to prove effectiveness of individual anticholinergics. This was therefore a pilot feasibility study.

Women were recruited from the Urogynaecology unit at a tertiary teaching hospital. Potential recruits for this study were identified by the author by review of referral letters to secondary care received from GPs or other clinicians prior to attendance. When patients attended, they were asked to complete a pelvic floor assessment questionnaire

to assess the severity of symptoms as part of routine clinical care. This was undertaken using the electronic pelvic floor assessment questionnaire (ePAQ)[8], which enables a comprehensive assessment of the pelvic floor.

The ePAQ-PF is an electronic Pelvic Floor Assessment Questionnaire which has been specifically designed to assess patients with pelvic floor problems. It is an interactive, web-based health related quality of life questionnaire that measures urinary, bowel, vaginal and sexual symptoms and their related impact. It has been validated as a patient related outcome measure (PROM) having undergone extensive psychometric testing in both primary and secondary care settings. 10 specialist urogynaecology departments throughout the UK have adopted the questionnaire for routine use in clinical assessment and follow-up. The questionnaire has an interactive element which hides irrelevant questions (e.g. level of impact) if the symptom is not reported, reducing burden to the responder. Accidental non-response is avoided as an answer is required before progressing to the next question and there is the option of skipping questions if subjects would rather not answer. This assesses pelvic floor function in 4 dimensions: Urinary, Bowel, Vaginal & Sexual and subdivided into 19 psychometrically robust & clinically meaningful domains scores, each score being transformed on a range from 0 (indicating best health status) to 100 (worst health status). The domain score is calculated using the simple formula: $\text{Domain Score} = \frac{\text{total of raw scores for each item in the domain}}{\text{maximum possible score}} \times 100$. The Urinary dimension include overactive bladder as one of its domains.

The sexual dimension provides 3 domain scores for the different aspects of pelvic floor symptomatology that may impact on sexual function: (1) Urinary, (2) Bowel & (3) Vaginal. The 2 final sexual domain scores are (4) Dyspareunia and (5) General sex life. The score for the urinary domain of the sexual dimension is derived from 4 items shown below. Each item is scored on an ordinal scale from 0-3, where 0 represents 'Never' and 3 represent 'All of the time'. These 4 items included;

- (1) Overall impact of bladder problems on sex life

- (2) Anxiety related to bladder problems during sex
- (3) Avoidance of sex by the patient because of their bladder problems
- (4) Partners avoiding sex because of the patient's bladder problems

Items not contributing to this score but analysed by the ePAQ also include orgasm incontinence, penetration incontinence & post-coital UTI.

Patients were identified as being suitable for the study if they scored over 33% bother on the OAB domain of the urinary Dimension and the Urinary domain of the Sexual function Dimension.

Sexually active women diagnosed to have OAB on the ePAQ (electronic Pelvic Floor Assessment Questionnaire) and commencing anticholinergics for the first time were invited to participate in the study. These women were asymptomatic for prolapse. A POP-Q assessment was performed and Aa, Ba, Ap and Bp was above -1 (i.e no anterior or posterior wall prolapse) with no utero-cervical descent for all potential recruits. A confirmed urodynamic diagnosis of detrusor overactivity (DOA) was not a criteria for referral and recruitment was based on symptomatology. Voiding dysfunction (post-void residual of >20% of the voided volume) was ruled out in all recruited women. Pre-treatment data collected included age, ethnicity, parity, BMI, menopausal status, hysterectomy status and previous vaginal operations performed.

Data were collected on the status of bladder symptoms and sexual function before, 3 months after and 6 months after treatment with anticholinergics. The anticholinergics were Tolterodine, Solifenacin, Oxybutynin and Kentera Patch.

The PGI- I asks a patient to rate the response of her condition to therapy and is simple, direct, easy to use, and intuitively understandable to the clinician. They are single item questions which rate the outcome from 'very much worse' to 'very much improved' over a 5 point Likert scale. The construct validity of the PGI-I has been widely established for treatment response.

Sexual function was assessed using PISQ 12[9]. The PISQ 12 (The Pelvic Organ Prolapse Urinary Incontinence Sexual Questionnaire 12) is a condition-specific sexual function questionnaire for women with POP and/or UI that is shown to be valid and reliable. It consists of 12 questions and is reliable and responsive to change in sexually active women with POP and/or UI. In addition, the PISQ-12 is easy to understand and use, and is rapidly completed by the respondent. It has been used to assess the effect of non-surgical therapy, as well as pelvic floor reconstructive surgery on sexual function in women with POP/UI. Of the twelve questions, nine are general sexual-function question and three directly pertain to women with UI/POP.

The data were analysed using SPSS (IBM SPSS Statistics 20). The aim was to analyse and establish the impact of a 20 point improvement in OAB symptoms on bladder symptoms and correlate to changes in sexual function. Patient Global Impression of improvement (PGI-I) data were collected post treatment. Wilcoxon Signed rank test was used to compare pre and post treatment responses in PISQ. Linear regression was used to assess the relationship between the PISQ parameters analysed and changes in OAB scores following treatment. Significance was set at a p value of < 0.05 . Chi square test was performed for Patient Global Impression of Improvement for OAB symptoms and Sexual function after treatment.

Results

In total 34 women were recruited of whom 24 completed the study to at least 6 months and their data was analysed. Table 1 shows the demographic data of the women recruited. The mean BMI of women recruited was 26.8 (SD 5.6) and mean age was (40.9) (SD 9.4)

Wilcoxon signed rank test for PISQ at baseline and repeated at 3 months and 6 months showed no significant improvement in scores with a p value of 0.909 at 3 months and 0.458 at 6 months. The data was also extracted by excluding women who were

menopausal (7/24) to see if this contributed to the impact on Sexual function. The results did not show any difference and changes in PISQ scores remained statistically insignificant pre and post treatment at 3 and 6 months.

Linear Regressions failed to show any association of any of the PISQ domains to changes in OAB scores following treatment.

Table 2 shows mean PISQ scores at baseline and at 3 and 6 months post commencement of treatment.

PGI I for OAB showed that (16/24) women had an improvement in OAB symptoms on anticholinergics. This is similar to expected levels of improvement/cure on medical treatment for OAB. Of these women only 8% (2/24) experienced an improvement in sexual function. Women who experienced no improvement in their OAB symptoms 33% (8/24) did not experience any improvement in their sexual function. Using Chi square test improvement in OAB symptoms were not associated with a statistically significant improvement in sexual function ($p=0.43$).

Discussion

In women with OAB, treatment of the bladder symptoms does not guarantee improvement in sexual function. Only 8% of women commenced on anticholinergics have an improvement in sexual function, compared to 66% who will experience an improvement in OAB symptoms. Improvement in sexual function is only seen in women who have an improvement in OAB symptoms. Overall changes in the different aspects of sexual function are not significant on anticholinergic treatment.

The main strengths of the study are that demographic data was collected and patients were followed up for a sufficient duration ie 3 and 6 months to be able to see differences in sexual function. All patients were treatment naïve. Prolapse, which can impact on

sexual function independently was an exclusion criteria. We analysed women who were premenopausal separately as menopause can impact on sexual function as an independent variable. The other strength of the study was that patient selection was based on identifying patients who had sexual dysfunction related to urinary incontinence. The main weakness of the study was sample size. This was related to identifying patients who fulfilled all the criteria. Most patients attending a tertiary urogynaecology clinic for OAB are not treatment naïve so had been tried on at least one and sometimes more anticholinergics. This precluded their recruitment to the study. We also found a significant proportion of women recruited did not experience an improvement in their OAB symptoms post-treatment. These patients acted as a control group.

The other weakness of our study was that women were on a range of anticholinergics. It could be that these different agents impact on sexual function in different ways. Ideally the study would be performed with a single anticholinergic.

There have been several studies published which have found improvement in sexual function scores by treatment with anticholinergics with corresponding improvement in OAB scores [5, 6, 10].

In the study by Rogers et al [10], women with symptoms of OAB were recruited however they were not identified as having problems of sexual dysfunction prior to treatment. Analysis of patients was using health related Quality of life measure rather than a questionnaire specific for pelvic floor dysfunction.

The study by Sand et al [6] assessed the effect of Transdermal oxybutynin on sexual function. Assessment of patients was using the King's Health Questionnaire and Beck Depression Inventory-II. They also found an improvement in different aspects of sexual function including coital incontinence and effect on relationship with partners.

Patel et al [5] similarly demonstrated an improvement in sexual function with improvement in OAB. This study too like the previous two failed to use a condition specific questionnaire like PISQ to assess changes in sexual function. This study advances the understanding of sexual problems in women with OAB and opportunities for intervention with pharmacotherapy. This study allows us to give more realistic expectations to our patients when commencing treatment for OAB.

This has been very poorly studied in the past and thus prevents us from providing reliable evidence based information to our patients when treating the condition. This study also advances the understanding of the effectiveness of pharmacotherapy in improving sexual quality of life and sexual function and highlights the complex mechanisms of sexual dysfunction. Bladder function may contribute to some extent to sexual function but overall impact on sexual function is multifactorial with emotional, psychological, partner related as well as physical factors all playing an important role. This study highlights this issue and it is likely this was why improvements in sexual function were not noted with improvements in bladder function alone.

There are still many unanswered questions relating to OAB and sexual function. Though improvement in OAB is likely with anticholinergics, this does not guarantee resolution or improvement in sexual dysfunction. Larger, well conducted trials of women on anticholinergics with sexual dysfunction related to their urinary incontinence are required to better answer whether anticholinergics do actually positively affect sexual function.

Acknowledgements: The author would like to thank Hilary Wood, who was the Research nurse on the study and who helped with data collection.

Table 1: Demographic data of women recruited to the study(N=34)

Demographic data	N (%)
Ethnicity	C = 30 (88) As = 2 (6) BA =2 (6)
Menopausal	7(20)
HRT	5 (15)
Hysterectomy	5(15)
Previous vaginal Surgery	2 (6)

C= White Caucasian; As= Asian; BA= Black Afrocarribean

Table 2 Baseline, 3 month and 6 month PISQ in all recruits and postmenopausal women

	Baseline PISQ	3mth PISQ	6 mth PISQ
All women	30.15	30.25	39.50
Postmenopausal women	30.50	35.00	36.00

Reference List

1. Field SM, Hilton P. The prevalence of sexual problems in women attending for urodynamic investigation. *Int Urogynecol J Pelvic Floor Dysfunct* 1993;4:212-5.
2. Cohen BL, Barboglio P, Gousse A. The impact of lower urinary tract symptoms and urinary incontinence on female sexual dysfunction using a validated instrument. *J Sex Med* 2008 Jun;5(6):1418-23.
3. Coyne KS, Margolis MK, Jumadilova Z, Bavendam T, Mueller E, Rogers R. Overactive bladder and women's sexual health: what is the impact? *J Sex Med* 2007 May;4(3):656-66.
4. Oh SJ, Ku JH, Choo MS, Yun JM, Kim DY, Park WH. Health-related quality of life and sexual function in women with stress urinary incontinence and overactive bladder. *Int J Urol* 2008 Jan;15(1):62-7.
5. Patel AS, O'Leary ML, Stein RJ, et al. The relationship between overactive bladder and sexual activity in women. *Int Braz J Urol* 2006 Jan;32(1):77-87.
6. Sand PK, Goldberg RP, Dmochowski RR, McIlwain M, Dahl NV. The impact of the overactive bladder syndrome on sexual function: a preliminary report from the Multicenter Assessment of Transdermal Therapy in Overactive Bladder with Oxybutynin trial. *Am J Obstet Gynecol* 2006 Dec;195(6):1730-5.
7. Sen I, Onaran M, Tan MO, et al. Evaluation of sexual function in women with overactive bladder syndrome. *Urol Int* 2007;78(2):112-5.
8. Radley SC, Jones GL, Tanguy EA, Stevens VG, Nelson C, Mathers NJ. Computer interviewing in urogynaecology: concept, development and psychometric testing of an electronic pelvic floor assessment questionnaire in primary and secondary care. *BJOG* 2006 Feb;113(2):231-8.
9. Rogers RG, Coates KW, Kammerer-Doak D, Khalsa S, Qualls C. A short form of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12). *Int Urogynecol J Pelvic Floor Dysfunct* 2003 Aug;14(3):164-8.
10. Rogers RG, Omotosho T, Bachmann G, Sun F, Morrow JD. Continued symptom improvement in sexually active women with overactive bladder and urgency urinary incontinence treated with tolterodine ER for 6 months. *Int Urogynecol J Pelvic Floor Dysfunct* 2009 Apr;20(4):381-5.

7.7 Paper 7 Impact of Pelvic Floor Muscle Training on Sexual function of women with Urinary Incontinence and a comparison of electrical stimulation versus standard treatment (IPSU Trial): a randomised controlled trial

Swati Jha, Stephen J Walters, Oscar Bortolami, Simon Dixon, Abualbishr Alshreef

Abstract

Aims

To evaluate the clinical and cost-effectiveness of electric stimulation plus standard pelvic floor muscle training compared to standard pelvic floor muscle training alone in women with urinary incontinence and sexual dysfunction.

Methods

Single centre two arm parallel group randomised controlled trial conducted in a Teaching hospital in England. Participants were women presenting with urinary incontinence and sexual dysfunction. The interventions compared were electric stimulation versus standard pelvic floor muscle training. Outcome measures included Prolapse and Incontinence Sexual function Questionnaire (PISQ) physical function dimension at post-treatment (primary); other dimensions of PISQ, SF-36; EQ-5D, EPAQ, resource use, adverse events and cost-effectiveness (secondary outcomes).

Results

114 women were randomised (Intervention n=57; Control group n=57). 64/114 (56%) participants had valid primary outcome data at follow-up (Intervention 30; Control 34). The mean PISQ-PF dimension scores at follow-up were 33.1 (SD 5.5) and 32.3 (SD 5.2) for the Intervention and Control groups respectively; with the Control group having a higher (better) score. After adjusting for baseline score, BMI, menopausal status, time from randomisation and baseline oxford scale score the mean difference was -1.0 (95% CI: -4.0 to 1.9; P=0.474). There was no differences between the groups in any of the secondary outcomes at follow-up. Within this study, the use of electrical stimulation

was cost-effective with very small incremental costs and quality adjusted life years (QALYs).

Conclusions

In women presenting with urinary incontinence in conjunction with sexual dysfunction, physiotherapy is beneficial to improve overall sexual function. However no specific form of physiotherapy is beneficial over another.

Introduction

Urinary incontinence (UI) is defined by the International Continence Society as the 'complaint of involuntary leakage of urine on effort or exertion, or on sneezing or coughing' (1). It is usually caused by weakness or damage to muscles and connective tissues of the pelvic floor, compromising urethral support, or by weakness of the urethral sphincter itself. Epidemiological studies suggest that UI affects up to 41% of the female population (2). It is a health burden and impacts not only on social, psychological, occupational, domestic and physical health but also on sexual well-being. The proportion of women suffering from UI who have sexual dysfunction is significant (3) (4-7) and has been reported to range from 26% (3) to 83% (8). The taboo nature of sexual dysfunction means that symptom reporting has been infrequent and is often underreported. In addition, there is a lack of awareness of availability of treatment. Pelvic Floor Muscle Training (PFMT) is now accepted as the first line treatment for urinary incontinence (9) and the National Institute of Clinical Excellence (NICE) recommend that a trial of supervised PFMT of at least 3 months' duration should be offered to all women with stress or mixed UI prior to any surgical intervention(10). There is good evidence that daily pelvic floor muscle training continued for 3 months is safe and effective with an improvement in urinary incontinence expected in 40–60% of women (11). The aim of therapy is to improve the strength and efficacy of pelvic floor contraction.

The reports on the impact of PFMT on sexual function of women with UI is limited. The current available evidence suggests that supervised PFMT has a beneficial effect on overall sexual function. To date there has been no study assessing the impact of PFMT on sexual function of women with urinary incontinence using a validated condition specific questionnaire. In addition there have been no studies comparing the impact of electrical stimulation versus standard PFMT on sexual function of women with UI.

This study aims to evaluate the clinical and cost-effectiveness of electric stimulation plus standard pelvic floor muscle training (the Intervention) compared to standard pelvic floor muscle training (usual care control treatment) in women with predominant stress urinary incontinence and sexual dysfunction.

Methods

Trial design

Single centre two arm parallel group randomised controlled trial

Setting

Teaching hospital in England

Participants

Women referred to secondary care, within the hospital or community, with urinary incontinence who, following clinical assessment or urodynamic studies, are deemed to require PFMT. All women were reviewed and examined by a urogynaecologist (2 clinicians recruiting to the study) to ensure they fulfilled the inclusion and exclusion criteria. Women were identified to have urinary incontinence on the basis of their presenting complaint and questionnaire completion.

Women were eligible for inclusion in the trial if:

- Sexually active, over the age of 18yrs and with urinary incontinence attending for PFMT.
- Women scoring greater than 25% on the urinary domain of the sexual function dimension, and/or greater than 33% for the degree of bother for the same symptom
Women gave written (personally signed and dated) informed consent.
- Were able to understand, and are willing to comply with the requirements of the protocol.

The following exclusion criteria were applied:

- Women with prolapse as their predominant problem.
- Women who have had any previous incontinence surgery.
- Women who have a Grade 3 or above muscle strength as measured using the modified Oxford Scale on vaginal examination.
- Women with vaginal discharge or UTI.
- Women fitted with an implanted pacemaker.
- Women fitted with a copper coil IUD
- Women who were pregnant.
- Women with undiagnosed pelvic pain.
- Women with a known sensitivity to the electrodes or the electrode gel.
- Women with inflammation or infection of the vulva and vagina.
- Women who had experienced recent haemorrhage or haematoma.
- Women with Atrophic vaginitis.
- Any other medical condition or abnormality (e.g. malignancy or complication) that in the opinion of the investigator would impact upon the safety or efficacy of the study treatment or any study assessments.
- The patient was already enrolled in another interventional trial.
- Non-English speaking women or with a specific language problem.

Potential participants were identified by review of referral letters received from GPs or other clinicians.

Interventions

PFMT (Pelvic Floor Muscle training) was the control and PFMT plus electrical stimulation was the intervention. The technique for PFMT was as recommended by NICE(12). This comprised at least 8 contractions performed three times a day. This was supervised by the Women's Health Physiotherapy team and included 3 members. They were all trained in the provision of PFMT and were members of the Association of Chartered Physiotherapists in Women's Health (ACPWH).

Outcomes

Assessments were made at baseline (prior to commencing PFMT), and approximately 6 months randomisation. The primary outcome was the self-reported Prolapse and Incontinence Sexual function Questionnaire (PISQ-31)(13) physical function dimension, at six months post-randomisation. Secondary outcomes included the other dimensions of PISQ-31 (Behavioral Emotive dimension and Partner-Related dimension scores); SF-36 domain scores(14); EQ-5D score(15); ePAQ(16) urinary & sexual domain scores, adverse events resource use, and cost-effectiveness

The PISQ is a 31 item questionnaire with responses measured on a 5-point Likert scale. It evaluates sexual function of women with either urinary incontinence and/or pelvic organ prolapse. The PISQ identifies 3 separate and distinct domains of sexual function plus an overall total score. These include Behavioural Emotive (15 items), Physical (10 items) and Partner Related (6 items). Whereas the Behavioural Emotive domain evaluates sexual desire, frequency of sexual activity, and orgasmic capabilities, the Physical Domain assesses more directly the effect of urinary incontinence on sexual function. The Partner Related Domain on the other hand assesses the patient's perception of her partner's response to the effect of her pelvic floor disorder on their sexual functioning, as well as her partner's sexual functioning. Scores are calculated by totalling the scores for each question, from 0 (always) to 4 (never), with the exception of question 5, which is scaled from 0 (always) to 5 (do not masturbate). Individual domain scores are calculated by

adding the scores for the individual items in each domain. The total PISQ-31 score ranges from 0 to 125; the physical domain scores range from 0 to 40; Behavioural emotive 0 to 61; Partner related 0 to 24. Higher scores on all domains indicate better sexual functioning.

The SF-36 is a generic health related quality of life, which is capable of producing eight domain scores including, social functioning, emotional role limitations, mental health and general health perceptions. Each domain is scored from zero to 100, with higher scores indicating better health. The SF-36 one of the most popular health related quality of life instruments in the world and has been shown to have good measurement properties across a wide range of conditions.

The EQ-5D is a five–item generic health related quality of life instrument that produces a single preference weighted utility score ranging from -0.57 to 1.00 (good health). It is principally used to generate quality adjusted life years (QALYs) for use in economic evaluation and is recommended by the National Institute for Health and Clinical Excellence (NICE) for use in its technology appraisal programme.

The e-PAQ is an interactive web-based computerised interview, designed to assess & analyse pelvic floor symptoms in women It comprehensively measures symptoms as well as their impact on quality of life. It immediately processes response data, providing an instantaneous measure of pelvic floor health that can be printed out & used during the clinical episode. The e-PAQ provides 34 domain scores in 4 dimensions: Urinary, Bowel, Vaginal & Sexual (all scored on a scale of 0 - 100).

Sample size

The primary outcome was the mean PISQ-31 physical dimension score at 6-months post randomisation. The 10 item physical dimension of the PISQ-31 is scored on a 0 to 40 scale with higher scores indicating better sexual functioning.

From a study of sexual function, in 54 women, following surgery for urodynamic stress incontinence (17), the mean PISQ-31 Physical score pre-operation was 31.0 (SD 6.2) and 35.2 (SD 4.8) a mean improvement in sexual functioning of 4.2 points following surgery. Studies have shown a total change of 5.5 (5.3-5.8) points in the total score and 2 point difference in individual domains is a Minimally Important Difference for the PISQ score (18). On this basis assuming a three-point difference is of clinical and practical importance and a standard deviation of five-points then to have an 80% power of detecting a 3-point mean difference in PISQ-31 physical dimension scores at 6-month between the Intervention and standard control treatment group as statistically significant at the 5% (two-sided) level would require 45 patients per group (90 in total). If 20% of patients drop out and are lost to follow-up then the study will need to recruit and randomize 57 per group (114 in total).

Randomisation

Women scheduled to undergo PFMT (Pelvic Floor Muscle Training) for predominant stress incontinence were randomised to either 1) Standard PFMT or 2) PFMT plus Electrical Stimulation.

Allocation was through block randomisation (with a variable block size an integer multiple of two) stratified by menopausal status (Pre or post-menopausal). The study statistician generated a randomisation schedule using the STATA software. Nottingham University Clinical Trials Research Unit (CTRU) Set-up and hosted a web based randomisation system, for a two arm trial with 114 participants, stratified by menopausal status.

The research administrator arranged for the patient information sheets and consent forms to be made available at each appropriate clinic where it was expected potential patients would be recruited.

Blinding

In order for the physiotherapist to perform the study procedures, they were aware of which group the patient has been randomised to. The woman were not blinded to the treatment they received. The 2 Clinicians were also blinded to the treatment the patient was randomised to when they attended for a final visit.

Statistical Methods

The statistical analysis was performed on an intention-to-treat-basis. A P-value of less than 0.05 was regarded as being statistically significant. The primary outcome mean post-randomisation PISQ-31 physical function score was compared between the Intervention and Control groups using a two independent samples t-test (unadjusted analysis) and a multiple linear regression analysis, adjusting for baseline score, BMI, menopausal status, time from randomisation and baseline Oxford Scale score. A 95% confidence interval for the treatment effect was also reported. Secondary outcomes (other dimensions of the PISQ-31, SF-36, EQ-5D and EPAQ) were analysed in a similar way to the primary outcome.

The mean change in the PISQ scores was calculated using a paired t test.

Multiple imputation was used to impute missing data on the primary outcome. Data was imputed using chained equations, (regression) with 20 imputations using baseline, follow-up, menopausal status, time from randomisation, body mass index, diastolic blood pressure, SF36 physical score, SF-36 mental score, and baseline oxford scale.

Safety and Harms analysis

Serious adverse events (SAEs) and adverse events (AEs) were summarised and assessed for similarity between the treatment groups. Both SAEs and AEs were reported on an intention to treat basis (i.e. according to the group to which the participants was randomised).

Cost Effectiveness

A cost-effectiveness analysis was undertaken alongside the trial using recommended methods (19-21). The analysis takes the NHS perspective and includes costs and outcomes up to the patient's final visit. The first visit for all patients was allocated a 60 minute appointment, the second visit for patients receiving electrical stimulation was also allocated a 60 minute appointment and all other appointments were allocated 30 minutes. Based on NHS Reference costs, 60 minute appointments were valued at £52 and the 30 minute appointments at £42. In addition, patients receiving electrical stimulation were also allocated an equipment and consumables cost of £16.31, based on equipment costs of £54.59, a life span of 10 years and utilisation rate of 80%. Quality-adjusted life years (QALYs) were calculated from the EQ-5D scores using the trapezium rule, using the actual time of follow-up.

Analyses of total costs and QALYs used adjustments for baseline covariates via seemingly unrelated regression (22). Multiple imputation was used to replace missing data. Costs and QALYs gained were compared between the groups and then used to plot data on the cost-effectiveness plane. A value of £20,000 per QALY was used to determine the probability that the intervention is cost-effective under current funding conditions. Sensitivity analysis was undertaken using alternative cost sources for the PFMT visits and the Sf-6D for the calculation of QALYs.

Results

198 women were assessed for eligibility of whom 114 were randomised to standard PFMT or electrical stimulation. Participants were recruited between 01.12.2012 and 30.11.2015 and followed up at 4-6 weekly intervals. The trial stopped recruitment once the sample size was reached. The flow of participants through the trial is shown in Figure 1. The study achieved its pre-specified target sample size of 114 participants. Of

the 114 participants randomised, sixty nine completed the study or had primary outcome reported. Sixty four participants had complete primary outcome data (PISQ-31 Physical dimension score) at the end of follow up. On the control group of the 37 patients completing the study or having primary outcome, 33 were on intention to treat (ITT) and completed the study, one did not complete study but was included anyway on ITT analysis, 3 completed the study but did not provide primary outcome data. On the experimental group, of the 32 patients completing the study or having primary outcome 30 were on ITT and completed the study while two completed the study but did not provide primary outcome data. The patient that withdrew later on (Id=R038) however was included anyway on the ITT analysis given that provided a primary outcome value (collected at visit 4).

Baseline demographic data and health related quality of life data for the control and intervention arms are summarised in Tables 1 and 2 respectively. These were comparable in the two groups and no significant differences noted. Table 2 compares the baseline characteristics of the 64 participants (34 control, 30 experimental) who had valid post-randomisation follow-up outcome data and were included in the ITT analysis with the characteristics of the 50 (out of 114) participants (23 control, 37 experimental) who were also randomised but had no valid follow-up outcome data. The baseline characteristics of the 64 participants who provided valid outcome data were similar between the intervention and control groups suggesting that the baseline balance between the randomised groups had been maintained despite the 44% attrition in participants.

A small but statistically significant change (improvement) in functioning was observed for overall PISQ outcomes following PFMT when both treatment options were combined (Table 3). This was in the Physical factors related to sexual activity rather than behaviour/emotive or partner related domains. However when comparing the Control group and the Intervention group the unadjusted and adjusted mean difference was not statistically significant (Table 4).

Sensitivity analysis on the primary outcome was carried out and the analysis was repeated for complete cases, imputing data for all participants. This shows similar results to the primary analysis suggesting the observed results are consistent and fairly robust to the missing outcome data and loss to follow-up.

No treatment effect was observed between the control and intervention group on the EQ-5D, SF36 single scores and component summaries EPAQ sex life scores or Oxford scores on all analyses.

Subgroup analysis by menopausal status demonstrated no statistical evidence of any subgroup effects or interactions between the treatment and control group.

Overall 5 Adverse Events (AEs) were observed on 4 subjects (One subject experienced 2 AEs) however none of these were related to the study and included road traffic accidents, surgery for other health problems and accidents resulting in the requirement for a plaster.

There was no statistically significant difference in the number of visits between groups, but due to the longer appointment time for the second visit and the cost of the equipment, the mean cost of the electrical stimulation group was £32 higher (£100 vs £131, $p < 0.001$). Mean QALYs were 0.15 higher in the electrical stimulation group ($p < 0.001$) and when combined with the mean cost difference, leads to an incremental cost per QALY gained of £213. There is a >99% chance of electrical stimulation being cost-effective compared to the standard PFMT. The sensitivity analyses did not materially change these results.

Within this trial, the use of electrical stimulation is likely to be cost-effective. This conclusion is driven by a very small incremental cost associated with the addition of electrical stimulation. There is also a small and statistically significant gain in QALYs measured via the EQ-5D.

Discussion and Conclusion

Main Findings

In women presenting with sexual dysfunction in conjunction with urinary incontinence, physiotherapy is beneficial to improve overall sexual function. However no specific form of PFMT is beneficial over another. The effects of Electrical stimulation and standard PFMT on patient reported outcomes at follow-up are broadly similar with no reliable statistical evidence of any differences in primary or secondary outcomes. However, small differences in costs and QALYs were identified which suggest that electrical stimulation is cost-effective.

Strength and Limitations

This is the only study to compare PFMT alone to PFMT with electrical stimulation and assess its impact on sexual function. The trial design being an RCT was well suited to compare the 2 treatments. Similar to previous studies, the IPSU trial has confirmed that PFMT either on its own (23-25) or with electrical stimulation improves overall sexual function. But whereas previous studies assessing the impact of PFMT on sexual function have failed to use validated questionnaires for analysis (25-28) the IPSU trial used the PISQ a validated questionnaire for the assessment of sexual function in women with pelvic floor dysfunction. In addition most of these trials were observational studies with very small sample sizes and underpowered to establish the benefit or make comparisons between treatments.

Another advantage is that the IPSU trial also assesses the cost effectiveness of the intervention.

The main limitation of the IPSU trial is that the number of women analysed was smaller than the numbers needed to reach meaningful conclusions. In addition there was no blinding of the patients and physiotherapists, but it was felt to be impractical to

completely blind treatment. It was accepted that bias may be introduced as a consequence. This bias may arise as the treatment expectations following different modalities of treatment and the subjective clinical outcomes may be over-estimated or under-estimated depending on how women perceived their her prior problems and expected outcomes. Our clinical practical experience suggests that this bias would be minimal and its measurement would be beyond the objectives of this trial. Clinician bias is eliminated by patients performing ePAQ and PISQ at the end of the study as this provides objective evidence of the degree of change.

A new version of the PISQ was developed after this study was commenced, the PISQ IR (29). Using the previous version of the questionnaire has however allowed analysis of the 3 domains of sexual function.

In terms of the economic analysis, a key drawback is that the trial does not examine the long-term effects of treatment or assess electrical stimulation's position within a treatment pathway. Ideally, the results of this research should be combined with those of other RCTs and considered within a wider health technology assessment study, such as that undertaken by Imamura and colleagues (2010).

Interpretation

The current theory as to why PFMT may improve sexual function is varied. The pelvic floor muscles are directly responsible for the amount of sensation a woman feels during intercourse, and for the amount of grip felt by her partner. Rhythmic contractions of the pelvic floor contribute to arousal and many women's ability to achieve orgasm. Women may be able to reach orgasm more easily, after a pelvic floor exercise program. Exercise improves muscle tone and improves circulation, and this is particularly important for the smaller muscles of the pelvic floor, which are responsible for engorging the clitoris when women are aroused. This may explain why the improvement is in the physical aspect of sexual function as opposed to other aspects.

Previous studies have shown no difference in this benefit when used for purposes of urinary incontinence alone (30). This study reaffirms that there is no difference in PFMT alone compared to electrical stimulation and irrespective of the method adopted it is beneficial. Whilst our economic analysis shows that the use of electrical stimulation is cost-effective, in the absence of clear clinical benefits the policy implications of these results are uncertain.

Practical and research recommendations

In women presenting with urinary incontinence and concurrent sexual dysfunction, PFMT is an effective treatment. The modality of PFMT does not impact on outcomes. Given the safety of this intervention it would be reasonable for all women to trial a course of PFMT before being referred to secondary care. In terms of research, these results need to be considered in combination with other evidence, preferably through a systematic review and cost-effectiveness analysis.

Figure 1: CONSORT Flow chart: Participant flow in the IPSU

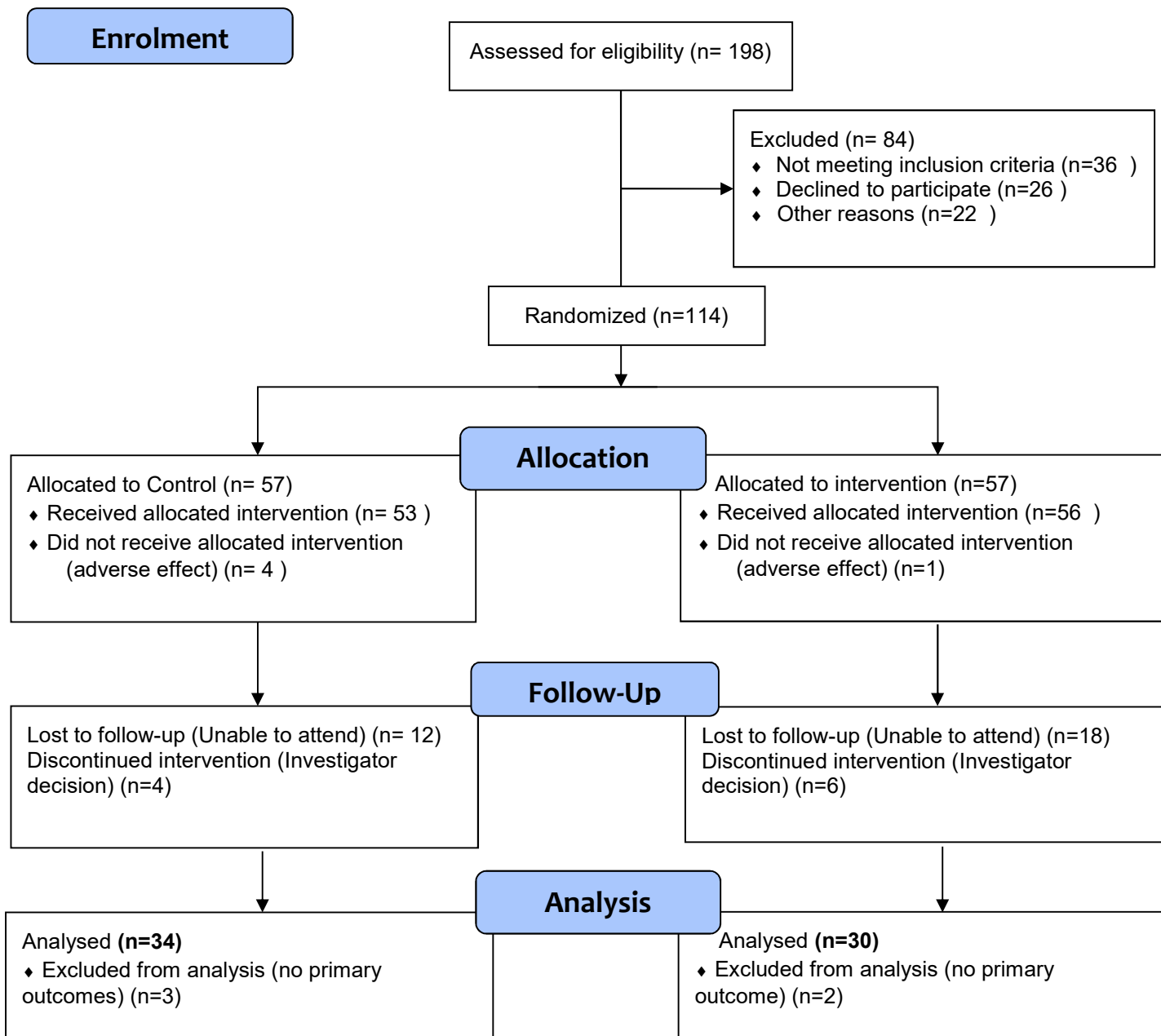


Table 1 Demographics and characteristics of participants at baseline

		Group					
		Standard physiotherapy		Electrical Stimulation		Total	
		n	%	n	%	n	%
Age	Mean (SD)	45.5 (9.8)	---	45.8(9.4)	---	45.6(9.5)	--
Menopausal Status	No	41	72	40	70	81	71
	Yes	16	28	17	30	33	29
	Total	57	100	57	100	114	100
Parity	0	2	4	0	0	2	2
	1	11	19	13	23	24	21
	2	32	56	24	42	56	49
	3	6	11	10	18	16	14
	4	3	5	8	14	11	10
	5	2	4	2	4	4	4
	8	1	2	0	0	1	1
	Total	57	100	57	100	114	100
Ethnicity	English/Welsh/Scottish/Northern Ireland/British	56	98	56	98	112	98
	Any Asian Background	0	0	1	2	1	1
	Any other black/African/Caribbean	1	2	0	0	1	1
	Total	57	100	57	100	114	100
Hysterectomy	No	49	86	47	82	95	84
	Yes	8	14	10	18	18	16
	Total	57	100	57	100	113	100
Regular Menstrual Cycle	No	7	12	9	16	16	14
	Yes	27	47	23	40	50	44
Dysmenorrhoea	No	30	53	23	40	53	47
	Yes	5	19	8	14	13	11
Dyspareunia	No	48	84	48	84	96	84
	Yes	4	7	7	12	11	10
Oxford Scale grade	0	1	2	5	9	6	5
	1	23	40	14	25	37	33
	2	30	53	33	58	63	55
	3	0	0	1	2	1	1
	Not Done	3	5	3	5	6	6
	Total	57	100	57	100	114	100
BMI	Mean (SD)	28.4 (5.5)	--	30.7 (7.4)	--	29.5 (6.6)	--
		Group					
		Standard physiotherapy (n=57)		Electrical Stimulation (n=57)		Total (n=114)	
PISQ behaviour emotive domain	N (%)	55 (96.5%)		50 (87.7%)		105 (92.1%)	
	Mean (SD)	38.2 (8.6)		34.1 (10.2)		36.2 (9.6)	
PISQ Physical Factor	N (%)	55 (96.5%)		49 (86.0%)		104 (91.2%)	
	Mean (SD)	29.7 (5.7)		27.7 (5.6)		28.7 (5.8)	
PISQ Partner related	N (%)	54 (94.7%)		49 (86.0%)		103 (90.4%)	
	Mean (SD)	20.1 (2.0)		19.0 (3.1)		19.6 (2.6)	
PISQ Total Score	N (%)	54 (94.7%)		48 (84.2%)		102 (89.5%)	
	Mean (SD)	88.2 (12.7)		80.7 (14.3)		84.7 (14.0)	
EQ5D Score	N (%)	55 (96.49%)		51 (89.47%)		106 (92.98%)	
	Mean (SD)	0.79 (0.20)		0.78 (0.15)		0.78 (0.18)	
SF36 Physical Component scale	N (%)	55 (96.5%)		51 (89.5%)		106 (93.0%)	
	Mean (SD)	16.4 (39.1)		20.2 (36.6)		18.2 (37.8)	
SF36 Mental component scale	N (%)	55 (96.5%)		51 (89.5%)		106 (93.0%)	
	Mean (SD)	18.8 (37.8)		22.7 (37.4)		20.7 (37.5)	
ePAQ PF : General Sex Life	N (%)	52 (91.2%)		56 (98.2%)		108 (94.7%)	
	Mean (SD)	41.4 (27.4)		50.9 (25.3)		46.3 (26.6)	

Table 2: Baseline characteristics by treatment group and missing data status

Characteristic	Missing PISQ physical dimension						Complete PISQ physical dimension					
	Control		Intervention		All		Control		Intervention		All	
	(n=23)		(n=27)		(n=50)		(n=34)		(n=30)		(n=64)	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Age	23	45.0 (9.9)	27	44.7 (9.7)	50	44.8 (9.7)	34	45.7 (9.8)	30	46.7 (9.1)	64	46.2 (9.4)
BMI	21	28.3 (5.8)	24	31.1 (6.4)	45	29.8 (6.2)	33	28.4 (5.4)	28	30.4 (8.2)	61	29.3 (6.9)
PISQ behaviour/emotion factor	21	37.1 (9.6)	21	32.5 (11.8)	42	34.8 (10.9)	34	38.8 (8.1)	29	35.2 (8.9)	63	37.2 (8.6)
PISQ physical factor	21	28.4 (6.0)	21	26.5 (5.5)	42	27.4 (5.7)	34	30.5 (5.5)	28	28.5 (5.7)	62	29.6 (5.6)
PISQ partner related factor	20	20.1 (2.1)	21	19.0 (3.1)	41	19.6 (2.7)	34	20.2 (2.0)	28	19.0 (3.2)	62	19.6 (2.6)
PISQ total score	20	86.0 (13.6)	21	78.1 (15.1)	41	81.9 (14.8)	34	89.5 (12.2)	27	82.7 (13.6)	61	86.5 (13.2)
EQ5D score	21	0.79 (0.13)	22	0.77 (0.18)	43	0.78 (0.16)	34	0.79 (0.24)	29	0.79 (0.13)	63	0.79 (0.19)
SF-36 Physical Component Scale	21	15.9 (38.7)	23	10.6 (36.7)	44	13.1 (37.3)	34	16.8 (39.9)	28	28.0 (35.2)	62	21.9 (38.0)
SF-36 Mental Component Scale	21	16.6 (37.9)	23	11.4 (36.2)	44	13.9 (36.7)	34	20.1 (38.2)	28	32.1 (36.4)	62	25.5 (37.5)
ePAQ PF: General sex life	18	44.1 (27.1)	26	50.1 (24.6)	44	47.6 (25.5)	34	39.9 (27.8)	30	51.7 (26.3)	64	45.5 (27.5)

Characteristic		Missing PISQ physical dimension			Complete PISQ physical dimension		
		Control	Intervention	All	Control	Intervention	All
		(n=23)	(n=27)	(n=50)	(n=34)	(n=30)	(n=64)
Ethnicity	English / Welsh / Scottish / Northern Irish / British	23 (100.0%)	27 (100.0%)	50 (100.0%)	33 (97.1%)	29 (96.7%)	62 (96.9%)
	Any other Asian background	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (3.3%)	1 (1.6%)
	Any other Black / African / Caribbean Background	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.9%)	0 (0.0%)	1 (1.6%)
Parity	0	2 (8.7%)	0 (0.0%)	2 (4.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	1	4 (17.4%)	6 (22.2%)	10 (20.0%)	7 (20.6%)	7 (23.3%)	14 (21.9%)

						15	36
	2	11 (47.8%)	9 (33.3%)	20 (40.0%)	21 (61.8%)	(50.0%)	(56.3%)
	3	2 (8.7%)	6 (22.2%)	8 (16.0%)	4 (11.8%)	4 (13.3%)	8 (12.5%)
	4	2 (8.7%)	6 (22.2%)	8 (16.0%)	1 (2.9%)	2 (6.7%)	3 (4.7%)
	5	1 (4.3%)	0 (0.0%)	1 (2.0%)	1 (2.9%)	2 (6.7%)	3 (4.7%)
	8	1 (4.3%)	0 (0.0%)	1 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Hysterectomy	No	20 (87.0%)	23 (85.2%)	43 (86.0%)	28 (82.4%)	24 (80.0%)	52 (81.3%)
	Yes	3 (13.0%)	4 (14.8%)	7 (14.0%)	5 (14.7%)	6 (20.0%)	11 (17.2%)
Menopausal	No	18 (78.3%)	21 (77.8%)	39 (78.0%)	23 (67.6%)	19 (63.3%)	42 (65.6%)
	Yes	5 (21.7%)	6 (22.2%)	11 (22.0%)	11 (32.4%)	22 (36.7%)	22 (34.4%)
Regular menstrual cycle	No	4 (17.4%)	7 (25.9%)	11 (22.0%)	3 (8.8%)	2 (6.7%)	5 (7.8%)
	Yes	11 (47.8%)	11 (40.7%)	22 (44.0%)	16 (47.1%)	12 (40.0%)	28 (43.8%)
Dysmenorrhoea	No	14 (60.9%)	12 (44.4%)	26 (52.0%)	16 (47.1%)	11 (36.7%)	27 (42.2%)
	Yes	2 (8.7%)	6 (22.2%)	8 (16.0%)	3 (8.8%)	2 (6.7%)	5 (7.8%)
Dyspareunia	No	18 (78.3%)	23 (85.2%)	41 (82.0%)	30 (88.2%)	25 (83.3%)	55 (85.9%)
	Yes	2 (8.7%)	3 (11.1%)	5 (10.0%)	2 (5.9%)	4 (13.3%)	6 (9.4%)
Oxford scale grade	0	1 (4.3%)	3 (11.1%)	4 (8.0%)	0 (0.0%)	2 (6.7%)	2 (3.1%)
	1	7 (30.4%)	8 (29.6%)	15 (30.0%)	16 (47.1%)	6 (20.0%)	22 (34.4%)
	2	12 (52.2%)	11 (40.7%)	23 (46.0%)	18 (52.9%)	22 (73.3%)	40 (62.5%)
	3	0 (0.0%)	1 (3.7%)	1 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table 3 Overall change in PISQ following physiotherapy (both types of treatment combined)

Outcome	n	Mean change (SD)	95% CI	p-value
PISQ behaviour/emotion factor	63	2.3 (6.8)	0.6 to 4.0	0.009
PISQ physical factor	62	3.2 (6.2)	1.6 to 4.8	<0.001
PISQ partner related factor	62	0.5 (2.2)	-0.1 to 1.0	0.094
PISQ total score	61	5.9 (11.8)	2.9 to 8.9	<0.001

Table 4: Primary Outcomes: mean difference of PISQ domains between Control and Intervention

Outcome	Control		Intervention		Unadjusted				Adjusted*			
	n	Mean (SD)	n	Mean (SD)	N analyses	mean difference	95% CI	p-value	N analyses	mean difference	95% CI	p-value
PISQ physical factor	34	33.1 (5.5)	30	32.3 (5.2)	64	-0.8	-3.5 to 1.9	0.572	60	-1	-4.0 to 1.9	0.474
PISQ behaviour/emotion factor	34	40.8 (8.7)	30	37.4 (11.2)	64	-3.4	-8.4 to 1.6	0.176	60	1.9	-2.1 to 5.9	0.345
PISQ partner related factor	34	20.4 (2.0)	30	19.6 (3.0)	64	-0.8	-2.1 to 0.4	0.202	59	0.4	-0.6 to 1.5	0.412
PISQ total score	34	94.2 (12.5)	30	89.2 (15.8)	64	-5	-12.1 to 2.1	0.165	59	1.1	-5.9 to 8.2	0.748

*Adjusted for baseline score, BMI, menopausal status, time from randomisation and oxford scale

The PISQ-physical factor is scored on a 0 to 40 scale with a higher scoring indicating better sexual functioning

Reference List

- (1) Abrams P, Artibani W, Cardozo L, Dmochowski R, van Kerrebroeck P, Sand P. Reviewing the ICS 2002 terminology report: the ongoing debate. *Neurourol Urodyn* 2009;28(4):287.
- (2) Hannestad YS, Lie RT, Rortveit G, Hunskaar S. Familial risk of urinary incontinence in women: population based cross sectional study. *BMJ* 2004 Oct 16;329(7471):889-91.
- (3) Korda JB, Braun M, Engelmann UH. [Sexual dysfunction at urinary incontinence]. *Urologe A* 2007 Sep;46(9):1058-65.
- (4) Salonia A, Zanni G, Nappi RE, Briganti A, Deho F, Fabbri F, et al. Sexual dysfunction is common in women with lower urinary tract symptoms and urinary incontinence: results of a cross-sectional study. *Eur Urol* 2004 May;45(5):642-8.
- (5) Jha S, Radley S, Farkas A, Jones G. The impact of TVT on sexual function. *Int Urogynecol J Pelvic Floor Dysfunct* 2009 Feb;20(2):165-9.
- (6) Aslan G, Koseoglu H, Sadik O, Gimen S, Cihan A, Esen A. Sexual function in women with urinary incontinence. *Int J Impot Res* 2005 May;17(3):248-51.
- (7) Handa VL, Harvey L, Cundiff GW, Siddique SA, Kjerulff KH. Sexual function among women with urinary incontinence and pelvic organ prolapse. *Am J Obstet Gynecol* 2004 Sep;191(3):751-6.
- (8) Clark A, Romm J. Effect of urinary incontinence on sexual activity in women. *J Reprod Med* 1993 Sep;38(9):679-83.
- (9) Berghmans LC, Hendriks HJ, Bo K, Hay-Smith EJ, de Bie RA, van Waalwijk van Doorn ES. Conservative treatment of stress urinary incontinence in women: a systematic review of randomized clinical trials. *Br J Urol* 1998 Aug;82(2):181-91.
- (10) NICE CG171. The Management of Urinary Incontinence in Women. 10-9-2013.
Ref Type: Generic
- (11) Bo K. Pelvic floor muscle strength and response to pelvic floor muscle training for stress urinary incontinence. *Neurourol Urodyn* 2003;22(7):654-8.
- (12) National Institute of Clinical Excellence. **Urinary incontinence: the management of urinary incontinence in women** . CG40. 2006.
Ref Type: Generic
- (13) Rogers RG, Kammerer-Doak D, Villarreal A, Coates K, Qualls C. A new instrument to measure sexual function in women with urinary incontinence or pelvic organ prolapse. *Am J Obstet Gynecol* 2001 Mar;184(4):552-8.

- (14) Hays RD, Morales LS. The RAND-36 measure of health-related quality of life. *Ann Med* 2001 Jul;33(5):350-7.
- (15) Dolan P. Modeling valuations for EuroQol health states. *Med Care* 1997 Nov;35(11):1095-108.
- (16) Radley SC, Jones GL. Measuring quality of life in urogynaecology. *BJOG* 2004 Dec;111 Suppl 1:33-6.
- (17) Jha S, Moran P, Greenham H, Ford C. Sexual function following surgery for urodynamic stress incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2007 Aug;18(8):845-50.
- (18) Mamik MM, Rogers RG, Qualls CR, Morrow JD. The minimum important difference for the Pelvic Organ Prolapse-Urinary Incontinence Sexual Function Questionnaire. *Int Urogynecol J* 2014 Oct;25(10):1321-6.
- (19) National Institute for Health and Care Excellence. Guide to the methods of technology appraisal. 2013.
- Ref Type: Generic
- (20) Faria R, Gomes M, Epstein D, White IR. A guide to handling missing data in cost-effectiveness analysis conducted within randomised controlled trials. *Pharmacoeconomics* 2014 Dec;32(12):1157-70.
- (21) Manca A, Hawkins N, Sculpher MJ. Estimating mean QALYs in trial-based cost-effectiveness analysis: the importance of controlling for baseline utility. *Health Econ* 2005 May;14(5):487-96.
- (22) Willan AR, Briggs AH, Hoch JS. Regression methods for covariate adjustment and subgroup analysis for non-censored cost-effectiveness data. *Health Econ* 2004 May;13(5):461-75.
- (23) Ferreira CH, Dwyer PL, Davidson M, De SA, Ugarte JA, Frawley HC. Does pelvic floor muscle training improve female sexual function? A systematic review. *Int Urogynecol J* 2015 Dec;26(12):1735-50.
- (24) Sacomori C, Cardoso FL. Predictors of improvement in sexual function of women with urinary incontinence after treatment with pelvic floor exercises: a secondary analysis. *J Sex Med* 2015 Mar;12(3):746-55.
- (25) Zahariou AG, Karamouti MV, Papaioannou PD. Pelvic floor muscle training improves sexual function of women with stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2008 Mar;19(3):401-6.
- (26) Beji NK, Yalcin O, Erkan HA. The effect of pelvic floor training on sexual function of treated patients. *Int Urogynecol J Pelvic Floor Dysfunct* 2003 Oct;14(4):234-8.

- (27) Bo K, Talseth T, Vinsnes A. Randomized controlled trial on the effect of pelvic floor muscle training on quality of life and sexual problems in genuine stress incontinent women. *Acta Obstet Gynecol Scand* 2000 Jul;79(7):598-603.
- (28) Rivalta M, Sighinolfi MC, Micali S, De Stefani S, Bianchi G. Sexual Function and Quality of Life in Women with Urinary Incontinence Treated by a Complete Pelvic Floor Rehabilitation Program (Biofeedback, Functional Electrical Stimulation, Pelvic Floor Muscles Exercises, and Vaginal Cones). *J Sex Med* 2010 Feb 2.
- (29) Rogers RG, Rockwood TH, Constantine ML, Thakar R, Kammerer-Doak DN, Pauls RN, et al. A new measure of sexual function in women with pelvic floor disorders (PFD): the Pelvic Organ Prolapse/Incontinence Sexual Questionnaire, IUGA-Revised (PISQ-IR). *Int Urogynecol J* 2013 Jul;24(7):1091-103.
- (30) Bo K, Talseth T, Holme I. Single blind, randomised controlled trial of pelvic floor exercises, electrical stimulation, vaginal cones, and no treatment in management of genuine stress incontinence in women. *BMJ* 1999 Feb 20;318(7182):487-93.

8. Conclusions and areas for future research

Sexual well-being is complex and dependent on various inter-related factors including physical and mental well-being. It is an important determinant of emotional well-being, self-worth, and overall quality of life of women. However, urinary incontinence has a negative impact on sexual function. The impact of prolapse on sexual function was found to be similar to the impact of urinary incontinence. In women with urinary incontinence, urodynamic diagnosis does not correlate with the nature of underlying sexual problems, orgasm or penetration incontinence. Worsening urinary incontinence is associated with a more deleterious effect on sexual function.

Through the work presented I have demonstrated the impact of various treatment strategies of urinary incontinence on sexual function. PFMT is associated with an improvement in sexual function but different modalities of treatment i.e. adding electrical stimulation to standard PFMT did not alter outcomes.

Medical treatment of overactive bladder did not guarantee improvement in sexual function and when improvements were noted this was within the first 3 months of treatment.

In most patients undergoing surgery for SUI, coital incontinence improves. There is potential for overall sexual function to deteriorate after surgery and this should be emphasized during the consent process for surgery. This is important to avoid disappointment and unhappiness with the surgery and to ensure realistic expectations.

Although problems relating to sexual health are complex involving both psychological and physical factors. Consideration should be given to the impact of urinary incontinence and treatment offered as part of management of sexual dysfunction and to enquire about these symptoms before and after treatment routinely as part of the package of care being provided.

More recent forms of treatment for women with urinary incontinence include B3 agonist Betmiga, intravesical Botox, Percutaneous Tibial Nerve stimulation (PTNS) and Sacral nerve stimulation (SNS). Further work into the impact these treatments have on sexual function is required and was outside the remit of this thesis.

Most of the research into sexual health in women suffering urinary incontinence does not seek to identify what proportion of the problems are linked directly to the urinary incontinence and therefore the actual impact of treatment of this condition on their sexual health is difficult to gauge. Furthermore its importance in treatment outcomes and satisfaction has not been evaluated and would form an important future area of research. Good quality research into sexual function in women with urinary incontinence aimed at quantifying what aspects of a woman's sexual function is affected by the urinary incontinence per se is required. This will allow improvement in management strategies and provision of more realistic expectations to patients of the impact that specific treatments are likely to have.

Appendix 1: Journal Permissions

ELSEVIER LICENSE TERMS AND CONDITIONS

Mar 27, 2016

This is a License Agreement between Swati Jha ("You") and Elsevier ("Elsevier") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by Elsevier, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

Supplier	Elsevier Limited The Boulevard, Langford Lane Kidlington, Oxford, OX5 1GB, UK
Registered Company Number	1982084
Customer name	Swati Jha
Customer address	Level 4 Jessop Wing Sheffield, S10 2SF
License number	3822010248745
License date	Mar 04, 2016
Licensed content publisher	Elsevier
Licensed content publication	European Journal of Obstetrics & Gynecology and Reproductive Biology
Licensed content title	Female sexual dysfunction
Licensed content author	Swati Jha, Rane Thakar
Licensed content date	December 2010
Licensed content volume number	153
Licensed content issue number	2
Number of pages	7
Start Page	117
End Page	123
Type of Use	reuse in a thesis/dissertation
Intended publisher of new work	other
Portion	full article
Format	electronic
Are you the author of this Elsevier article?	Yes
Will you be translating?	No
Title of your thesis/dissertation	Urinary Incontinence and Impact of Management on Sexual function in Women
Expected completion date	Sep 2016
Estimated size (number of pages)	100

FW: K24129 - Textbook of Female Urology and Urogynecology, Fourth Edition - Batch 1 - First pages - Chapter 59

Peden, Robert [Robert.Peden@tandf.co.uk]

Sent:09 March 2016 13:25

To: Jha, Swati (Obstetrics, Gynaecology & Neonatology)

Dear Dr Jha

It's OK with us to re-use your chapter in your e-Thesis, with due acknowledgement.

With best wishes

Robert Peden
Senior Editor, Gynecology
CRC Press

From: Swati.Jha@sth.nhs.uk [<mailto:Swati.Jha@sth.nhs.uk>]

Sent: Friday, March 04, 2016 3:36 PM

To: Christine, Selvan

Subject: RE: K24129 - Textbook of Female Urology and Urogynecology, Fourth Edition - Batch 1 - First pages - Chapter 59

Dear Chris

Over the past 6 years I have been working on my Thesis entitled "Urinary Incontinence and Impact of Management on Sexual function in Women". I am registered with the University of Sheffield and am keen to complete my thesis through the publication route. I am permitted to use both Research articles and book chapters to achieve this.

The chapter I wrote for the Textbook of Female Urology and Urogynaecology provides an overview and literature search leading into the work which my thesis involves.

I seek permission to use the chapter I have written for the book in my e-Thesis.

I look forward to hearing from you.

Kind regards

Swati Jha

Swati Jha MD, FRCOG
Cons Obst/Gynae and Honorary Senior Clinical Lecturer
Subspecialist in Urogynaecology
Jessop Wing, Sheffield Teaching Hospitals NHSFT
S10 2SF

Office: 0114 2268319

Secretary :0114 2268166

Pager:07623678570



Title: Prolapse or incontinence: what affects sexual function the most?

Author: Swati Jha

Publication: International Urogynecology Journal

Publisher: Springer

Date: Jan 1, 2015

Copyright © 2015, The Author(s)

Logged in as:

Swati Jha

Account #:
3001006086

LOGOUT

Permissions Request

This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Springer and BioMed Central offer a reprint service for those who require professionally produced copies of articles published under Creative Commons Attribution (CC BY) licenses. To obtain a quotation, please email reprints@springeropen.com with the article details, quantity(ies) and delivery destination. Minimum order 25 copies.

CLOSE WINDOW

Copyright © 2016 [Copyright Clearance Center, Inc.](#) All Rights Reserved. [Privacy statement.](#) [Terms and Conditions.](#)
Comments? We would like to hear from you. E-mail us at customercare@copyright.com

SPRINGER LICENSE TERMS AND CONDITIONS

Mar 27, 2016

This is a License Agreement between Swati Jha ("You") and Springer ("Springer") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by Springer, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

License Number	3826001075635
License date	Mar 11, 2016
Licensed content publisher	Springer
Licensed content publication	International Urogynecology Journal
Licensed content title	Incontinence during intercourse: myths unravelled
Licensed content author	Swati Jha
Licensed content date	Jan 1, 2012
Volume number	23
Issue number	5
Type of Use	Thesis/Dissertation
Portion	Full text
Number of copies	1
Author of this Springer article	Yes and you are the sole author of the new work
Order reference number	None
Title of your thesis / dissertation	Urinary Incontinence and Impact of Management on Sexual function in Women
Expected completion date	Sep 2016
Estimated size(pages)	100
Total	0.00 USD
Terms and Conditions	

Introduction

The publisher for this copyrighted material is Springer. By clicking "accept" in connection with completing this licensing transaction, you agree that the following terms and conditions apply to this transaction (along with the Billing and Payment terms and conditions established by Copyright Clearance Center, Inc. ("CCC"), at the time that you opened your Rightslink account and that are available at any time at <http://myaccount.copyright.com>).

Limited License

With reference to your request to reuse material on which Springer controls the copyright, permission is granted for the use indicated in your enquiry under the following conditions:

- Licenses are for one-time use only with a maximum distribution equal to the number stated in your request.
- Springer material represents original material which does not carry references to other sources. If the material in question appears with a credit to another source, this permission is not valid and authorization has to be obtained from the original copyright holder.

ELSEVIER LICENSE TERMS AND CONDITIONS

Mar 27, 2016

This is a License Agreement between Swati Jha ("You") and Elsevier ("Elsevier") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by Elsevier, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

Supplier	Elsevier Limited The Boulevard,Langford Lane Kidlington,Oxford,OX5 1GB,UK
Registered Company Number	1982084
Customer name	Swati Jha
Customer address	Level 4 Jessop Wing Sheffield, S10 2SF
License number	3824981347433
License date	Mar 04, 2016
Licensed content publisher	Elsevier
Licensed content publication	Journal of Sexual Medicine
Licensed content title	Impact of Incontinence Surgery on Sexual Function: A Systematic Review and Meta-Analysis
Licensed content author	Swati Jha,Manjunath Ammenbal,Mostafa Metwally
Licensed content date	January 2012
Licensed content volume number	9
Licensed content issue number	1
Number of pages	10
Start Page	34
End Page	43
Type of Use	reuse in a thesis/dissertation
Portion	full article
Format	electronic
Are you the author of this Elsevier article?	Yes
Will you be translating?	No
Title of your thesis/dissertation	Urinary Incontinence and Impact of Management on Sexual function in Women
Expected completion date	Sep 2016
Estimated size (number of pages)	
Elsevier VAT number	GB 494 6272 12

SPRINGER LICENSE TERMS AND CONDITIONS

Mar 27, 2016

This is a License Agreement between Swati Jha ("You") and Springer ("Springer") provided by Copyright Clearance Center ("CCC"). The license consists of your order details, the terms and conditions provided by Springer, and the payment terms and conditions.

All payments must be made in full to CCC. For payment instructions, please see information listed at the bottom of this form.

License Number	3825941286966
License date	Mar 11, 2016
Licensed content publisher	Springer
Licensed content publication	Archives of Gynecology and Obstetrics
Licensed content title	Impact of treatment of overactive bladder with anticholinergics on sexual function
Licensed content author	Swati Jha
Licensed content date	Jan 1, 2015
Volume number	293
Issue number	2
Type of Use	Book/Textbook
Requestor type	Publisher
Publisher	Sheffield University
Portion	Full text
Format	Print and Electronic
Will you be translating?	No
Print run	1
Author of this Springer article	Yes and you are the sole author of the new work
Order reference number	E Thesis
Title of new book	e-Thesis
Publisher	Sheffield University
Author of new book	Swati Jha
Expected publication date of new book	May 2016
Estimated size of new book (pages)	100
Total	0.00 USD
Terms and Conditions	

Introduction

The publisher for this copyrighted material is Springer. By clicking "accept" in connection with completing this licensing transaction, you agree that the following terms and conditions apply to this transaction (along with the Billing and Payment terms and conditions established by Copyright Clearance Center, Inc. ("CCC"), at the time that you opened your

FW: Your Submission

Davies, Sarah (ELS-OXF) [S.Davies@elsevier.com]

Sent: 28 June 2017 15:53

To: Jha, Swati (Obstetrics, Gynaecology & Neonatology)

Cc: Physiotherapy (ELS) [Physiotherapy@elsevier.com]

Dear Swati,

Thank you for contacting us regarding a query about your recently accepted article and your thesis. You are able to include your article in your thesis without the need to seek formal permission. In terms of referencing the article as it is an article in press: this shouldn't be a problem either. I would suggest that you reference it as "....., accepted for publication in Physiotherapy, <<date/month>> 2017. In Press. Available online 23 June 2017. DOI: <https://doi.org/10.1016/j.physio.2017.06.003>

I hope this helps and best of luck with the thesis! If you require any further information please do not hesitate to contact me.

Kind regards,
Sarah Davies
Senior Publisher

-----Original Message-----

From: Swati.Jha@sth.nhs.uk [<mailto:Swati.Jha@sth.nhs.uk>]

Sent: 27 June 2017 22:19

To: Physiotherapy (ELS) <Physiotherapy@elsevier.com>

Subject: RE: Your Submission

*** External email: use caution ***

Dear Annette

many thanks for your help. The paper has now been accepted and is in press. I need to apply for permission to use this article in my Thesis. This is usually done after the paper is published but as it is currently in press how can i do so please?

kind regards

Swati

Swati Jha MD, FRCOG

Cons Obst/Gynae and Honorary Senior Clinical Lecturer Subspecialist in Urogynaecology Jessop Wing,
Sheffield Teaching Hospitals NHSFT
S10 2SF

Office: 0114 2268319

Secretary :0114 2268166

Pager:07623678570

From: Physiotherapy (ELS) [Physiotherapy@elsevier.com]

Sent: 20 June 2017 14:15

To: Jha, Swati (Obstetrics, Gynaecology & Neonatology)

Subject: RE: Your Submission

Dear Dr Jha,

Thank you for your email. You will be sent a link via the production department in due course, you can submit your audio slides at that time.

Appendix 2: Co Author permissions

Dear Dr Alshreef,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

Swati Jha

List of co-authored papers

- Jha S, Walters S, Bortolami O, Dixon S, Alshreef A. Impact of Pelvic Floor Muscle Training on Sexual function of women with Urinary Incontinence and a comparison of electrical stimulation versus standard treatment (IPSU Trial): a randomised controlled trial. PHYST975

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: Abualbishr Alshreef

Signed: Abu S

Date: 16/06/2017

Dear Dr Gopinath,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

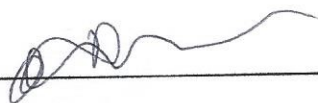
Swati Jha

List of co-authored papers

- Jha S, Gopinath D: Prolapse or incontinence: what affects sexual function the most? Int Urogynecol J. 2015 Nov 19.

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: D. GOPINATH

Signed:  _____

Date: 14.04.16

Dear Dr Ammenbal,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on Urinary incontinence & Impact of management on sexual function in women). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

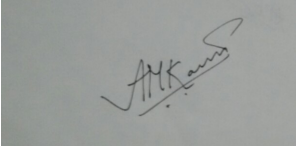
Swati Jha

List of co-authored papers

- Jha S, Ammenbal M, Metwally M. Impact of incontinence surgery on sexual function: a systematic review and meta-analysis. J Sex Med. 2012 Jan;9(1):34-43.

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: Dr M Kamath Ammembal

Signed:  _____

Date: 17 th April 2016 _____

Dear Dr Radley,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

Swati Jha

List of co-authored papers

- Jha S, Strelley K, Radley S. Incontinence during intercourse: myths unravelled. Int Urogynecol J. 2012 May;23(5):633-7.

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: Stephen Radley

Signed: 

Date: 18/4/2016.

Dear Dr Strelley,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

Swati Jha

List of co-authored papers

- Jha S, Strelley K, Radley S. Incontinence during intercourse: myths unravelled. Int Urogynecol J. 2012 May;23(5):633-7.

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: K Strelley

Signed: 

Date: 04 / 04 / 16

14 APR 2016

Dear Dr Metwally,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

Swati Jha

List of co-authored papers

- Jha S, Ammenbal M, Metwally M. Impact of incontinence surgery on sexual function: a systematic review and meta-analysis. J Sex Med. 2012 Jan;9(1):34-43.

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name Mostafa Metwally



Signed

Date: 05-04-2016

Dear Dr Bortolami,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

Swati Jha

List of co-authored papers

- Jha S, Walters S, Bortolami O, Dixon S, Alshreef A. Impact of Pelvic Floor Muscle Training on Sexual function of women with Urinary Incontinence and a comparison of electrical stimulation versus standard treatment (IPSU Trial): a randomised controlled trial. PHYST975

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: Oscar Bortolami

Signed: Oscar Bortolami

Date: 17th June 2017

Dear Dr Thakar,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

Swati Jha

List of co-authored papers

- Jha S, Thakar R. Female Sexual dysfunction. Eur.J.Obstet.Gynecol.Reprod.Biol. 2010;153:117-23.

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: __Ranee Thakar



Signed:

Date: __05/04/2016_____

Dear Professor Dixon,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards

Swati Jha

List of co-authored papers

- Jha S, Walters S, Bortolami O, Dixon S, Alshreef A. Impact of Pelvic Floor Muscle Training on Sexual function of women with Urinary Incontinence and a comparison of electrical stimulation versus standard treatment (IPSU Trial): a randomised controlled trial. PHYST975

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: Simon Dixon

Signed:

A handwritten signature in black ink, appearing to read 'Simon Dixon', with a stylized flourish at the end.

Date: 16th June, 2017

Dear Professor Walters,

I am currently in the process of applying for an MD by publication at the University of Sheffield (on **Urinary incontinence & Impact of management on sexual function in women**). As a co-author on the paper listed below I would be grateful if you would allow me to include this paper in my submission. If you agree to this, could you please sign this document and return to me by email or by post to Dr Swati Jha, Level 4 Jessop Wing, Tree Root Walk, Sheffield Teaching Hospitals, S10 2SF.

Thank you for your response and please contact me if there are any questions.

Regards


Swati Jha

List of co-authored papers

- Jha S, Walters S, Bortolami O, Dixon S, Alshreef A. Impact of Pelvic Floor Muscle Training on Sexual function of women with Urinary Incontinence and a comparison of electrical stimulation versus standard treatment (IPSU Trial): a randomised controlled trial. PHYST975

I agree to the inclusion of the above listed published research article in Dr Swati Jha's MD by publication thesis, to be submitted to the University of Sheffield.

Name: Stephen Walters

Signed: 

Date: 16 June 2017

Appendix 3: Protocol and ethics for paper 6 and 7



National Research Ethics Service

South Yorkshire Research Ethics Committee

Millside
Mill Pond Road
Meanwood
Leeds
LS6 4RA

Tel: 0113 3050127
Fax:

14 July 2010

Dr Swati Jha
Consultant Obstetrician and Gynaecologist
Level 4, Jessop Wing, Tree Root Walk
Sheffield Teaching Hospital NHSFT
Sheffield
S10 2SF

Dear Dr Jha

Study title: Impact of treatment of Overactive Bladder on Sexual Function
REC reference: 09/H1310/25

This study was given a favourable ethical opinion by the Committee on 18 June 2009.

It is a condition of approval by the Research Ethics Committee that the Chief Investigator should submit a progress report for the study 12 months after the date on which the favourable opinion was given, and then annually thereafter. To date, the Committee has not yet received the annual progress report for the study, which was due on 17 June 2010. It would be appreciated if you could complete and submit the report by no later than 17 August 2010.

Guidance on progress reports and a copy of the standard NRES progress report form is available from the National Research Ethics Service website.

The NRES website also provides guidance on declaring the end of the study.

[Failure to submit progress reports may lead to the REC reviewing its opinion on the study.]


09/H1310/25:

Please quote this number on all correspondence

Yours sincerely

Ometewa Kuforiji
Committee Assistant Co-ordinator

E-mail: Ometewa.Kuforiji@leedspft.nhs.uk

	<p>Pfizer UK Overactive Bladder / Detrusor Overactivity Competitive Grants Programme 2008</p> <p>RESEARCH PROPOSAL</p>
<p>Study Title</p>	
<p>Impact of treatment of Overactive Bladder on Sexual Function</p>	
<p>Statement declaring your clinical or outcomes research study</p>	
<p>An observational questionnaire study of women with Overactive Bladder being treated with anticholinergic comparing sexual function before and after treatment.</p>	
<p>Objectives</p>	
<p>Statement of objectives</p> <p>To assess the impact of treatment of overactive bladder on sexual function.</p> <p>Specific aim/hypothesis</p> <p>To establish if an improvement in OAB symptoms by treatment with anticholinergics is associated with a corresponding improvement in sexual function. This will be done by comparing sexual function before and after treatment.</p> <p>Relevance of proposed study to "Advancing the Understanding of Overactive Bladder / Detrusor Overactivity"</p> <p>Several Studies have shown OAB to adversely affect sexual function¹⁻⁶, but there is limited knowledge about the impact of treatment of overactive bladder on sexual function. This study aims to identify if an improvement in OAB symptoms is associated with an alteration in sexual function and if so what aspects of sexual function are improved.</p>	
<p>Description</p>	
<p>Experimental/research design</p> <p>This is a prospective observational Questionnaire study.</p> <p>Methodology (including methods of statistical analysis)</p>	

Sample Size

We accepted a 20% improvement in sexual function to be clinically significant. To estimate this with +/-10% i.e. 95% confidence limits from 10% to 30% will require 62 responders to the study. Assuming a 20% drop out rate the sample size required is 74 responders.

Data collection

Sexually active women diagnosed to have OAB on the ePAQ (electronic Pelvic Floor Assessment Questionnaire) and commencing anticholinergics for the first time will be potential recruits for the study. These women will be asymptomatic for prolapse. A POP-Q assessment will be performed and Aa, Ba, Ap and Bp should be above -1 (i.e no anterior or posterior wall prolapse) with no utero-cervical descent. Women may or may not have a urodynamic diagnosis of detrusor overactivity (DOA) but will have no voiding dysfunction (post-void residual of <100mls). Pre-treatment data collected will include age, ethnicity, parity, BMI, menopausal status, hysterectomy status and previous vaginal operations performed.

Data will be collected on the status of bladder symptoms and sexual function before, 3 months after and 6 months after treatment with anticholinergics. The anticholinergics will include Tolterodine and its formulation, Solifenacin, and Oxybutynin and its formulation. The impact of a 20 point improvement in OAB symptoms on bladder symptoms will be analysed and correlated to changes in sexual function. Patient Global Impression of improvement (PGI-I) data will be collected post treatment.

Tools/ Questionnaire

The ePAQ and the PGI-I are validated and reliable condition specific questionnaires used in the assessment of women with incontinence and related problems.

The instrument used to assess pelvic floor symptoms will be the electronic pelvic floor symptoms assessment questionnaire (e-PAQ) which provides symptoms assessment in 4 dimensions: Urinary, Bowel, Vaginal & Sexual. Each dimension provides 5 psychometrically robust & clinically meaningful symptom domain scores, each score being transformed on a range from 0 (indicating best health status) to 100 (worst health status), The domain score is calculated using the simple formula: Domain Score = total of raw scores for each item in the domain / maximum possible score × 100. The sexual dimension provides 3 domain scores for the different aspects of pelvic floor symptomatology that may impact on sexual function: (1) Urinary, (2) Bowel & (3) Vaginal. The 2 final sexual domain scores are (4) Dyspareunia and (5) General sex life. The score for the urinary domain of the sexual dimension is derived from 4 items shown below. Each item is scored on an ordinal scale from 0-3, where 0 represents 'Never' and 3 represent 'All of the time'. These 4 items included;

- (1) Overall impact of bladder problems on sex life
- (2) Anxiety related to bladder problems during sex
- (3) Avoidance of sex by the patient because of their bladder problems
- (4) Partners avoiding sex because of the patient's bladder problems

Items not contributing to this score but analysed by the ePAQ also include orgasm incontinence, penetration incontinence & post-coital UTI. The impact of treatment of OAB on each of these parameters will be evaluated.

The PGI- I asks a patient to rate the response of her condition to therapy and is simple, direct, easy to use, and intuitively understandable to the clinician. They are single item questions which rate the outcome from 'very much worse' to 'very much improved' over a 5 point Likert scale. The construct validity of the PGI-I has been widely established for treatment response. The PGI-I is incorporated into the ePAQ and is the last item on the questionnaire when it is being completed following treatment.

Analysis

The data will be analysed using SPSS. Wilcoxon Signed rank test will be used to compare pre and post treatment responses. Linear regression will be used to assess the relationship between the parameters analysed and changes in OAB scores following treatment. Significance has been set at a p value of < 0.05 .

By comparing the improvement in the scores of OAB and sexual function to the PGI-I the minimally important difference (MID) for each domain of the ePAQ will be calculated.

Potential problems and strategies for overcoming them

The potential problems include

1. Patients may not be able to attend for Follow up appointments, resulting in a high drop out rate.

The ePAQ, which is the tool being used for assessment of patients, can be used by on-line completion. An initial survey has shown that 70% of women have access to the internet, hence this will enable a follow up of patients, even when they are unable to attend clinic.

2. The Questionnaire burden

Patients often find it tedious to complete a multitude of questionnaires. For this study, women only have to complete a single questionnaire which assesses all aspects of pelvic floor function including urinary, sexual, bowel and prolapse symptoms. The PGI-I is also incorporated into the questionnaire and this reduces the burden of the questionnaire.

3. Change in anticholinergics

Women commenced on anticholinergics quite often change medications. For the purposes of this study it is the improvement in OAB symptoms rather than the type of anticholinergic they are on that we are interested in.

4. Patients with no improvement

Not all women will experience an improvement in their OAB symptoms post-treatment. These women will act as a control group to compare with those who do

experience a benefit in their OAB symptoms.

Expected outcome

We anticipate an improvement in sexual function with a corresponding improvement in OAB symptoms. This study will help determine which domains of sexual function are improved by a corresponding improvement in OAB symptoms.

Study relevance to past work

We have done work looking at the impact of surgical correction of Stress incontinence and shown all domains of sexual function⁷ to be improved. This same study showed the impact on sexual function in women diagnosed to have mixed incontinence was far less marked and did not influence all domains of sexual function even though the improvement in their stress incontinence was similar to those with pure stress incontinence. There has been work in the past which suggest an association of penetration incontinence with SUI and orgasm incontinence with OAB. This has never been confirmed in a formal study and in fact the small amount of data we have from studies done by the chief investigator would suggest this to be inaccurate⁸.

There is also very little data relating to the impact of treatment with anticholinergics on OAB. A review of literature did not demonstrate any primary published studies looking at this clinical problem. There is therefore an urgent need for this study to be done.

Initial results to support study (if applicable)

The above mentioned study demonstrated only two domains (orgasm incontinence and patient avoidance of intercourse) of sexual function improved with surgical treatment of the women with mixed incontinence and this is related to the fact that the overactive bladder component is untreated with surgical correction⁷. Another study done by the principal investigator showed that OAB was as likely to be associated with penetration incontinence as orgasm incontinence⁸. There is very little evidence in literature to show the change/ improvement in sexual function symptoms following treatment of OAB.

This study aims to assess the impact of treatment of OAB with anticholinergics on the different domains of sexual function.

Description of the laboratory facilities and equipment to be used

The urogynaecology department of the Birmingham Women's hospital is a tertiary referral unit with upto 1000 referrals a year. This is a large stand alone trust catering for Women's health with facilities to investigate and treat patients at a tertiary level. The Department offers specialist care to women of all ages in a friendly welcoming environment, providing a high standard of care to women in South Birmingham and beyond.

The service is provided by 2 consultants, 3 urogynaecology specialist nurses, as well as a urogynaecology subspecialist trainee, research fellow and 2 specialist registrars. The unit has a strong ethos in managing bladder problems, conservatively, whilst also offering proven surgical options when necessary. The unit offers an individualised, patient focused service, from referral to discharge and the current services include

- The ongoing evaluation, investigation and treatment of urinary incontinence and pelvic floor dysfunction
- Transperineal & transvaginal ultrasound scans
- Laboratory urodynamics
- Video Urodynamics
- Ambulatory Urodynamics
- Complimentary investigations (urethral pressure profile and pad testing)
- Specialist combined clinics with a Colorectal surgeon with an interest in functional bowel disease and Urologist with an interest in female urology
- An OASIS clinic
- Development of an interest in sensory urgency
- One of our current research interests is developing a nurse based service as a 2 year pilot funded through a pharmaceutical grant

The ongoing research in the Unit include a number of Drug trials of which two are currently funded by Pfizer. Of these, I am personally collaborating the SOPHIA study.

The equipment to be used involves the use of two computers on which patients are able to complete the ePAQ which is the questionnaire being used to assess OAB symptoms and sexual function pre and post treatment. Within the department we also have facilities to conduct urodynamics studies and ensure a normal void profile using the uroflowmeter and bladder scan.

For patients unable to attend the Follow up clinic, the follow Up Questionnaire can be completed on Line as the ePAQ has been used in clinical practice by on line completion.

Description of the partner institutions and departments to be involved (if applicable)

NA

Bibliography of up to 50 additional references

1. Cohen BL, Barboglio P, Gousse A. The Impact of Lower Urinary Tract Symptoms and Urinary Incontinence on Female Sexual Dysfunction Using a Validated Instrument. *J.Sex Med.* 2008.
2. Oh SJ, Ku JH, Choo MS, Yun JM, Kim DY, Park WH. Health-related quality of life and sexual function in women with stress urinary incontinence and overactive bladder. *Int.J.Urol.* 2008;15:62-67.
3. Sen I, Onaran M, Tan MO, Acar C, Camtosun A, Sozen S et al. Evaluation of sexual function in women with overactive bladder syndrome. *Urol.Int.* 2007;78:112-15.
4. Sand PK, Goldberg RP, Dmochowski RR, McIlwain M, Dahl NV. The impact of the overactive bladder syndrome on sexual function: a preliminary report from the Multicenter Assessment of Transdermal Therapy in Overactive Bladder with Oxybutynin trial. *Am.J.Obstet Gynecol.* 2006;195:1730-35.
5. Coyne KS, Margolis MK, Brewster-Jordan J, Sutherland SE, Bavendam T, Rogers RG. Evaluating the impact of overactive bladder on sexual health in women: what is relevant? *J.Sex Med.* 2007;4:124-36.
6. Patel AS, O'Leary ML, Stein RJ, Leng WW, Chancellor MB, Patel SG et al. The relationship between overactive bladder and sexual activity in women. *Int.Braz.J.Urol.* 2006;32:77-87.
7. Jha S, Radley S, Farkas A, Jones G. Impact of TVT on Sexual Function. Oral Presentation, Basingstoke. UKCS. 09.04.2008.
8. Jha S, Radley S, Farkas A. The bladder is a Complex Witness. Oral presentation, Basingstoke. UKCS. 10.04.2008.



National Research Ethics Service

NRES Committee Yorkshire & The Humber - South Yorkshire

Millside
Mill Pond Lane
Meanwood
Leeds
LS6 4RA

Telephone: 0113 305 0128

18 August 2011

Dr Swati Jha
Consultant Obstetrician and Gynaecologist
Sheffield Teaching Hospitals NHS Foundation Trust
Level 4, Jessop Wing
Tree Root Walk
Sheffield
S10 2SF

Dear Dr Jha

Study title: IPSU study: Impact of Physiotherapy on Sexual function in women with Stress Urinary Incontinence (SUI) and a comparison of electrical stimulation versus standard physiotherapy: a randomised controlled trial

REC reference: 11/YH/0170

Protocol number: 2

Thank you for your letter of 15th August 2011 responding to the Committee's request for further information on the above research.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation subject to the conditions specified below.

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to

the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Covering Letter		05 May 2011
Covering Letter		01 August 2011
Covering Letter		15 August 2011
Investigator CV		
Other: Email from funder		21 April 2011
Other: Questionnaire cover letter	1	01 August 2011
Participant Consent Form	1.1	01 August 2011
Participant Information Sheet	1.1	01 August 2011
Protocol	1	01 May 2011
Questionnaire: EQ5D EuroQoL		
Questionnaire: PISQ		
Questionnaire: SF-36		
REC application		05 May 2011
Referees or other scientific critique report		
Response to Request for Further Information		
Response to Request for Further Information		

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "*After ethical review – guidance for researchers*" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

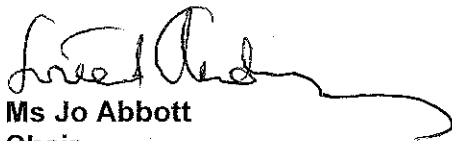
You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

11/YH/0170	Please quote this number on all correspondence
-------------------	---

With the Committee's best wishes for the success of this project

Yours sincerely


Ms Jo Abbott
Chair

Email: sinead.audsley@nhs.net

Enclosures: "After ethical review – guidance for researchers"

Copy to: *Prof Simon Heller, Sheffield Teaching Hospitals NHS Foundation Trust*
Miss Angela Driscoll, Sheffield Teaching Hospitals NHS Foundation Trust

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Sheffield Teaching Hospitals 
NHS Foundation Trust

STH15385
Study Protocol.
Version 1. Dated 17TH May 2010

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy: a randomised controlled trial.

Chief/Principal Investigator:

Name: **Swati Jha**
Consultant Obstetrician & Gynaecologist & Honorary Senior Clinical Lecturer
University of Sheffield
Address: Level 4, Jessop Wing,
Tree Root Walk,
Sheffield
S10 2SF.
Telephone: 0114 2268166
Fax: 0114 2268171
E-mail: Swati.Jha@sth.nhs.uk

Study Sponsor:

Name: Sheffield Teaching Hospitals NHS Foundation Trust
Address: Research Department
1st Floor
11 Broomfield Road
Sheffield
S10 2SE
Telephone: 0114 226 5938
Fax: 0114 226 5937

Co-Investigator

Name: Mr. Stephen Radley.
Job Title: Consultant Obstetrician and Gynaecologist
Organisation: Sheffield Teaching Hospitals NHSFT
Email Address: stephen.radley@sth.nhs.uk

Name: Professor Stephen Walters
Job Title: Professor of Medical Statistics and Clinical Trials
Organisation: University of Sheffield
Email: S.J.Walters@sheffield.ac.uk

Impact of Physiotherapy on Sexual function of women with SU1.
Version 1: Dated 17th May 2010.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Name: Professor Simon Dixon

Job Title: Professor of Health Economics
Organisation: University of Sheffield
Email Address: s.dixon@shef.ac.uk

Name: Maria Goodwin

Job Title: Senior 1. Womens Health Physiotherapist
Organisation: Sheffield Teaching Hospitals NHSFT
Email Address: maria.goodwin@sth.nhs.uk

Name: Philippa Watmough-Cownie.

Job Title: Service User Representative
Email:

Collaborators

Name: Kate Reece. Group 1 Physiotherapist.
Job Title: Senior 1. Womens Health Physiotherapist
Organisation: Sheffield Teaching Hospitals NHSFT
Email Address: kate.reece@sth.nhs.uk

Project duration:

It is anticipated this will be 42 months:

- Study set-up including ethics/governance etc. 6 months
- Recruitment 24 months
- Follow up 6 months
- Final data analysis and preparation of results for dissemination 6 months

STH Directorate Affiliation:

Obstetrics Gynaecology and Neonatology

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

TABLE OF CONTENTS

1. Abstract_____	Page 4
2. Background and Introduction_____	Page 4
3. Methodology_____	Page 6
4. Study Procedures_____	Page 8
5. Outcomes _____	Page 12
6. Sample Size Calculation_____	Page 13
7. Analysis of Data_____	Page 13
8. Patient Input_____	Page 15
9. Quality Control _____	Page 16
10. Duration of Study_____	Page 17
11. Project Management_____	Page 17
12. Data Management_____	Page 17
13. Expertise of Research Team_____	Page 18
14. Taking the Work Forward_____	Page 19
15. Ethical Issues_____	Page 20
16. Funding_____	Page 20
17. Costing Schedule_____	Page 20
18. Intellectual Property_____	Page 20
19. Dissemination_____	Page 20
References_____	Page 21
Appendix 1: Study Flow Chart_____	Page 24
Appendix 2: PISQ_____	Page 25
Appendix 3: The Modified Oxford Scale_____	Page 26
Appendix 4: ePAQ_____	Page 27
Appendix 5: SF- 36_____	Page 27
Appendix 6: EQ-5D_____	Page 27

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Title

Impact of physiotherapy on sexual function in women with urinary incontinence (UI) and a comparison of electrical stimulation versus standard physiotherapy:
A prospective pragmatic parallel group randomized controlled trial (RCT)

Short Title

Impact of physiotherapy on the sexual function of women with urinary incontinence.

1. ABSTRACT

Aims

This study aims to evaluate the effect of physiotherapy on sexual function of women with urinary incontinence. It also compares 2 different methods of pelvic floor muscle training comparing electrical stimulation to standard physiotherapy as a prospective parallel group randomised controlled trial (RCT). The clinical and cost effectiveness of these 2 interventions on the sexual function of women with urinary incontinence and the response to treatments over a 6-month period will be compared.

2. BACKGROUND AND INTRODUCTION

Urinary incontinence (UI) is defined by the International Continence Society as the 'complaint of involuntary leakage of urine on effort or exertion, or on sneezing or coughing' (Abrams et al. 2009). It is usually caused by weakness or damage to muscles and connective tissues of the pelvic floor, compromising urethral support, or by weakness of the urethral sphincter itself. Stress incontinence i.e. the 'complaint of involuntary leakage of urine on effort or exertion, or on sneezing or coughing' is the commonest cause of urinary incontinence in women and epidemiological studies have shown it to be most common between 45 and 54 years (Rortveit & Hunskaar 2006), with urge incontinence becoming more prevalent in older women.

Epidemiological studies suggest that UI affects up to 41% of the female population (Hannestad et al. 2004). It is a health burden and impacts not only on social, psychological, occupational, domestic and physical health but also on sexual well being. The proportion of women suffering from UI who have sexual dysfunction is significant (Korda, Braun, & Engelmann 2007) (Aslan et al. 2005; Handa et al. 2004; Jha et al. 2009; Salonia et al. 2004) and has been reported to range from 26% (Korda, Braun, & Engelmann 2007) to 83% (Clark & Romm 1993). The taboo nature of sexual dysfunction means that symptom reporting has been infrequent and is often underreported. In addition, there is a lack of awareness of availability of treatment.

Pelvic Floor Muscle Training (PFMT) is now accepted as the first line treatment for urinary incontinence (Berghmans et al. 1998) and the National Institute of Clinical Excellence (NICE) recommend that a trial of supervised pelvic floor muscle training of at least 3 months' duration should be offered to all women with stress or mixed UI prior to any surgical intervention (National Institute of Clinical Excellence 2006). There is good evidence that daily pelvic floor muscle training continued for 3 months is safe and effective with an improvement in urinary incontinence expected in 40–60% of women (Bo 2003).

The exact mechanism by which PFMT improves incontinence was postulated by Bo (Bo 2004) who stated this may be achieved by three mechanisms: 1) women learn to consciously pre-contract the Pelvic Floor Muscles (PFM) before and during increases in

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

abdominal pressure (such as coughing, physical activity) to prevent leakage; 2) strength training builds up long-lasting muscle volume and thus provides structural support; and 3) abdominal muscle training indirectly strengthens the PFM. The first can be placed in a behavioral construct, while the two latter both have the aim of changing neuromuscular function and morphology, thus making the PFM contraction automatic; however the aim of therapy is to improve the strength and efficacy of pelvic floor contraction.

Whereas there are several studies reporting on response of sexual function following incontinence surgery (Berthier et al. 2008; Brubaker et al. 2009; Cayan et al. 2008; Elzevier, Venema, & Nijeholt 2004; Ghezzi et al. 2006; Jha et al. 2007), the reports on the impact of physiotherapy on sexual function of women with SUI is limited. The current available evidence suggests that supervised PFMT has a beneficial effect on overall sexual function. An observational study assessing the impact of PFMT on sexual function showed all aspects of sexual function to be improved (Zahariou, Karamouti, & Papaioannou 2008). All domains of the FSFI (Female Sexual Function Index) significantly improved with median total FSFI scores increasing from 20.3 to 26.8. This is one of the few studies to quantify, using a validated questionnaire, the improvement in sexual function of women with SUI, undergoing successfully a 12-month supervised PFMT program. Unfortunately the Female Sexual Function Index is not validated for use in women with urinary incontinence.

Beji (Beji, Yalcin, & Erkan 2003) showed similar results with an improvement in sexual desire, performance during coitus and achievement of orgasm in women who received pelvic floor muscle rehabilitation but also failed to use a validated questionnaire when assessing the impact of PFMT on sexual function.

Bo Talseth, & Vinsnes (2000) also showed physiotherapy improved some aspects of sex life, but failed to look at different domains of sexual function. Rivalta et al. (2009) looked at the impact of biofeedback, electrical stimulation, PFMT and vaginal cones in combination in 3 women with urinary incontinence and associated sexual dysfunction. More recently Rivalta et al. (2010) found in a group of 16 women that sexual function was treated and quality of life improved by a complete pelvic floor rehabilitation program ie biofeedback, functional electrical stimulation, pelvic floor muscles exercises, and vaginal cones.

Benefits were demonstrated however numbers were too small and the benefit of individual interventions difficult to assess. All these studies were of a small size and underpowered to answer the relevant question. In addition, they fail to use a validated questionnaire and have made no comparisons with different types of physiotherapy.

Neuromuscular electrical stimulation has been shown to be safe and effective in the treatment of women with urinary incontinence both stress (Sand et al. 1995; Smith, III 1996) and urgency (Siegel et al. 1997; Smith, III 1996). It is at least as effective as PFMT (Bo, Talseth, & Holme 1999). In patients with sexual dysfunction electrical stimulation has been found to be of benefit particularly those with vulval pain disorders (Dionisi et al. 2008; Nappi et al. 2003). IGIuseppe, Pace & Vicentini (2007) demonstrated that in women with UI and who scored low on the Female Sexual Function Index (FSFI) showed an improvement in urinary leakage and also in their sexual life following treatment by neuromuscular electrical stimulation. This was an observational study with relatively small numbers and made no comparisons with alternative forms of physiotherapy.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

The current theory as to why PFMT may improve sexual function is varied. The pelvic floor muscles are directly responsible for the amount of sensation a woman feels during intercourse, and for the amount of grip felt by her partner. Rhythmic contractions of the pelvic floor contribute to arousal and many women's ability to achieve orgasm. Women may be able to reach orgasm more easily, after a pelvic floor exercise program. Exercise improves muscle tone, which means that the muscle is tighter, so is stretched more by an erect penis. Strong, firm muscles have more nerve endings, and more nerve endings mean more sensations during sex. Exercise improves circulation, and this is particularly important for the smaller muscles of the pelvic floor, which are responsible for engorging the clitoris when women are aroused.

To date there has been no study assessing the impact of physiotherapy on sexual function of women with urinary incontinence using a validated condition specific questionnaire. There have been no studies comparing the impact of electrical stimulation versus standard PFMT on sexual function of women with urinary incontinence.

3. METHODOLOGY

ETHICS

The study is registered with the R&D office of the Sheffield Teaching Hospitals NHS Foundation Trust. Research ethical approval and NHS research governance approval will be sought and gained prior to commencement of the project.

AIMS & OBJECTIVES

1. To evaluate the effect of physiotherapy on sexual function of women with UI
2. To compare standard physiotherapy with electrical stimulation
3. To evaluate the cost effectiveness of one treatment versus the other.

Research Question

1. Does physiotherapy improve sexual function in women with urinary incontinence?
2. Does standard PFMT versus PFMT in conjunction with electrical stimulation in the treatment of urinary incontinence improve clinical and patient-centred outcomes related to sexual function?

Null Hypothesis

There is no change in sexual function of women following physiotherapy for urinary incontinence.

There is no difference in sexual function following treatment with standard PFMT versus standard PFMT with electrical stimulation.

TRIAL DESIGN

A prospective pragmatic parallel group randomized controlled trial (RCT).
(Appendix 1: flow chart of study design).

As the study compares two different forms of treatment this would be the most appropriate design.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

STUDY POPULATION

Population

Women referred to secondary care with urinary incontinence who, following clinical assessment or urodynamic studies, are deemed to require physiotherapy (Pelvic floor Muscle training) are potential recruits for this study. Potential participants will be identified by review of referral letters received from GPs or other clinicians.

SETTING

The Jessop Wing of the Royal Hallamshire Hospital, Sheffield, UK will be recruiting patients for this study. A feasibility assessment has been performed to ensure that the Gynaecology outpatients department is referred the appropriate number of patients to recruit to this study in the estimated time frame. On average 30 patients are referred each month for stress incontinence to the physiotherapy department. Of these 15 are premenopausal sexually active women. Assuming 50% women agree to be recruited into the study, recruitment could be achieved in 16-18 months but we are allowing for 2 years allowing for any delays or issues that could potentially cause recruitment to be slower than anticipated.

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria

- Women must have given written (personally signed and dated) informed consent.
- Women who are able to understand, and are willing to comply with the requirements of the protocol.
- Women who are sexually active and are between the age of 18yrs and premenopausal with urinary incontinence attending physiotherapy for PFMT.
- Women who score either greater than 25% on the urinary domain of the sexual function dimension, and/or greater than 33% for the degree of bother for the same symptom

Exclusion criteria

- Women with a prolapse as their predominant problem.
- Women who have had any previous incontinence surgery.
- Women who have a Grade 3 or above muscle strength as measured using the modified Oxford Scale on vaginal examination.
- Women with vaginal discharge or UTI.
- Women fitted with an implanted pacemaker.
- Women who are pregnant.
- Women with undiagnosed pelvic pain.
- Women with a known sensitivity to the electrodes or the electrode gel.
- Women with inflammation or infection of the vulva and vagina.
- Women who have experienced recent haemorrhage or haematoma.
- Women with Atrophic vaginitis.
- Any other medical condition or abnormality (e.g. malignancy or complication) that in the opinion of the investigator would impact upon the safety or efficacy of the study treatment or any study assessments.
- The patient is enrolled in another interventional trial.
- Non-English speaking women or with a specific language problem.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

RANDOMISATION

Women scheduled to undergo PFMT for predominant stress incontinence will be randomised to either 1) Standard PFMT or 2) PFMT plus Electrical Stimulation.

Allocation will be through block randomisation (with a variable block size an integer multiple of two). The study statistician will generate a randomisation schedule using the STATA software. A series of consecutively numbered opaque sealed envelopes will be created that will contain the treatment allocations. These sealed envelopes will be opened by the research administrator at the time of randomisation in the next consecutive order revealing which arm the patient is randomized to. The numbers on the envelope will become the patient's identification number for the duration of the study. The randomization envelopes will be labeled from 001-150 which would allow for any screen failure patients who decide not to take part in the study once randomization has been performed or who do not meet the inclusion/exclusion criteria at visit 1 when performed by the physiotherapist. The envelopes will be opened in strict numerical order.

The research administrator will sign/date the randomisation form to confirm it was opened in consecutive order and also record the date, patient's NHS number/details on the randomization form and in the medical notes. The Research administrator will be independent from the physiotherapists who are performing the study procedure so bias will not be affected.

The research administrator will arrange for the patient information sheets and consent forms to be made available at each appropriate clinic where it is expected potential patients will be recruited.

Randomization envelopes will be stored in a locked cabinet when not required.

BLINDING

In order for the physiotherapist to perform the study procedures, they will be aware of which group the patient has been randomised to.

The woman will not be blinded to the treatment they will receive. We believe that it would be impractical to blind treatment, but accept that bias may be introduced as a consequence. This bias may arise as the treatment expectations following different modalities of treatment and the subjective clinical outcomes may be over-estimated or under-estimated depending on how she would view her prior problems and expected outcomes. Our clinical practical experience suggests that this bias would be minimal and its measurement would be beyond the objectives of this trial. Clinician bias is eliminated by patients performing ePAQ and PISQ at the end of the study as this provides objective evidence of the degree of change.

4. STUDY PROCEDURES

All potential patients will be seen in clinic by their hospital Doctor where a full history will be obtained and the necessary investigations will be performed including a vaginal examination using the modified Oxford scale, which is routine hospital procedure.

The patient will have completed e-PAQ (interactive questionnaire) either at home or at the time of this visit and their Doctor will decide on a plan of care.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

If the clinician is referring the woman for physiotherapy and they meet all the inclusion/exclusion at this point they will be invited to participate in the study. All patients invited into the study will be given the approved patient information letter and consent form to take home and review/sign. All consent forms will be returned to the study administrator in a pre-paid envelope once signed by the patient.

114 women (57 to each arm) will be randomly allocated to each treatment arm. Pelvic floor symptoms, including incontinence severity before and after treatment will be assessed using the 'Electronic Pelvic Floor Assessment Questionnaire' (ePAQ). Changes in sexual function will be assessed using the 'Prolapse and Incontinence Sexual function Questionnaire' (PISQ). SF-36 domain scores; EQ-5D score; ePAQ urinary & sexual domain scores before and after physiotherapy and a comparison in the two groups.

Incontinence severity will be assessed using ePAQ, and different aspects of sexual function will be assessed by the PISQ, including physical, behavior, emotive and partner related domains. Assessments will be made at baseline and on completion of treatment. SPSS will be used for analysis of results.

Note

It is normal practice at the Jessop Wing, Sheffield for women to be invited to a physiotherapy group session where they will receive information about the normal routine treatment they can expect to receive along with advice on how to perform pelvic floor exercises. Once the physiotherapist receives the referral letter from the medical staff the patient will be sent a letter inviting them to attend this group session. This session provides women with an opportunity to ask questions about the study.

Consent and Randomization

Once the research administrator has received the consent form from the patient the randomization envelope will be opened in consecutive number order (starting at 001) to identify which group the patient will be randomized to. The research administrator will sign/date the randomisation form to confirm it was opened in consecutive order and record the date, patient's NHS number/details on the randomization form and in the medical notes. The research administrator will then contact the patient to notify them of their clinic appointment and which treatment they will receive.

Group 1 = Standard Pelvic Floor Muscle Training.

Patients will receive a minimum of 4 and up to 6 sessions with assessments by the physiotherapist being performed at each visit on a monthly basis.

Group 2 = Pelvic Floor Muscle Training with Electrical Stimulation.

Patients will receive a minimum of 4 sessions and up to 6 sessions with assessments by the physiotherapist being performed at each visit on a monthly basis.

Neuromuscular stimulation is the electrical stimulation of muscle and nerve fibres. A small hand held machine will be attached to an internal vaginal electrode and used at home by the patient on a daily basis. Treatment sessions last 20 minutes and the treatment continues for 3-6 months. Electrotherapy will be chosen when the pelvic floor is generally graded between 0-2 on the Oxford scale. Alongside this and as a means of assessing progress, Electromyography (EMG) will be used (which may show high resting baselines). This increases patient awareness during a voluntary contraction. EMG is a technique for

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

evaluating physiologic properties of muscles and is used to achieving biofeedback and is an integral component of electrical stimulation. This will show the activity of the muscle on a screen which increases interest and challenge to the treatment of electrical stimulation. Two physiotherapists will be involved in this study, one will treat group 1 patients and one will treat group 2.

The following procedures will be performed on **each** group of patients:

Visit 1:

Physiotherapy visit. (Week 0.)

Group 1 Patients:

- Perform subjective and objective assessment using standard department assessment tool.
- Perform a vaginal examination using the modified Oxford scale.
- Identify/document problems with the patient
- Identify goals and agree an action plan with the patient.
- Review e-paq results with the patient.
- Review frequency / volume chart with the patient
- Document a personalized exercise plan:

Advice and education on posture, core stability and on performing pelvic floor exercises will be given. Exercises will include slow and fast contractions.

NICE guidelines recommend 8 PFM contractions repeated three times a day. All exercises should be patient specific and based on the initial assessment of the pelvic floor.

- Perform bladder re-education as necessary
- Arrange the next appointment and provide the patient with contact details.
- Complete the 'Case Report Form' (CRF) and 'Source Data'.

Group 2 patients: As above +

- Discuss treatment option of electrotherapy to commence at the next visit.

Visit 2:

Physiotherapy Visit. (week 3 +/- 1 week)

For Both Groups.

- Review symptoms with the patient.
- Review goals and establish new ones with the patient.
- Review & encourage personalized exercise programme with the patient
- Discuss with the patient problems identified by e-paq / pisaq in sexual domain.
- Arrange the next appointment.
- Complete 'Case Report Form' (CRF) and 'Source Data'.
- Obtain Adverse Events data and document in Case Report Form.

Group 2 only:

- EMG assessment and commence electrotherapy

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Maintenance visits 3/4/5/6 (performed at 3 weekly intervals +/- 1 week

i.e week 6/9/12/15/18. +/- 1 week

For Both Groups:

- Review symptoms with the patient.
- Review goals and establish new ones with the patient.
- Assess any change in symptoms subjectively
- Assess if managing daily treatments with the patient
- Discuss/review exercises in relation to 'activities of daily living' with the patient
- Encourage patient to continue treatment and pelvic floor exercises.
- Discuss any sexual problems
- Review/resolve any questions
- Arrange the next appointment.
- Complete the 'Case Report Form' (CRF) and 'Source Data'.
- Record any Adverse events

Group 2 only:

- Assess if using neuromuscular stimulator correctly.
- Change programme if necessary

Those patients experiencing benefit will continue using the device for a minimum of 3 months to a maximum of 6 months with assessments by the physiotherapist being performed at each visit. The program may be changed depending on the progress made with their urinary incontinence as per departmental protocol.

At the end of the treatment phase patients whose symptoms have improved will be discharged and patients who have experienced no or minimal improvement will be referred back to their hospital gynaecologist for further treatment.

End of study visit:

The study can complete in both groups only after a minimum of 4 visits (*visit 4/5/6 or week 12/15/18*).

- Complete the 'Case Report Form' (CRF) and 'Source data'.

ADVERSE EVENTS

An adverse event (AE) is any untoward medical occurrence in a patient or clinical investigation subject administered a pharmaceutical product or device and which does not necessarily have to have a causal relationship with the treatment.

Although no serious adverse events are anticipated, it is possible that these may occur and a system for reporting these promptly is required.

All Adverse Events (AE's) or Serious Adverse Events (SAE's) occurred during the trial either observed by the investigator or reported by the participant, whether or not attributed to the study, will be reported on the Case Report Form (CRF). AEs/SAEs considered to be related to the trial by the investigator will be followed up until resolution or the event is considered stable. The investigator may be asked to provide follow-up information.

All related AEs/SAEs that result in a participant's withdrawal from the trial or are present at

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

the end of the trial should be followed up until a satisfactory resolution occurs.

The Chief Investigator shall submit, once a year throughout the clinical trial, or on request, a safety report to the Ethics Committee that includes all AEs/SAEs.

In order to elicit details of any AEs/SAE's, at each visit the patient should be asked a non-leading question such as: "Do you feel different in any way since the last assessment / visit?"

5. OUTCOMES

1. Primary Outcomes

Self reported PISQ-31 Physical dimension score, at six months in women undergoing physiotherapy for urinary incontinence and a comparison in the two randomized groups.

2. Secondary Outcomes

PISQ-31 Behavioral Emotive dimension and Partner-Related dimension scores; SF-36 domain scores; EQ-5D score; ePAQ urinary & sexual domain scores before and after physiotherapy and a comparison in the 2 groups.

Assessments will be at Baseline (prior to commencing Physiotherapy), 3 and 6 month (post commencement of Physiotherapy) intervals.

The PISQ is a 31 item questionnaire with responses measured on a 5-point Likert scale. It evaluates sexual function of women with either urinary incontinence and/or pelvic organ prolapse. The PISQ identifies 3 separate and distinct domains of sexual function. These include Behavioural Emotive, Physical and Partner Related. Whereas the Behavioural Emotive domain evaluates sexual desire, frequency of sexual activity, and orgasmic capabilities, the Physical Domain assesses more directly the effect of urinary incontinence on sexual function. The partner Related Domain on the other hand assesses the patient's perception of her partner's response to the effect of her pelvic floor disorder on their sexual functioning, as well as her partner's sexual functioning. Scores are calculated by totaling the scores for each question, from 0 (always) to 4 (never), with the exception of question 5, which is scaled from 0 (always) to 5 (do not masturbate). Individual domain scores are calculated by adding the scores for the individual items in each domain.

The SF-36 is a generic health related quality of life, which is capable of producing eight domain scores including, social functioning, emotional role limitations, mental health and general health perceptions. Each domain is scored from zero to 100, with higher scores indicating better health. The SF-36 one of the most popular health related quality of life instruments in the world and has been shown to have good measurement properties across a wide range of conditions.

The EQ-5D (Dolan 1997) is a short generic health related quality of life instrument that produces a single score. It is principally used to generate quality adjusted life years (QALYs) for use in economic evaluation and is recommended by the National Institute for Health and Clinical Excellence (NICE) for use in its technology appraisal programme.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

6. SAMPLE SIZE CALCULATION

For the purposes of sample size estimation the primary outcome will be the mean PISQ-31 physical dimension score at 6-months post randomisation.

From a study performed by the group who developed the PISQ 32, they found the mean and Standard Deviation in the 3 dimensions of the PISQ in women with UI to be:

Behavioral Emotive	39.2+/- 9.1
Physical	34.1+/- 5.3
Partner-Related	19.2+/- 3.1
Total PISQ	92.6+/- 13.5

The above study looking at PISQ scores in women with urinary incontinence found these values in women with no urinary incontinence (who served as controls for the study), to be

Behavioral-Emotive	43.7+/-7.0
a difference of 4.5 points compared to women with UI	
Physical	36.8+/-2.5
a difference of 2.7 points compared to women with UI	
Partner-Related	20.5+/-1.7
Total PISQ	100.1+8.8

To have an 80% power of detecting a 3-point mean difference in PISQ-31 physical dimension scores at 6-month between the Electrical stimulation/Biofeedback and standard treatment group as statistically significant at the 5% (two-sided) level with s.d of 5 will require 45 patients per group (90 in total). If 20% of patients drop out and are lost to follow-up then the study will need to recruit and randomize 57 per group (114 in total). With 90 patients we will be able to show a difference of 2.2 units in a non-randomised before and after comparison with baseline and 6 month scores for the overall effect of both treatments

If we assume a standard deviation of 9.0 points for the PISQ-31 behavioral Emotive dimension score at 6-months, with a sample size of 45 patients the study would have 80% power to detect a difference of 5.5 or more points in mean 6-month PISQ-31. Following randomization, with 45 patients per group we will also have 80% power to detect a difference of 5.5 or more points in mean 6-month post randomisation PISQ-31 Behavioural emotive domain scores between the groups as statistically significant at the 5% (two-sided) level.

7. ANALYSIS OF DATA

As the trial is a pragmatic parallel group randomised, with a usual (control) treatment arm, data will be reported and presented according to the revised CONSORT Statement for reporting of pragmatic randomized controlled trials (Moher, Schulz, & Altman 2001; Zwarenstein et al. 2008). The statistical analysis will be performed on an intention-to-treat-basis. All statistical exploratory tests will be two-tailed with alpha = 0.05. Baseline demographic (e.g. age, parity, previous history urinary incontinence, current smoking history) and health related quality of life data (PISQ-31, ePAQ, SF-36 and EQ-5D scores) will be assessed for comparability between the treatment groups.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

The primary aim is to assess the impact of physiotherapy on sexual function of women with urinary incontinence and compare standard PMFT treatment plus electrical stimulation versus standard PMFT treatment. The primary outcome will be the patient's self-reported PISQ-31 Physical dimension score, at three months post randomization. Statistical methods appropriate for analysing patient reported outcome measures as described in Walters (Walters S.J. 2009) will be used. A two independent samples *t*-test will be used to compare mean PISQ-31 Physical dimension scores, at three months post randomization between the two groups (standard PMFT treatment plus electrical stimulation versus standard PMFT treatment). A 95% confidence interval (CI) for the mean difference in PISQ-31 Physical Symptom dimension scores between the electrical stimulation treatment and standard groups will also be calculated. In the event of differences between the electrical stimulation treatment and standard groups with respect to baseline demographic, physical, and health-related quality of life measurements, multiple linear regressions will be used to adjust the treatment effect for these variables. The ordinary least squares estimated adjusted regression coefficient estimate for the treatment group parameter along with its 95% confidence interval (CI) will then be reported alongside the simple unadjusted estimate.

Secondary outcomes such as the mean PISQ-31 Behavioural Emotive dimension and Partner-Related dimensions; ePAQ dimension scores, and SF-36 outcomes at three month follow-up will be compared before and after treatment and between the two groups using a two independent samples *t*-test. A 95% confidence interval (CI) for the mean difference in this parameter between the treatment groups will also be calculated.

For the repeated PISQ-31 and other secondary outcomes at baseline, 3 and 6 months a summary measure such as the Area Under the Curve (AUC) will be calculated for each patient (Matthews et al. 1990). Two independent samples *t*-test will be used to compare mean AUC between the groups. A 95% confidence interval (CI) for the mean difference in AUCs between the groups will also be calculated.

No interim analysis of the data is planned. No sub-group analysis will be performed. All data will be analyzed with SPSS for Windows software (SPSS; Chicago, IL). Further analyses will be undertaken in addition to the ITT trial-based evaluation. Missing primary outcome data (3-month post randomization PISQ-31 Physical Symptom dimension scores) will be imputed through a variety of methods including: Last observation carried forward (LOCF); horizontal mean imputation and regression imputation as described by Walters (Walters S.J. 2009); to check the robustness and sensitivity of the ITT analysis.

The economic evaluation will take the form a cost-utility analysis and will take a NHS and Personal Social Services perspective (although no PSS costs are thought possible in this patient group). Costs will be based around the number and type of physiotherapy sessions undertaken (i.e. with and without electrical stimulation). Differences in the use of any equipment (including portable electrical stimulation equipment) will also be recorded. All other costs will be captured by a patient questionnaire at 6 months. Unit costs for the two types of sessions will be constructed through a small micro-costing exercise of 100 sessions, and will examine differences in length of time and necessary equipment and consumables. Other unit costs will come from NHS Reference costs, the British National Formulary and 'Unit costs of health and social care'. The EQ-5D will be scored using the 'Dolan' tariff, with QALYs then estimated using linear interpolation between data points.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

The focus of the economic analysis will be to estimate the probability that the intervention is cost-effective at funding thresholds of £20,000 and £30,000 per QALY. This will be supported by plots on the cost-effectiveness plane and cost-effectiveness acceptability curves. Missing data will be imputed using multiple imputation. Deterministic sensitivity analysis will be used to examine any service issues identified by the Trial Steering Group.

8. PATIENT INPUT

A lay summary of the protocol was reviewed by 4 patient groups as described below and feedback requested. The suggestions made by each were addressed and incorporated into the design of the protocol.

Service User Representative

A patient who had already received treatment for this condition was approached to join the study group as a representative of Service users. Having used the physiotherapy services successfully, she has been involved in the protocol development and is a named applicant on the RfPB application. Her chief role has been to provide information and feedback into the design of the study especially in relation to the lay summary and she will be actively involved in monitoring the progression of the study and speaking to potential patients who are considering consenting to the study.

Physiotherapy Patients Group

This is a patient group run by the hospital Women's Health Physiotherapy team and includes women who are receiving physiotherapy as a treatment for incontinence. This group of patients comprised women who could be potential recruits for the study hence this group provided a patient perspective to the protocol.

The Jessop Wing Readers panel

This panel comprises of a lay panel that provide feedback on the overall design and content of the information leaflets produced for the department of Obstetrics and Gynaecology. They reviewed the protocol individually and provided advice and guidance on the wording of the protocol and supporting documents.

Sheffield Teaching Hospitals NHS Foundation Trust Patient Representative

This group plays an important role in different aspects of the Trust Management including:

- Attending and participating in Directorate Management Team meetings as a full, active member as and when there are issues of interest on the agenda.
- Attending any other relevant Directorate meetings.
- Attending quarterly meetings of the Patient Representative Group
- Representing the views of the patient carer population.

Members of this group reviewed the lay summary and provided feedback individually.

In addition to feedback into the design of the protocol each of the above groups were asked the following:

1. If they felt the research was worthwhile?
2. If they would be willing to be involved as recruits?
3. If they wished to be informed of the results?

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

4. If they would be willing to be involved in a service users trial steering committee?

All those providing feedback felt the research was worthwhile and needed to be performed. 82% who were approached said they would have been willing to participate if they were approached.

Those wishing to be informed of the results have provided their contact details and will be informed in due course of the results.

Those willing to be on a trial steering committee will be contacted again once funding has been made available and a Trial Steering Committee will be set-up..

Changes made following PPI input:

1. The service user representative felt that women with previous surgery were less likely to benefit from physiotherapy as they would probably have had physiotherapy prior to their primary surgery. It was therefore agreed that previous continence surgery would be an exclusion criteria as this could lead to bias.
2. A member of the physiotherapy patients group highlighted that pelvic floor tone and sexual function can be influenced by age as an independent variable. This could impact on the results if women recruited were of different ages. The initial protocol included women up to the age of 60, but following this feedback it was agreed that premenopausal women alone would be included in the study.
3. The Jessop Wing Readers Panel suggested changes in the wording of the flowchart of the study. They also recommended adding to the patient information leaflet that treatment would not be delayed if they chose not to be in the study. This statement will be incorporated into the patient information sheet (PIS).
4. Sheffield Teaching Hospitals NHS Foundation Trust Patient Representatives suggested adding a statement regarding the time frame for the return of the questionnaire to facilitate the study and enhance compliance. This will be added to the PIS.

9. QUALITY CONTROL

All monitoring and auditing procedures which are the responsibility of the Sponsor, Sheffield Teaching Hospitals NHS Foundation Trust Research Department and other Regulatory Authorities will be adhered to. The Trial Management Group (TMG) will also meet on a monthly basis to discuss the performance of the study in relation to the timelines, recruitment and any safety issues identified during the performance of the study.

Trial Management Group (TMG)

The TMG is an informal group of trial personnel who have input into the monitoring and supervision of the trial. It will be the responsibility of the Chief Investigator to perform the role of study manager and they will also Chair the (TMG) who will consist of the other recruiting PI's, Physiotherapists', Research Administrator and Directorate Research co-ordinator. The Trial Management Group (TMG) will meet on a regular basis to discuss the performance of the study in relation to the timelines, recruitment and any safety issues identified during the performance of the study. The role of the TMG is to assist the study manager in the day-to-day running of the trial.

The Trial Steering Committee (TSC)

It is role of the Steering Committee (TSC) is to provide overall supervision of the trial and in particular, the progress of the trial, adherence to protocol, patient safety and consideration

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

of new information. Day to day management of the trial is the responsibility of the Chief Investigator (CI). The TSC will be required to make executive decisions about the trial, for example, whether a trial should continue or not following advice by the ethics committee. The Trial Steering Committee (TSC) will act independently of the Trial Management Group and will consist of the following people:

- Mr Andrew Farkas: Consultant Gynaecologist and Clinical Director of Obstetrics, Gynaecology and Neonatology
- Miss Angela Driscoll. R&D Co-ordinator from the Research Department within the Sheffield Hospital NHS Foundation Trust.
- The Service User Representative.

10. DURATION OF STUDY

It is anticipated this will be 42 months (including study set-up):

- Study set-up including ethics submission/governance. 6 months
- Recruitment 6-30 months
- Minimum follow up 6 months (30-36 months)
- Final data analysis and preparation of results for dissemination 6 months (36-42 months)

11. PROJECT MANAGEMENT

It will be the responsibility of the Chief Investigator to disseminate all study related information and procedures to all participants in the team along with information relating to protocol amendments or safety issues.

A research administrator will be employed to support the physiotherapists with the research administration of this protocol. As this protocol mimics current practice funding will not be available to fund the physiotherapists. However, funding will be requested to enable the physiotherapist to obtain training in GCP/research governance and to attend the meetings of the trial management group (TMG).

The research administrator will help to support the physiotherapist by organising the clinics/appointments, randomisation, maintaining the site file, study documentation, completion of Case Report Forms (CRF) and data entry into the study database etc...

The Directorate Research Co-ordinator has assisted in the design of the protocol and co-ordinated the RfPB application and will support the study set-up, ethical and governance approval, provide research training to the research administrator and physiotherapists, and will ensure accrual data is maintained.

It is the policy within the Jessop Hospital-Sheffield that the Jessop Wing Research Executive provides administrative support to all studies performed within the Directorate of Obstetrics, Gynaecology and Neonatology. This resource is funded and will be available to assist with the ethics and governance requirements of the study.

12. DATA MANAGEMENT

Services will be bought from the Sheffield University Clinical Trials Research Unit to design and maintain the database and perform the analysis.

A database system built to a specification agreed between Sheffield CTRU and the Chief Investigator will be developed. The system will be accessible remotely via a web browser, with the data stored securely on a central server. Access will be controlled by the use of

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

assigned logins and encrypted passwords. The system will have a full electronic audit trail and will be regularly backed up. If required point of entry checks will be included in the system. The data will be available in CSV format ready for import into standard spreadsheets and statistical analysis packages. On-going support will be provided for minor modifications and trouble-shooting. All activities will be performed in accordance with Sheffield CTRU Standard Operating Procedures.

Support after database set-up is limited to providing minor modifications and trouble-shooting only e.g. one or two additional field or changes to coding where simple. This does not include addition of new questionnaires or new CRF pages after the database has been set-up and data entry has commenced.

Data management mainly comprises of the production of regular data quality reports (including missing data, out of range values, incongruent values, etc.) and basic summary statistics (recruitment rates, basic analyses). This role will be performed by the Chief Investigator.

Other funding will be requested for the following:

- Consumables
- Physiotherapist training and time to participate in the TMG
- PPI aspects
- Steering committee remuneration
- Service User Representative remuneration
- Postage
- NeuroTrace 4 continence devices along with periform vaginal probes.

13. EXPERTISE OF THE TEAM:

Swati Jha. (Chief Investigator).

- Consultant Obstetrician & Gynaecologist, Sheffield Teaching Hospital NHS Foundation Trust.
- Recruiting PI
- Member of Study Management Group

Mr. Stephen Radley. (Recruiting Investigator).

- Consultant Obstetrician & Gynaecologist, Sheffield Teaching Hospital NHS Foundation Trust.
- Recruiting Patients.
- Member of Study Management Group

Professor Stephen Walters. (Co- Investigator).

- Health Services Research, School of Health & Related Research, University of Sheffield.
- Professor of Medical Statistics and Clinical Trials
- Sample size calculation and Data analysis

Professor Simon Dixon. (Co-Investigator).

- Professor of Health Economics
- Responsible for the economic evaluation
- Health Services Research, School of Health & Related Research, University of Sheffield.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Maria Goodwin. (Co-Investigator).

- Womens Health Physiotherapist. Sheffield Teaching Hospital NHS Foundation Trust.
- Performing physiotherapy to group 2 patients.
- Member of Study Management Group

Kate Reece. Womens Health Physiotherapist.

- Physiotherapist. Sheffield Teaching Hospital NHS Foundation Trust.
- Performing physiotherapy to group 1 patients
- Member of Study Management Group

Philippa Watmough-Cownie: Service User Representative.

- Provide patient perspective on study
- Speak to patients with any questions regarding the study
- Member of Study Management Group

To be appointed. Research Administrator.

- To support the physiotherapist with the day-to-day management of the study. Responsible for study documentation, Site file maintenance, organisation of study clinics, CRF completion, data base entry, communication with patients in relation to clinic appointments etc.
- Member of Trial Steering Committee

Mrs Clare Pye. Directorate Research Co-ordinator.

- Assisted with the design of the protocol and application form. Co-ordinated the RfPB application and will facilitate study set-up within the directorate including ethics, governance, accrual etc..
- Provide training as required to other members of the TMG
- Member of Study Management Group

Support Services

Departments which will be used to facilitate study:

- Department of Obstetrics, Gynaecology & Neonatology
- Department of Physiotherapy
- Department of Research & Development
- Yorkshire & Humber Research Design Service
- Sheffield University Clinical Trial Research Unit

14. TAKING THE WORK FORWARD

Depending on the outcomes, future counselling and management of patients with coexisting urinary incontinence and sexual dysfunction could be affected. Current practice is that women with sexual dysfunction in association with urinary incontinence are referred for electrical stimulation. There is no evidence to support this practice. Electrical stimulation has a cost implication to the NHS as devices are required. These devices need regular maintenance and servicing and have a limited life span. In addition, EMG machines are needed to perform the procedure. There are also training implications, as all physiotherapists are trained to teach PFMT, however not all physiotherapists are trained to carry out electrical stimulation.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

If the results fail to show benefit this expenditure may be avoided. If however there is benefit demonstrated from electrical stimulation there will be a case for investing in this form of treatment in future.

The results will therefore guide further evidence based management of these patients while resulting in potential cost savings to the NHS.

15. ETHICAL ISSUES

Non-English speaking women or women with a specific language problem will not be recruited as the validated questionnaires used in this study are not available in other languages and to arrange for them to be translated and validated at this stage of the protocol design into other languages would be a major piece of work.

16. FUNDING

Funding is being applied for from the Research for Patient Benefit Scheme (RfPB).

17. COSTING SCHEDULE

Refer to finance form.

18. INTELLECTUAL PROPERTY

None anticipated

19. DISSEMINATION

The work will be published in Medline indexed peer reviewed Journals i.e. IUGA Journal, Neurology Urodynamics and the BJOG. It will be presented at National and International meetings such as the UKCS, ICS and IUGA.

Patients and Jessop reader group members comprising the advisory steering group for the study will be informed of the results as will all patients recruited into the study and Reader Group members who have expressed an interest in the results and are not members of the advisory steering group.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

References

- Abrams, P., Artibani, W., Cardozo, L., Dmochowski, R., van Kerrebroeck, P., & Sand, P. 2009, "Reviewing the ICS 2002 terminology report: the ongoing debate", *Neurourol.Urodyn.*, vol. 28, no. 4, p. 287.
- Aslan, G., Koseoglu, H., Sadik, O., Gimen, S., Cihan, A., & Esen, A. 2005, "Sexual function in women with urinary incontinence", *Int.J Impot.Res.*, vol. 17, no. 3, pp. 248-251.
- Beji, N. K., Yalcin, O., & Erkan, H. A. 2003, "The effect of pelvic floor training on sexual function of treated patients", *Int Urogynecol J Pelvic Floor Dysfunct*, vol. 14, no. 4, pp. 234-238.
- Berghmans, L. C., Hendriks, H. J., Bo, K., Hay-Smith, E. J., de Bie, R. A., & van Waalwijk van Doorn ES 1998, "Conservative treatment of stress urinary incontinence in women: a systematic review of randomized clinical trials", *Br.J Urol.*, vol. 82, no. 2, pp. 181-191.
- Berthier, A., Sentilhes, L., Taibi, S., Loisel, C., Grise, P., & Marpeau, L. 2008, "Sexual function in women following the transvaginal tension-free tape procedure for incontinence", *Int J Gynaecol Obstet*, vol. 102, no. 2, pp. 105-109.
- Bo, K. 2003, "Pelvic floor muscle strength and response to pelvic floor muscle training for stress urinary incontinence", *Neurourol.Urodyn.*, vol. 22, no. 7, pp. 654-658.
- Bo, K. 2004, "Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work?", *Int Urogynecol J Pelvic Floor Dysfunct*, vol. 15, no. 2, pp. 76-84.
- Bo, K., Talseth, T., & Holme, I. 1999, "Single blind, randomised controlled trial of pelvic floor exercises, electrical stimulation, vaginal cones, and no treatment in management of genuine stress incontinence in women", *BMJ*, vol. 318, no. 7182, pp. 487-493.
- Bo, K., Talseth, T., & Vinsnes, A. 2000, "Randomized controlled trial on the effect of pelvic floor muscle training on quality of life and sexual problems in genuine stress incontinent women", *Acta Obstet Gynecol Scand.*, vol. 79, no. 7, pp. 598-603.
- Brubaker, L., Chiang, S., Zyczynski, H., Norton, P., Kalinoski, D. L., Stoddard, A., Kusek, J. W., & Steers, W. 2009, "The impact of stress incontinence surgery on female sexual function", *Am.J Obstet Gynecol*.
- Cayan, F., Dilek, S., Akbay, E., & Cayan, S. 2008, "Sexual function after surgery for stress urinary incontinence: vaginal sling versus Burch colposuspension", *Arch.Gynecol Obstet*, vol. 277, no. 1, pp. 31-36.
- Clark, A. & Romm, J. 1993, "Effect of urinary incontinence on sexual activity in women", *J Reprod.Med.*, vol. 38, no. 9, pp. 679-683.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

- Dionisi, B., Anglana, F., Inghirami, P., Lippa, P., & Senatori, R. 2008, "[Use of transcutaneous electrical stimulation and biofeedback for the treatment of vulvodynia (vulvar vestibular syndrome): result of 3 years of experience]", *Minerva Ginecol.*, vol. 60, no. 6, pp. 485-491.
- Dolan, P. 1997, "Modeling valuations for EuroQol health states", *Med Care*, vol. 35, no. 11, pp. 1095-1108.
- Elzevier, H. W., Venema, P. L., & Nijeholt, A. A. 2004, "Sexual function after tension-free vaginal tape (TVT) for stress incontinence: results of a mailed questionnaire", *Int Urogynecol J Pelvic Floor Dysfunct*, vol. 15, no. 5, pp. 313-318.
- Ghezzi, F., Serati, M., Cromi, A., Uccella, S., Triacca, P., & Bolis, P. 2006, "Impact of tension-free vaginal tape on sexual function: results of a prospective study", *Int Urogynecol J Pelvic Floor Dysfunct*, vol. 17, no. 1, pp. 54-59.
- Giuseppe, P. G., Pace, G., & Vicentini, C. 2007, "Sexual function in women with urinary incontinence treated by pelvic floor transvaginal electrical stimulation", *J Sex Med.*, vol. 4, no. 3, pp. 702-707.
- Handa, V. L., Harvey, L., Cundiff, G. W., Siddique, S. A., & Kjerulff, K. H. 2004, "Sexual function among women with urinary incontinence and pelvic organ prolapse", *Am.J Obstet.Gynecol.*, vol. 191, no. 3, pp. 751-756.
- Hannestad, Y. S., Lie, R. T., Rortveit, G., & Hunskar, S. 2004, "Familial risk of urinary incontinence in women: population based cross sectional study", *BMJ*, vol. 329, no. 7471, pp. 889-891.
- Jha, S., Moran, P., Greenham, H., & Ford, C. 2007, "Sexual function following surgery for urodynamic stress incontinence", *Int Urogynecol J Pelvic Floor Dysfunct*, vol. 18, no. 8, pp. 845-850.
- Jha, S., Radley, S., Farkas, A., & Jones, G. 2009, "The impact of TVT on sexual function", *Int.Urogynecol.J Pelvic.Floor.Dysfunct.*, vol. 20, no. 2, pp. 165-169.
- Korda, J. B., Braun, M., & Engelmann, U. H. 2007, "[Sexual dysfunction at urinary incontinence]", *Urologe A*, vol. 46, no. 9, pp. 1058-1065.
- Matthews, J. N., Altman, D. G., Campbell, M. J., & Royston, P. 1990, "Analysis of serial measurements in medical research", *BMJ*, vol. 300, no. 6719, pp. 230-235.
- Moher, D., Schulz, K. F., & Altman, D. G. 2001, "The CONSORT statement: revised recommendations for improving the quality of reports of parallel-group randomised trials", *Lancet*, vol. 357, no. 9263, pp. 1191-1194.
- Nappi, R. E., Ferdeghini, F., Abbiati, I., Vercesi, C., Farina, C., & Polatti, F. 2003, "Electrical stimulation (ES) in the management of sexual pain disorders", *J Sex Marital Ther.*, vol. 29 Suppl 1, pp. 103-110.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

National Institute of Clinical Excellence. **Urinary incontinence: the management of urinary incontinence in women**. CG40. 2006.

Ref Type: Generic

Rivalta, M., Sighinolfi, M. C., De Stefani, S., Micali, S., Mofferdin, A., Grande, M., & Bianchi, G. 2009, "Biofeedback, electrical stimulation, pelvic floor muscle exercises, and vaginal cones: a combined rehabilitative approach for sexual dysfunction associated with urinary incontinence", *J Sex Med.*, vol. 6, no. 6, pp. 1674-1677.

Rivalta, M., Sighinolfi, M. C., Micali, S., De Stefani, S., & Bianchi, G. 2010, "Sexual Function and Quality of Life in Women with Urinary Incontinence Treated by a Complete Pelvic Floor Rehabilitation Program (Biofeedback, Functional Electrical Stimulation, Pelvic Floor Muscles Exercises, and Vaginal Cones)", *J Sex Med.*

Rortveit, G. & Hunskaar, S. 2006, "Urinary incontinence and age at the first and last delivery: the Norwegian HUNT/EPINCONT study", *Am.J Obstet Gynecol.*, vol. 195, no. 2, pp. 433-438.

Salonia, A., Zanni, G., Nappi, R. E., Briganti, A., Deho, F., Fabbri, F., Colombo, R., Guazzoni, G., Di, G., V, Rigatti, P., & Montorsi, F. 2004, "Sexual dysfunction is common in women with lower urinary tract symptoms and urinary incontinence: results of a cross-sectional study", *Eur.Urol.*, vol. 45, no. 5, pp. 642-648.

Sand, P. K., Richardson, D. A., Staskin, D. R., Swift, S. E., Appell, R. A., Whitmore, K. E., & Ostergard, D. R. 1995, "Pelvic floor electrical stimulation in the treatment of genuine stress incontinence: a multicenter, placebo-controlled trial", *Am.J Obstet Gynecol.*, vol. 173, no. 1, pp. 72-79.

Siegel, S. W., Richardson, D. A., Miller, K. L., Karram, M. M., Blackwood, N. B., Sand, P. K., Staskin, D. R., & Tuttle, J. P. 1997, "Pelvic floor electrical stimulation for the treatment of urge and mixed urinary incontinence in women", *Urology*, vol. 50, no. 6, pp. 934-940.

Smith, J. J., III 1996, "Intravaginal stimulation randomized trial", *J Urol.*, vol. 155, no. 1, pp. 127-130.

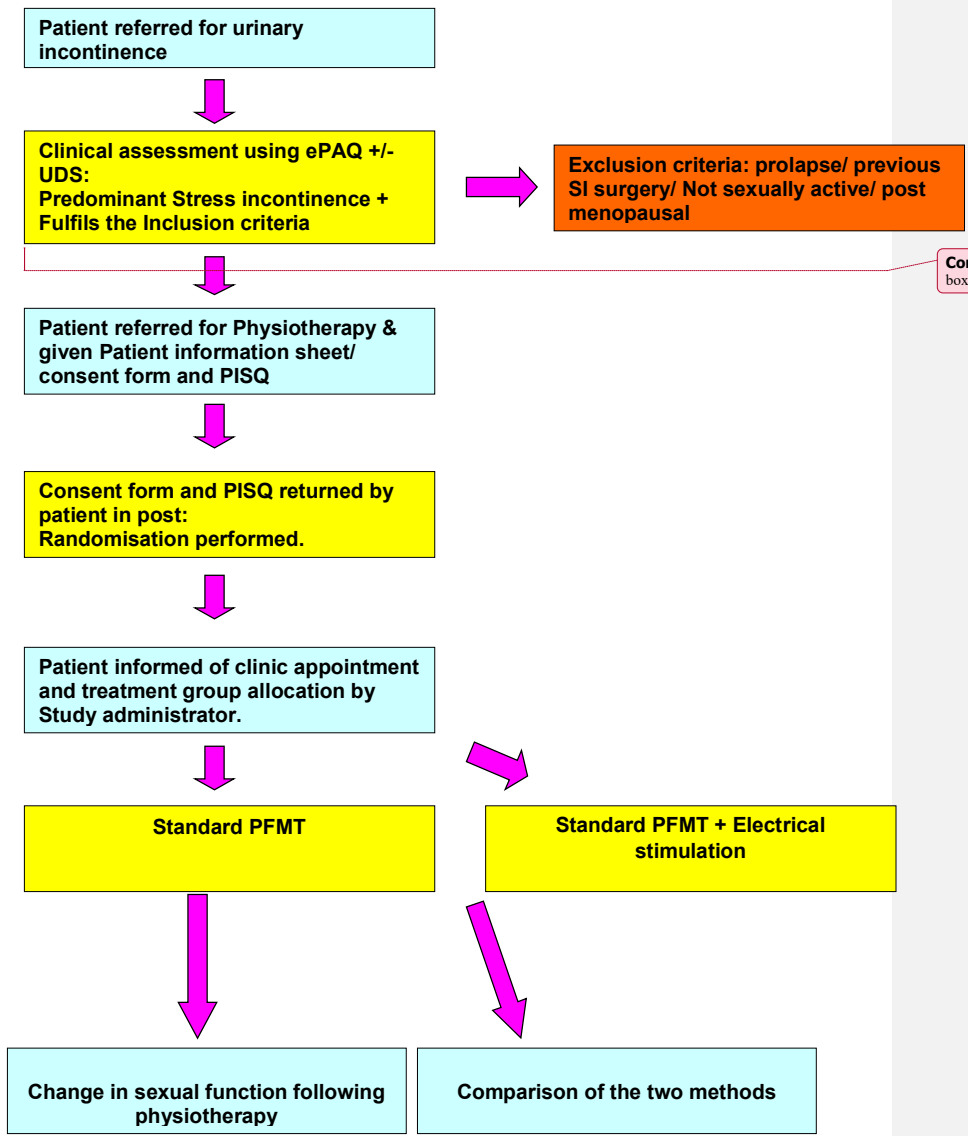
Walters S.J. *Quality of life outcomes in clinical trials and health care evaluation: a practical guide to analysis and interpretation*. 2009. Chichester: Wiley.

Ref Type: Generic

Zahariou, A. G., Karamouti, M. V., & Papaioannou, P. D. 2008, "Pelvic floor muscle training improves sexual function of women with stress urinary incontinence", *Int Urogynecol J Pelvic Floor Dysfunct*, vol. 19, no. 3, pp. 401-406.

Zwarenstein, M., Treweek, S., Gagnier, J. J., Altman, D. G., Tunis, S., Haynes, B., Oxman, A. D., & Moher, D. 2008, "Improving the reporting of pragmatic trials: an extension of the CONSORT statement", *BMJ*, vol. 337, p. a2390.

Appendix 1: Study flowchart



Commented [j1]: I have added + fulfils inclusion criteria in the box above

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Appendix 2: PISQ

The PISQ is a 31 item questionnaire with responses measured on a 5 point Likert scale. It evaluates sexual function of women with either urinary incontinence and/or pelvic organ prolapse.

The PISQ identifies 3 separate and distinct domains of sexual function. These include Behavioural Emotive, Physical and Partner Related. Whereas the Behavioural Emotive domain evaluates sexual desire, frequency of sexual activity, and orgasmic capabilities, the Physical Domain assesses more directly the effect of urinary incontinence on sexual function. The partner Related Domain on the other hand assesses the patient's perception of her partner's response to the effect of her pelvic floor disorder on their sexual functioning, as well as her partner's sexual functioning.

Scores are calculated by totalling the scores for each question, from 0 (always) to 4 (never), with the exception of question 5, which is scaled from 0 (always) to 5 (do not masturbate). Individual domain scores are calculated by adding the scores for the individual items in each domain.

Behaviour emotive domain includes questions 1,2,5,6,7,8,9,10,12,22,23,24,26,27 and 29. The physical domain includes questions 11,13,16,17,18,19,20,21,25, and 30. The partner related domain comprised questions 3,4,14,15,28, and 31.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Appendix 3: The Modified Oxford Scale

Grade 0: No discernible PFM contraction

Grade 1: a flicker, or pulsing under the examining finger- a very weak contraction

Grade 2: a weak contraction - an increase in tension in the muscle without any discernible lift or squeeze

Grade 3: a moderate contraction – characterised by a degree of lifting of the posterior vaginal wall and squeezing on the base of the finger (pubovisceralis) with in drawing of the perineum. A grade 3 or higher grade contraction are generally discernible on visual perineal inspection.

Grade 4: a good PFM contraction producing elevation of the posterior vaginal wall against resistance and in drawing of the perineum. If two fingers (index and middle) are placed laterally and/or vertically and separated, a grade 4 contraction can squeeze them together against resistance.

Grade 5: a strong contraction of the PFM; strong resistance can be given against elevation of the posterior vaginal wall and approximation of the index and the middle finger as above.

ANNEXE 4. RFPB APPLICATION: PB-PG-0110-19276

Impact of Physiotherapy on Sexual function of women with Stress Urinary Incontinence and a comparison of electrical stimulation versus standard physiotherapy:

Appendix 4: ePAQ

The e-PAQ is an interactive web-based computerised interview, designed to assess & analyse pelvic floor symptoms in women. It comprehensively measures symptoms as well as their impact on quality of life. It immediately processes response data, providing an instantaneous measure of pelvic floor health that can be printed out & used during the clinical episode.

e-PAQ provides 19 domain scores in 4 dimensions: Urinary, Bowel, Vaginal & Sexual (all scored on a scale of 0 - 100).

The impact of the problem on Quality of life is also estimated. The domains of relevance for this study will be the urinary and vaginal domains, and the impact of these symptoms on quality of life.

Appendix 5: SF- 36

The SF-36 is a generic health related quality of life, which is capable of producing eight domain scores including, social functioning, emotional role limitations, mental health and general health perceptions. Each domain is scored from zero to 100, with higher scores indicating better health. The SF-36 one of the most popular health related quality of life instruments in the world and has been shown to have good measurement properties across a wide range of conditions.

Appendix 6: EQ-5D

The EQ-5D is a short generic health related quality of life instrument that produces a single score. It is principally used to generate quality adjusted life years (QALYs) for use in economic evaluation and is recommended by the National Institute for Health and Clinical Excellence (NICE) for use in its technology appraisal programme.