University of KwaZulu-Natal
Nelson R Mandela School of Medicine
Department of Obstetrics and Gynaecology

A clinical audit of Laparoscopic Surgery for Recto-Vaginal Endometriosis at a Tertiary Referral Centre in KwaZulu-Natal

Dr. Makaya Mchunu

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The dissertation is submitted to the University of KwaZulu-Natal in fulfillment of the requirement for the degree of Masters in Medicine (MMED)-Obstetrics and Gynaecology

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Declaration

I, Makaya Mchunu, hereby declare that the work on which this dissertation is based, is original and is my own unaided work carried out by me. It has not been presented for any other or similar degree at the University of KwaZulu-Natal or any other university. The work was performed under the supervision of Dr SR Ramphal

Signed: _____

Date: 14 February 2015

Supervisor: _____ _____

Date: 14 February 2015

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DEDICATION

This work is dedicated to my wife, Nonku for her understanding and unwavering support when I was involved with this task.

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ACRONYMS / ABBREVIATIONS:

AFS	: American Fertility Society
CA 125	: Cancer antigen 125
CT scan	: Computerized Tomography Scan
DIE	: Deep Infiltrating Endometriosis
ESU	: Electrosurgical units
GnRHa	: Gonadotrophin- Releasing Hormone analogues
IALCH	: Inkosi Albert Luthuli Central Hospital
IBS	: Irritable bowel syndrome
IGFBP1	: Insulin-like growth-factor binding protein-1
IVU	: Intravenous Urography
Laser	: Light Amplified and Stimulated Emission of Radiation
MRI	: Magnetic Resonance Imaging
NSAIDs	: Non-steroidal anti-inflammatory drugs
OC	: Oral Contraceptives
R-AFS	: Revised-American Fertility Society
RVE	: Recto-vaginal Endometriosis
SA	: South Africa
UKZN	: University of KwaZulu-Natal
USA	: United States of America

Abstract

Aim: The aim of the study was to evaluate the operative and post-operative complications, and outcomes of laparoscopic surgery using the Harmonic scalpel in patients with recto-vaginal endometriosis (RVE). Furthermore, pre-operative work up and referral patterns were evaluated.

Design: Retrospective chart review.

Method: Following ethical (BREC No. BE O42/11) and hospital regulatory approvals, a retrospective chart review of the hospital case records of all patients who underwent laparoscopic surgery for RVE using the Harmonic scalpel from January 2004 to December 2010 was performed. All relevant clinical information was captured on structured data sheets which were kept confidential and used strictly for the purposes of the audit.

Results: The case records of 105 women who had laparoscopic surgery for endometriosis between January 2004 to December 2010 were identified Thirty-three (31.4%) patients with RVE were treated using the Harmonic scalpel as the main energy source. From this cohort of patients, there was one case which required conversion to laparotomy for rectal injury which was successfully repaired; one case required re-laparoscopy for suspected intra-operative bleeding and another required cystoscopy and double J stenting due to anuria of 21 hours post- surgery.

The mean hospital stay was 4 days. 76% of women had improvement of pain after surgical intervention and concomitant adjuvant medical therapy was used in 30.3%.

Conclusion: The usage of Harmonic scalpel as the energy source in the management of RVE appears to be safe and the morbidity is comparable to other energy sources reported in literature.

Key words: Endometriosis, Recto-vaginal, Surgery, Complications

Chapter 1

Introduction

Endometriosis is a common benign gynaecological disease that leads to significant health problems for women in their reproductive ages. It is defined as presence and proliferation of endometrial-like tissue outside the uterine cavity and is estimated to occur in 10-15% of women in their reproductive ages[1, 2]. Endometriotic lesions occur commonly in the pelvic side walls, ovaries, pouch of Douglas and the utero-vesical fold[3]. There are three forms of endometriosis in the pelvis, viz., peritoneal, ovarian and deep infiltrating endometriosis (DIE) of which recto-vaginal endometriosis is the most common[4, 5]. In DIE, the endometriotic implants invade the retroperitoneal space for a distance of 5 mm or greater and the lesions involve the pouch of Douglas, utero-sacral ligaments and the recto-vaginal septum[6].

Recto-vaginal endometriosis (RVE) is a severe form of DIE and its pathophysiology is still an area of controversy[7]. The endometriotic nodules have a dominant fibrotic component within the connective tissue between the anterior-rectal wall and the vagina; and the endometriotic infiltration may also occur between the vagina, cervix, posterior aspect of the uterus and the rectum[8].

The depth of endometriotic nodule invasion into the pouch of Douglas is variable, i.e., the nodules can invade through into the vagina or cervix, and can be visualized on speculum examination. The presence of endometriotic lesions in the vagina or cervix confirm the presence of RVE, which occurs in approximately 31.4% of patients with endometriosis[3].

Recto-vaginal endometriosis is strongly associated with dyschezia, painful menstruation, dyspareunia, extreme fatigue and chronic pelvic pain. These symptoms adversely affect the quality of life of women affected[3].

Endometriosis can be suspected by its typical clinical presentation, clinical findings and its well-known sonographic features, but laparoscopy remains the gold standard for diagnosis.

It has been reported that medical therapy is effective in the treatment of superficial endometriosis but has less effect on RVE[9]. However, combined oral hormonal contraceptives, gonadotrophin-releasing hormone analogues (GnRHa) and progestogens may cause temporary relief of pain symptoms for a short period of time.

Laparoscopic surgery of RVE is often regarded as the gold standard. It involves various energy sources for the excision of deep endometriosis. This form of surgery is challenging and associated with morbidity of which conversion to laparotomy is not infrequent. The surgery is technically difficult, requires skills gained through intensive training and is mostly considered for patients with severe incapacitating symptoms. The choice of surgery depends on the surgical skills available and the reproductive needs of the woman[9]. Many authors, advocate complete tissue separation and excision of the diseased tissues, however, there is no consensus among gynaecologists on the best approach to achieve this goal and there is variety of approaches suggested[10, 11].

Conventional surgery utilizes electrosurgical energy which is associated with the risk of bowel and a ureteric injury since the pathology is in close proximity to these structures. The Harmonic scalpel facilitates dissection using ultrasonic energy (mechanical) with minimal thermal injury and allows for rapid tissue healing. However there is scant literature on complications and outcomes on the usage of the Harmonic scalpel for the treatment of RVE.

The main objective of this study was to evaluate operative and post-operative complications and outcomes of laparoscopic surgery using the Harmonic scalpel in patients with RVE. Furthermore, referral patterns and pre-operative workup were evaluated.

Chapter 2 Background and Literature Review

2.1 Epidemiology of Endometriosis

2.1.1 Prevalence

Endometriosis is mostly found in women of child-bearing age, commonly between the ages of 25 to 29 years, but it can also occur beyond the average age if there is associated infertility rather than pelvic pain alone[12]. Also, this disease condition can be found in adolescent women with an estimated 50% of women under the age of 20 years with chronic pelvic pain or dyspareunia, having the disease[13].

The prevalence of endometriosis varies and this depends on the population where the studies are conducted[3]. About 1-7% of women undergoing bilateral tubal sterilization, 12-32% of women in the reproductive age group undergoing laparoscopy for pelvic pain and approximately 20-40% of women with infertility are affected[14]. Emmanuel et al., reported that endometriosis occurs in 10-15% of women in their reproductive years[2]. Studies have shown that there is a lower incidence rate of endometriosis in African-American women compared to white Americans, while the incidence rate is higher among Asian American women when compared to white women[15].

It is estimated that 55% of DIE occurs in the pouch of Douglas, 35% in the utero-sacral ligaments and 11% in the utero-vesical fold. The overall prevalence of RVE varies from 5–10% of women with endometriosis and has been noted to be increasingly recognised as a different clinical syndrome from the superficial forms of the disease [3, 16].

2.1.2 Risk factors

Age

Virtually all women in their reproductive ages are potentially vulnerable to develop endometriosis but appropriate immune competency mostly eradicates such lesions in a timely fashion, preventing its clinical sequelae[17]. Pelvic endometriosis is not often diagnosed before the age of menarche and decreases after the age of menopause. The studies done in women below the age of fifty years reported that the frequency of the endometriosis rises with age until menopause, however recent studies have not supported these findings[18, 19] .

This discrepancy can be explained by the different selection criteria in various studies. Furthermore, in recent years more young women undergo laparoscopy rather than laparotomy for infertility and the diagnoses of endometriosis is made as a coincidental finding.

Social Class and Race

Women of higher social class have been reported to have higher incidence of endometriosis[20, 21]. These findings could be explained by the affordability the women of higher social class have over lower social classes for pelvic pain or infertility and hence the diagnosis of endometriosis. Kyama et al., showed that African-American women have lower incidence of endometriosis than white Americans, whereas Asian Americans have higher incidence of endometriosis than white women[15]. The same disparity might account for the higher incidence of the disease in white women compared to other races.

Menstruation, Reproductive factors and Contraception

The English literature is scanty on the association between woman's menstrual history and risk of developing pelvic endometriosis. Epidemiological studies conducted in the United States of America (USA) and Italy reported that women with early menarche, and those with heavy menstrual periods are at greater risk of developing pelvic endometriosis[20, 21]. This could be related to the 'retrograde hypothesis'[22]. Also, the risk of developing the disease is inversely related to parity[19, 23]. However, the available data have not revealed any link between first pregnancy age or spontaneous abortion to the risk of developing endometriosis[21, 24].

Treatment of endometriosis with oral contraceptives (OC) has not been shown to completely eradicate endometriosis because when treatment stops, the atrophic forms of ectopic endometrial implants are reactivated[25]. Some authors have hypothesized that use of OC could increase the risk of severe disease since they temporarily suppress endometriosis. Sangi-Haghpeykar et al., reported that the risk of the disease was reduced among current OC users[26]. However, data is conflicting regarding the link between the OC use and the risk developing endometriosis. One large cohort study reported that, the rate of developing endometriosis was low among the current or recent users of OC than those women who were never put on them (relative risk of 0.4, 95%, confidence interval 0.2–0.7), there was a higher risk of developing the disease in women who discontinued OC much earlier (2–4 years) with risk ratio of 1.8, 95% CI 1.0–3.1)[27].

Heredity and Family history of endometriosis

There is evidence indicating that combinations of genetic, hormonal, immunological and anatomical factors have an impact on the formation and development of the ectopic foci of endometriosis. The genetic predisposition is evidenced by a 7% chance of developing the disease if it is present in a first-degree relative and women with positive family history might have a more severe form of the disease[28, 29].

Simpson et al., reported a six-fold risk for developing endometriosis to sisters of women with the disease, while Moen et al., found an odds ratio of 7.2 ($p < 0.05$) for developing endometriosis for a first-degree relative with the disease[30, 31]. Furthermore, Moen (1994), showed that six sisters of eight monozygotic twins with endometriosis also developed the disease[32].

Lifestyle: smoking, alcohol and exercise

Some authors have suggested an inverse relationship between heavy smokers and the risk of developing endometriosis. Cramer et al., found a decreased risk of the disease in smokers[21]. The anti-estrogenic effect of smoking is the recognized explanation. However, Missmer et al., observed an increased risk of endometriosis with increased number of cigarettes currently smoked per day to women with no infertility problems[14].

A moderate ingestion of alcohol leads to increased serum levels of estrogens and hence the risk of developing endometriosis and an increased consumption of saturated fats leads to high risk of other benign or malignant diseases in gynaecology while regular physical activity might be associated with lower levels of estrogens and lower risk of developing endometriosis. However data is scanty[33-35].

2.2 Pathogenesis, Morphology and Molecular Bases

The pathogenesis of endometriosis is mostly dependent on ovarian steroids, in particular estrogen and progesterone. The ectopic endometrium has been shown to produce estrogen in increased amounts. The abnormal expression of the aromatase enzyme in the ectopic endometrium allows the conversion of androgen hormones to estrogen[36]. In the pelvis, there are three separate forms of endometriosis viz., peritoneal, ovarian and DIE[4, 5].

In DIE, the endometriotic implants penetrate into the retroperitoneal space for a distance of 5 mm or more and may extend into the pouch of Douglas, uterosacral ligaments and the recto-vaginal septum[6]. RVE is a severe form of DIE[7]. It encompasses endometriotic invasion between the vagina, cervix, posterior aspect of the uterus and the rectum. The depth of invasion into the vagina and cervix varies and if the invasion is severe, the endometriotic lesions can be easily visualized on clinical speculum examination and this is an ominous sign indicating the presence of RVE[3]. These lesions may also penetrate through the different layers of the rectal wall, even penetrating through into the rectal mucosa[3]. There are three classes of recto-vaginal endometriotic nodules, viz., (i) Type I-lesions occur in the recto-vaginal septum, (ii) Type II- lesions occur in the posterior vaginal fornix and (iii) Type III- lesions resemble the shape of an hour-glass. The prevalence of these nodules are 10, 58 and 32% respectively[37].

Several theories with regard to its pathogenesis have been postulated:

Sampson's theory:

Transplantation and Implantation theory postulates that viable fragments of endometrium are shed at the time of menstruation and passed through the fallopian tubes and become implanted on the peritoneal surfaces and grow into endometriotic lesions, a phenomena of retrograde menstruation[22]. In general, retrograde menstruation is reported to occur in 70% to 90% of women; however, it is a common finding in

women with endometriosis compared to those who do not have the disease[38, 39]. Studies in animal models have shown that when endometrial cells are deposited in the peritoneal cavity, the lesions formed are similar to those found in women with endometriosis. Also, it has been demonstrated that when menstrual blood is placed in the peritoneum of disease free animals, ectopic lesions similar to endometriosis develop[40].

Coelomic Metaplasia Theory:

Iwanoff and Meyer are well recognized as the founders and supporters of the above mentioned theory. The theory postulates that endometriosis develops from metaplasia of the cells lining the pelvic peritoneum[41]. This hypothesis is based on embryologic studies that illustrated that mullerian ducts, germinal epithelium of the ovary and the pelvic peritoneum have the same embryologic precursor. The findings that endometriosis is rare in males is recognized as the proof of coelomic metaplasia theory. However, both men in the study were on estrogen therapy[42, 43].

Lymphatic and Vascular Metastasis Theory:

This theory suggests that distant endometriotic lesions are established by the lymphogenous spread of viable endometrial cells. Halban reported that endometriosis could emerge in the retro-peritoneum and in sites not directly opposed to peritoneum[44]. Although retrograde menstruation seems almost certain to be involved in the pathogenesis of the disease, the theory does not explain the full spectrum of the disease, as the endometrial implants are occasionally found in other sites such as the lung or in the nose. Endometriosis does occur in men who are taking large doses of oestrogen but the occurrence is rare[45]. This follows that the theories of coelomic metaplasia and Halban's theory better explains the aetiology of endometriosis rather than retrograde menstruation.

Immunological Theory:

The alterations in both humoral and cellular immunity have been described in the pathogenesis of endometriosis. It has been reported that the natural killer cell activity is reduced in women with endometriosis, and that there is an abnormal expression of macrophages that both secrete cytokines and growth factors involved in promoting the proliferation of the ectopic endometrium[28].

Exogenous oestrogen replacement therapy is suggested to play a role in the development of endometriosis in post-menopausal women and this disease is estimated to occur between 2-5 % of this age group[46, 47]. Some authors suggest that RVE has different pathophysiological process to peritoneal endometriosis and should be called recto-vaginal adenomyosis or recto-vaginal adenomyomata[4, 5]. However, Vercellin et al., indicate that RVE may be a different manifestation of endometriosis with a single origin i.e. regurgitated endometrial cells. The endometrial cells implant into the most dependent area of the pelvis, the posterior cul-de sac (Pouch of Douglas). The recto-sigmoid colon acts as an anatomic shelter, covering endometrial cells and preventing them from being cleared by the usual process within the peritoneum cavity. They also hypothesized that bleeding of the intraperitoneal endometriotic papules may trigger inflammatory response in the pouch of Douglas leading to adhesion formation between anterior rectal wall and posterior vaginal fornix peritoneal surfaces; and the ectopic implants become nodular because of reactive proliferation of fibroblasts eventually becoming isolated from the rest of the pelvis by adhesion formation[48].

Congenital anomalies like obstructive müllerian duct of the cervix or vagina account for the majority of girls under the age of 17 years with the disease of endometriosis[49].

Morphology

The appearance of endometriotic lesion varies, it may appear as a superficial "powder-burn" or "gunshot" lesions on the ovaries, serosal surface and peritoneum. They may also appear as atypical or "subtle" lesions, as well as red implants (petechial, vesicular, polypoid, haemorrhagic or red flame-like) and as serous or clear vesicles. Moreover, the lesions may appear as white plaques or scarring, or as yellowish brown peritoneal discoloration of the peritoneum and the type and severity of symptoms is related to the depth of endometriotic peritoneum infiltration[(50)]. The nodules often contain a thick fluid-like tar and the cysts are often densely adherent to the peritoneum of the ovarian fossa. The adjacent fibrotic tissue may involve the tubes and bowel[(51)]. Deeply infiltrating endometriotic nodules penetrate to a depth of 5 mm or more below the peritoneum and may extend into the utero-sacral ligaments, vagina, bowel, bladder, or ureters[(6)]. The nodule and surrounding fibrosis may infiltrate the rectal or vaginal walls with the POD being obliterated by dense adhesions, and the endometriotic nodules may develop in the uterosacral ligaments[(52)]. When the endometriotic nodule extends laterally, the ureter and the parametrium may be invaded.

Molecular Basis

Several proteins were proposed and the role they play in the development of endometriosis evaluated. Some of the proteins investigated were HOXA10 and Annexin-1. The HOXA10 protein is a member of the homeobox gene family that has a substantial role in formation of endometriosis. Kim et al., evaluated the expression of HOXA10 in the eutopic endometrium of baboons with induced endometriosis [(53)]. They observed that HOXA10 mRNA was reduced after 3, 6, 12, and 16 months of disease, and these findings showed statistical significance at 12 and16 months. Also, the HOXA10 protein levels were found to be low in both epithelial and stromal cells of the endometrium. Furthermore, they also observed a decrease in the expression of integrin-b3 (usually up-regulated by HOXA10), whereas EMX2 was increased (a gene that is

inhibited by HOXA10). In their study, they also analysed the methylation patterns of the HOXA10 gene in both the diseased and disease free animals (controls). It was observed that the F1 region on the promoter was significantly methylated in the diseased animals compared to controls and this was suggested to account for the decrease in HOXA10 expression [(53)].

In the same study, the role of HOXA10 in IGFBP1 expression was also studied using human endometrial stromal cells. They found that the overexpression of HOXA10 in human endometrial stromal cells led to a decrease of IGFBP1 mRNA. However, when HOXA10 was under-expressed; IGFBP1 mRNA was elevated, even in the presence of H1db cAMP. The authors concluded that their data demonstrated that the HOXA10 gene has a negative influence on IGFBP1 expression in decidualizing cells. Thus, a decrease in HOXA10 levels may play a role in the altered uterine environment associated with endometriosis[(53)].

The other protein evaluated was Annexin-I. This protein belongs to the Annexin family of Ca^{2+}-dependent phospholipid-binding proteins. Li et al., 2008, detected the expression of Annexin-1 in peritoneal fluids of women with endometriosis. These findings emerged when they evaluated the expression of Annexin-1 in eutopic endometrium of women with endometriosis and in those without the disease[(54)]. Immunohistochemistry demonstrated that Annexin-1 protein was expressed throughout the menstrual cycle mainly in endometrial glandular cells. This protein was detected in the peritoneal fluids of women with endometriosis. These authors concluded that Annexin-1 is over expressed in eutopic endometrium and is detectable in the peritoneal fluids of women with the disease, and this is thought to play a part in the pathogenesis of endometriosis[(54)].

2.3 Classification of Pelvic Endometriosis

Staging of endometriosis is a way of describing how mild or severe the condition is. The stage of the disease is determined via laparoscope by inspecting the uterus, fallopian tubes, and ovaries, and by inspecting the entire abdomen for the presence or absence of adhesions. Several classification schemes to assist in describing the anatomic location and severity of endometriosis at surgery have been described.

Acosta et al., proposed a classification system of pelvic endometriosis that divided the disease based on surgical findings into mild, moderate, and severe categories (see Box 1)[55]. The categories included the site of lesions, presence or absence of adhesions, and the presence or absence of tissue scarring or retraction. Also, the presence of small endometriomas (< 2 cm) or the presence of minimal peritubal or periovarian adhesions distinguished a moderate form of the disease from a mild form of the disease. However, many physicians believed that this classification system has several disadvantages, because of the arbitrariness of the staging and its inability to distinguish between unilateral or bilateral disease.

Box1. A proposed classification of pelvic endometriosis[55]

Mild
1. Scattered, fresh lesions (ie, implants not associated with scarring or retraction of the peritoneum) in the anterior or posterior cul-de-sac or pelvic peritoneum.
2. Rare surface implant on ovary, with no endometrioma, without surface scarring and retraction, or small endometrioma
3. No peritubular adhesions.

Moderate
1. Endometriosis involving one or both ovaries, with several surface lesions, with scarring and retraction, or small endometriomata.
2. Minimal periovarian adhesions associated with ovarian lesions described.
3. Minimal peritubular adhesions associated with ovarian lesions described.
4. Superficial implants in the anterior and/or posterior cul-de-sac with scarring and retraction. Some adhesions, but not sigmoid invasion.

Severe
1. Endometriosis involving one or both ovaries with endometrioma > 2 x 2 cm (usually both).
2. One or both ovaries bound down by adhesions associated with endometriosis, with or without tubal adhesions to ovaries.
3. One or both tubes bound down or obstructed by endometriosis; associated adhesions or lesions.
4. Obliteration of the cul-de-sac from adhesions or lesions associated with endometriosis.
5. Thickening of the uterosacral ligaments and cul-de-sac lesions from invasive endometriosis with obliteration of the cul-de-sac.
6. Significant bowel or urinary tract involvement.

Kistner et al., developed a different staging system that moved from early peritoneal implants to ovarian involvement to tubo-ovarian involvement to dissemination throughout the pelvis (see Box 2)[56]. The strong emphasis in this group was that the impaired tubo-ovarian mobility was the major cause of infertility.

Box 2 Kistner's classification of endometriosis[56]

Stage I Areas of endometriosis are present on the posterior pelvic peritoneum (cul-de-sac, uterosacral ligaments) or on the surface of the broad ligaments but do not exceed 5 mm in diameter. Avascular adhesions may involve the tubes, but the fimbriae are free. The ovaries may show a few avascular adhesions, but there is no ovarian fixation. The surfaces of the bowel and the appendix are normal.

Stage IIA Areas of endometriosis are present on the posterior pelvic peritoneum (cul-de-sac, uterosacral ligaments) and the broad ligaments but do not exceed 5 mm in diameter. Avascular adhesions may involve the tubes, but the fimbriae are free. Ovarian involvement by endometriosis has been subclassified as follow: IIA-1: Endometrial cyst or surface is 5 cm or less
IIA-2: Endometrial cyst or surface is over 5 cm.
IIA-3: Ruptured endometrioma; the bowel and the appendix are normal.

Stage IIB The posterior leaf of the broad ligament is covered by adherent ovarian tissue. The tubes present adhesions not removable by endoscopic procedures. The fimbriae are free. The ovaries are fixed to the broad ligament and show areas of endometriosis over 5 mm in diameter. The cul-de-sac presents multiple implants, but there is no adherent bowel nor is the uterus in fixed position. The bowel and the appendix are normal.

Stage III The posterior leaf of the broad ligament may be covered by adherent tube or ovary. The tubal fimbriae are covered by adhesions. The ovaries are adherent to the broad ligament, and tube may or may not show surface endometriosis or endometriomas. The cul-de-sac shows multiple areas of endometriosis, but there is no evidence of adherent bowel or uterine fixation. The bowel and the appendix are normal .

Stage IV Endometriosis involves the bladder serosa, and the uterus is in fixed, third-degree retroversion. The cul-de-sac is covered by adherent bowel or is obliterated by the fixed uterus. The bowel is adherent to the cul-de-sac, uterosacral ligaments, or uterine corpus. The appendix may be involved by the endometriotic process.

Despite several modifications, none of the classification systems of endometriosis received widespread acceptance and use before the year 1978, and this led to the design and publication of another classification system of endometriosis in 1979 by the American Fertility Society (AFS) (Fig 1)[57]. In this classification scheme endometriosis was stratified into mild, moderate, severe, and extensive disease and used a weighted point score that included assessment of the extent of endometriosis (two-dimensional) and presence of adhesions in the peritoneum, ovaries, and tubes. It also allowed for assessment of unilateral versus bilateral disease.

The American Fertility Society*†

Birmingham, Alabama

Patient's Name _____ **Date** _____

Stage I (Minimal) - 1-5
Stage II (Mild) - 6-15
Stage III (Moderate) - 16-40
Stage IV (Severe) - >40
Total _____

Laparoscopy _____ **Laparotomy** _____ **Photography** _____
Recommended Treatment _____
_____
Prognosis _____

PERITONEUM	**ENDOMETRIOSIS**	**<1cm**	**1-3cm**	**>3cm**
	Superficial	1	2	4
	Deep	2	4	6
OVARY	**R Superficial**	1	2	4
	Deep	4	16	20
	L Superficial	1	2	4
	Deep	4	16	20
	POSTERIOR CULDESAC OBLITERATION	**Partial**	**Complete**	
		4	40	
OVARY	**ADHESIONS**	**<1/3 Enclosure**	**1/3-2/3 Enclosure**	**>2/3 Enclosure**
	R Filmy	1	2	4
	Dense	4	8	16
	L Filmy	1	2	4
	Dense	4	8	16
TUBE	**R Filmy**	1	2	4
	Dense	4*	8*	16
	L Filmy	1	2	4
	Dense	4*	8*	16

*If the fimbriated end of the fallopian tube is completely enclosed, change the point assignment to 16.

Fig.1 *The American Fertility Society classification of endometriosis. (From American Fertility Society. Classification of endometriosis 1979)* [57]

This classification scheme allows for significant flexibility in point assignment, which enables any case to be categorized, including those that were recognized to not follow the assignment. This allows any case to be categorized, including those that were recognized to not follow the usual chronology of disease progression and for a comprehensive pelvic evaluation at the time of staging. It also allows for easy and clear communication among practitioners. However, some authors stated that the features of infertility were emphasized, but not necessarily related to pelvic pain[58].

Patient's Name _____ Date _____

Stage I (Minimal) - 1-5
Stage II (Mild) - 6-15
Stage III (Moderate) - 16-40
Stage IV (Severe) - >40
Total _____

Laparoscopy _____ Laparotomy _____ Photography _____
Recommended Treatment _____
Prognosis _____

PERITONEUM	ENDOMETRIOSIS	<1cm	1-3cm	>3cm
	Superficial	1	2	4
	Deep	2	4	6
OVARY	R Superficial	1	2	4
	Deep	4	16	20
	L Superficial	1	2	4
	Deep	4	16	20
	POSTERIOR CULDESAC OBLITERATION	Partial	Complete	
		4	40	
OVARY	ADHESIONS	<1/3 Enclosure	1/3-2/3 Enclosure	>2/3 Enclosure
	R Filmy	1	2	4
	Dense	4	8	16
	L Filmy	1	2	4
	Dense	4	8	16
TUBE	R Filmy	1	2	4
	Dense	4*	8*	16
	L Filmy	1	2	4
	Dense	4*	8*	16

*If the fimbriated end of the fallopian tube is completely enclosed, change the point assignment to 16.

Denote appearance of superficial implants types as red (R), red, red-pink, flamelike vesicular blebs, clear vesicles), white (W opacifications, peritoneal defects, yellow-brown), or black (B) black, hemosiderin deposits, blue). Denote percent of total described as R ___%, W ___% and B ___%. Total should equal 100%.

Additional Endometriosis: _____

Associated Pathology: _____

To Be Used with Normal Tubes and Ovaries

To Be Used with Abnormal Tubes and/or Ovaries

Fig 2. *The American Fertility Society revised classification of endometriosis. (From American Fertility Society. Revised classification of endometriosis*[59]*.*

Hassan offered a modification that increased the point scoring system when the endometriotic lesions extends into the utero-sacral ligaments and the deep retroperitoneal space[58] . In response to the criticism, the AFS revised its classification scheme (Fig 2)[59]. The Revised American Fertility Society (R-AFS) classification of endometriosis was more detailed and formed a separate category for minimal disease while eliminating the extensive disease category and a three-dimensional assessment of disease was included that differentiated superficial from invasive disease.

The limitations of the R-AFS classification system have been mentioned viz, Arbitrariness of the scoring system, its potential for observational error, limited reproducibility and failure to encompass lesion morphologic type[57].

2.4 Extrapelvic Endometriosis

Extrapelvic endometriosis is defined as endometriotic implants found elsewhere in the body, including the gastrointestinal tract, urinary tract, pulmonary system, extremities, skin, and central nervous system[60]. It's true prevalence is unknown because of a lack of epidemiologically well-defined studies. Case reports scattered throughout the surgical and gynecologic literature include findings of extrapelvic endometriosis in virtually every organ system and tissue in the body.

The diagnosis of extrapelvic endometriosis is more difficult because of the variety of symptoms, signs, and different locations, and the low clinical suspicion that doctors and general surgeons have for the disease[61]. It is generally diagnosed in a slightly older population and with less frequency than pelvic endometriosis. Several studies have shown that the median age at diagnosis is 34 to 40 years, compared with the commonly reported range of 25 to 30 for pelvic endometriosis[61-63].

Extrapelvic endometriosis is divided into four classes, as suggested by Markham's classification scheme: Class I designates disease of the gastrointestinal tract; class U, organs of the urinary tract; class L, disease of the lungs and thorax; and class O refers to disease at all other sites[64]. Classes are subdivided further based on intrinsic or extrinsic disease and on the size of the lesions. This classification system is not in widely accepted.

2.5 Endometriosis and Infertility

The infertility problems which include ovulatory disorders, tubal obstruction and semen abnormalities are relatively easy to diagnose and they have been estimated to account for infertility in about 75% of affected couples[65]. Endometriosis has been said to account for infertility in the remaining 25% and is estimated to occur in 40% of women of these affected couples[66]. However, in a study of 500 cases with recto-vaginal nodules, Donnez et al., reported that 64.8% women had associated infertility[67].

There is controversy in the mechanism of infertility in women with endometriosis and this likely depends on the stage and grade of the disease. Endometriosis is staged surgically using the R-AFS staging system and it ranges from minimal presence of ectopic tissue (1-5mm lesions on the pelvic peritoneum) (stage 1) to severe anatomic distortion (deep infiltrating endometriosis with major pelvic adhesions and obliteration of normal pelvic organ relationships) stage (IV) (see Fig 2)[59].

The evidence is inconclusive whether the early stage disease (stage I or II) could be the cause of infertility, although it may be the only abnormality identified during infertility work-up. It is hypothesized that there is overproduction of prostaglandins, metalloproteinases, cytokines and chemokines in women with minimal or mild endometriosis, leading to inflammatory processes that impair peritoneal, ovarian, tubal and endometrial function resulting in defective folliculogenesis, fertilization and implantation[36, 68]. This theory is supported by studies showing that the numbers of

macrophages and cytokines are raised in the peritoneal fluids of women with endometriosis which can inhibits sperm function and cilliary function in vitro[69-72].

2.6 Endometriosis and Pain

Chronic pain is usually defined as pain that continues beyond the expected healing time[73]. It is a non-cyclic pain localised in the anatomic pelvis, anterior abdominal wall at or below the umbilicus, the lumbo-sacral back, or the buttocks. The pain is severe enough to cause functional disability for women to seek medical help and this pain lasts for six months or beyond[74].

The pain symptoms of endometriosis are: dysmenorrhea, dyspareunia, and chronic pelvic pain [75]. The symptoms can be non-cyclic or non-menstrual. In women who had laparoscopy for chronic pelvic pain, at least 33% were found to have endometriosis, whereas the incidence of endometriosis was found to be only 5% in those who had laparoscopy for indications other than for pelvic pain or infertility[76]. The association of endometriosis with chronic pelvic pain is further supported by the improvement of pain observed with surgical treatment of endometriosis, but it is difficult to prove that endometriosis causes pelvic pain[77].

Several theories have been hypothesized to explain the pain caused in endometriotic tissue, production and release of prostaglandins in relation to pain, inflammatory mediators, fibrosis and cyclic haemorrhages from endometriotic tissue in patients with RVE. Anaf et al., proposed that pain elicited during physical examination is caused by pressure exerted on the nodule and this suggests a close relationship between the lesion and the nerve structure in the recto-vaginal septum[78]. The majority of patients with RVE have chronic pelvic pain. Most experts in gynaecology prefer a duration of six or more months as the major criterion to define chronic pelvic pain, but three months is

more consistent with the criterion proposed by the International Association for the Study of Pain[79].

Pain caused by endometriosis is usually visceral in origin as endometriosis occurs most commonly in pelvic viscera and visceral peritoneum. The clinical characteristics of visceral pain are: (i) it is not elicited by all viscera; (ii) may always be functional and (iii) it is not always injury related. It often results in somatic referral pain, possibly because of central convergence of visceral and somatic afferents; and it tends to be poorly localized, probably because the nociceptive afferents within the viscera are of the low concentration[80]. The pain is generated in response to: distension of a viscous or an organ capsule, spasm of visceral muscular fibres, ischemia from vascular disturbances, haemorrhage, neoplasm, inflammation, or to traction on mesentery. All of these characteristics of visceral pain are important in trying to understand the complexity of endometriosis associated pelvic pain. Inflammation has a particularly important role in visceral endometriosis associated pain[81].

There is evidence that endometriosis can cause nociceptive pain (transduction, transmission, modulation, and perception). Firstly, for endometriosis to cause pain via a nociceptive mechanism there should be nociceptor near endometriotic lesions so that endometriosis can act as a noxious stimulus and trigger transduction. There is ample evidence for the presence of nociceptors in or near endometriotic lesions. Tokushige et al (2006), showed that the concentration of nerve fibres in peritoneal endometriotic lesions of women with symptoms was 6-fold greater than in peritoneum of disease free women. Most of the nerve fibres in close proximity to endometriosis glands were shown to be unmyelinated nerve fibres. In addition, several patients with endometriosis also had endosalpingiosis lesions, and interestingly the concentration of nerve fibres in endosalpingiosis lesions was not different from that in normal peritoneum[82].

It is known that endometriosis may cause somatic nociceptive pain as well. Anaf et al., demonstrated that in the recto-vaginal endometriosis nodules, the myelinated nerve fibres (likely to be Adfibres) were present and were usually encapsulated in nodular fibrosis. They reported that there was perineural and endoneural invasion, and demonstrated that pain levels correlated with the amount of nerve encapsulation in fibrosis and endometriotic lesions, and the degree of perineural and endoneural invasion. Ad fibres generally transmit first pain and somatic pain and their presence in recto-vaginal endometriosis nodules may explain the marked tenderness that is observed with palpation of these deeply invasive lesions[(78)].

2.7 Clinical Manifestation and Diagnosis of Recto-vaginal Endometriosis

Women with RVE may present with the classical symptoms of endometriosis which may be variable and unpredictable. In general, the following symptoms occur in patients with endometriosis: severe dysmenorrhea, deep dyspareunia, chronic pelvic pain and ovulation pain. Symptoms associated with bowel or bladder dysfunction, with or without abnormal bleeding or pain, infertility, chronic fatigue and dyschezia are also mentioned[(83)].

Almost all patients with RVE present with symptoms of dyspareunia, dyschezia, rectal bleeding, diarrhoea, tenesmus and bowel obstruction[(3)]. When rectal infiltration occurs, dyschezia and rectal bleeding can occur and usually coincides with menstrual bleeding[(84)]. Dyspareunia typically is localized to the posterior vaginal wall and occurs during deep vaginal thrusting. Two recent studies have found that severe dyspareunia and painful defecation during menstruation is predictive of DIE and RVE[(85)]. Apareunia and abdominal bloating are other symptoms that are not infrequently reported[(86)].

There is evidence suggesting that many patients with recto-vaginal endometriosis seek help late after significant unnecessary suffering has occurred[3]. The gastro-intestinal symptoms of patients with RVE are similar to those of irritable bowel syndrome (IBS) and these patients are often mismanaged[87]. It is not uncommon for women seen by a gynaecologist not to spontaneously disclose gastro-intestinal symptoms. This is probably due to the fear of embarrassment, or they do not associate their symptoms to gynaecological pathology.

Diagnosis of Recto-vaginal Endometriosis

The presence of RVE is typically suggested by physical examination; finding of a painful recto-vaginal nodule or findings on pelvic imaging or during laparoscopy performed to evaluate pelvic pain or infertility. Pre-operative diagnosis of RVE is of paramount importance for the establishment of the precise distribution and extent of invasion of the lesions and this helps the surgeon decide on the best management option of these patients.

The clinical history, vaginal and/or rectal examination as well as imaging play a crucial role in the management plan of women with endometriosis. Clinical examination findings of a fixed retroverted uterus, a palpable or visible nodule in the posterior fornix and tender irregular uterosacral ligaments are highly diagnostic of RVE. When the clinical examination is performed at the time of menstruation, the sensitivity to diagnose RVE is increased[88].

CA 125 is expressed by both eutopic and ectopic endometrium. In women with advanced endometriosis, the plasma concentrations are raised towards the end of luteal phase and during menstruation compared to women without the disease. Sensitivity of 36% and specificity of 87% has been reported in diagnosing deeply infiltrating endometriosis[89]. This blood marker is nonspecific and is also elevated in women with ovarian malignancy and other inflammatory disease processes of the pelvis. However,

when compared with laparoscopy, measuring serum CA125 levels for endometriosis is of no value as a diagnostic tool. Mol et al, found that the sensitivity of CA 125 was only 28% with a specificity of 90% (corresponding likelihood ratio of a raised level is 2.8) for diagnosing all disease stages of endometriosis. However, for moderate to severe endometriosis, it was found to perform better with a specificity of 89% and sensitivity of 47% (corresponding likely-hood ratio of a raised level is 4.3) for diagnosing the disease[90].

Diagnostic imaging for evaluation of recto-vaginal endometriosis include: transvaginal and transrectal sonography, magnetic resonance imaging (MRI), Intravenous Urography (IVU) and double-contrast barium enema.

Transvaginal Sonography

Transvaginal sonography is the first-line imaging tool when RVE is suspected[91]. The radiologist should be informed when suspecting RVE so that the sigmoid colon may be evaluated during imaging. Numerous studies suggested that transvaginal sonography plays a vital role in the diagnosis of RVE, especially if the nodule involves the recto-sigmoid colon with a sensitivity of between 74% and 98% and specificity of between 88% and 100%[92-94].

The limitations of transvaginal ultrasound to diagnose RVE include[91]:

1. Imaging field extends only to the rectosigmoid junction
2. It cannot assess the depth of infiltration into the vaginal or rectal walls
3. It cannot determine the distance of the nodule from the anal junction which helps to determine the extent of surgical resection.

Sonovaginography has been reported to increase the sensitivity of transvaginal ultrasound. In this procedure, the transvaginal probe is introduced into the vagina after a saline solution has been infused. One study evaluated 46 women scheduled for the

resection of the clinically suspected recto-vaginal wall lesion. Sonovaginograhy diagnosed 91% of the pathologically confirmed endometriotic lesions compared to 44% with the conventional transvaginal sonography alone. Specificity was found to be 86% and 50% respectively[95].

Rectal Endoscopic Ultrasound

It is not typically used as the first-line study tool for evaluating RVE. It has been found by numerous studies, although relatively small, to be a useful clinical tool in the diagnosis of RVE. Its sensitivity and specificity to diagnose RVE infiltrating the rectal wall is reported to be 97% and 96%, respectively[96]. Studies comparing transrectal sonography and MRI have found that transrectal sonography is superior to MRI for detection of rectal wall invasion. Rectal endoscopic sonography has been advocated for the diagnoses of endometriosis involving the rectal wall, recto-vaginal septum, uterosacral ligaments or recto-sigmoid colon[96, 97].

Magnetic Resonance Imaging (MRI)

MRI has only been shown to have high sensitivity, specificity, positive and negative predictive values as well as accuracy in evaluating the extent of the lesion[98]. It has been found to be better than transvaginal sonography for the diagnosis of endometriomas and small peritoneal lesions. It sensitivity is reported to be 70% for the disease confirmed by histology[92]. However, it was not found to be superior to transvaginal or rectal endoscopic ultrasound for evaluating endometriosis of the rectal wall[97, 99]. These findings were also demonstrated in a retrospective study of 92 women that compared the three modalities and found similar sensitivities, MRI: 87 %; transvaginal ultrasound: 94%; and rectal endoscopic ultrasound; 89%; and the specificities were 93, 100 and 93% respectively. Surgical exploration was used as the reference standard in these studies[100, 101]. However, MRI can be used for women in whom a rectovaginal disease is suspected but is not found after evaluation with both

physical examination and transvaginal ultrasound. Its limitations are that fibrosis of the endometriotic tissue can change the signal intensity pattern and also, the bowel peristalsis can cause motion artefacts in the image[91].

Computerized Tomography

Computerized Tomography (CT scan) was reported to have a good sensitivity and specificity for diagnosing bowel endometriosis (99% and 100% respectively). This was reported in a study of 98 women where computerized tomography was used in combination with colon distension using water enteroclysis to determine the presence and depth of bowel endometriotic infiltration[102].

Double Contrast Barium Enema

Its use in the evaluation of RVE is mainly when gastrointestinal symptoms suggesting partial bowel obstruction are present. In a retrospective study of 108 women with symptoms suggestive of intestinal endometriosis, Double Contrast Barium Enema showed an accuracy of 99% for predicting the need of intestinal surgery[103]. A recent study showed its sensitivity to be 88% and specificity of 93% for bowel endometriosis in 234 women studied and it was found to be superior to MRI for detecting bowel invasion[104, 105].

Diagnostic Laparoscopy

For a definitive diagnosis of RVE, visual inspection of the pelvis with laparoscopy is regarded as the gold standard investigation tool, unless the disease can be visualized in the posterior vaginal fornix. However, the disease may not be readily visualised at laparoscopy since it is often occluded by the posterior cul-de-sac adhesions. RVE does not often appear as the classical discolouration of pigmented lesions at laparoscopy; it commonly appears as a superficial scar tissue in the cul de sac and can be easily missed.

However, with indirect palpation of the scar tissue using a laparoscopic probe, this initial superficial scarring tissue can be eventually be much deeper[106].

2.8 Management of Recto-vaginal Endometriosis

The management of endometriosis can be achieved in three ways: surgery; medical or both. Surgical excision is the effective method and is regarded the gold standard in the management of recto-vaginal endometriosis[107, 108]. RVE remains a significant cause of morbidity, and often present with a variety of symptoms that can sometimes be severe. Its management is guided by several factors, including the indication for treatment, anatomic location of the disease and patient preference. Women with asymptomatic or mild symptoms that are not bothersome can be managed expectantly. However, RVE containing adenomyotic nodules is best managed by surgery because medical treatment is relatively ineffective in these type of women[109].

2.8.1 Expectant management

When pain symptoms are minimal or are effectively managed by long-term medical treatment, then expectant management of RVE is a reasonable option. In a case series by Fedel at al., 88 women were managed for RVE, two women required surgery because of increasing pain severance and four asymptomatic women required surgical intervention because of increasing size of nodules as noted by ultrasound. Only 24 of these women used oral contraceptives while the others did not receive treatment. The study had a mean follow-up of 68 months[10].

2.8.2 Medical management

RVE remains a significant cause of morbidity. Medical treatment avoids the risks associated with surgery. This is significant since extensive pelvic dissection or bowel resection may result in complications such as genital tract fistulae, bladder injury or

dysfunction or bowel anastomotic leakage. Medical therapy is relatively ineffective for treatment of women with RVE and surgery as first line of treatment is advocated for women with RVE containing adenomyotic nodules[109]. Vercellin et al., also supported surgical intervention as the first-line option for women with severe RVE[110] . Also, Varcellini et al., noted that women with endometriosis undergo several surgeries and the risk of surgical complications increases with repeat procedures due to multiple exposures to surgical risk and development of scar tissue[111].

There are no studies that have compared medical with surgical treatment for RVE. Donazol and GRHa appear to benefit the affected women in terms of disease regression but may not be recommended for long-term use because of their side effects[2]. However, extensive counselling, optimal analgesia, progestogens or the combined oral contraceptives are accepted for empirical treatment of pain presumed to be caused by RVE when definitive diagnosis is not yet confirmed. Literature is unclear as to the best regimen of combined oral contraceptives suitable for endometriosis, viz., conventional, continuous or a tricycle regimen. GnRHa may be used but the drug is expensive and is associated with more side effects and there are concerns about its negative effect on bone mineral density. However, there is an increased risk of disease recurrence following cessation of medical treatment as the available medical therapies for symptomatic disease generally inhibit ovulation and this form of treatment is reserved for women with no short-term fertility interests[112]. Suppression of ovarian function by hormonal treatment for a minimum period of six months lowers the occurrence of pain associated with endometriosis. Some of the drugs studied were: Combined oral contraceptives, Danazol, Gestrinone, Medroxyprogesterone acetate, and GRHa and it was shown that hormonal therapy is equally effective but the side-effects and cost profiles differ[50, 113].

Non-steroidal anti-inflammatory drugs (NSAIDs) appear to be reasonable for the treatment of endometriosis as the disease results in chronic inflammation. Although these drugs have been used often as the first line therapy for pain induced by endometriosis, their analgesic effect for the disease has not been studied fully.

Kauppila et al., found that this group of drugs is effective in reducing the pain associated with endometriosis, however, gastrointestinal side effects were more common with Aspirin and Indomethacin and also there were psychic complaints in women treated with Indomethacin as compared to Aspirin or placebo[114]. There is no evidence to demonstrate whether NSAIDs (specifically naproxen) are effective in managing pain caused by endometriosis. Furthermore, there is no evidence to show whether any individual drug is superior to another[115]. In a review of the topic of medical treatment of endometriosis, Vercellini et al., concluded that despite problems in interpretation of data, medical treatment in terms of pain relief appears to be effective in women with RVE[111].

2.8.3 Surgical management

Surgery is advocated as the first-line treatment option for women with severe RVE[112]. The parameters of consideration include the size of the nodule and the extent of affected bowel circumference, the depth of invasion into the rectal wall, other endometriotic foci in the pelvis, experience and skills of the surgeon[116, 117]. The most common surgical procedures employed in the management of RVE are shaving (superficial thickness excision), resection of the nodule together with the anterior side of the rectum (full thickness discoid resection) and colon or rectal segmental resection[118].

This form of surgical approach may be conservative or radical. Conservative surgical treatment consists of excising the symptomatic endometriotic lesions and leaving the surrounding structures intact while radical treatment encompasses segmental bowel resection, hysterectomy and bilateral salpingo-oophorectomy with removal of symptomatic lesions at other sites. The surgical approach is usually by laparoscopy but may also be by laparotomy depending on the anatomic site of the disease, complexity of the procedure and the surgeon's laparoscopic skills.

Laparoscopic surgery for RVE is often difficult, requires skills acquired by intensive training and is reserved for women with severe disabling symptoms not responding to medical therapy and in women who have endometrioma or urinary or bowel obstruction. Laparoscopy offers better visualization of endometrial lesions compared to laparotomy and is therefore the surgical treatment of choice. It involves various energy sources for the excision of deep nodules. Complications with laparoscopic surgery are not infrequent. However, serious complications that may be encountered during surgery range from uncontrolled bleeding, injury to the bowel and urological system (bladder and ureter), conversion to laparotomy and gas embolization. Post-operative complications include pyrexia, bowel leaks, urine leaks, voiding and bowel dysfunctions, urinary tract infections and wound infection[(119)].

Conventional surgery utilizes electrosurgical energy which is associated with the hazards of bowel injury when operating in close proximity to the rectum. When the disease involves the bowel, the risk of severe complications during surgery is increased and a multidisciplinary approach in management of the disease is advisable. The choice of surgery will depend on the surgical skills available and to the future reproductive plans of the women[(9)].

Numerous surgical approaches have been proposed for RVE when the rectum is involved but no consensus has been reached as to which form of therapy is best when the muscular rectal layer is involved[(88)]. Ford et al., in their cohort study of 60 women, reviewed the quality of life after surgical resection of RVE. In twelve women, excision was performed by laparotomy and in forty-eight by laparoscopy. Improvement in quality of life was reported by 86% and 61% had a good response. They also found that the response was good and the quality of life issues was significantly improved in those women who had segmental resection of the rectum, or those who had simultaneous hysterectomy, in addition to treatment for endometriosis[(11)].

2.8.3.1 Conservative Surgery

Conservative surgery for RVE involves dissection of the recto-vaginal space and removal of the endometrioatic nodule(s) as well as laparoscopic ablation of endometriotic implants with cauterization or laser. The authors who advocate for conservative treatment of RVE argue that it achieves decreased rates of complications and higher pregnancy rates with similar rates of symptomatic improvement thereby preserving fertility when compared with intestinal resection[118]. To date, comparative efficacies of the ablative methods have not been evaluated through randomized controlled trials.

The common procedures employed in the conservative treatment of RVE are those aiming for simple resection of the lesion after separating the endometriotic nodule from the rectal wall, layer-to-layer excision (shaving) of the lesion with no resection of the entire thickness of the intestinal wall[118, 120]. Local excision of the nodule (shaving and discoid resection) is employed when there are no signs of rectal wall invasion found on pre-operative workup. It carries fewer complications and good clinical results can be expected. However, in patients with bowel invasion, systematic shaving is the least aggressive approach and it carries a low rate of complications[118]. Donez et al., using this technique, noted 3.2% serious complications, 8% relapse, and 84% pregnancies occurred after the surgical intervention with 57% pregnancies occurring spontaneously. There were no alterations in bladder function or intestine function one month after the shaving intervention technique[67].

2.8.3.2 Radical Surgery

Radical surgery for RVE which encompasses hysterectomy or complete excision of all endometriotic tissue including segmental bowel resection if needed, seems to result in significant post-operative pain relief[11, 119]. Currently, some gynecological surgeons advocate for colorectal resection in symptomatic women with severe RVE, as this offers the best treatment for improvement of pain and relapses are avoided if concomitant resection of all intestinal endometriotic foci is done[121, 122]. Other groups prefer endometriotic nodule excision rather than colon or rectal resection since the former has shown a reduced rate of morbidity and the pain recurrence post-surgery is similar between the two approaches[60, 120]. The first case reports on the feasibility and safety of complete laparoscopic segmental bowel resection of RVE involving the sigmoid was undertaken in the USA, back in 1992 by Nezhat et al. In their study of 16 women with RVE, there were no major intra-operative or post- operative complications reported and the procedure was well tolerated[108].

Donnez et al., in a study addressing surgical resection of RVE, reported an incidence of 0.8% rectal perforation, 0.4% of delayed haemorrhage (<24 hours post- surgery) and 0, 8% of urinary retention. The perforation was detected during the procedure and the defect was repaired either by colpotomy(n = 2) or by mini laparotomy (n = 2)[119].

Slack et al., using laser excision for RVE, identified rectal wall defect in 25% of women that required repair. Fourteen percent required full thickness repair and 11% had a partial defect repair of the rectus muscularis. One woman had to undergo resection of a recto-sigmoid colon segment because the disease had invaded the full-thickness of the colon and this was associated with diverticulitis. Two other women had segmental recto-sigmoid resection because of circumferential lesion.

Minor post-operative complications were observed in 3.2%, of which post-operative urinary retention occurred in all patients. This was alluded to trauma of the

parasympathetic plexus with subsequent temporary denervation of the bladder. This complication was managed with urinary catheterisation for a maximum of 7 days. There were 3% major complications. Two developed recto-vaginal fistulae, which presented on days 5 and 7 post-surgery and required exploratory laparotomy with creation of a temporary diverting loop colostomy. One patient developed both recto-vaginal and uretero-vaginal fistula. A temporary colostomy was also created and ureteric re-implantation done. Ureteric stenting was performed in one woman. The average duration of hospital stay was 3.4 days, ranging from one to eleven days) [(9)].

Ford et al., studied pain, quality of life and complications following radical resection of RVE. They found that women who had a hysterectomy or a disc or segmental resection of the rectum showed good response and had a normal quality of life after the surgical intervention and concluded that hysterectomy and rectal resection resulted in a good response and better quality of life[(11)].

The risk of recurrence of endometriosis is high in younger patients. In a study by Fedel et al., the recurrence of pain symptoms viz. dysmenorrhea, pelvic pain, or dyspareunia occurred in 21 patients, with a cumulative recurrence rate of 28% at thirty six months. Dysmenorrhea recurred in 21(25.3%) patients; pelvic pain recurred in 16 (19.3%) patients, and dyspareunia recurred in 21(25.3%) patients. The evidence of DIE recurrence was detected in 25 patients. This was detected on clinical examination or on transrectal sonography and this was found to be equivalent to a cumulative recurrence rate of 34.2% at thirty-six months. There was a need for surgical intervention and medical treatment in 21 women because of DIE recurrence (thirty six month cumulative rate was 27%)[(10)]. The recurrence rate of endometriosis after laparoscopic ablation is about 40% in 10 years[(123)].

2.8.3.4 Energy Sources

Laparoscopy uses different sources of energy including monopolar electrosurgery, bipolar electrosurgery, argon beam coagulation, laser, ultrasonic energy and pulsed bipor technology. Electrosurgery is the commonest energy source utilized.

Electro surgery defined as the cutting and coagulation of tissue using high-frequency electrical current[124]. Electrosurgical units (ESU) used the in the operation room convert the standard electrical frequencies from the wall outlet (50-60Hz) to much higher frequencies, 500,000 to 3000,000 Hz[124]. The tissue effect can be achieved by cutting or coagulation. In the cutting mode, the ESU generates a continuous (or undulated), low-voltage current, concentrating the energy on a small area (high current density) whereas, in the coagulation mode, the ESU generates an interrupted (modulated), high-voltage current, dispersed over a large surface area (low current density).

Monopolar Electrosurgery

In this energy source, the electrical current created in the Electrosurgical units (ESU) passes through a single electrode to the tissue, causing the desired tissue effect and the effect occurs almost near the electrode. The current passes through the patient to complete the circuit. Either cutting or coagulation mode may be used to achieve the desired tissue effect but the cutting mode is preferred when thermal spread is undesirable such as near the ureters, bowel or other vital structures, whereas, coagulation is preferred in high resistant areas, such as, fatty tissue and scar tissue. In laparoscopic surgery, conventional monopolar electrosurgery scissors have several shortcomings, including the risk of thermal injury to the viscera, difficulty in achieving haemostasis and smoke production, necessitating additional tools such as bipolar graspers, sutures and clips to be used[124].

Bipolar Electrosurgery

In this energy source, the electrical current created in the ESU is confined to the tissue between the electrodes of the surgical instrument. It is generally performed at low voltage (cutting mode) since tissue impedance is relatively low due to the proximity of the two electrodes. Compared to Unipolar electro surgery, the damage to tissue with Bipolar electrosurgery is less resulting in reduced depth of penetration and therefore less risk of tissue perforation[125]. This device has less smoke production and has better haemostatic capability than Monopolar[126]. Since there is no current return to the patient, this reduces ground pad and alternate site burns and capacitive coupling.

The Ligasure System

The Ligasure System uses a new bipolar technology for vascular sealing with a higher current and lower voltage (180 V) than conventional electrosurgery. The system combines pressure and energy to create vessel fusion in a unique manner leading to melting of the collagen and elastin proteins in the vessel walls, changing them to a permanent, plastic-like seal. It does not depend on a proximal thrombus when compared with the classic bipolar electrocautery. When the seal cycle is complete, an inbuilt feedback-controlled response system automatically discontinues energy delivery, reducing guesswork and the thermal spread is minimized to approximately 2 mm for most LigaSure instruments. There is no sticking or charring and the seals can withstand three times normal systolic blood pressure[127].

Laser

The Light Amplification and Stimulated Emission of radiation is sometimes used as an alternative to electrosurgery but the popularity in gynaecological surgery has declined[128]. However, it is still useful in some gynaecological operations such as

cervical conization, laparoscopic excision of endometriosis and treatment of vulval intraepithelial neoplasia[129, 130]. It consists of an energy source, a gating/focusing mechanism and radiating medium. The type of medium includes carbon dioxide or potassium-titanium-phosphate medium that determine the wavelength emitted[129].

Harmonic scalpel

The Harmonic scalpel is an ultrasonic cutting and coagulation device that converts ultrasonic energy into mechanical energy at the functional end of the instrument. It is designed to coagulate and cut tissues. It uses a high energy ultrasound that is beyond the range of human hearing (20 000) cycles per second. It is powered by a generator and houses an acoustic transducer that converts electrical energy into high frequency mechanical vibrations. It allows excellent cutting and facilitates dissection. It works at a relatively low temperature, thus reducing thermal injury and allows rapid tissue healing. This instrument has no electrical current passing through the patient, so there is no danger of electrical damage to the nearby tissues[131]. The Harmonic scalpel has been used successfully in numerous open and laparoscopic procedures[132, 133]. Its advantages include minimal thermal spread and decreased tissue charring and smoke formation when compared with the traditional electrosurgical instruments. There is no risk of electrical injury due to the absence of the electrical current within the patient[134]. Its disadvantages include: limited ability to coagulate vessels larger than 3-5mm, increased cost of disposable instruments, potential for extensive thermal spread at high energy levels (level 5) for more than five seconds and user- dependant nature of the instrument[135, 136].

Harmonic scalpel has been used as an energy source in RVE and its popularity is increasing because of the benefit it provides. This is ultrasonic energy and avoids the problems associated with electrosurgical energy, namely thermal injuries, direct and capacitated coupling and electrical pad injuries. The surgical effect is dependent on the power setting, the grip pressure, the contour and shape of the applied blade and the tension applied to the tissue. It also appears that the ‘shear’ handle and tip is the

most common instrument utilized with the Harmonic energy source. The shear allows for fine dissection, coagulation, cutting and could be used as a retractor during surgery. According to our knowledge, the usage of the Harmonic scalpel in the management of RVE addressing outcomes and complications has not been evaluated.

Chapter 3: Study

3.1 Aims

The main aim of this study was to evaluate operative and post-operative complications and outcomes of laparoscopic surgery using the Harmonic scalpel in patients with RVE. Furthermore, referral patterns and pre-operative work up were evaluated.

3.2 Methodology and Statistics

The study was a retrospective chart review analysis of all women who underwent laparoscopic surgery for recto-vaginal endometriosis using the Harmonic scalpel between January 2004 to December 2010 at the gynaecological endoscopic unit at Inkosi Albert Luthuli Central Hospital(IALCH). Cases with non-infiltrating endometriosis and those with ovarian and peritoneal nodules were excluded except for those with nodules in the recto-vaginal septum.

Eligible women were identified from clinical database (all clinical records in this hospital are computerized and kept in a database (MEDICOM, India)and were analyzed with respect to age, parity, referral pattern, presenting complaints, operative complications and followed up to a minimum of 3 months after surgery (Appendages 3.6.4). The study cohort was limited to women with RVE confirmed by histology.

Patients with suspected recto-vaginal endometriosis were referred to the endoscopic unit at IALCH from regional hospitals in the Durban metropolitan area. A detailed history including symptoms viz. chronic pelvic pain, dysmenorrhea, dyspareunia and defecatory symptoms were evaluated.

This was followed by a detailed clinical examination which included weight, height (BMI), abdominal palpation and a pelvic examination which included evaluation of

uterus, position of the cervix, assessment of the recto-vagal space and uterosacral ligaments to establish the thickness of the nodule.

Pre-operative workup included blood investigations viz. full blood count, urea and electrolytes as well as CA 125 levels. Imaging evaluation included both pelvic and trans-abdominal ultrasound and in selected cases, CT scan pelvis, MRI, Barium enema and Intravenous urography. Patients had a Barium enema if rectal wall infiltration was suspected on clinical history and examination. Patients were counselled with regard to the surgery to be done, likely complications and possible risks of conversion to laparotomy. In addition, risks to rectal injury and the potential need for a colostomy and the risk of haemorrhage with subsequent blood transfusion were discussed. Informed written consent was subsequently taken.

All surgical procedures were preceded by full bowel preparation of three days and included a liquid diet. The surgical technique involved the insertion of a Verre's needle for the insufflation of gas into the peritoneal cavity. The primary 5-mm port was placed in the umbilicus. If there was history of previous abdominal surgery, the Palmers point was used as the entry site. Laparoscopic surgery was performed using standard 4 puncture port entry.Three secondary ports, of which two 5-mm each, were placed under direct vision into the lower pelvis bilaterally, 2cm above the mid-point between lateral umbilical ligament and anterior superior iliac spine. A third port, namely, an 11mm port was placed midway between the symphysis pubis and umbilicus.

On peritoneal entry, the entire pelvis and abdominal cavity was inspected. This was followed by freeing of any adhesions, mobilization of the ureters, dissection of both para-rectal spaces and separation of the rectum from the vagina. Any nodules attached to the vagina were resected. The shaving technique was favored over segmental resection of the bowel in patients with RVE.

Defects in the rectum following excision of the lesions were repaired laparoscopically in 2 layers when feasible using polyglycolic sutures. If there were technical difficulties,

then conversion to laparotomy was undertaken. All nodules were removed from the cavity via a 11mm port or via colpotomy (incision in the vagina through the posterior fornix). Concurrent endometroitic lesions at other sites (uterosacrals, ovarian, peritoneal) were also resected using the harmonic scalpel. All endometriotic tissues were sent for histological confirmation. Both intra-operative and post-operative complications were documented.

At the end of the surgical procedure, bipolar cautery was used to achieve optimal haemostasis and an underwater air leak test was done to check for the integrity of the bowel. This involved insertion of Foley catheter into the rectum and insufflation of gas using a Toumy syringe. If findings were equivocal then the patient was kept nil per mouth and a gastrograffin test was done the following day to rule out any leakage.

The main energy source utilized during operation was the Harmonic scalpel. The Harmonic scalpel is designed to cut and coagulate tissues. It uses an ultrasound at frequency of 55500 cycles per second. It is powered by a generator and houses an acoustic transducer that converts electrical energy into high frequency mechanical vibrations. It allows for excellent cutting and facilitates dissection. It works at a relatively low temperature, thus reducing thermal injury and allows rapid tissue healing. This instrument has no electrical current passing through the patient, so there is no danger of electrical damage to the nearby tissues[(131)].

The post-operative surveillance included monitoring of the temperature, blood pressure and pulse rate. Patients were asked about their general well-beings, pain especially abdominal pain and return of bowel activity and they were discharged on day 4 (Mondays) post-surgery largely because operations are done on Thursdays in our unit and it is not practical to discharge patients on weekends.

Major complications were defined as those that carry morbidity that required further surgery and those causing delay in discharge from hospital.

Patients were followed in the endoscopy clinic once every month for the duration of three months post-surgery and were asked to compare and grade the intensity of pain both before and after surgery. The need for adjuvant medical therapy was evaluated and was prescribed to patients who showed no improvement of pain. Outcomes concerning pain and quality of life after surgical intervention or after addition of adjuvant medical therapy were informally assessed. Response to treatment was assessed by changes in pain intensity.

Statistics

The information was recorded into a structured data sheet and was analyzed using the computer program, SPSS (Statistical Package for the Social Sciences) version 15. Descriptive variables and frequencies variables were used to analyze data.

Primary outcome in this study included referral patterns, pre-operative investigations, operative findings and complications. Secondary outcomes were assessment of pain and use of adjunctive medical therapy.

The protocol for the study was approved by the UKZN Post Graduate and Biomedical Research Ethics Committee (Appendices A and B). Hospital permission was granted by IALCH management for accessing the institution's computerized database files (Appendix C).

3.3 Results

Between January 2004 and December 2010, a total of 105 women underwent laparoscopic surgery for advanced stage endometriosis in the gynaecological endoscopic unit at IALCH. Thirty-three (31.4%) of the patients had RVE confirmed by histology as shown in table 3. The mean age of our study cohort was 35 years the mean body mass index (BMI) was 27 (Table 1). The majority of the women were nulliparous (42.4%) and the most prevalent racial group were Indians (Fig 3). The majority of patients were referred from regional hospitals (51.5%) as shown in Fig 4.

Table 1. Demographics

	N	Minimum	Maximum	Mean
Age (years)	33	21	48	35.36
Weight (kg)	33	46	82	67.42
Height(cm)	33	150	165	157.3
BMI(kg/cm$^{2)}$	33	18	34	27.15

BMI = body mass index; kg = kilogram; cm = centimetre

Table 2. Patient characteristics

		Frequency	Percentage (%)
Parity	0	14	42.4
	1	9	28.1
	2	6	18.8
	3	4	12.5
Racial group	Indian	30	90.9
	African	2	6.1
	White	1	3.0

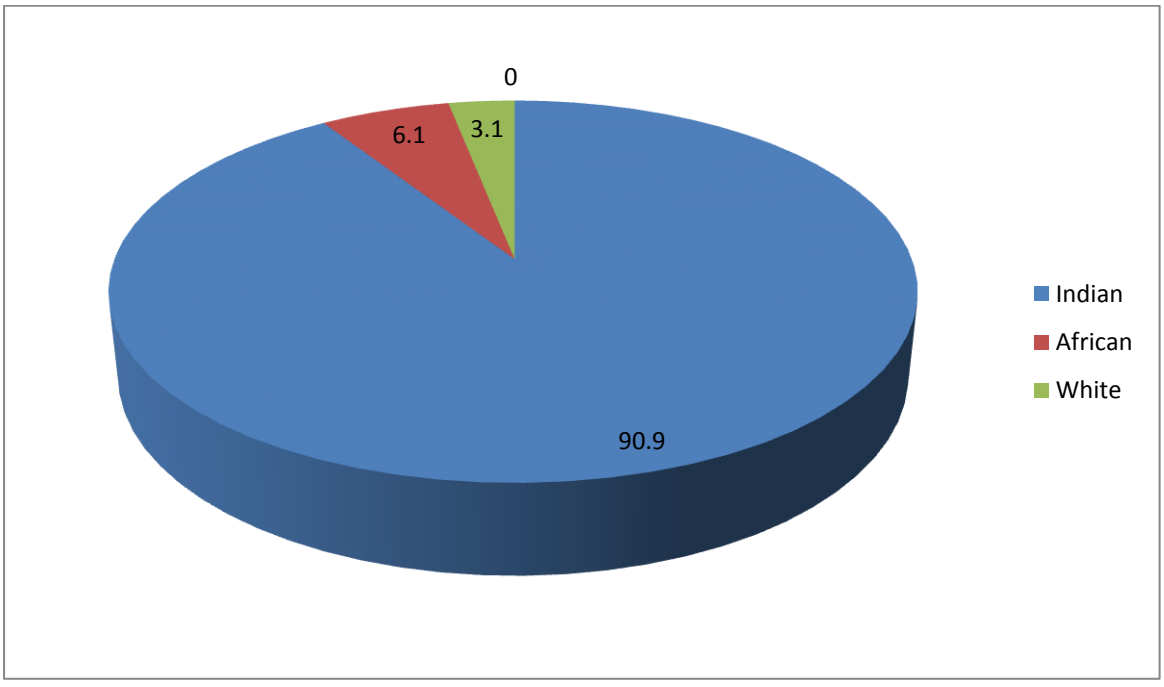

Fig 3. Racial groups (%)

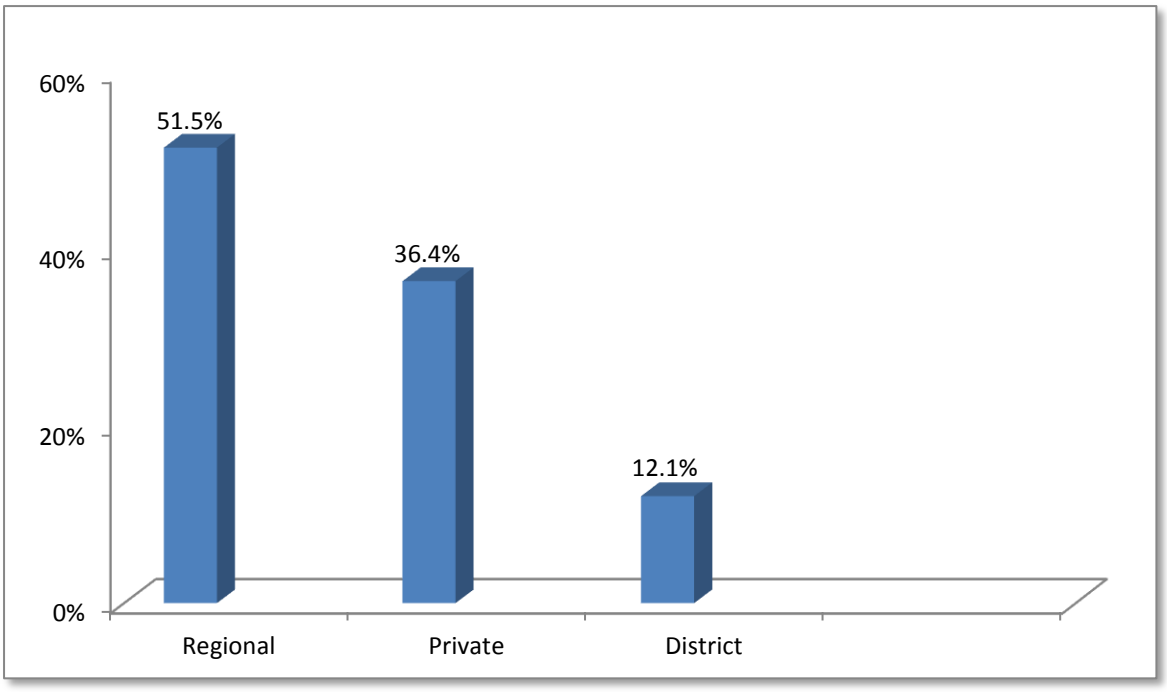

Fig 4 Referral pattern (Hospitals)

In twenty four patients, the diagnosis of RVE was already suspected on clinical examination or laparoscopy prior referral to IALCH. In addition, some patients had pelvic ultrasound, and or CT scan of the pelvis before referral as shown in table 3.

Table 3. Diagnosis of RVE before referral to IALCH

	Frequency (n)	Percentage (%)
Not made	9	27.3
Clinical	24	66.7
Laparoscopic	5	15.2
Sonar	3	9.1
Ct Pelvis	1	3.0
MRI	0	0

The most common presenting symptom was chronic pelvic pain which was non-cyclical and occurred in all women. Secondary dysmenorrhoea was the second most common symptom and was seen in thirty-one patients (93.9%) and painful defecation was seen in (36.4%), as shown in table 4. The majority of patients had symptoms for over a year (54.5%) and twenty-four patients (72.7%) had symptoms for less than a year before visiting a health care professional (Fig 4).

Table 4. Presenting complaints

Presenting Complaint	Frequency (n)	Percentage (%)
Chronic pelvic pain (non-cyclic)	33	100%
Secondary dysmenorrhea	31	93.9
Dyspareunia	19	57.6
Superficial	7	36.8
Deep	12	63.2
Defacatory Symptoms	17	51.5
Dyschezia		
Painful defecation	12	36.4
Rectal bleeding	0	0
Irritable bowel	5	15.2

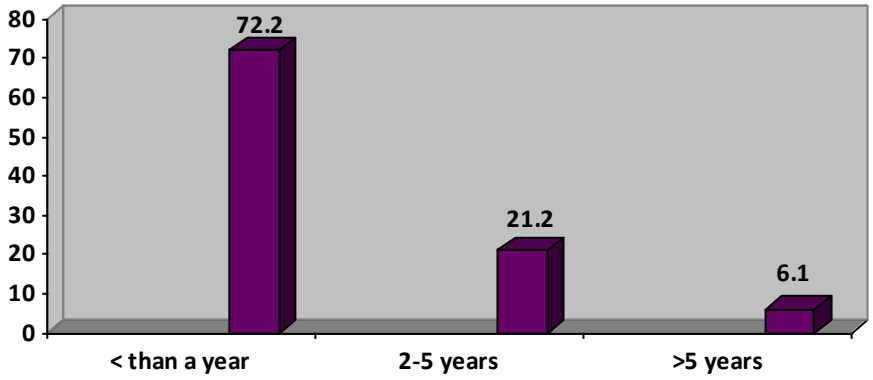

Fig 4. Interval between symptoms and 1st visit to health professional

Seventeen patients (51.5%) were seen for the first time by health care professionals at hospitals and fifteen patients (45.5%) by private general practitioners. The average period from the first visit to a health care professional to clinical diagnosis of recto-vaginal endometriosis was 30.15 months (9 to 65) months. The mean duration between first visit to IALCH to surgical intervention was 81.61 days. Table 5

Table 5. Interval between symptoms and 1st visit to health professional

	Minimum	Maximum	Mean
Duration from 1st visit to HP to clinical Dx of RVE(months)	9	65	30.15
Duration from 1st visit to IALCH to initial Surgery (days)	14	189	81.61

Twelve patients (36.4%) had problem of infertility and the average period of infertility was 10 years ranging from 1- 20years (Fig 5). Thirteen patients had previous surgery, namely ten (30.3%) had laparoscopy and three (9.1%) had a laparotomy.

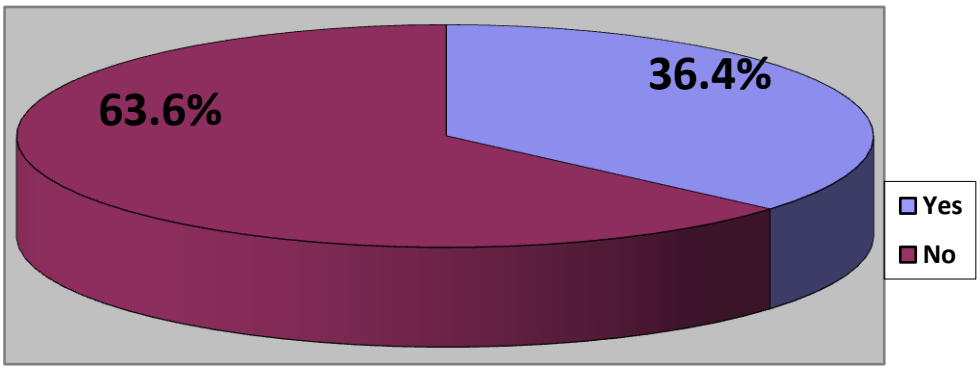

Fig 5. Prevalence of infertility

Nine patients (27.3%) had mild abdominal tenderness (pelvic) and seven (21.2%) had a pelvic mass palpable. The uterus was enlarged in one (3%) and an adnexal mass was palpable in five (15.2%). In two patients (6.1%), a lesion could be seen in the posterior fornix on vaginal examination using Cusco speculum. Nineteen patients (57.6%) had a palpable nodule in the posterior fornix and nineteen patients (57.6%) had utero-cervical tenderness. Utero-sacral ligaments were thickened in sixteen (48.5%), tender in eighteen (54.5%) and nodular in fifteen (45.5%), see table 6.

Table 6 Clinical findings on abdominal and pelvic examination

	Frequency(n)	Percentage (%)
Abdominal distension	0	0
Abdominal tenderness	9	27.3
Abdominal mass	7	21.2
Pelvic Examination		
Uterus Enlarged	1	3.0
Adnexal masses	5	15.2
Vaginal Examination (Speculum)		
Cervix Position: Anterior	1	3.0
Posterior	32	97.0
Lesion in the Posterior Fornix	2	6.1
Digital Examination:		
Displaced Cervix	0	0.0
Position: Posterior	33	100.00
Nodule in Posterior Fornix	19	57.6
Uterocervical tenderness	19	57.6
Uterocervical Ligaments		
Thickening	16	54.5
Tenderness	18	54.5
Nodularity	15	45.5

Pre-operative work up: The mean haemoglobin was 12.7 g/dl, ranging from 11.0 to14.7 g/dl. The mean CA 125 was 66.14U/ml (8-223U/ml) of which eighteen patients (54.6%) had a CA 125 of more than 30 U/ml.

Imaging: Transvaginal ultrasound detected fourteen patients (42.4%) with recto-vaginal nodule. Twenty one patients had a Barium enema which revealed abnormalities in three (15%) patients. Twenty patients had computerize tomography scan (CT) of the pelvis; only two (10%) of these scans revealed abnormalities in the recto-vaginal region. Twenty patients underwent MRI investigation of which twelve (70.59%) were reported to have recto-vaginal endometriosis. Fourteen patients had intravenous urography and it showed abnormalities (hydronephrosis) in three patients (21.4%). (Table 7)

Table 6. Pre-Operative work up

Blood	N	Minimum	Maximum	Mean
Hb g/dl	33	11.0	14.7	12.7
Ca 125 U/ml	33	8	223	66.14

Table 7. Preoperative work-up (Imaging)

		Frequency(n)	Percentage (%)
Abdominal ultrasound		22	66.7
Nil suggested recto-vaginal nodule			
Transvaginal ultrasound: Done		33	42.4
	Suggestive	14	
Barium enema:	Done	20	60.6
	Suggestive	3	15
CT scan Pelvis	Done	20	60.6
	Suggestive	2	10
MRI	Done	17	51.5
	Suggestive	12	70.59
IVU	Done	14	42.4
	Abnormality	3	21.4

The mean operating time was one hour twenty minutes (66 min 89 minutes). Recto-vaginal nodules and peritoneal endometriosis were identified in all patients. The histology specimens of all 33 patients confirmed endometriosis. Twenty eight (84.8%) patients had nodules of greater than 1cm. Ovarian endometriosis occurred in twenty four (72.7%) patients with sixteen (66.7%) having unilateral endometriomas. Uterosacral endometriosis was identified in eighteen (54.5%) patients and twenty one (63.6%) had dense adhesions during surgery (Tables 8 and 9).

Table 8. Disease staging at surgery

Site of endometriotic nodules		Frequency (n)	Percentage (%)
Peritoneal endometriosis: Nodule size:	<1cm	5	15.2
	: >1cm	28	84.8
Ovarian Endometriosis			
	Nil	9	27.3
	Unilateral	16	66.7
	Bilateral	8	33.3
Deep infiltrating endometriosis			
	Recto-vaginal	33	100.0
	Uterosacrals	18	54.5
Adhesions:	Fine	12	36.4
	Dense	21	63.6

Table 9. Duration of surgery

	N	Minimum	Maximum	Mean	Std. Deviation
Duration of surgery (Min)	33	66	121	84.9	11.23

Intra-Operative Complications

One (3%) patient required conversion from laparoscopy to laparotomy due to a rectal injury during operation.

Immediate post-Operative complications

One patient had a re-laparoscopy performed 8 hours following her initial procedure because of suspected intra-peritoneal bleeding. Another patient was anuric for 21 hours post-surgery and required a cystoscopy and insertion of bilateral ureteric double j stents in theatre. Table 10

No patients had documented post-operative pyrexia, chest infection and paralytic ileus. The mean post-operative haemoglobin was 12.7 g/dl (8.4 to 14.7 g/dl).
The mean hospital stay was 5 (4 to 8) days

Table 10. Surgery complications

	Frequency (n)	Percentage (%)
Bowel : Small intestine	0	0.0
Large intestine	1	3.0
Urological : Bladder/ureter	0	0.0
Conversion to laparotomy	1	3.0
Intra-operative haemorrhage	0	0.0
Re-laparoscopy		
Cystoscopy + Double J stenting	1	3.0%
Post-operative transfusion	1	3.0%

Pain outcome

Patients were followed in the outpatient clinic for three months post-surgery and were asked to compare symptoms associated with pain before and after surgery. Twenty-five (75.8%) patients reported improvement of pain after surgery and eight reported no improvement. No patient reported deterioration of pain. Twenty-three of the twenty five (69.7%) patients did not need adjuvant medical therapy. In total, ten (30.3%) patients were started on adjuvant medical therapy post-surgical intervention (Fig 6).
There were no late complications and no readmissions.

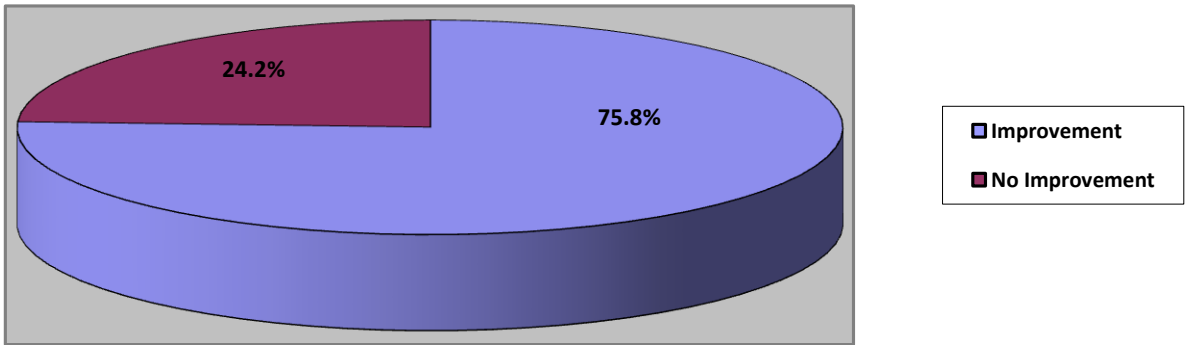

Fig 6. Pain outcome

Adjuvant therapy

In total, ten (30.3%) patients had concomitant adjuvant medical therapy post-surgery. Eight (80%) patients were started on GnRHa, namely Zoladex(AstraZeneca), one (10%) patient received Medrxoyprogesterone acetate (MDPA) namely Depo Provera (Pfizer) and another patient had inserted a hormonal secreting intrauterine contraceptive device, namely Mirena (Bayer Schering), see table 22.

Table 11. Adjuvant Medical Therapy

	Frequency (n)	Percentage (%)
Adjuvant therapy	10	30.3
No adjuvant	23	69.7
Total	33	100.0

Table 12 Drugs used as adjuvant therapy

	Frequency(n)	Percentage (%)
Zoladex	8	80.0
Medroxyprogesterone acetate	1	10
Mirena	1	10
Total	10	100.0

3.4 DISCUSSION

Laparoscopic surgery with complete excision of endometriosis offers long-term pain relief in most women with RVE and results in a low rate of persistent or recurrent disease[137]. The prevalence of RVE in our audit was 31.4% and this is consistent with other studies involving tertiary referral centre for endometriosis[86]. Our audit has shown that RVE is a significant type of endometriosis being referred to the endoscopic unit. This is significant in that patients with this severe form of endometriosis are now being treated in a dedicated centre, whereas in the past we were not aware as to where they were being managed.

The study cohort was mainly in the reproductive age group (35.4 years) and all patients were sexually active. This is in keeping with other studies where RVE was found mainly in the reproductive years[118, 138]. In a study by Chapron et al., the mean age of patients with RVE was 29.2 years (23-47), while Fauconnier et al., reported a mean age of 31.1 years[118, 139]. In another study by Tarjanne et al., who looked specifically at DIE, the reported mean age was 31(20-48) years, and 136 (89.5%) patients in their study cohort of 153 patients were nulliparous[138]. In our study, the majority were nulliparous (42.4%).

The most prevalent racial group in this study cohort was Indians (90.9%). This could be explained by the fact that Indians are the predominant racial group in the Durban metropolitan area. Over the years, many gynaecologists believed that endometriosis was confined exclusively to white women[140]. In the early studies, the majority reported the prevalence of endometriosis to be doubling among white women and very rare among Black patients[141-143]. However, these studies were conducted in geographical areas where the population is predominantly Caucasians. More recently, there appears to be conflict in the different studies regarding prevalence of endometriosis in different the racial and ethical groups.

In a study of 330 women who had laparoscopic tubal ligation, Asian women had almost nine times greater odds of endometriosis (OR, 8.6; 95% CI, 1.4-20.1) compared with white patients and the findings in Blacks and Hispanics were not statistically different[26]. Several other studies also reported an increase in the prevalence of endometriosis among Asian women who underwent infertility evaluation or laparoscopy for pelvic pain compared with white women[144, 145]. In the Nurses' Health Study II, a prospective cohort study of 90,000 women, Asian women did not have a statistically significant difference in the odds of self-reported endometriosis in the model that controlled for age, parity and BMI (OR, 0.6;95% CI, 0.4-0.9). However, Black and Hispanic women were 40% less likely to be diagnosed with endometriosis (OR, 0.6; 95% CI, 0.4-1.0 for Hispanic women)[14].

In our audit, the most common presenting symptom was chronic pelvic pain which was non-cyclical and occurred in all women with RVE followed by secondary dysmenorrhea (93.9%), dyspareunia (57.6%) and painful defecation 36.4%.This finding differs with that of Griffiths et al., who reported that the most common presenting symptom in women with RVE was secondary dysmenorrhea (84.3%) followed by deep dyspareunia (47.1%) and non-cyclic chronic pelvic pain (31.4%)[86]. Chronic pelvic pain (non-cyclical) is a non-specific symptom with a variety of causes (irritable bowel, myofascial syndrome or psychogenic pain)[146]. Several other studies have assessed the relationship of chronic pelvic pain in patients with RVE and control patients and they established that chronic pelvic pain (non-cyclical) was not specific to endometriosis[147, 148]. Fauconier et al., reported that when deep infiltrating endometriosis involves the bowel, painful defecation was higher during menstruation, which was also present in our study[139].

In our cohort, 36.4% presented with infertility. Women with endometriosis are more likely to have infertility problems. Angioni et al., reported a 16% incidence of infertility in their study of 31 patients who had DIE in the cul-de-sac, retrocervical region and in the recto-vaginal septum[149]. In a study of 500 cases with recto-vaginal nodules, Donnez et al., reported that 64.8% women had associated infertility[67]. Fauconnier et

al., reported 41% incidence of infertility when looking at the relation between pain symptoms and the anatomic location of DIE[139]. Missmer et al., found that the prevalence of endometriosis is 20-40% in women undergoing laparoscopy for infertility and women with endometriosis are more likely to have fertility problems as shown in the study[14]. Although there is less agreement on the treatment of pain, most women with endometriosis and infertility should be referred to fertility centres of excellence[150].

Possible mechanisms that may explain the association between RVE and infertility are as follows:-

1. Adhesions may impair proper egg release from the ovary and may impair tubal function especially in women with advanced stages of endometriosis (stage III and IV);
2. Peritoneal fluid in women with advanced endometriosis may inhibit sperm function thereby causing infertility;
3. Dyspareunia contributing to reduced coital frequency[69, 151]. Our unit is an endoscopy based unit receiving referrals from the Durban Metropolitan area and Kwa-Zulu Natal province while patients with infertility problems are referred to the infertility unit. Hence we may not have the true incidence of endometriosis associated with infertility in our area.

Similar to a study by Griffiths et al., patients in our cohort showed delay in seeking help to health professionals[3]. Furthermore, there was delay in clinical diagnosis of RVE. This could be explained by the failure of health professionals to recognize the disease and the inability to recognize the lesions in the posterior fornix. Many clinicians do not find it acceptable to examine patients during menstruation and lesions in the posterior fornix can easily be missed outside this period. Konninckx et al., conducted a prospective study in 61 women with DIE scheduled for laparoscopy and showed that clinical examination during menstruation can reliably diagnose RVE. In their study, pelvic nodularities were detected in 22 women when clinical examination was performed during menstruation while they were detected in only 4 women during routine clinical examination[106].

In our study, mild pelvic tenderness was detected in 27.3% of the patients and the uterus was enlarged in only one patient. Lesions in the posterior fornix were visualized in 6.1% while 57.6% had a palpable nodule in the posterior fornix. The utero-sacral ligaments were thickened in 48.5% with nodularity in 45.5%. Our findings appear to be congruent with ESHRE guidelines 2005, where it was reported that clinical signs of pelvic tenderness, fixed retroverted uterus, tender uterosacaral ligaments are associated with DIE more especially if nodules are palpable in the pouch of Douglas[(50)].

Cancer antigen 125 (CA 125) is a cell surface antigen that is expressed by derivatives of coelomic and mullerian epithelia. It has been established that it is elevated in many disease processes ranging from benign conditions to several diseases of the ovary and even in pregnancy[(152)]. In our cohort of patients, the mean CA 125 was 66.14 U/ml (8 to 223 U/ml). There were 18 (54.6%) patients with elevated CA 125 (more than 30U/ml). In a review, serum CA125 was found not to be a good marker for diagnosing endometriosis but can be a helpful additional parameter to diagnose it in patients with chronic pelvic pain[(153)]. However, Konninckx et al., reported that CA-125 concentrations were higher during menstruation in patients with DIE and in patients with deep and cystic ovarian endometriosis[(106)]. CA 125 was reported to be elevated in women with endometriosis stage III or IV compared to control women with normal pelvises [66.5 (14.5) vz. 8.2 (0.6) U/ml, mean (SEM), $p<0.001$] and 54% of patients with stage III or IV endometriosis had serum CA125 more than 35U/ml compared to 0% in controls[(154)]. On perusal of the literature, there appears to be no study addressing an association of CA125 and RVE.

All patients in our cohort were subjected to transvaginal ultrasound and 14(42.4%) patients had ultrasonographic features to support diagnosis of recto-vaginal nodule. The sensitivity of transvaginal ultrasound with regard to detection of recto-vaginal nodules is low (29.4%) in the reported literature[(155)]. The difficulty with transvaginal ultrasound is thought to be due to the orientation of transvaginal probes with the receiver oriented

toward the vaginal fornix. The ultrasound technique using the probe can be limited by the symphysis pubis and pain experienced by the patient when it is oriented toward the posterior vaginal wall during examination[156]. However, in a systemic review of ten prospective studies involving 1106 women done by Hudelist et al., the transvaginal sonography sensitivity for diagnosing rectosigmoid endometriosis was reported to be 91% with specificity of 98%[157]. It remains the initial imaging tool due to its ready availability and easy access. The increase in sensitivity in our study may be due to fact that sonographers were requested to specifically assess for the presence of recto-vaginal nodules.

Sonovaginography has been reported to increase the sensitivity of transvaginal sonography. In this procedure, the transvaginal probe is placed in the vagina after a saline solution has been instilled into the vagina. Bazot et al., studied 46 patients scheduled for resection of the clinically suspected lesions in the recto-vaginal wall and sonovaginography identified 91% of pathologically confirmed lesions compared with 44% with conventional transvaginal sonography. Specificity was found to be 86% and 50% respectively[155]. This technique was not practiced in our cohort of patients. Abdominal ultrasound was done in 22 patients (66, 7%) and it did not suggest the presence of RVE. This was not surprising as the abdominal ultrasound has poor evaluation of recto-vaginal region. Transrectal ultrasound is regarded to be the best tool in the diagnoses of RVE; the sensitivity is reported to be 97% and the specificity 96%[96]. We did not use this technique since we did not have a dedicated transrectal probe.

Twenty one patients had a Barium enema investigation because of lower bowel dysfunction and it identified abnormalities in three (15%) patients. In one patient, there was irregularity noted in the recto-sigmoid area, affecting the anterior wall while another had a focal indentation in relation to the anterior wall of the recto-vaginal junction. The third had a defect noted in the antero- superior rectum. Barium enema has

been found to have a 99% accuracy for predicting the need for intestinal surgery in a study conducted in 108 patients with symptoms suggestive of intestinal endometriosis[103]. Two other studies investigated the role played by double-contrast barium enema in recto-vaginal endometriosis and found rectal invasion in 54% and 33% respectively[37, 158] .

Two patients out of twenty in our cohort had abnormalities on CT scan. One patient had a mass measuring 2.1x1.1 cm in the pouch of Douglas and the second had a left adnexal mass extending to the pouch of Douglas with associated left hydronephrosis and hydroureter. The CT scan was done because bowel involvement was clinically suspected. The sensitivity of CT scan for diagnosing bowel endometriosis is reported to be 99% with a specificity of 100% in a single study of 98 patients[102]. This pick up rate is high because the study was looking at the endometriosis of the large bowel whereas our study was looking specifically for RVE.

Magnetic Resonance Imaging (MRI) is the best imaging tool to diagnose RVE[92]. It provides information on location, extension and infiltration of the vagina or rectum but fibrosis in the endometrium can change the signal intensity pattern causing motion artifacts on bowel peristalsis[91]. Bazot et al., reported the sensitivity of MRI to be 80% and specificity of 93% from 15 patients with recto-vaginal endometriosis[155]. In our study, MRI was done in selected patients to define the extent of the nodule and it had a high pick up rate as reported in literature. It identified recto-vaginal nodule in twelve (70.59%) out of seventeen patients done.

Fourteen patients had intravenous urography (IVU) and abnormality (hydronephrosis) was identified in three patients (21.4%). Large recto-vaginal nodules are known to have a mass effect on the ureters and can cause hydronephrosis[159]. In a study by Donnez et al., involving 500 patients with RVE, IVU identified 18 (4.4%) patients with stricture of

the lowest portion of the ureter causing moderate to severe hydronephrosis. In their study, seventeen patients had unilateral stenosis in which 7 patients had right side ureterohydronephrosis and 10 patients had left side ureterohydronephosis. One patient had bilateral ureterohydronephrosis[159].

In our study, all surgery was performed by a single surgeon who is the head of gynecological endoscopy unit at IALCH. The Harmonic scalpel was used in all patients. The instrument is designed to cut and coagulate tissues. It allows for excellent coagulation and cutting and also facilitates dissection. It works at a relatively low temperature, thus reducing thermal injury and allows rapid tissue healing. This instrument has no electrical current passing through the patient, hence electrical injuries are avoided[131]. Robbins operated on 14 women for peritoneal endometriosis using Harmonic scalpel. All women had uneventful post-operative recovery. Thirteen were discharged on the same day, while the other had post-operative bowel care after resection and repair of an endometriotic lesion on the anterior rectal wall and was discharged on day 4 post-operatively[160]. Ford et al., reported on one patient operated for recto-vaginal endometriosis using same tool. The patient had an uneventful post-operative course and patient was discharged on day 5 post-operatively[161].

In our audit, the mean operating time (excluding anaesthetic time) was 84.9 minutes (66-129) minutes. Donnez et al., reported a mean duration of 64 (45-120) minutes in 231 patients operated for RVE and Tarjanne el al. reported 100 (20-300) minutes when bowel resection was not done[107, 138]. Harmonic scalpel was used in both surgeries.

All the patients in our study had associated peritoneal endometriosis. In a study of 153 patients with RVE by Tarjanne et al., peritoneal endometriosis was present in 69 (45%) patients[138]. Peritoneal endometriosis is often commonly found either alone or in association with other types of endometriosis. This is despite the fact that peritoneal endometriosis is reported to originate from ‘retrograde menstruation’ while RVE originates from coelomic metaplasia[22] [41]. However, Vercellini et al., indicate that

RVE may be a different manifestation of endometriosis with a single origin i.e. regurgitated endometrial cells[48].

In our study cohort, twenty-eight (84.8%) patients had nodules of greater than 1cm and fifteen of the 28(53%) patients had severe symptoms of the disease. On literature perusal, endometriotic nodules vary in size from a few millimeters to 2cm in diameter. The amount of pigment in the nodule appears to increase with the age of the lesion. Initially these lesions appear as white plaques, non-pigmented clear vesicles or red petechia/ or flame-like areas and they change to bluish/brownish colour as they age because of haemolysed blood encased in fibrotic tissue[162]. The type and severity of symptoms is related to the depth of endometriotic infiltration and size of the nodule[162].

Ovarian endometriosis occurred in twenty-four patients (72.7%) with sixteen patients (66.7%) having unilateral endometriomas and 10 patients had left ovarian endometriosis in our study cohort. This finding is in keeping with Redwine's findings that left ovarian endometriosis is more common than right ovarian endometriosis[163]. In a study of 515 patients with endometriosis by Al-Fazan et al., ovarian endometriosis was encountered in 185 patients and left endometrioma occurred more frequently (60.4%) ($p<0.001$, OR 2.3, 95% CI 1.5-3.7)[164].

In our audit, there was no post-operative fever, wound infection or bowel ileus. Angioni et al., reported fever of $>38^0$C after two days post-surgery in 2/31 patients[149]. The complications from usage of harmonic scalpel in our study was comparable to those reported by other authors using other energy sources, namely, electro-surgery (monopolar and bilpolar) and Carbon Dioxide laser[67, 118].

There were 3 women in our study with major complications requiring surgical intervention. The first patient required conversion from laparoscopy to laparotomy due to a rectal injury. During surgery, following excision of recto-vaginal nodule, a defect in the rectal wall was identified. The decision to convert to laparotomy was made by a

surgeon. Primary repair of the bowel was performed and the patient had uneventful recovery.

The second patient required re-laparoscopy for bleeding in the post-operative period. This patient had undergone bilateral ovarian cystectomies and removal of a recto-vaginal nodule. Post operatively, she complained of increasing abdominal pain which was associated with tachycardia and there was a drop in the haemoglobin levels from 11.5 g/dl pre-operatively to 8.4 g/dl post-operatively. The patient had a blood transfusion and re-laparoscopy was performed. Minor oozing was identified at the hilum of the ovary. Coagulation was achieved with bipolar diathermy and a copious washout was performed and patient recovered well.

The last patient had extensive bilateral ureterolysis at surgery and resection of both uterosacrals and large recto-vaginal nodules was done. Ureteric stents were not used intra-operatively. Post-surgery, the patient was anuric for 21 hours despite being catheterized with a Foley's catheter. Changing of the Foley's catheter and a fluid challenge yielded no positive results. Urea was slightly elevated (7.5mmol/l) and an ultrasound revealed no fluid collection in the pelvis and there was no significant hydroureter or hydronephrosis. An urgent CT-IVP with delayed imaging was performed and showed poor enhancement of both kidneys. There was delayed excretion noted with filling of the left pelvic caleceal system only noted on the 35 minute delayed film. Both ureters were dilated up to the level of the pelvis. The conclusion was that there was acute bilateral obstructive uropathy which may be due to oedema, inflammatory change or bilateral ureteric spasms. The exact point of obstruction could not be determined. The patient was taken to theatre, cystoscopy was performed and double J ureteric stents were inserted. The patient started to pass copious amounts of urine immediately following insertion of the stents and passed volume of 2 litres in the next 3 hours. The patient recovered well and was discharged on day 4. The ureteric stents were removed at the out-patient clinic 2 weeks post-surgery. Ureteral spasms following surgery was the only explanation for the anuria and no other study could be found in the literature addressing this complication.

None of our patients underwent bowel resection, no thermal injury to the bowel or ureters and no patient developed recto-vaginal fistula, bladder or vascular injuries in our study. This could be because Harmonic scalpel was the primary energy source for dissection and coagulation.

Several studies have assessed outcomes and complications of conservative surgery for RVE. All have reported low major complication rates. Chapron et al., conducted a study on 29 patients with DIE invading the recto-vaginal septum using the laparoscopic assisted vaginal approach. The major complications were 3.5% (one patient developed recto-vaginal fistula) and the surgeries were carried out laparoscopically and the laparoscopic scissors were used for dissection and bipolar coagulation used for haemostasis[(118)]. In another recent study by Donnez el al., using the CO2 laser, major complications in their study of 500 patients with RVE included: 1.4% rectal perforation, 0.8% ureteral injury, blood loss of > 300ml in 0.2% and urinary retention in 0.8%. There were no conversions to laparotomy carried out[(67)]. In a recent study by Maytham et al., major complications were reported to be 7% of which 4% required re-operation[(165)].

In another study by Meuleman et al., 11% of women had severe complications, One of the complications, namely lower leg compartment syndrome occurred (3/56) and this was explained on the bases of long duration of operation with a mean duration of surgery of 7 hours[(166)].

The mean duration of hospital stay was 4 days (3 to 6). Chapron et al., reported the mean duration of hospital stay of 3.5 ± 1.3 days (range 2-9)[(118)]. In another study by Tarjanne et al., the reported mean duration of hospital stay was 2 (1-12) days for patients who had no bowel resection done and 5(3-12) days for patients who had bowel resection done[(138)]. With advanced laparoscopy especially with operation at close proximity to the rectum, it is advisable that these patients be observed post-surgery. Injury to the bowel may show delay in clinical manifestation and our patients are normally kept in for a minimum of 3 days post-surgery.

Twenty-three (69.7%) patients reported improvement in pain and quality of life and did not need adjuvant therapy. Two out of twenty-five (6%) reported some improvement but needed adjuvant medical therapy because of the fear of the previous pain experience and 8/33 (24.2%) patients reported no change to their symptoms. These findings are in keeping with other studies, namely, Chapron et al., reported an improvement in chronic pelvic pain of 92.9% with 85.8% described as excellent and 7.1% described as satisfactory after one year of follow up following surgery and Angioni et al., reported 60% improvement in chronic pelvic pain after a five year follow up following surgery[118, 149].

In total, 10/33 (30.3%) patients in our audit had concomitant medical therapy. At the end of 3 months, only 3 patients on concomitant adjuvant medical therapy reported improvement of symptoms[110]. This was not surprising because according to Vercellin et al., hormonal therapy for RVE only induces temporary quiescence of active foci but do not cure the disease[110]. However, women who do not want to be subjected to surgery again may prefer medical therapy if surgery did not help to alleviate pain symptoms. Vercerllin et al., reported that low-dose Norethindrone acetate could be considered as an alternative to repeat surgery for symptomatic women with recto-vaginal lesions and who don't want to conceive. According to their study, 73% women were satisfied with the treatment compared to 62% who were on Ethenyl E_2 plus Cyproterone Acetate after 12 months follow up[167].

There were limitations to our study. Firstly, it is a retrospective study. Secondly, the assessment of pain and quality of life issues were not standardized and formally assessed using validated questionnaire. This might lead to uncertainty regarding the parameters used to describe pain symptoms as was based on documentation by individual physicians from patient description of pain before and after surgery. The third limitation was that there was short duration of follow up. In the unit, once patients showed improvement in the symptomatology, they are referred to the base hospital for further follow up and it would have been difficult to get the records of these patients.

The fourth limitation was that fertility outcome could not be assessed as we do not have an established assisted reproductive unit.

3.5 Recommendations and Conclusion

Careful examination of the patient with RVE, with particular attention to the posterior fornix, can pick up significant number of patients with RVE more especially during menstruation. The MRI pelvis can be regarded as the best imaging tool in detecting RVE as shown in our results and in the reported literature but it must be noted that its sensitivity is dependent on the its operator. Patients with RVE should be managed in the dedicated center where laparoscopic surgical excision can be done and where the specialized multi-disciplinary team (surgeons, colorectal and specialized radiologists) is readily available. This reduces the possible complications as shown in the study. Further studies to assess shaving, bowel resection and discoid excision using Harmonic scalpel should be undertaken and may be of value in assessing the ideal surgical approach for RVE.

Conclusion

The usage of Harmonic scalpel as the energy source in the surgical management of RVE appears to be safe. Our findings are similar to that in the published literature using other energy sources for the surgical management of RVE.

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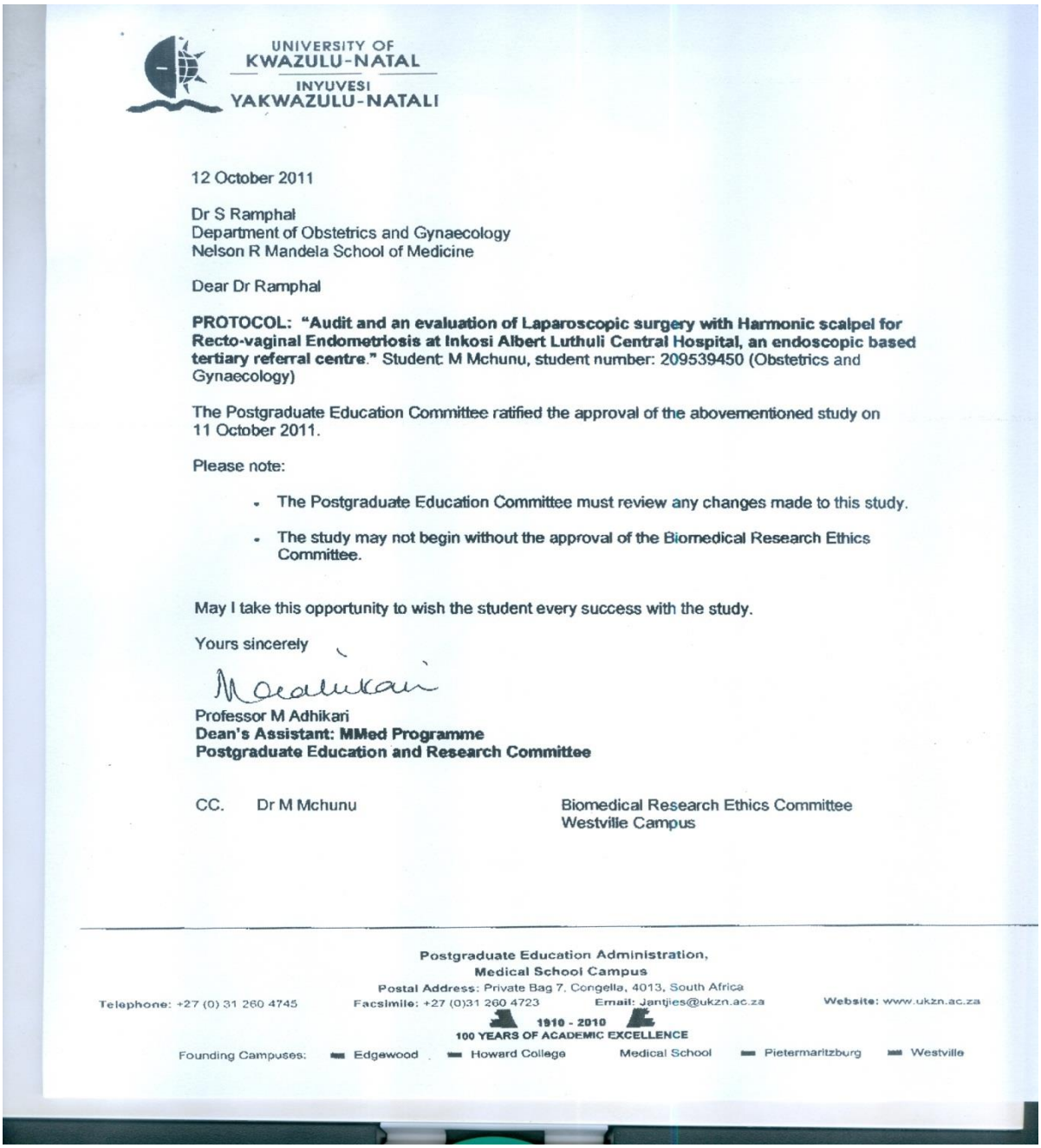
Appendix A: UKZN Post Graduate Approval Letter



UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

12 October 2011

Dr S Ramphal
Department of Obstetrics and Gynaecology
Nelson R Mandela School of Medicine

Dear Dr Ramphal

PROTOCOL: "Audit and an evaluation of Laparoscopic surgery with Harmonic scalpel for Recto-vaginal Endometriosis at Inkosi Albert Luthuli Central Hospital, an endoscopic based tertiary referral centre." Student: M Mchunu, student number: 209539450 (Obstetrics and Gynaecology)

The Postgraduate Education Committee ratified the approval of the abovementioned study on 11 October 2011.

Please note:

- The Postgraduate Education Committee must review any changes made to this study.
- The study may not begin without the approval of the Biomedical Research Ethics Committee.

May I take this opportunity to wish the student every success with the study.

Yours sincerely

Professor M Adhikari
Dean's Assistant: MMed Programme
Postgraduate Education and Research Committee

CC. Dr M Mchunu

Biomedical Research Ethics Committee
Westville Campus

Postgraduate Education Administration,
Medical School Campus
Postal Address: Private Bag 7, Congella, 4013, South Africa
Telephone: +27 (0) 31 260 4745 Facsimile: +27 (0)31 260 4723 Email: Jantjies@ukzn.ac.za Website: www.ukzn.ac.za

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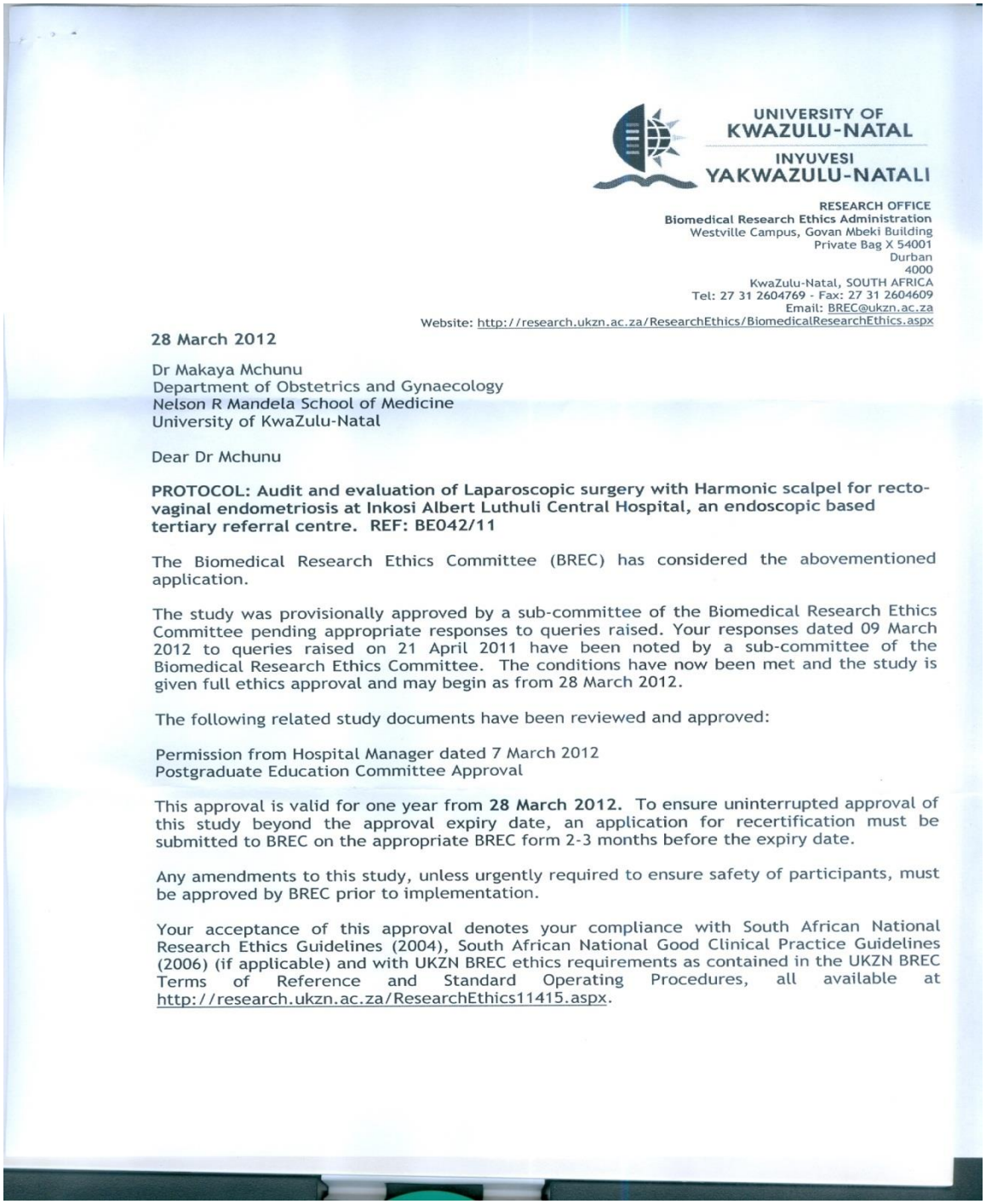
Appendix B: BREC (042/11) approval letter



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INYUVESI YAKWAZULU-NATALI

RESEARCH OFFICE
Biomedical Research Ethics Administration
Westville Campus, Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za
Website: http://research.ukzn.ac.za/ResearchEthics/BiomedicalResearchEthics.aspx

28 March 2012

Dr Makaya Mchunu
Department of Obstetrics and Gynaecology
Nelson R Mandela School of Medicine
University of KwaZulu-Natal

Dear Dr Mchunu

PROTOCOL: Audit and evaluation of Laparoscopic surgery with Harmonic scalpel for recto-vaginal endometriosis at Inkosi Albert Luthuli Central Hospital, an endoscopic based tertiary referral centre. REF: BE042/11

The Biomedical Research Ethics Committee (BREC) has considered the abovementioned application.

The study was provisionally approved by a sub-committee of the Biomedical Research Ethics Committee pending appropriate responses to queries raised. Your responses dated 09 March 2012 to queries raised on 21 April 2011 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 28 March 2012.

The following related study documents have been reviewed and approved:

Permission from Hospital Manager dated 7 March 2012
Postgraduate Education Committee Approval

This approval is valid for one year from **28 March 2012.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/ResearchEthics11415.aspx.

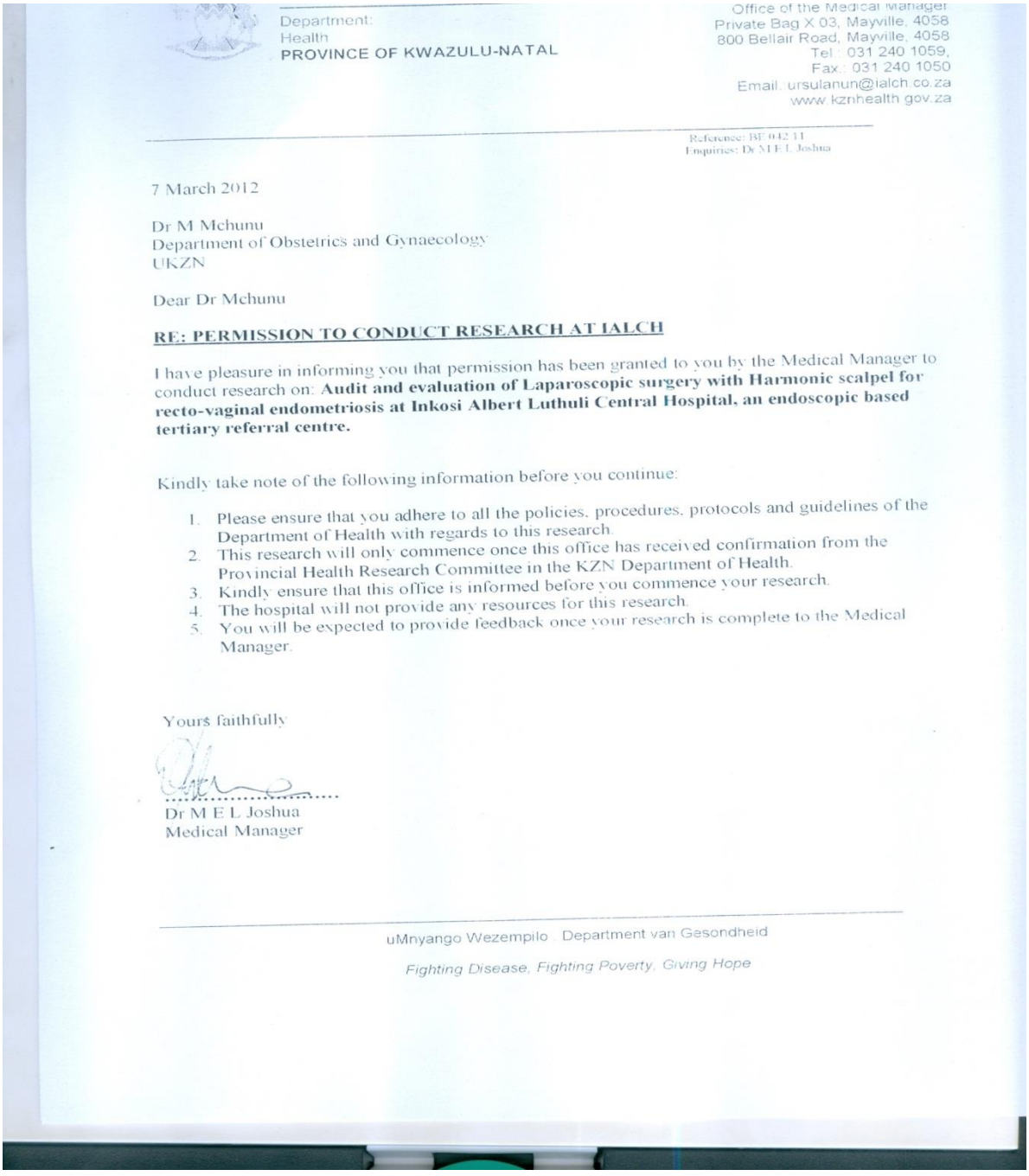
BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

PROFESSOR D R WASSENAAR
Chair: Biomedical Research Ethics Committee

Appendix C: **Inkosi Albert Luthuli Central hospital Approval Letter**



Department:
Health
PROVINCE OF KWAZULU-NATAL

Office of the Medical Manager
Private Bag X 03, Mayville, 4058
800 Bellair Road, Mayville, 4058
Tel.: 031 240 1059,
Fax.: 031 240 1050
Email: ursulanun@ialch.co.za
www.kznhealth.gov.za

Reference: BE 042/11
Enquiries: Dr M E L Joshua

7 March 2012

Dr M Mchunu
Department of Obstetrics and Gynaecology
UKZN

Dear Dr Mchunu

RE: PERMISSION TO CONDUCT RESEARCH AT IALCH

I have pleasure in informing you that permission has been granted to you by the Medical Manager to conduct research on: **Audit and evaluation of Laparoscopic surgery with Harmonic scalpel for recto-vaginal endometriosis at Inkosi Albert Luthuli Central Hospital, an endoscopic based tertiary referral centre.**

Kindly take note of the following information before you continue:

1. Please ensure that you adhere to all the policies, procedures, protocols and guidelines of the Department of Health with regards to this research.
2. This research will only commence once this office has received confirmation from the Provincial Health Research Committee in the KZN Department of Health.
3. Kindly ensure that this office is informed before you commence your research.
4. The hospital will not provide any resources for this research.
5. You will be expected to provide feedback once your research is complete to the Medical Manager.

Yours faithfully

.....
Dr M E L Joshua
Medical Manager

uMnyango Wezempilo Department van Gesondheid

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Structured Data Capture Sheet

Study No

Age (years)

Parity

Racial group: African =1
Indian =2
Coloured =3
White =4

Referred from: Private = 1
Semi-Private = 2
District Hospital = 3
Regional = 4

Specify how dx was made: Not made =0
Clinical =1
Sonar =2
MRI =3
CT Pelvis =4
Laparoscopic =5

Presenting Complaint: Chronic Pelvic pain Y=1, N=2
Dysmenorrhea Y=1, N=2
Dyspareunia: Superficial Y=1, N=2
Deep Y=1, N=2

Defecatory symptoms: Dyschezia Y=1, N=2
Painful defecation Y=1, N=2
Rectal bleeding Y=1, N=2
Irritable bowel Y=1, N=2

Duration of Symptoms in (months): < 3 =1
4-6 = 2
7-12 = 3
13 or more =4

Duration between symptoms and 1st visit to health professional(years): within 1 =1
1 to 2 =2
> 2 =3

1st visit to Health Professional: GP =1

Hospital =2
Specialist 3

Duration from 1st visit to HP to clinical dx of RVE (months)

Infertility : Y=1, N=2

If infertility, duration (years)

Previous Gynaecological operation Y=1, N=2

If yes, Specify: Laparoscopy =1
Laparotomy =2

Duration between 1st visit to IALCH and Surgical intervention (weeks)

Examination: **Weight** **Height** **BMI**
Anemia Yes=1, N=2
Abdominal distension Yes=1, N=2
Abdominal tenderness Yes=1, N=2
Abdominal masses Yes=1, N=2

Pelvic Examination: Uterus enlarged Yes=1, N=2
Adnexal masses Yes=1, N=2

Vaginal examination (speculum): Cervix position: Anterior=1, posterior=2, central=3

Lesion on posterior fornix Yes=1, N=2

Uterosacral ligaments: Thickening Yes=1, N=2
Tenderness Yes=1, N=2
Nodularity Yes=1, N=2

Pre-operative work up

Hb		Barium meal:
Hct		CT Pelvis:

Ca125			MRI:
Sonar:	Abdominal		IVP:
	Transvaginal		

Referral to other disciplines Yes=1, N=2

If yes Specify

State reason:

Duration from 1st visit at IALCH to time of initial surgery (days)

Surgery Details

Energy Source :				Duration of Operation(min)		
Staging at Surgery **Korninceky Classification**	Peritoneal Endometriosis	<1cm			> 1cm	
	Ovarian Endometriosis	Unilateral:			Bilateral	
	Deep Endometriosis	Recto-vaginal		Uterosacrals	Extra-peritoneal	
	Presence of adhesions	**Y**	N	Dense		
				Light		
Intra-operative Complications	Bowel injury	Small		Management		
		Large				
	Urological	Bladder		?Any Conversion to Laparotomy		
		Ureter				
	Hemorrhage	Y	N	If yes transfusion, how many units		

Immediate Post-Operative Complications

Infections- Pyrexia (2 consecutive Temps of 38 or more):	Yes=1, N=2	
Wound infection	Yes=1, n=2	
Urinary tract infection	Yes=1, n=2	
Chest Infection	Yes=1, n=2	
Bowel- ileus	Yes=1, N=2	

Anaemia	**Hb**	**Any blood transfusion**		**Yes**	**No**	**If Yes, how many units**	
Other: Thrombo-embolism		**Yes**	**No**	**Re-laparotomy**		**Yes**	**no**

Re-Operation:

Re-laparotomy	Yes=1, n=2	
Re-Laparoscopy	Yes=1, N=2	

Other, specify

Period from date of initial Surgery at IALCH to most recent visit to IALCH, specify	