Factors involved in stress urinary incontinence one year after first delivery

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Abstract

Introduction and Hypothesis: The aim of the study was to investigate the risk factors involved in stress urinary incontinence (SUI) one year after first delivery.

Methods: This was a prospective study of 352 primigravid women who gave birth at Donostia Hospital during 2007. Urinary symptoms were investigated (2002 ICS definitions) on inclusion and one year after delivery and the incontinence severity index (ISI) was calculated. Incontinent women answered the International Consultation on Incontinence short form questionnaire. Pelvic floor muscle strength and joint hypermobility were evaluated.

Results: SUI affected 40 (11.4%) women one year after first delivery. The ISI distribution was: 62.5% slight, 32.5% moderate, 2.5% severe and 2.5% very severe. The only factor independently associated with SUI after delivery was the development of SUI during pregnancy (OR:5.79; 95% CI:2.79–12.00).

Conclusions: The new onset of SUI during pregnancy is an independent risk factor for SUI in the postpartum period.

Key words: Parity; Pregnancy; Labor; Delivery; Stress urinary incontinence; Risk factors.

BRIEF SUMMARY

The influence of a variety of factors on the prevalence of stress urinary incontinence one year after delivery is analyzed in primiparous women.

Introduction

Parity is an established risk factor for stress urinary incontinence (SUI) among young and middle-aged women [1], but the underlying aetiology is not completely understood. It seems that pelvic floor damage that takes place during pregnancy, labor and delivery may be involved. Pregnant women suffer from a variety of mechanical and hormonal changes that have been linked to urinary incontinence (UI). Besides, the passage of the newborn through the birth canal causes injuries to the structures of the pelvic floor that can also modify the continence mechanism. There are also some data suggesting that constitutional variables may predispose to urinary incontinence after childbirth. In this regard, an association between greater antenatal bladder neck mobility and SUI in the postpartum period has been reported [2].

The effect of pregnancy on postpartum urinary incontinence has been evaluated by analyzing the association between the development of UI during pregnancy and its prevalence after delivery. It has been published that pregnancy UI is an independent risk factor for incontinence in the postpartum period [3–5] and long after delivery [6–8]. The factors involved in the persistence of pregnancy UI after childbirth has also been studied. It seems that women with higher body mass index (BMI) and those who have delivered heavier babies are more at risk [9].

The influence of labor and delivery on postpartum UI has been evaluated, taking into account a wide variety of variables from both periods, such as the use of epidural anaesthesia, labor augmentation with oxytocin, length of the second stage of labor, mode of delivery, pelvic floor injuries and weight of the newborn. The majority of authors agree that vaginal delivery is an established risk factor for UI [3, 5, 9–12] and for SUI [10, 13–16]. There are also some data suggesting that prolonged second stage of labor [17] and forceps-assisted delivery [3,18] are associated with postpartum UI.

The majority of the aforementioned studies included multiparous women (1, 3, 4, 10, 12, 16, 17), or women who had subsequent pregnancies during the follow-up period (6–8, 14). Only a few authors have analyzed the correlation between different parity-related factors and urinary incontinence including only primiparae [5, 9, 11, 13, 15, 18]. Otherwise, the influence of pregnancy on postpartum incontinence has not always been taken into account. In fact, we found only a couple of studies that included the new onset of UI during pregnancy as a factor,

when analyzing the risk of postpartum UI in primiparae [5,9]. However, these authors did not make any distinction between the different types of urinary incontinence.

The authors consider that the best model for analyzing the effect of parity on urinary incontinence is that which includes only primiparous women, who were continent before pregnancy and who do not have any subsequent pregnancies during follow-up. The authors also believe that parity involves pelvic floor changes during pregnancy, labor and delivery, all of which should be considered. Finally, and taking into account the physiopathological differences between the different types of UI we think that each type of incontinence, should be analyzed separately.

The aim of this study was to investigate the constitutional, pregnancy, labor and delivery factors involved in the risk of stress urinary incontinence one year after first delivery. The study hypothesis is that pregnancy itself plays a substantial role in the prevalence of SUI after childbirth. In this study the prevalence, severity and impact of SUI on quality of life one year after first delivery was also evaluated.

Material and methods

A prospective cohort study was undertaken to evaluate the influence of first pregnancy and delivery on the development of stress urinary incontinence one year after childbirth. The study group was selected from the primigravid women who came to give birth at Donostia Hospital from April to October, 2007. Our aim was to study only the new cases of SUI, so those women who made reference to any kind of urinary incontinence before pregnancy were excluded from the study. Other exclusion criteria were: multiple pregnancy, gestational age of less than 37 weeks, diabetes mellitus or a maternal history of the condition, previous urogynecological surgery, urogynecological malformations and neurological disorders. Women who had a subsequent pregnancy during the follow-up period were also excluded.

An interview on urinary symptoms was held with pregnant women at term and one year after delivery, using the 2002 ICS definitions [19]. The interview was held face-to-face on inclusion and by telephone one year after delivery. Urinary incontinence was defined as "the complaint of any involuntary leakage of urine"; stress urinary incontinence was defined as "the complaint of involuntary leakage on effort or exertion, or sneezing or coughing," and urge urinary incontinence (UUI) was defined as "the complaint of involuntary leakage accompanied by or immediately preceded by urgency".

The diagnosis of new onset of SUI during pregnancy or after delivery was based on symptoms. It was applied when a woman answered "yes" to the stress urinary incontinence question, once we had ruled out the presence of UI prior to pregnancy. The women with SUI were asked about frequency and amount of leakage in order to calculate the four-level incontinence severity index (ISI) developed by Sandvik et al. [20]. This index is calculated by multiplying the reported frequency (four levels) by the amount of leakage (three levels). The four levels of frequency and the value of each one are as follows: less than once per month (1), a few times a month (2), a few times a week (3), or every day and/or night (4). The three levels of the amount of leakage and the corresponding values are: drops (1), small splashes (2), or more (3). The resulting index value (1–12) is further categorized into slight (1–2), moderate (3–6), severe (8–9) and very severe (12). The Spanish version of the severity index has been validated against a 24-hour pad-weighing test [21]. All the incontinent women were also asked to complete the validated Spanish version of the International Consultation of Incontinence

short form questionnaire (ICIQ-UI-SF) [22]. This condition-specific questionnaire measures the symptoms and impact of urinary incontinence on quality of life [23].

To investigate the risk factors associated with SUI one year after delivery, we analyzed the following variables: maternal age; maternal height; maternal weight at term; and weight gained during pregnancy; gestational age on inclusion; mode of delivery; use of epidural anaesthesia; augmentation of labor with oxytocin; length of second stage of labor; perineal trauma in vaginal deliveries (episiotomy and tears); newborn weight; and newborn head circumference. We also included other constitutional factors such as joint hypermobility, as a marker of collagen weakness, and strength of pelvic floor contraction.

All the women underwent a standardized physical examination on inclusion, including measurement of height and weight. Maternal weight gain during pregnancy was calculated by subtracting maternal weight at term from the reported weight at the beginning of pregnancy. BMI was calculated as weight in kilograms/(height in meters)^2.

Pelvic floor contraction strength was evaluated six months after delivery and it was assessed using a perineometer (Peritron®), measuring the strongest of three voluntary pelvic floor contractions, as has been reported previously [24]. At the six-month follow-up visit, joint hypermobility was also evaluated, taking into account the modified Beighton criteria [25]. It was not possible to evaluate this factor on inclusion, because of the difficulty of performing all the movements required for diagnosis in pregnant women at term.

Information about labor, delivery and the newborn was obtained after delivery from the clinical charts. Prolonged second stage of labor was defined as time from full cervical dilatation to delivery, of two hours or more. Prolonged active second stage of labor was defined as time of one hour or more from the onset of maternal pushing to delivery.

All the patients included in the present study were fully informed before enrolment and gave their consent. The study protocol was approved by the Donostia Hospital Medical Ethics and Investigation Committee.

Statistical analysis of the data:

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS version 15.0 for Windows).

Correlation of clinical and demographic characteristics with the presence of SUI one year after delivery was examined by comparison of the mean (Student's *t* test, analysis of variance) and percentages (Chi-square and Fisher test). Statistical significance was set as $p=0.05$. A multiple logistic regression model was performed with the variables close to statistical significance ($p<0.2$), in order to assess the relationship between SUI and the variables described above.

Results

During the study period, 479 pregnant women at term who came to give birth at Donostia Hospital were interviewed. Twenty-one (4.4%) women complained of UI prior to pregnancy and were consequently excluded. One year after delivery, 20 women were or had been pregnant again and were also excluded. Of the remaining 438 eligible women, 352 (80.3%) attended the one-year follow-up visit and formed the study group. The demographic characteristics and delivery details of the recruited women are shown in Table 1. There were no significant differences between the study group and the women who did not attend the follow-up visit, except for maternal age. The mean age of the women of this second group was significantly lower.

SUI affected 40 (11.4%) women one year after first delivery. Out of the total, 15 (4.3%) were new onset after delivery, and 25 (7.1%) reported stress incontinence during pregnancy. Two (0.6%) women also had symptoms of UUI. The incontinence severity index distribution was 25 (62.5%) slight, 13 (32.5%) moderate, 1 (2.5%) severe and 1 (2.5%) very severe. The two women with mixed symptoms were located in the moderate ISI group. The mean score of the ICIQ-UI-SF questionnaire was 7.48 (SD: 3.62) and the mean score of the impact on everyday life question was 3.85 (SD: 2.94).

The results of the univariate analysis performed to correlate SUI with different variables are shown in Table 2. Women who were incontinent during pregnancy and who had a vaginal delivery were more at risk of presenting SUI one year after first childbirth. The mean value of the pelvic floor contraction strength six months after delivery was also significantly lower among the incontinent women.

A multiple logistic regression model was performed with the variables close to statistical significance. Maternal age, SUI during pregnancy, mode of delivery and pelvic floor contraction strength at six months postpartum were included. This analysis indicated that the only factor that was independently associated with SUI one year after delivery was the new onset of SUI during pregnancy. This factor increased the risk more than five times (OR: 5.79; 95% CI: 2.79–12.00) for suffering from SUI one year postpartum. The mode of delivery was associated with an increase in risk, but not to a degree that was statistically significant.

Discussion

This prospective, observational study describes the prevalence of SUI one year after first childbirth and the risk factors involved. The differences between continent and incontinent women were evaluated with regard to a wide variety of constitutional, pregnancy, labor and delivery factors. The multivariant analysis indicated that the new onset of SUI during pregnancy was the only independent risk factor associated with SUI one year after childbirth.

Our results also showed that SUI persists one year after delivery in up to 11.4% of primiparous women, with the majority presenting a slight or moderate severity index, and low impact on quality of life. Reported prevalence rates of SUI postpartum vary from 6.1% to 41% [6–8,14,15,17,26–30], most likely because of methodological differences between the studies. A personal interview on urinary symptoms was administered in order to diagnose SUI and our results agree with the data published by other authors that used the same method. Groutz et al. [27] reported an SUI rate of 10.3% one year after spontaneous vaginal delivery and of 12% one year after caesarean section performed for obstructed labor. Chaliha et al. [28] reported SUI prevalence of 12.4% three months after delivery.

The severity of postpartum SUI and its impact on quality of life are less well known. Women experiencing UI six months after first delivery reported negative effects on health-related quality of life when this was evaluated with the generic SF-12 questionnaire [31]. Dolan et al. [32] assessed quality of life of incontinent women three months postpartum using a condition-specific questionnaire, and concluded that causes of morbidity other than UI were responsible for the worsening of general and personal health. The present study made use of a condition-specific questionnaire, but with only one question on the impact of UI on everyday life. The score for this question – and therefore the perceived impact on life – was low.

The most interesting finding of the present study is the strong association between new onset of SUI during pregnancy and increased risk of SUI one year postpartum (OR:5.79). This finding suggests that pregnancy itself may play an important role in postpartum SUI and could explain why caesarean section is not always protective. The association between incontinence during pregnancy and the presence of symptoms after delivery has already been suggested. Eason et al. [4] indicated that UI during pregnancy increased the risk of presenting symptoms of UI three months after delivery by a factor of 1.9. Burgio et al. [3] published similar results,

with a two-fold increase in risk. These authors included multiparous women in their study, which could explain why they found a smaller increase compared to the present study. Wesnes et al. [5], including only primiparous women, indicated that incontinence during pregnancy increased the risk of incontinence six months after delivery 2.3 times. The main difference between the present study and those mentioned above is that it focuses on SUI only, rather than UI in general. The authors firmly believe that the physiopathological differences between the different types of incontinence justify a separate analysis.

There are only a few studies that investigate the association between pregnancy and postpartum SUI. Thomasson et al. [33], in a retrospective study including only vaginal deliveries, concluded that nearly five times as many primiparous incontinent women leaked urine during pregnancy, compared with primiparous continent women. Viktrup et al. [6, 7] and Dolan et al. [8] also found a relationship between incontinence during pregnancy and the prevalence of SUI long after delivery. Although these authors included only primiparae, the majority of women included in their studies had subsequent pregnancies in the long follow-up period.

The main distinguishing characteristic of the present study is that it was designed with the aim of evaluating risk factors for SUI one year after first pregnancy and delivery, which is why only new cases were included. Another important difference is that only primiparous women without any subsequent pregnancies were included, in order to avoid the possible effects of other pregnancies and deliveries on the continence mechanism. The authors consider this to be the best model for analyzing the association between parity and SUI. Finally, previously published studies in the field use questionnaires to detect SUI, whereas the present study makes use of personal interviews, which should be considered as another strength.

The results of this study may be limited due to the symptom-based definition of SUI. Pregnant women were included when they came to give birth at the hospital and some of them were in the active phase of labor, so it was not possible to perform an adequate stress test in all cases. This was also the reason why the validated incontinence severity index was used, rather than a pad test to assess the severity of incontinence. Another limitation of the study design was that constitutional risk factors of SUI, such as antenatal bladder neck mobility, could not be evaluated. King et al. [2] indicated that primiparous women with postpartum SUI have

significantly greater antenatal bladder neck mobility than those women who are continent postpartum. The evaluation of the protective effect of a caesarean section was also limited. Due to the scant number of cases, scheduled caesareans were not separated from those performed during the active phase of labor. It has been reported that the prevalence of SUI one year after delivery is similar in women who have vaginal deliveries and those who undergo caesarean section for obstructed labor [27]. Finally, it was not possible to perform an adequate evaluation of other factors involved in UI, such as maternal age. The inclusion of only primigravid women narrowed the age range and limited the possibility of evaluating this variable.

Despite these limitations, the study confirms the hypothesis that pregnancy itself plays an important role in the prevalence of SUI after childbirth. The results indicate that the new onset of SUI during pregnancy is strongly associated with the presence of this symptom one year after delivery. We were able to demonstrate this independent association taking into account a large number of constitutional, pregnancy, labor and delivery variables. These results suggest that the efforts to prevent postpartum urinary incontinence should start during pregnancy. Further research is needed to investigate which pregnancy-related changes are involved in the stress urinary incontinence that begins during pregnancy and persists after delivery, and which are the best methods for preventing it.

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Table 1 Demographic characteristics and delivery details of the 458 recruited pregnant women

		One year follow-up visit		*p* value
		Attended (n=352)	Not attended (n=106)	
Maternal age (years)	Mean, SD	31.2 ± 3.5	29.6 ± 4.4	0.001
Gestational age (days)	Mean, SD	278.8 ± 9.7	279.2 ± 9.1	0.7
Maternal BMI	Mean, SD	23.2 ± 3.6	23.2 ± 3.7	0.9
Mode of delivery				
Spontaneous vaginal delivery	n (%)	213 (60.5)	65 (61.3)	0.9
Forceps or spatula delivery	n (%)	77 (21.9)	20 (18.9)	
Vacuum delivery	n (%)	16 (4.5)	5 (4.7)	
Scheduled caesarean section	n (%)	16 (4.5)	5 (4.7)	
Intrapartum caesarean section	n (%)	30 (8.5)	11 (10.4)	
Episiotomy in vaginal deliveries	n (%)	241 (78.8)	64 (71.1)	0.13
Epidural anaesthesia in vaginal deliveries	n (%)	292 (95.4)	85 (94.4)	0.7
Birth weight (g)	Mean, SD	3304 ± 452	3326 ± 418	0.6

BMI: body mass index; SD: standard deviation

Table 2 Results of the univariate analysis performed to associate stress urinary incontinence (SUI) with different variables.

Constitutional, pregnancy, labor and delivery factors		**Status of SUI one year postpartum**		*p* value
		Continent (n=312)	Incontinent (n=40)	
Maternal age (years)	Mean, SD	31.0 ± 3.4	32.3 ± 4.5	0.09
Gestational age (days)	Mean, SD	278.7 ± 9.7	279.8 ± 10.2	0.51
Maternal BMI	Mean, SD	23.1 ± 3.6	24.1 ± 3.7	0.14
Maternal weight gain in pregnancy (kg)	Mean, SD	12.7 ± 4.4	12.8 ± 4.1	0.86
SUI during pregnancy	n (%)	78 (25.0)	25 (62.5)	0.000
Joint hypermobility	n (%)	34 (10.9)	4 (10)	0.85
Mode of delivery				
Spontaneous vaginal delivery	n (%)	189 (60.6)	24 (60.0)	0.05*
Instrumental vaginal delivery	n (%)	78 (25)	15 (37.5)	
Caesarean section	n (%)	45 (14.4)	1 (2.2)	
2^{nd} stage of labor ≥ 2 hours	n (%)	82 (26.3)	15 (37.5)	0.13
Active 2^{nd} stage of labor ≥ 1 hour	n (%)	19 (6.1)	4 (10)	0.34*
Use of oxytocin	n (%)	239 (76.6)	35 (86.5)	0.11
Epidural anaesthesia	n (%)	282 (90.4)	39 (97.5)	0.13
Episiotomy in vaginal deliveries	n (%)	213 (79.8)	28 (71.8)	0.25
Birth weight (g)	Mean, SD	3290 ± 452	3408 ± 440	0.12
Cephalic perimeter of the newborn (cm)	Mean, SD	34.4 ± 1.3	35.5 ± 1.5	0.6
Pelvic floor contraction strength (cm H_2O)	Mean, SD	38.4 ± 22.3	30.6 ± 13.9	0.03

(*) Fisher's test
BMI: body mass index; SD: standard deviation