

# The Effect of Simple Hysterectomy on Vesicourethral Function

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## ABSTRACT

Hysterectomy is such a common surgery that any causal relationship with vesicourethral function is an important consideration. However, the impact of simple hysterectomy upon lower urinary tract function still remains controversial. Many women awaiting hysterectomy experience preoperative urinary symptoms. Thus, not all postoperative complaints of bladder dysfunction can be attributed to the surgery itself. Several cross-sectional studies have relied solely on retrospective analyses, and found an increase in the relative risk of urinary symptoms in women following simple hysterectomy. However, in numerous prospective controlled studies which evaluated changes in urinary symptoms, urodynamic parameters, and the mobility and vascularization of bladder neck before and after hysterectomy, such an effect could not be established. A number of possible explanations for the discrepancies among studies are presented in this paper. It is concluded that simple hysterectomy has no detrimental effect on vesicourethral function. *Key words:* Hysterectomy, urinary symptom, stress urinary incontinence, ultrasound

## INTRODUCTION

Hysterectomy is such a common operation that any causal relationship with bladder disorder is an important consideration. The female genital and lower urinary tracts share a common embryologic origin, arising from the urogenital sinus. Therefore, a causal relationship between hysterectomy and urinary symptoms has often been suggested. A detrimental effect from hysterectomy on bladder function was first mentioned in 1969 [1]. In numerous prospective studies, however, this effect could not be established [2-6]. Moreover, the literature shows that this matter is often disputed between urologists and gynecologists. This article will review the available literature to discuss this controversial issue.

### *Epidemiological cross-sectional studies*

A number of epidemiological cross-sectional studies have studied the relationship between simple hysterectomy and urinary incontinence (Table 1). No relationship was found in the studies of Hording et al and Jolleys [7-8]. Milsom et al [9] assessed a large number of Nordic women and found the incidence of urinary incontinence was closely correlated with age. Of interest, there was no difference in the incidence of urinary incontinence following hysterectomy when these pa-

tients were stratified by age. When all age groups were combined, however, the incidence of urinary incontinence in women with prior hysterectomy was 20.8% compared with 16.4% for those who had not had the procedure ( $P < 0.05$ ).

Oldenhave et al [10] surveyed questionnaires from 6,622 women, and found urinary leakage in 17.1% of women who had a prior hysterectomy with preservation of one or both ovaries. This result was over twice the incidence of urinary incontinence reported by women without a hysterectomy (7.9%;  $P < 0.001$ ). A flaw in this study was that no hormone tests were performed to confirm the presence of a residual or dysfunctional ovary. In a study of women living in an elderly community in the United States, Brown et al [11] concluded that there was an increased risk of daily urinary incontinence among women with a previous hysterectomy ( $OR = 1.4$ ). The average age of these subjects was 77 years, and 40% reported prior hysterectomies. However, the rate of oophorectomy was also not indicated. Another study found that after multivariate analysis, urinary incontinence was associated with only menopausal status [12].

It seems that menopausal status is highly associated with lower urinary tract symptoms (LUTS). Both aging and menopause may play important roles in the pathophysiology. But the impact of hysterectomy is difficult to evaluate due to the many variables in these cross-sectional studies.

### *Prospective studies of urinary symptoms*

Many studies have studied LUTS before and after hysterectomy (Table 2) [2-4, 13-21]. The case numbers and length of follow-up varies in these studies. Most prospective studies showed favorable results in LUTS postoperatively, and only one series reported a worsening of symptoms [16]. In a number of papers, it was found that some of the stress-incontinent women were "cured" [2-4, 17-19], although the majority of women had "mild to moderate" stress urinary incontinence (SUI) [4].

### *Urodynamic controlled studies*

Several studies presented urodynamic changes before and after a simple hysterectomy (Table 3) [3, 15-17, 22-25]. The methodology in these studies, including the urodynamic parameters and length of follow-up, varied noticeably. Most of them showed stable or improved results [3, 15, 17, 22-25], and only one reported that bladder function deteriorated [16]. Long et al reported the maximum cystometric capacity and maximum urethral closure pressure increase significantly following laparoscopic hysterectomy and abdominal total hysterectomy [3], partly accounting for a lower prevalence of urinary frequency and SUI postoperatively in a number of studies [2-4, 13-14, 17-21].

### *Prospective studies of bladder neck mobility*

Three studies were found with comparisons of bladder neck mo-

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bility before and after hysterectomy [3,26-27]. Bladder neck position was measured in the x-y coordinate system with the inferior edge of the pubic bone as the reference point [28]. "Dx" was defined as the perpendicular distance between the bladder neck and the central line of the symphysis, while "Dy" was the distance between the bladder neck and the axis perpendicular to the central line of the symphysis at the inferior edge of the pubic bone (Fig. 1) [26]. The displacement of Dx and Dy between resting and straining could be calculated as "bladder neck mobility in the ventrodorsal and cephalocaudal direction". Demerci et al concluded that the cephalocaudal mobility of the bladder neck decreased during stress after abdominal hysterectomy [27]. These results were somewhat different than those in the study of Long et al who reported that the ventrodorsal mobility of the bladder neck

decreased significantly following laparoscopic hysterectomy [4]. One common result, however, was that hypermobility of the bladder neck improved following hysterectomy. Afterwards, Long et al compared bladder neck mobility following laparoscopic hysterectomy with and without vaginal cuff suspension and concluded that performing cuff suspension could strengthen the traction effect on the endopelvic fascia, reducing bladder neck movements in both the cephalocaudal and ventrodorsal direction [26].

*Prospective study of vascularization*

Only one study mentioned changes in the vascularization of the lower urinary tract following hysterectomy [29]. Liu and Long evaluated the Doppler velocimetric parameters of the bladder neck and

**Table 1.** The cross-sectional studies on the risk\* of hysterectomy and urinary incontinence

Study	Year of Survey	Numbers of Respondents	Response Rate (%)	Age (years)	RR (95%.CI)
Hording et al [7]	1981	522	85	45	None (not specified)
Jolleys [8]	1987	833	89	>25	None (not specified)
Milsom et al [9]	1986	7459	75	46-86	1.3 (1.05-1.54)
Oldenhav [10]	1987	7256	71	39-60	2.2 (1.83-2.54)
Brown et al [11]	1987	7949	95	>65	1.4 (1.1-1.6)
Bokers et al [12]	1992	858	68	Postmenopausal	2.1 (1.5-2.9)

\* A relative risk of >1 indicates that women who undergoing hysterectomy had a greater risk of urinary incontinence than women without hysterectomy.

**Table 2.** The prospective studies reporting LUTS and/or urinary incontinence before and after hysterectomy

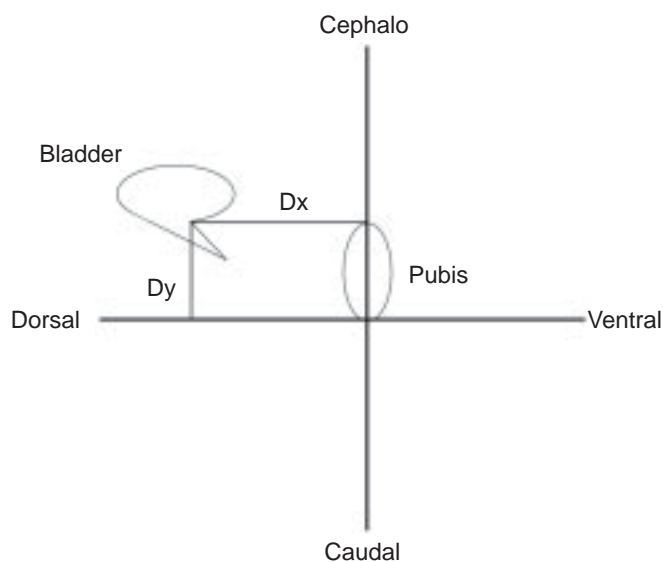
Study	No. of patients	Follow-up (months)	Symptoms		Remarks
			Pre-op (%)	Post-op (%)	
Jequier [13]	104	26	62	50	Symptoms not specified
Kilkku [14]	212	52	42	26	Stress and urge incontinence
Vervest et al [15]	554	52-104	22	22	Stress and urge incontinence
Kujansuu et al [17]	31	12	52	35	Only stress incontinence
Parys et al [16]	36	12-24	58	75	Symptoms including incontinence
Virtanen et al [18]	102	52	40	16	Stress and urge incontinence
Carlson et al [19]	355	12	53	46	Stress and urge incontinence
Clarke et al [20]	300	12	63	44	Urine index symptoms
Kjerulff et al [21]	1299	24	29	10	Urinary incontinence
Long et al [3]	81	3	61	51	LUTS
Long et al [4]	151	3-6	54	38	LUTS

\* LUTS: Lower urinary tract symptoms; Op: operative.

**Table 3.** The prospective studies reporting urodynamic results before and after hysterectomy

Study	No. of patients	Follow-up (weeks)	Flowmetry	Cystometry	Urethral Pressure Profile
Hansen et al [22]	35	68	Improved (ns)	Improved (compliance)	
Vervest et al [15]	22	12-26	Stable (Q-max)	Stable (capacity, compliance)	Stable (MUCP, FUL)
Coughlan et al [23]	25	52		Improved (less DI)	
Parys et al [16]	44	12-24		Worsened (more SI, DI, and obstruction)	Stable (MUCP, FUL)
Kujansuu et al [17]	31	12			Stable (MUCP,FUL, PTR)
Langer et al [24]	16	>52	Stable (Q-max)	Stable (capacity, compliance)	Stable (MUCP, FUL, PTR)
Lalos and Bjerle [25]	35	26	Stable (Q-max, RU)	Stable (capacity, compliance)	
Long et al [3]	81	12-24	Stable (Q-max, RU)	Improved (capacity)	Improved (MUCP)

\* ns: not specified; Q-max: maximum flow rate; MUCP: maximum urethral closure pressure; FUL: functional urethral length; PTR: pressure transmission ratio; SI: stress incontinence; DI: detrusor instability.



**Fig. 1.** Evaluation of the location of the bladder neck on introital ultrasonography relative to the reference coordinate system. Dx, the distance between the bladder neck and the central line of the symphysis; Dy, the distance between the bladder neck and the axis perpendicular to the central line of the symphysis.

periurethral vessels before and after laparoscopic hysterectomy and found little impact on the blood flow postoperatively. Although some women experienced relief of symptoms of mild SUI or de novo SUI after laparoscopic hysterectomy, this was unrelated to the changes in the vascularization of the lower urinary tract.

#### Other studies

The specific effects of the route of hysterectomy, whether vaginal, abdominal or laparoscopic, on vesicourethral function have been poorly studied. In some reports, data on the route of hysterectomy were included [15,23,30-33], and no influence on the incidence of LUTS was identified.

## DISCUSSION

The discrepancy between epidemiological and controlled studies is striking. Controversy still remains regarding the effect of simple hysterectomy upon LUTS. Most women undergoing hysterectomy are in the perimenopausal stage and the fact that changeable urinary symptoms frequently appear during this period makes accurate investigation difficult.

In 1969, Hanley [1] first mentioned a detrimental effect from hysterectomy on bladder function. Parys et al reported that 80% of the women who underwent a simple hysterectomy demonstrated evidence of nerve conduction abnormality postoperatively [17]. Brown et al reviewed 45 articles and speculated that there is a 60% increased incidence of urinary incontinence after hysterectomy in women  $\geq 60$  years old [34]. It is also well known, however, that urogenital aging plays an important role in urinary incontinence in postmenopausal women. Kok et al [35] found that 10% of originally continent women  $> 65$  years old developed urinary incontinence during a 3-year study period. So assessment of postoperative changes in the position of the bladder neck and urinary symptoms had better be performed within a short interval

to exclude other confounding factors. In contrast, Virtanen et al [18] noted a decrease in the incidence of urinary frequency and stress incontinence after total hysterectomy. Kjerulff et al [21] found the majority of women who undergo hysterectomy for benign indications experienced improved urinary incontinence during the first two years after surgery.

The conflicting results between studies could have occurred for the following reasons :

- Urodynamic study may not have been sensitive enough to detect subtle changes in vesicourethral dysfunction, and it is easily influenced by psychological factors.
- Variations exist in the individual perception of voiding symptoms.
- There is a high prevalence of changeable urinary symptoms in perimenopausal women, and de novo symptoms and de novo cure are common [36]. Most women undergoing hysterectomy fall into this age group.
- Mild SUI can become more dominant when menorrhagia has been abolished by hysterectomy, thus, giving a seemingly causal relationship.
- A recall bias often exists in cross-sectional studies, resulting in detrimental results in retrospective studies and improved results in prospective studies.
- A few women regard preoperative LUTS as a lesser problem than a gynecological disorder. Therefore, they are willing to tolerate LUTS following hysterectomy.
- Not every gynecologist anchors the vaginal cuff to the cardinal-uterosacral ligament complex routinely during hysterectomy.
- Limited cases in the majority of prospective studies make it hard to draw a conclusion.
- Urogenital aging plays an important role in LUTS in postmenopausal women. Post-hysterectomy changes in LUTS should be assessed within a short interval to exclude this confounding factor.
- Hysterectomy may be performed in combination with bilateral oophorectomy. Estrogen loss is known to cause LUTS [37].

In radical hysterectomy, dissection and transaction of the parametrium and uterosacral ligaments is necessary and the autonomic and somatic nerves can easily be damaged [38]. In contrast with radical hysterectomy, simple hysterectomy has no direct injury to this area that would result in LUTS. Moreover, urethral support is given by the hammock of the distal anterior vaginal wall in conjunction with the pubourethral ligaments [39], making severe damage unlikely in simple hysterectomy unlikely unless radical hysterectomy is performed [40]. This issue was specifically studied using perineal or introital ultrasonography in 3 reports [4,26-27]. Improvement in bladder neck hypermobility during Valsalva was shown following hysterectomy.

## CONCLUSIONS

There is a high prevalence of changeable LUTS in perimenopausal women. However, since most women undergoing hysterectomy fall into this age group, the effects can only be elucidated from a prospective subjective and objective assessment. A number of retrospective studies showed a negative influence of hysterectomy on LUTS, and the majority of prospective, controlled studies revealed favorable effects. In addition, overview of clinical and ultrasonographic measurements in the literature, including LUTS, urodynamic testing, and the movement and vascularization of the bladder neck, show improved or un-

changed results. Therefore, we conclude that there is no detrimental effect of simple hysterectomy on vesicourethral function.

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