

# The Effect of Pelvic Organ Prolapse on Lower Urinary Tract Function

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Pelvic organ prolapse (POP) is a process in which the pelvic contents, including the reproductive organ, bladder, rectum, and/or small intestines become herniated through defects in the vaginal wall. The pelvic organs are closely related to the urinary tract and thus various urinary functions can be affected. The purpose of this study was to evaluate the relationship between pelvic organ prolapse and lower urinary tract function by urodynamic studies. From March 1999 to May 2000, 40 patients with pelvic organ prolapse who underwent urodynamic studies (uroflowmetry, filling cystometry, urethral pressure profile) without barrier reduction of prolapse were analyzed. The majority of the cases of low grade POP involved patients with anterior wall prolapse, whereas the higher POP stages were more frequent in women with cervical cuff prolapse. Symptoms of stress urinary incontinence and hesitancy were more frequent in the patients with anterior wall prolapse. The urodynamic study showed a statistically significant increase in MUCP in patients with POP stage IV and the leading point of POP was cervical cuff. The subjective urinary symptoms of patients with POP appear to be less reliable as a diagnostic tool. POP had no adverse effect on the bladder storage function. However, POP affected the voiding function through an increase in MUCP, especially in patients with stage IV prolapse and when the leading point of POP was cervical cuff. Following the surgical correction of POP, an evaluation of the preoperative changes in the urodynamic study parameters should be performed.

**Key Words:** Pelvic organ prolapse, urodynamic study

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## INTRODUCTION

Pelvic organ prolapse consists of a herniation of the intrapelvic organs such as the uterus, bladder, urethra and rectum, due to a deficiency in the pelvic supporting system, and it is a common disorder among elderly women. As the life expectancy of women increases and the quality of their life is improved, pelvic organ prolapse is becoming a major concern. Pelvic organ prolapse affects the female bladder and urethra, due to its proximity to these organs and is known to cause urinary frequency, dysuria, urinary incontinence, urgency and hesitancy.<sup>1</sup> Richardson and associates reported that pelvic organ prolapse caused urethral obstruction by increasing the urethral closure pressure, thereby lowering the rate of stress urinary incontinence in patients with pelvic organ prolapse.<sup>2</sup> Urethral obstruction was observed when the urodynamic test was performed on patients with advanced pelvic organ prolapse,<sup>3</sup> and increased urethral closure pressure was observed in patients with large cystocele, but this did not influence the voiding mechanism.<sup>4</sup>

However no studies have been done to ascertain whether pelvic organ prolapse has an influence on the storage function of the bladder or on the urethral function. This study was performed to investigate the effects of pelvic organ prolapse on the bladder storage function and urethral function using urodynamic studies.

## MATERIALS AND METHODS

The study population consisted of 40 patients

with pelvic organ prolapse who underwent a urodynamic study at the urogynecology clinic, Yonsei University Medical Center between March 1999 and May 2000. Each patient underwent a standardized urogynecologic interview and complete physical examination. Pelvic organ prolapse was quantified according to the International Continence Society's Pelvic Organ Prolapse Quantitation (POP-Q) system.<sup>5</sup> All patients had pelvic examinations performed both in the supine position and in a 45° upright position in a birthing chair while performing the Valsalva maneuver with maximal effort. All urodynamic tests were performed without prolapse being reduced. Urodynamic study (Dantec-5000; Menuet, Copenhagen, Denmark) included multi-channel cystometry, urethral pressure profilometry and uroflowmetry. Urethral pressure profilometry was performed with a 12 Fr catheter (Mentor Co, Kedah, Malaysia). The question as to whether pelvic organ prolapse could influence bladder and urethral function was studied according to the stage and leading point of prolapse. All terminology conforms to the recommendations of the International Continence Society, unless otherwise stated.<sup>6</sup>

For statistical analysis we used SPSS (SPSS Inc, Chicago, Illinois, U.S.A) software. The chi-square test and ANOVA test were used where appropriate. A p value of <0.05 was considered significant.

**RESULTS**

The mean age was 59.1 ± 10.2 years (range 34-81), with 90% of patients being over 51 years old. All patients were parous and the average number of deliveries was 4.0 ± 1.4 (Table 1). In the prolapse stage I and II groups, 13 of 15 patients showed anterior vaginal defects (substage, Aa). In the stage III and IV groups, however, 10 of 25 patients showed apical defects (substage C) (Table 2). Urge incontinence and hesitancy were more common in patients with anterior vaginal wall defects than in those with apical defects (Table 3).

There were no differences in the uroflowmetry and filling cystometry parameters according to the POP stage (Table 4 and 5). Maximal urethral pressure and continence area, however, were significantly higher in the stage IV group than in the stage I, II and III groups (Table 6). There were no differences in the uroflowmetry and filling cystometry parameters according to the leading point of POP (Table 7 and 8). The continence area was significantly higher in patients with apical defects than in those with anterior vaginal wall defects (Table 9).

**DISCUSSION**

As the life expectancy of women is increased and the quality of their life is improved, the

**Table 1.** Clinical Data on 40 Women with POP

	Mean ± SD	Range
Age (year)	59.1 ± 10.2	34 - 81
Parity	4.0 ± 1.4	2 - 7
Body weight (kg)	57.1 ± 6.9	41 - 72
Height (cm)	156.2 ± 5.2	145 - 165

**Table 2.** Stages According to POP-Q System

	I	II	III	IV
Aa	1 (2.5%)	12 (30.0%)	6 (15.0%)	19 (47.5%)
Ba			9 (22.5%)	9 (22.5%)
Ap		1 (2.5%)		1 (2.5%)
C		1 (2.5%)	3 (7.5%)	7 (17.5%)
	1 (2.5%)	14 (35.0%)	18 (45.0%)	7 (17.5%)

**Table 3.** Subjective Symptoms in Patients with POP

	Ant. wall	Cervical cuff
Dysuria	1 (3.6%)	0 (0%)
Frequency	20 (71.4%)	8 (72.7%)
Urgency	13 (46.4%)	5 (45.5%)
Nocturia	17 (60.7%)	5 (45.5%)
Post-voiding fullness	12 (42.9%)	6 (54.5%)
Stress urinary incontinence	21 (75.0%)	4 (36.4%)
Urge incontinence	7 (25.0%)	1 (9.1%)
Hesitancy	11 (39.3%)	2 (18.2%)

**Table 4.** Uroflowmetry According to Stage of POP

	I	II	III	IV	F	<i>p</i>
Max.flow rate (ml/s)	23.1	16.8 ± 4.6	22.1 ± 11.4	15.7 ± 8.2	1.966	0.155
Aver.flow rate (ml/s)	14.3	8.9 ± 3.6	10.4 ± 6.0	7.0 ± 3.8	1.3	0.285
Flow time (sec)	37	28.2 ± 24.1	31.2 ± 16.9	28.3 ± 13.9	0.1	0.896
Time to max.flow (sec)	10	7.7 ± 6.1	7.6 ± 3.7	7.7 ± 4.6	0.005	0.995
Vol.voided (ml)	535	217.8 ± 129.2	328.1 ± 191.8	195.6 ± 143.5	2.544	0.093
Residual urine (ml)	15	26.8 ± 67.3	58.0 ± 76.1	32.1 ± 42.7	0.913	0.411

**Table 5.** Filling Cystometry According to Stage of POP

	I	II	III	IV	F	<i>p</i>
1st desire to void (ml)	163	208.3 ± 112.2	235.9 ± 72.7	179.1 ± 56.6	1.156	0.326
Normal desire to void (ml)	255	314.1 ± 154.4	359.3 ± 104.3	283.9 ± 74.0	1.156	0.326
Strong desire to void (ml)	407	392.3 ± 143.9	473.3 ± 124.4	381.1 ± 67.5	2.255	0.12
Urgency (ml)	530	457.6 ± 132.9	520.2 ± 105.5	436.9 ± 69.7	1.962	0.155
Max.cystometric capacity(ml)	530	512.6 ± 115.2	556.4 ± 82.7	484.7 ± 61.8	1.787	0.182

**Table 6.** Urethral Pressure Profilometry According to Stage of POP

	I	II	III	IV	F	<i>p</i>
Max.urethral closure Pressure (cmH <sub>2</sub> O)	64	60.9 ± 20.3	63.1 ± 24.9	97.9 ± 27.1	6.546	0.004
Functional urethral length (mm)	39	33.5 ± 10.7	35.3 ± 10.0	36.0 ± 10.7	0.176	0.839
Continence area (mm × cmH <sub>2</sub> O)	677	617.6 ± 295.9	542.4 ± 289.3	995.6 ± 268.9	6.365	0.004

**Table 7.** Uroflowmetry According to Leading Point of POP

	Anterior wall	Cervical cuff	<i>p</i>
Max.flow rate (ml/s)	20.6 ± 9.3	16.1 ± 8.3	0.166
Aver. Flow rate (ml/s)	10.3 ± 5.1	7.2 ± 3.7	0.077
Flow time (sec)	29.7 ± 20.1	31.8 ± 15.1	0.753
Time to max.flow (sec)	7.3 ± 4.1	9.4 ± 5.7	0.201
Vol. Voided (ml)	295.0 ± 180.7	229.9 ± 146.9	0.295
Residual urine (ml)	35.1 ± 61.2	60.2 ± 83.9	0.307

**Table 8.** Filling Cystometry According to Leading Point of POP

	Anterior wall	Cervical cuff	<i>p</i>
1st desire to void (ml)	214.1 ± 82.8	211.8 ± 102.9	0.942
Normal desire to void (ml)	336.2 ± 121.9	309.5 ± 125.6	0.545
Strong desire to void (ml)	443.8 ± 130.7	392.5 ± 118.6	0.265
Urgency (ml)	505.7 ± 111.2	438.2 ± 108.8	0.094
Max.cystometric capacity (ml)	545.4 ± 94.2	485.8 ± 86.3	0.077

**Table 9.** Urethral Pressure Profilometry According to Leading Point of POP

	Anterior wall	Cervical cuff	<i>p</i>
Max.urethral closure Pressure (cmH <sub>2</sub> O)	64.9 ± 21.2	81.4 ± 33.8	0.075
Functional urethral length (mm)	36.4 ± 9.1	30.7 ± 12.0	0.118
Continence area (mm × cmH <sub>2</sub> O)	587.3 ± 264.8	856.6 ± 370.1	0.015

incidence of pelvic organ prolapse among elderly women is increasing, and it is becoming more and more a matter of concern. The incidence of pelvic organ prolapse is known to constitute 0.09-0.3% of all gynecological diseases.<sup>7,8</sup> This data is not accurate, however, because the symptoms of pelvic organ prolapse vary considerably, and many patients with pelvic organ prolapse do not seek medical help.

The pelvic organ prolapse quantitation system<sup>5</sup> makes it possible to evaluate pelvic organ prolapse objectively according to the site-specific anatomical defects and to compare the surgical outcomes. We performed urodynamic tests without the prolapse being reduced, because such reduction makes it possible to relieve urologic symptoms, which can have an influence on the evaluation of the lower urinary tract function in patients with pelvic organ prolapse.<sup>2,3</sup>

The major etiological factors of pelvic organ prolapse were birth trauma, neuropathy related to pelvic surgery, estrogen deficiency, constipation, chronic cough, myopathy and collagen abnormality. Hysterectomy may cause pelvic organ prolapse and voiding difficulties by distorting the normal pelvic anatomy and disturbing the local neural network and circulation.<sup>9</sup> Vaginal delivery is also known to be the most important etiological factor in pelvic organ prolapse,<sup>10</sup> because it influences the nerve conduction and the contractility of the pelvic muscle, making it vulnerable to pelvic organ prolapse. The average age and average

number of vaginal deliveries in our study were similar to those of other studies.<sup>7,8,11</sup> In our study, as the number of vaginal deliveries increased, the incidence of pelvic organ prolapse increased accordingly.

The symptoms of pelvic organ prolapse are vaginal bleeding, back and lower abdominal pain, constipation, and heaviness of the genitalia. The changes in urethral and vaginal position in patients with pelvic organ prolapse affect the bladder and the urethra, leading to frequency, dysuria, urinary incontinence, urgency and hesitancy.<sup>1,11</sup> Prolonged voiding disturbance occasionally causes urinary tract infection.<sup>12</sup> The majority of the patients in stages I and II had anterior vaginal wall defects, but for those patients in stages III and IV the incidence of apical defects was relatively high. Subjective urinary symptoms were more common in patients with anterior vaginal defects than in those with apical defects. However this difference was not significant. For an objective evaluation, a multichannel urodynamic study will have to be performed.

When the urodynamic parameters of the patients with pelvic organ prolapse were analyzed according to prolapse stage and substage, no differences were found in the uroflowmetry and filling cystometry parameters. However the urethral pressure profile, the maximal urethral closure pressure were significantly higher and the continence area was significantly larger in patients with stage IV prolapse. The continence area was

increased in patients with apical defects. Our results were similar to those of other studies,<sup>3,13</sup> and suggest that pelvic organ prolapse causes a mechanical obstruction of the non-mobile urethra.

Pelvic organ prolapse did not influence the storage function of the bladder. Rather, in the more severe cases of pelvic organ prolapse, apical defects were more commonly observed. Apical defects rather than anterior vaginal defects tend to increase the maximal urethral closure pressure and continence area. Thus, pelvic organ prolapse with apical defects can lead to urethral obstruction and voiding dysfunction.

Uroflowmetry is a non-invasive method which reflects the function of detrusor contractility and the urethral resistance. Symptomatic stress incontinence is infrequent in patients with significant POP<sup>2</sup>, so women with more severe prolapse would be expected to manifest obstructed voiding patterns. Women with large POP, however, did not have a voiding pattern that was statistically different from that of women with minor degrees of POP<sup>14</sup>. Our data also shows no differences in the various uroflowmetry parameters according to the POP stage. Although this result was not statistically significant, patients with apical defects and those in stage IV showed decreased maximal flow rates. This may be due to a mechanical obstruction of the urethra. The number of patients enrolled in our study was too small to be able to investigate changes in the urodynamic parameters according to substage.

Concealed stress urinary incontinence followed by the reduction of pelvic organ prolapse has been reported.<sup>15</sup> It is necessary to perform an urodynamic test in patients with pelvic organ prolapse before surgical correction in order to predict the possibility of postoperative voiding difficulty. Stanton and associates reported that there was no change in the urodynamic parameters, before and after prolapse surgery, even when the symptoms were relieved.<sup>16</sup> Therefore, a prospective randomized study is required to analyze changes in the urodynamic parameters, between the preoperative and postoperative periods, in patients with pelvic organ prolapse.

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