

# A Study of the Relationship between Pelvic Organ Prolapse and Positive Dipstick Urinalysis in Postmenopausal Women

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**Objective:** To study the relationship between pelvic organ prolapse and positive dipstick urinalysis in postmenopausal women.

**Material and Method:** From April 2014 to August 2015, the postmenopausal women who attended the urogynecology clinic, Thammasat university hospital, were asked to join in the study. After signing the informed consent, the general characteristics data including the lower urinary tract symptoms (LUTS) were collected. The physical examination and evaluation of the quantitative measurement for POP were undergone. All women were asked to take the mid-streamed urine for dipstick urinalysis. Urinary tract infections were diagnosed by positive leukocyte esterase or nitrite test. Immediately after emptying the bladder, postvoid residual urine volume (PVR) was measured by using translabial ultrasound and calculated by the formula: height x depth x 5.6.

**Results:** There were 221 postmenopausal women with POP and the incidence of the urinary tract infection in this group was 17.6%. Procidencia uteri were found in 39 women and 14 women had positive nitrite or leukocyte esterase tests with a significant correlation ( $p = 0.001$ ). The anterior vaginal wall was the most common descending part and usually combined with other parts. Most women had prolapses at least grade II. The average postvoid residual urine was  $35.0 \pm 24.4$  ml. The total eversion of vaginal wall, procidencia uteri, was significantly associated with high PVR ( $p < 0.001$ ). And the women with high PVR had increased risk of positive urine dipstick test ( $p = 0.009$ ). There was a correlation between anterior and posterior wall prolapses and UTI ( $p = 0.02$ ).

**Conclusion:** There were relationships between pelvic organ prolapse, especially procidencia uteri, anterior and posterior prolapses and UTI in postmenopausal women.

**Keywords:** Postmenopause, POP, Dipstick urinalysis, PVR

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The national statistic organization reported that life expectancy of Thai women is 76.3 years<sup>(1)</sup>. The average age at menopause of Thai women is  $49.46 \pm 3.30$  years<sup>(2)</sup>. It means that they have to live in this menopausal status at least 20 years. The declining of estrogen level causes changes in histology of vaginal mucosa and leads to vulvovaginal atrophy. This process often progresses with aging and could have adversely affect the quality of life of the postmenopausal women. One of the common symptoms of this atrophy is bladder infection which can be asymptomatic or symptomatic. Urinary tract infection (UTI) had found in 15-20% of women aged 65-70 years and

20-50% of women aged more than 80 years<sup>(3)</sup>. A prospective study of 1,140 women presented with pelvic floor dysfunction and had urodynamic studies done, showed that the nulliparous women and postvoid residual urine over 30 ml had increased chance of recurrent UTI. But this study could not find any specific association between pelvic organ prolapse (POP) and UTI<sup>(4)</sup>. It is doubtful that a previous study confirmed a link between voiding dysfunction and uterine/vaginal prolapse<sup>(5)</sup>, so why this large prospective study could not see the link between prolapse and UTI. One review explained that it might be due to the stretching effects of childbirth that could help reduce the friction of intercourse which was believed to be associated with bladder infection<sup>(6)</sup>. A review study in the specific group of postmenopausal women concluded that presence of any grade of cystocele and high PVR increased chance of recurrent UTI<sup>(3)</sup>. For Thai population, there was no study reported the prevalence

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of UTI in postmenopausal women with POP. Since the Thai culture is quite different from the western culture, the sexual activity among older Thais was lower than the older western women<sup>(7)</sup>. So we conducted this study to evaluate the prevalence of UTI in Thai postmenopausal women with any types and grades of POP and to assess the correlation between PVR and UTI. We choose to use dipstick urinalysis for diagnosis of UTI because it is common practice in outpatient clinic to utilize dipstick urinalysis for detecting and diagnosis of UTI. This test determines pyuria by measuring leukocyte esterase and bacteriuria by measuring nitrite<sup>(8)</sup>. Pyuria is a significant sign of inflammation. The absence of pyuria is a good predictor for the absence of bacteriuria<sup>(9)</sup>. Both leukocyte esterase and nitrite have high positive predictive value and high sensitivity when used in the elderly population with high clinical suspicion of UTI<sup>(10)</sup>. Urine culture is considered the gold standard for diagnosing UTI, however, its results take at least 24 hour to obtain. Dipstick urinalysis can be a reliable screening method for diagnosis of urinary tract infection and when using a cost-utility analysis, a study could demonstrate the value of this approach in UTI<sup>(11)</sup>. It is clinically reasonable to empirically initiate antibiotic treatment in peri and postmenopausal women who have positive leukocyte esterase and or nitrite dipstick UA<sup>(12)</sup>.

The aims of the study were to study the relationship between pelvic organ prolapse and positive dipstick urinalysis in postmenopausal women and to evaluate the prevalence of UTI in Thai postmenopausal women with any types and grade of POP and to assess the correlation between PVR and UTI.

### Material and Method

This cross-sectional study was performed during April 2014 to August 2015. All women with inclusion criteria: stop having the menstrual period at least 12 months continuously with all types and grades of pelvic organ prolapse and did not take any antibiotic in preceding 3 months, were asked to join in the study. The exclusion criteria were the women with any cancer, immunocompromised host and had severe skin infection at perineum. After signing the inform consent, their general characteristics data including the lower urinary tract symptoms (LUTS) were collected. A gynecologist (co-author) did the physical examination and evaluated the POP by using quantitative measurement for POP (POP-Q)<sup>(13)</sup> and then let the participants have the mid-streamed urine for dipstick analysis. Positive leukocyte esterase and or positive nitrite test were diagnosed as

urinary tract infection<sup>(14,15)</sup>. Immediately after emptying the bladder, postvoid residual urine volume in milliliters (PVR) was measured by using translabial ultrasound and calculated by the formula: height x depth x 5.6<sup>(16)</sup> (Fig. 1).

The prevalence of UTI diagnosed by positive dipstick test in postmenopausal women with pelvic organ prolapse was reported in percentage. Spearman rank test was used for the correlation between UTI and POP. And also the correlations between postvoid residual urine and all types as well as all grades of POP were analyzed by using Spearman's rho correlation coefficients.

### Results

From April 2014 to August 2015, there were 221 postmenopausal women joining in this study. The general characteristics were shown in the Table 1. Most common presenting symptom was vaginal bulking alone (146, 66.1%). There were 71 (32.2%) women with lower urinary tract symptoms and there was a significant correlation between LUTs and UTI diagnosed by positive dipstick test ( $r = 0.16$ ,  $p$ -value = 0.02). The Odds of UTI was 0.64 (95% CI=0.36-1.16) higher in the group of women with PVR more than 30 ml. compare to the group of women with PVR less than 30 ml.

In 221 postmenopausal women, 39 (17.6%) had total eversion of vagina which is defined as procidentia uteri, remaining 182 women had incomplete prolapse in different types and grade as shown in Table 2. Anterior and apical prolapses were found more common than posterior compartment prolapse.

There were 59 women had single-site prolapse. Apical compartment prolapse was the most common single-site prolapse (35, 15.8%) followed by cystocele (21, 9.5%). Of 36 (16.2%) women with 2 sites of prolapse, 14 (6.3%) had cystocele combined with apical prolapse,

**Table 1.** The general characteristics and presenting symptoms of the participants

General characteristics (n = 221)	
Age (mean ± SD, year)	66.3±10.1
Weight (mean ± SD, kg)	58.5±9.4
Parity (mean ± SD) (min-max)	3.2±2.0 (0-12)
Presenting symptoms (n (%))	
Vaginal bulking (VB)	146 (66.1)
LUTS	30 (13.6)
Vaginal ulcer	2 (1.0)
Difficult defecation	2 (1.0)
VB and LUTS	41 (18.6)

18 (8.1%) had cystocele combined with rectocele and 4 (1.8%) had rectocele with apical prolapse. There were 87 (39.4%) women had incomplete prolapse of all compartments.

The correlation between all types and grades of prolapse and UTI diagnosed by positive urine dipstick was shown in Table 3.

The incidence of UTI diagnosed by positive dipstick urinalysis in the present was 17.6% (39/221 women). In the group of women with one site of prolapse, there was no correlation between UTI and any prolapse compartments. As same as in the groups of women with 2 and 3-site of prolapse, there were no correlation between UTI and POP. When compare

between procidentia uteri and UTI, there were 14/39 (35.9%) women had bladder infection with significant correlation ( $r = 0.22$ ,  $p$ -value = 0.001).

The data of postvoid residual urine in this study was not normal distributed. The average of overall postvoid residual urine in this study was  $35.0 \pm 24.8$  milliliters (rank 0-178 ml). The correlation between POP and PVR in the groups of one and 2 site of prolapses were not statistically significant. Incomplete prolapse of all 3 sites was significantly correlated with PVR,  $r = 0.34$ ,  $p$ -value = 0.002. Procidentia uteri was correlated with PVR significantly,  $r = 0.25$ ,  $p$ -value = 0.001 (Table 4). When using a cut off value of 50 ml, the odd ratio for the PVR more than 50 ml in the women with procidentia uteri was 0.39 (95% CI = 0.24-0.60). The correlation coefficient between PVR and UTI was 0.22,  $p$ -value = 0.001.

**Table 2.** The prevalence of all grades and types of incomplete POP

Compartment	Number (%)
*Anterior wall prolapse (n = 140, 63.3%)	
Stage 1	1 (0.5)
Stage 2	64 (29.0)
Stage 3	66 (29.9)
Stage 4	9 (4.1)
*Apical prolapse (n = 130, 58.8%)	
Stage 1	2 (0.9)
Stage 2	67 (30.3)
Stage 3	55 (24.9)
Stage 4	16 (7.2)
*Posterior wall prolapse (n = 112, 50.7%)	
Stage 1	1 (0.5)
Stage 2	88 (39.8)
Stage 3	22 (1.0)
Stage 4	1 (0.5)

## Discussion

This study was performed in the urogynecology clinic, the most presenting symptom associated with the prolapse was vaginal bulking and the symptom related to lower urinary tract was the second most common symptom. During menopause, there are many physiological and anatomical changes and cause a lot of menopausal symptoms. Some symptoms such as vasomotor symptoms usually subside when time pass but some symptoms especially vulvo vaginal atrophic symptoms usually progress with age<sup>(17)</sup>. The postmenopausal women may suffer from the lower urinary tract symptoms such as frequent urination, incontinence and recurrent infection. This can be explained by the progressive atrophy of bladder and urethral lining with aging<sup>(18)</sup>. With high

**Table 3.** Correlation between POP and UTI

Prolapse compartment	Number of POP (n, %)	Number of UTI (n, %)	r*, p-value
Single-site of prolapse			
Anterior	21 (9.5)	1 (2.6)	-0.1, 0.69
Apical	35 (15.8)	2 (5.2)	0.1, 0.60
Posterior	3 (1.4)	1 (2.6)	NA
2-sites of prolapse			
Anterior and apical	14 (6.3)	2 (5.2)	0.23, 0.43
Anterior and posterior	18 (8.1)	3 (7.7)	0.30, 0.23
Apical and posterior	4 (1.8)	1 (2.6)	0.58, 0.42
3-sites of prolapse			
Anterior-apical-posterior	87 (39.4)	15 (38.5)	-0.05, 0.97
Procidentia uteri	39 (17.6)	14 (35.9)	0.22, 0.001
Total	221 (100)	39 (100)	-

\* Spearman correlation

**Table 4.** Correlation between different compartment of incomplete prolapses and PVR

Prolapse compartment (n)	PVR, mean (ml)	Min-max (ml)	r*, p-value
Single-site of prolapse			
Anterior (21)	24.4	0-63	0.29, 0.20
Apical (35)	21.9	0-63	0.23, 0.19
Posterior (3)	0	0	0
2-sites of prolapse			
Anterior and apical (19)	28.3	15-65	0.34, 0.24
Anterior and posterior (18)	30.9	0-112	0.30, 0.22
Apical and posterior (4)	18.8	10-34	0, 1.0
3-sites of prolapse			
Anterior-apical-posterior (87)	39.4	0-86	0.34, 0.002
Procidentia uteri (39)	51.2	14-178	0.25, 0.001

\* Spearman correlation

sensitivity and specificity of the urine dipstick test, so we used the dipstick test for screening of bladder infection<sup>(14)</sup>. There were 17.6% of all postmenopausal women with POP having positive dipstick test which was similar to the report described in the other epidemiologic studies<sup>(3)</sup>. The postmenopausal women with LUTS were found to have positive dipstick urinalysis more than the women without LUTS. The previous study shown that the elevated PVR (over 30 ml) is a significant factor associated with recurrent UTI<sup>(4)</sup>. In this study, the average PVR was 35.0±24.8 ml and the odd ratio of UTI in the women with PVR more than 30 ml was 0.64 with 95% confidence interval equal to 0.36-1.16. When categorized in specific groups, we found that the women with incomplete/complete 3-site of prolapse had significant correlation with PVR.

Pelvic organ prolapse is the descent of the organ in pelvis such as uterus, bladder, urethra and rectum. It is common in elderly women due to the deficiencies in pelvic support and usually causes multiple sites of descend<sup>(19)</sup>. From 221 postmenopausal women, there was 59 (26.7%) had single-site prolapse and apical prolapse was the most common single-site prolapse. Thirty-six women had 2-site prolapse. Of these women, 14/36 women had anterior wall prolapse combines with apical prolapse and 18/36 with posterior wall prolapses. More than half of the women in this study had all 3 sites descend including procidentia uteri. In previous study, patients with severe prolapse usually had higher PVR<sup>(6)</sup>. When classify in to specific group of one and two site of prolapses, the higher degree of prolapse were correlated with higher amount of PVR but no statistical significant. Only the 3-site of prolapse-group, both incomplete and procidentia uteri,

had significant correlations with PVR. The cut-off value of abnormal PVR are poorly defined, however the PVR more than 50 ml is widely used for diagnosis of abnormal residual urine volume<sup>(20)</sup>. Only procidentia uteri had significant correlation with PVR more than 50 ml. Consistently, the advanced grade of prolapse was significantly associated with high PVR. However, the odd ratio between procidentia uteri and PVR more than 50 ml was only 0.39 (95% CI 0.24-0.60). There was a significant correlation between PVR and UTI diagnosed by positive urine dipstick ( $r = 0.22$ ,  $p$ -value = 0.001). In the subgroup of women with incomplete prolapses; single-site, 2-sites of prolapse and all 3-site of prolapse, there were no significant correlation between types and grades of prolapse with the UTI. However, there was a significant correlation between procidentia uteri and the number of women with positive urine dipstick test. However, some previous studies could not find this association between POP and cystitis and they hypothesized that the relaxation of vaginal wall in women with POP may help prevent infection<sup>(4,5)</sup>. One recent study concluded that POP is not a risk factor for recurrent UTI but POP can cause high PVR which is the risk factor of UTI<sup>(21)</sup>. There was an association between PVR and 3-site POP in this study. Different from other studies, only postmenopausal women who also had high incidence of bladder infection due to atrophy were recruited. And we did categorize the site- specific group of the POP for analysis to find out of any associations between PVR and UTI. Compare to a review study in postmenopausal women which concluded that presence of any grade of cystocele (anterior prolapse) and high PVR increased chance of recurrent cystitis<sup>(3)</sup>,

the single site of anterior wall prolapse in the present did not associated with UTI including all other incomplete prolapses. Only procidentia uteri, which is the total eversion of vaginal wall, was found to be correlated with UTI. However, all of the correlations between each variable in this study (POP and UTI, PVR and POP) were lower than 0.5 beside they got statistical significant. This may be due to too small sample size for analyzing so we need to continue getting more data to support our study.

### Conclusion

The incidence of positive dipstick urinalysis diagnosed UTI in postmenopausal women with POP was 17.6%. The most common part of single site prolapse was apical prolapse. Anterior wall prolapse usually presented in the combination with apical or posterior or both parts. Prolapses grade 2-3 were found more frequent than grade 1 and 4. An average PVR in postmenopausal women with POP was 35.0±24.4 ml. Postmenopausal women with procidentia uteri seem to have high PVR and chance of bladder infection. Only the complete vaginal wall prolapse was found to be correlated with positive urine dipstick test and high PVR. Although there were not clearly high correlations from this study, the gynecologist should check for the bladder infection by at least using dipstick test in all postmenopausal women especially in the women with procidentia uteri.

### What is already known on this topic?

The postmenopausal women who had high grade of pelvic organ prolapse may have increased risk of cystitis especially women with procidentia uteri and anterior wall prolapse.

### What this study adds?

Apical prolapse was the most common single-site prolapse in postmenopausal women.

More than half of the postmenopausal women had multiple sites of prolapse.

Postmenopausal women with procidentia uteri have highly chance to have abnormal PVR (more than 50 ml) and also the chance of positive urine dipstick test.

### Potential conflicts of interest

None.

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การศึกษาความสัมพันธ์ของภาวะกระบังลมหย่อนและการติดเชื้อทางเดินปัสสาวะที่ไม่ซับซ้อนวินิจฉัยโดยผลบวกของแถบตรวจปัสสาวะในสตรีวัยทอง

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วัตถุประสงค์: เพื่อศึกษาถึงความสัมพันธ์ของภาวะกระบังลมหย่อนและการติดเชื้อแบคทีเรียในกระเพาะปัสสาวะในสตรีวัยทอง

วัสดุและวิธีการ: จากเดือนเมษายน พ.ศ. 2557 ถึงเดือน สิงหาคม พ.ศ. 2558 สตรีวัยทองที่มารับบริการที่คลินิกเวชศาสตร์เชิงกราน และศัลยกรรมช่องเสริม โรงพยาบาลมหาวิทยาลัยธรรมศาสตร์ ได้รับเชิญเข้าร่วมการศึกษา หลังจากลงชื่อยินยอมเข้าร่วมงานวิจัยแล้ว ข้อมูลทั่วไปและอาการที่เกี่ยวข้องทางเดินปัสสาวะส่วนล่างจะได้รับการบันทึกมีการตรวจร่างกายทั่วไปและประเมินการหย่อนของอวัยวะในอุ้งเชิงกรานเชิงปริมาณ สตรีทุกคนจะถูกขอให้เก็บปัสสาวะส่วนกลางเพื่อวิเคราะห์ด้วยแถบตรวจปัสสาวะ ค่าเม็ดเลือดขาวและค่าไนไตรท์ที่เป็นบวกจะได้รับการวินิจฉัยว่ามี การติดเชื้อในกระเพาะปัสสาวะทันทีหลังจากถ่ายปัสสาวะ ปริมาณปัสสาวะเหลือค้างจะถูกวัดโดยการใช้อัตราส่วนความดันปากของคลอดและคำนวณโดยใช้สูตรความสูง  $x$  ความลึก  $x 6.5 =$  ปัสสาวะเหลือค้างหน่วยเป็นมิลลิเมตร การวิเคราะห์ทางสถิติโดยใช้โปรแกรม SPSS

ผลการศึกษา: มีสตรีวัยทองที่มีภาวะหย่อนของอวัยวะในอุ้งเชิงกรานจำนวน 221 คนและมีอุบัติการณ์ของกระเพาะปัสสาวะอักเสบในสตรีกลุ่มนี้เท่ากับ 17.6% การเปลี่ยนของช่องคลอดทั้งหมดพบได้ในสตรี 39 คนและสตรี 14 คน มีการติดเชื้อในกระเพาะปัสสาวะซึ่งมีความสัมพันธ์กันอย่างมีนัยสำคัญ ( $p = 0.001$ ) ผนังช่องคลอดส่วนหน้าพบว่าเป็นส่วนที่มีการหย่อนมากที่สุดและมักพบร่วมกับการหย่อนในส่วนอื่น สตรีส่วนใหญ่จะมีการหย่อนระดับ 2 เป็นอย่างน้อยที่สุด ค่าเฉลี่ยของปริมาณปัสสาวะเหลือค้างเท่ากับ  $35.0 \pm 24.4$  มล. การหย่อนของช่องคลอดส่วนหน้าในระดับที่สูงขึ้นจะมีความสัมพันธ์อย่างมีนัยสำคัญกับปริมาณที่สูงสุดของปัสสาวะเหลือค้าง ( $p < 0.01$ ) และสตรีที่มีปริมาณปัสสาวะเหลือค้างสูงจะเพิ่มความเสี่ยงในการเกิดกระเพาะปัสสาวะอักเสบ ( $p = 0.009$ ) มีความสัมพันธ์ระหว่างการหย่อนของกระเพาะปัสสาวะส่วนหน้าและส่วนหลังกับการเกิดกระเพาะปัสสาวะอักเสบ ( $p = 0.02$ ) สรุป: มีความสัมพันธ์ระหว่างการหย่อนของอวัยวะในอุ้งเชิงกราน โดยเฉพาะการเปลี่ยนของผนังช่องคลอดทั้งหมด, การหย่อนของผนังช่องคลอดส่วนหน้าและส่วนหลังกับการเกิดกระเพาะปัสสาวะอักเสบติดเชื้อแบคทีเรียในสตรีวัยทอง