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A Comparison of Conventional Outpatient and Instrumental Intraoperative Pelvic Organ Prolapse Quantification Measurements in Patients Undergoing Vaginal Surgery for Pelvic Organ Prolapse

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ABSTRACT

Objectives: To compare the differences of pelvic organ prolapse quantification (POP-Q) measurements obtained preoperatively at the outpatient setting and intraoperatively with instrumental traction during full anesthetization in patients undergoing vaginal reconstructive surgery.

Materials and Methods: Retrospective chart review of 98 women having undergone vaginal pelvic organ prolapse (POP) repair for ≥ stage II uterovaginal prolapse during September 2014 and March 2020 at Phramongkutklao Hospital was conducted. Patients' baseline characteristics, history of POP and anti-incontinence surgery, clinical manifestations, POP stage, pessary use, and pre- and intra-operative POP-Q measurements were recorded. At preoperative outpatient setting, POP-Q examination was performed during maximal Valsalva. Intraoperatively, it was performed with instrumental cervical traction after full anesthetization. All POP-Q measurements were interpreted for prolapse location and severity according to the standardized POP-Q system.

Results: Mean age was 72.08 years, with 98% being postmenopausal. Mean body mass index (BMI) was 25.08 kg/m^2. Most had vaginal deliveries with a median parity of 3. All manifested with bulge symptom while 79.6% complained of voiding difficulty. 96 out of 98 presented with advanced stage prolapse. Among these, 20 patients were treated with vaginal pessary during the waiting period for POP surgical repair. POP-Q measurements (Ba, Ap, Bp, C, D, GH, and PB) obtained during intraoperative instrumental traction significantly demonstrated more prolapse severity when compared with those obtained during outpatient setting. No changes were found when evaluating point Aa

Conclusion: POP-Q measurements obtained during conventional outpatient examination provided less prolapse severity when compared with those measured during intraoperative instrumental traction after full anesthetization.

Keywords: pelvic organ prolapse, POP-Q examination, POP-Q measurement, outpatient, intraoperative.

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การเปรียบเทียบผลการตรวจหาตำแหน่งและระดับความรุนแรงของอวัยวะอุ้งเชิงกรานหย่อนด้วยมาตรวัดพอปคิว ระหว่างการตรวจด้วยวิธีมาตรฐานแบบผู้ป่วยนอกและการตรวจในห้องผ่าตัดภายหลังการระงับความรู้สึก ในผู้ป่วยที่มารับการผ่าตัดทางช่องคลอดรักษาอวัยวะอุ้งเชิงกรานหย่อน

เกรียงศักดิ์ ศิริศักดิ์พาณิชย์, กมลภพ เวชชศาสตร์

บทคัดย่อ

วัตถุประสงค์*: เพื่อเปรียบเทียบผลการตรวจหาตำแหน่ง (location) และระดับความรุนแรง (stage)ของอวัยวะอุ้งเชิงกรานหย่อนด้วยมาตรวัดพอปคิว(POP-Q)ระหว่างการตรวจด้วยวิธีมาตรฐานแบบผู้ป่วยนอกและการตรวจในห้องผ่าตัดโดยใช้เครื่องมือช่วยดึงภายหลังการระงับความรู้สึก*

วัสดุและวิธีการ*: ดำเนินการวิจัยแบบเก็บข้อมูลย้อนหลัง ที่กองสูตินรีเวชกรรม โรงพยาบาลพระมงกุฎเกล้าโดยทำการศึกษาในผู้ป่วยที่ได้รับการการผ่าตัดผ่านทางช่องคลอดด้วยภาวะอวัยวะในอุ้งเชิงกรานหย่อน ณ กองสูตินรีเวชกรรม โรงพยาบาลพระมงกุฎเกล้า ตั้งแต่เดือน กันยายน 2557 ถึง มีนาคม 2563*

ผลการศึกษา*: การวัดพอปคิวทั้งเก้าจุดด้วยวิธีมาตรฐานแบบผู้ป่วยนอกและการตรวจในห้องผ่าตัดภายหลังการระงับความรู้สึก มีความสัมพันธ์กันอย่างมีนัยสำคัญโดยการใช้ Spearman rank correlation ค่าเฉลี่ยพอปคิวที่จุด Aa ไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติ ระหว่างการตรวจด้วยวิธีมาตรฐานแบบผู้ป่วยนอกและการตรวจในห้องผ่าตัดภายหลังการระงับความรู้สึก (p = 0.611) ค่าพอปคิวที่จุด Ba แตกต่างอย่างมีนัยสำคัญทางสถิติ (p = 0.003) (ค่าเฉลี่ยของผลต่างเท่ากับ 0.52 เซนติเมตร) ระหว่างการตรวจด้วยวิธีมาตรฐานแบบผู้ป่วยนอกและการตรวจในห้องผ่าตัดภายหลังการระงับความรู้สึก (3.99±1.47 และ 4.51±1.81 เซนติเมตร) เช่นเดียวกับที่จุด C (p = 0.001) (ค่าเฉลี่ยของผลต่าง = 0.94 เซนติเมตร) ระยะโรคของภาวะอุ้งเชิงกรานหย่อนจากการตรวจทั้ง 2 วิธีพบว่ามีการพบระยะที่มากขึ้น ร้อยละ 19.39 (19/98) ยังคงระยะเดิม ร้อยละ 65.30 (64/98) และลดระยะลง ร้อยละ 15.30 (15/98)*

สรุป*: การวัดพอปคิวด้วยการตรวจด้วยวิธีมาตรฐานแบบผู้ป่วยนอกอาจทำให้ได้ระยะและความรุนแรงของภาวะอุ้งเชิงกรานหย่อนน้อยกว่าการการตรวจในห้องผ่าตัดโดยใช้เครื่องมือช่วยดึงภายหลังการระงับความรู้สึก ผู้ป่วยที่ได้รับการวางแผนเพื่อผ่าตัดรักษาภาวะอุ้งเชิงกรานหย่อนควรได้ทราบว่าอาจมีการเปลี่ยนแปลงแผนการผ่าตัดจากที่ได้แจ้งไว้ก่อนล่วงหน้าที่จะผ่าตัด*

คำสำคัญ*: อวัยวะอุ้งเชิงกรานหย่อน, มาตรวัดพอปคิว, เครื่องมือช่วยดึง*

Introduction

Pelvic organ prolapse (POP) is a common problem among aging population worldwide that considerably impacts women's quality of life. Although accepted as a low mortality and morbidity condition, it is a usual indicator for vaginal reconstructive surgery[1], with the estimated 11% life-time risk of undergoing at least one POP or anti-incontinence surgery[2]. To specifically plan for surgical treatment option, the exact site and severity of prolapse should be preoperatively identified. This can be achieved using the standardized pelvic organ prolapse quantification (POP-Q) system which was developed and introduced by the International Continence Society (ICS) in 1996 to precisely measure and define POP stage and location[3]. However, several studies have demonstrated that POP-Q measurements obtained during strong cough or maximal Valsalva while patients being positioned in dorsal lithotomy at the outpatient setting show less prolapse severity than the measurements acquired using intraoperative instrumental traction while being fully anesthetized[4, 5]. Possible factors contributing to this underestimation of outpatient POP severity included full bladder, fear, embarrassment, pain, impacted feces, and pelvic floor muscle contraction. Consequently, this often led to change in the planned surgical procedures, from simple hysterectomy and colporrhaphy procedures to vaginal obliteration or sophisticated mesh augmentation procedures, thus requiring more informative and thorough preoperative counseling prior to undergoing POP repair. Therefore, the purpose of this study is to compare the differences of POP-Q measurements obtained preoperatively at the outpatient setting and intraoperatively with instrumental traction during full anesthetization in patients undergoing vaginal reconstructive surgery.

Materials and Methods

Following the Institutional Review Board's ethical approval for the expedited-review research category, the retrospective study of all women undergoing vaginal reconstructive surgery for at least stage II uterovaginal prolapse during September 2014 and March 2020 at the Department of Obstetrics and Gynecology, Phramongkutklao General Hospital, was carried out. Patients' medical data including age, body mass index (BMI), parity, mode of delivery, menopausal status, previous POP and anti-incontinence surgery, clinical manifestations, POP stage, pessary use, as well as outpatient and intraoperative POP-Q measurements were thoroughly reviewed and recorded. Those with incomplete medical information were excluded from the study.

During the initial visit at the urogynecology outpatient clinic, patients were evaluated for presenting POP symptoms, as well as associated lower urinary tract (LUT) and defecatory symptoms. Following single catheterization to measure post-void residual urine, POP location and severity were assessed and interpreted during maximal Valsalva or strong cough while patients being positioned in dorsal lithotomy, according to the standardized POP-Q system[6]. The posterior blade of the Graves vaginal speculum was used to assess the most descending points on the anterior (point Aa, Ba) and posterior (point Ap, Bp) compartments separately. No speculum was used when evaluating for apical descent (point C, D). Total vaginal length (TVL) was measured without Valsalva maneuver. A POP ruler which was adapted from the modified Ayre's spatula, pre-marked with centimeter markings, was used to objectively quantify all POP-Q measurements. All six points (Aa, Ba, Ap, Bp, C, and D) were recorded in centimeters in relation to the hymen, with 0 if located at hymeneal ring, with negative values if located above hymen, and with positive values if located below hymen[6]. The three additional distances including genital hiatus (GH), perineal body (PB), and total vaginal length (TVL) were also recorded in centimeters without plus or minus symbols. After having obtained all POP-Q measurements, each patient was then assigned with POP stage, from 0 (no descent) to IV (complete protrusion), in regard to the most descending point of prolapse.

Women who underwent vaginal reconstructive surgery for at least stage II uterovaginal prolapse were reassessed for POP-Q measurements intraoperatively.

Following general or regional anesthesia, the patients were positioned in dorsal lithotomy with a 14-French Foley's catheter being inserted to continuously drain the bladder. POP-Q examination was performed under cervical traction using a Schroeder tenaculum forceps to gain maximal descent. POP-Q measurements, except TVL, were measured during this instrumental traction. Only one experienced urogynecologist (KS) was responsible for all surgical procedures and POP-Q examination.

Sample size calculation

According to the study by Krissi et al[7], who evaluated the preoperative and intraoperative POP-Q measurements in women undergoing vaginal reconstructive surgery for prolapse, the formula to compare two dependent means was applied for sample size calculation. With the preoperative and intraoperative point D of -4.2 (SD = 2.1) and -3.4 (SD = 2.5) respectively, the mean difference was 0.8. With the pre-defined values of (1) 95% confidence level (Z-alpha/2 = 1.96), (2) 90% power of detecting a difference ($Z\beta$ = 1.28), and (3) standard deviation of 2.1, the sample size was calculated to be 55. An extra 10% of the estimated samples were added to compensate for any missing data, thus yielding a total of at least 61 patients for the study.

$$N = \frac{(Z\alpha/2 + Z\beta)^2 \times (\sigma)^2}{(\Delta)^2}$$

Statistical analysis

The statistical analysis was performed using the Statistical Packages for the Social Sciences Version 23.0 for Windows (SPSS Inc, Chicago, IL, USA). The continuous variables were described as mean ± standard deviation (SD) or median (minimum-maximum) whereas the categorical data were expressed as number and percentage. The mean differences between preoperative and postoperative POP-Q values were compared using Wilcoxon Signed Ranks Test, whereas the correlation between the two methods was evaluated using the nonparametric Spearman Rank Correlation Test. A p value of less than 0.05 was considered as statistically significant.

Results

With the exclusion of those with incomplete medical records, a total of 98 women who underwent vaginal reconstructive surgery for at least stage II uterovaginal prolapse were eligible and enrolled for this study. The mean age was 72.08 ± 8.57 years, with 98% being postmenopausal. The mean BMI was 25.08 ± 4.42 kg/m^2. Almost 90% had vaginal deliveries with the median parity of 3 (range 0-10). None had ever undergone surgery for POP and urinary incontinence, neither vaginally nor abdominally. All manifested with bulge symptom with voiding difficulty being the most common LUT complaint (79.6%). Constipation was found in only one-third of the patients (35.7%). Almost all (96 out of 98; 97.96%) presented with advanced stage (stage III and IV) prolapse. Among these, 20 patients (5 of stage III and 15 of stage IV) were treated with vaginal pessary to relieve bulge symptom and voiding difficulty during the waiting period prior to POP surgical repair (Table1).

All POP-Q measurements, both obtained pre- and intraoperatively, showed significant correlation (correlation coefficient 0.251 - 0.721; all $p < 0.05$). Of the six-point measurements measured during intraoperative instrumental traction, all except point Aa (Aa: 2.39 ± 0.86 vs 2.46 ± 0.92; p = 0.611) significantly demonstrated more prolapse severity when compared with those obtained during the outpatient setting. Pre- and intraoperative comparison of GH and PB distances also revealed significant changes towards more widening of genital hiatus and more flattening of perineal body when intraoperative cervical traction was applied during POP-Q examination (GH: 4.98 ± 0.95 vs 4.31 ± 1.10, $p < 0.001$ and PB: 3.35 ± 0.62 vs 3.61 ± 0.62, p = 0.001). Although total vaginal length was remarkably longer in terms of statistical analysis when measured intraoperatively during full anesthetization, there seemed to be no clinical significance (TVL: 7.77 ± 1.29 vs 7.18 ± 0.76, $p < 0.001$) (Table 2). Furthermore, the comparative outcomes between pre- and intraoperative POP-Q measurements were illustrated in Fig. 1 for better understanding.

Table 1. Patient demographics and clinical characteristics (n = 98).

Characteristics	Values (n = 98)	
	n	%
Age (y)		
< 60	7	7.1
60-69	22	22.4
70-79	**55**	**56.1**
≥ 80	14	14.3
Mean ± SD	72.08 ± 8.57	
BMI (kg/m^2)		
< 18.5	5	5.1
18.5-24.9	45	45.9
25-29.9	37	37.8
≥ 30	11	11.2
Mean ± SD	25.08 ± 4.42	
Parity		
0	3	3.1
1	6	6.1
2	25	25.5
3	27	27.6
≥ 4	37	37.8
Median (min - max)	3	0 - 10
Mode of delivery		
NL	84	88.4
C/S	11	11.6
Menopause	96	98.0
POP symptom		
Bulge	98	100
LUT symptom		
No symptom	13	13.3
Void difficulty	78	79.6
OAB	3	3.1
SUI	4	4.1
Bowel symptom		
No symptom	63	64.3
Constipation	35	35.7
POP stage		
Stage II	2	2.04
Stage III	51	52.04
Stage IV	45	45.92
Pessary use	20	20.4

Data were presented as mean ± SD, median (min-max), or number (%)

LUT: lower urinary tract, OAB: overactive bladder, SUI: stress urinary incontinence, SD: standard deviation, BMI: body mass index, NL: newborn length, C/S: cesarean section, POP: pelvic organ prolapse.

Table 2. Comparison of pre- and intraoperative POP-Q measurements (n = 98).

POP-Q	Preoperative conventional	Intraoperative instrumental	Mean diff	95% CI		p value	Correlation coefficient (rs)	p value of correlation
	Mean ± SD	Mean ± SD		Lower	Upper			
Aa	2.46 ± 0.92	2.39 ± 0.86	0.07	-0.14	0.27	0.611	0.251	0.013*
Ba	3.99 ± 1.47	4.51 ± 1.81	-0.52	-0.87	-0.17	0.003*	0.506	< 0.001*
C	5.09 ± 2.76	6.03 ± 2.48	-0.94	-1.48	-0.41	< 0.001*	0.567	< 0.001*
D	2.07 ± 3.51	3.17 ± 2.88	-1.10	-1.66	-0.53	0.001*	0.639	< 0.001*
Ap	0.98 ± 2.06	1.69 ± 1.31	-0.71	-1.03	-0.38	< 0.001*	0.626	< 0.001*
Bp	1.49 ± 2.90	2.54 ± 2.22	-1.05	-1.46	-0.64	< 0.001*	0.721	< 0.001*
Gh	4.31 ± 1.10	4.98 ± 0.95	-0.68	-0.86	-0.49	< 0.001*	0.574	< 0.001*
Pb	3.61 ± 0.62	3.35 ± 0.62	0.27	0.11	0.42	0.001*	0.272	0.007*
TVL	7.18 ± 0.76	7.77 ± 1.29	-0.58	-0.84	-0.32	< 0.001*	0.294	0.003*

Data were presented as mean ± SD; Statistical analysis: Wilcoxon Signed Ranks Test and Spearman rank correlation; * statistical significance
POP-Q: pelvic organ prolapse quantification, SD: standard deviation, CI: confidence interval, TVL: total vaginal length

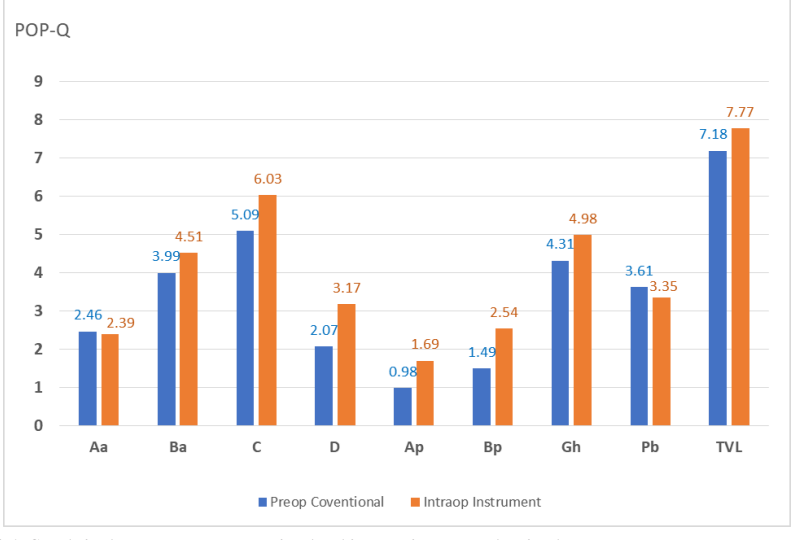

Fig. 1. Correlation between preoperative conventional and intraoperative instrumental assisted.
POP-Q: pelvic organ prolapse quantification, TVL: total vaginal length

When interpreting POP-Q measurements in terms of overall POP stage, two-thirds of the patients (64 out of 98; 65.30%) remained in the same stage, including 34 of stage III and 30 of stage IV, during intraoperative instrumental traction. Of the remaining one-third, 19 patients demonstrated up-staging while 15 patients down-staging (Table 3).

All patients underwent vaginal hysterectomy and concomitant procedures to correct the identifiable compartmental defects. Total colpocleisis was performed for non-sexually active women diagnosed intraoperatively with stage III-IV all-compartmental prolapse. High uterosacral vault suspension was conducted for those having at least stage II apical descent who wished to retain coital activity. Finally, anterior colporrhaphy and/or posterior colpoperineorrhaphy was carried out to correct cystocele and/or rectocele.

Table 3. Comparison of pre- and intraoperative POP stage (n = 98).

		Intraoperative instrumental		Total
		stage 3	stage 4	
Preoperative conventional	stage 2	0 (0)	2 (2.04)	2 (2.04)
	stage 3	34 (34.69)	17 (17.35)	51 (52.04)
	stage 4	15 (15.31)	30 (30.61)	45 (45.92)
Total		49 (50)	49 (50)	98 (100)

POP: pelvic organ prolapse

Discussion

Results from our study significantly demonstrated more prolapse severity in almost all POP-Q measurements (point Ba, Ap, Bp, C, D, GH, and PB) when POP-Q examination was performed using intraoperative cervical traction compared with the outpatient Valsalva maneuver. The findings corresponded with those of several previous studies[5, 7-8] which evaluated the outcomes of preoperative and intraoperative assessment of pelvic organ prolapse. Theoretically, this was possibly due to pelvic floor muscle relaxation which resulted from the blockage of pudendal nerve during general or regional anesthesia, leading to (1) reduced vaginal pressure, (2) increased width of urogenital hiatus, and (3) less resistive force to the prolapse on traction[9-11]. On the contrary, there was significant confounding effect of levator co-activation detected by 3D/4D ultrasound during the outpatient Valsalva technique, resulting in lesser extent of prolapse when inappropriate Valsalva was obtained during conventional POP-Q examination[12]. Hence, more attempts of proper and effective Valsalva are required to achieve maximal prolapse[13].

Although there was a significant correlation between point Aa values measured pre- and intraoperatively (correlation coefficient 0.251, p = 0.013), our study failed to demonstrate changes in Aa measurements (Aa: 2.39 ± 0.86 vs 2.46 ± 0.92; p = 0.611) when performing POP-Q examination under cervical traction. With the fixed urethral length and its distal end being embedded in the perineal membrane, point Aa which represents the location of the bladder neck, therefore, cannot be substantially pulled down during cervical traction, resulting in non-significant difference when compared between the two techniques.

When investigating in terms of overall POP stage, only 19.39% (19 out of 98) of the patients demonstrated more prolapse severity or up-staging during intraoperative POP-Q examination. This was similar to the result of Krissi et al[7] who reported increased stage in 12% of their study population. The explanation for this is that as many as 96 out of 98 recruited patients (97.96%) readily manifested with advanced stage prolapse, including 51 (52.04%) of stage III and 45 (45.92%) of stage IV. Hence, POP up staging during intraoperative instrumental traction could only be found in those previously diagnosed with stage II (2 out of 2) and stage III (17 out of 51) prolapse. Those preoperatively diagnosed with stage IV prolapse could either remain in stage IV (30 out of 45) or become demoted to stage III (15 out of 45). Preoperative use of vaginal pessary to relieve bulge symptom and voiding difficulty during the waiting period prior to reconstructive surgery may have provided partial pelvic support and be responsible for the unchanged and down-staging of prolapse when performing intraoperative POP-Q examination.

Conclusion

POP-Q examination performed at the outpatient setting during strong cough or maximal Valsalva relatively provided less prolapse severity when evaluating in terms of POP-Q measurements (Ba, Ap, Bp, C, D, GH, and PB) compared with the examination

performed during intraoperative instrumental traction after full anesthetization. However, no significant difference was found when measuring point Aa. Therefore, patients diagnosed with pelvic organ prolapse who are scheduled for pelvic reconstructive surgery should be thoroughly counseled of all possible surgical options and be informed that the preoperatively planned surgical procedures may be opted or modified upon intraoperative POP-Q measurement outcomes.

Potential conflicts of interest

The authors declare no conflicts of interest.

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