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Perioperative changes in superficial Pelvic Organ Prolapse Quantification system measurements after prolapse surgery

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Synopsis: Posterior repair was associated with significant improvements in perineal body length at 2 and 8 months' follow up, and genital hiatus length at 2 months' follow up.

Abstract

Objectives: To evaluate the values of perineal body (PB) and genital hiatus (GH) before and after posterior repair. We also evaluated the introital surface area (ISA)—a sum of transverse and longitudinal GH measurements.

Methods: This secondary analysis of a prospective case series included 94 women undergoing posterior vaginal prolapse surgery at a consultant urogynecology clinic between October 4, 2011, and October 2, 2014. Patients were examined in clinic using the Pelvic Organ Prolapse Quantification system with Valsalva maneuver, and in theatre pre- and postoperatively with traction.

Results: Immediately postoperatively, a statistically significant change (all $P<0.001$) was noted for GH (mean difference –0.59 cm), PB (–0.56 cm), and ISA (–0.87 cm) compared with preoperative measurement. This effect was maintained for GH (–0.42 cm) and PB (–0.40 cm) at 2 months' follow-up (both $P<0.001$), and for PB alone (–0.43 cm; $P=0.04$) at 8 months. ISA had a moderate correlation with GH ($r=0.55$).

Conclusions: Posterior repair significantly improved PB length at months 2 and 8, and GH length at month 2. ISA did not correlate with prolapse stage. Changes in GH were not maintained beyond postoperative month 2.

1 INTRODUCTION

The Pelvic Organ Prolapse Quantification (POP-Q) system is commonly used to assess prolapse stage. Besides six intravaginal measurement points and total vaginal length, the tool includes two external landmarks: the genital hiatus (GH) and perineal body (PB) lengths.[1] There is no consensus regarding the clinical role of these landmarks in the management of pelvic organ prolapse (POP). PB has poor association with prolapse stage, whereas larger GH seems to be linked with prolapse greater than stage three, possibly due to pelvic muscle injury.[2] A GH of 3.75 cm or more appears to be associated with apical support loss.[3] Additionally, the rate of recurrent anterior vaginal wall prolapse is higher in patients with a wider genital hiatus.[4] On the other hand, an increase in PB and a decrease in GH length could be used as measure of the extent of perineorrhaphy.[5] A sum of GH and PB measurements with a cutoff of 7cm is associated with higher prolapse grade and levator ani muscle avulsion on Valsalva.[6,7]

Changes in the above measurements following vaginal POP surgery have not been fully evaluated and their role in the long-term outcomes of POP surgery is unknown. The aim of the present study was to evaluate anatomical changes of the external POP-Q landmarks and determine how GH and PB measurements change after posterior vaginal repair and perineorrhaphy. Additionally, we aimed to calculate changes in the introital surface area (ISA), hypothesizing that it could be a surrogate measure of capacity of the vaginal introitus.

2 MATERIALS AND METHODS

This was a secondary analysis of data from a prospective case series, which was registered with the local audit department (audit registration 1511). The primary analysis compared the assessment of POP using the POP-Q system with Valsalva maneuver and intraoperative measurements with mechanical traction.[8] No ethics committee approval or informed consent was required for this study, since it represented an audit of our standard practice.

The present study included 100 consecutive women attending a consultant urogynecology clinic at St George's Hospital, London, UK, between October 4, 2011, and October 2, 2014, and subsequently undergoing posterior vaginal repair and/or perineorrhaphy as part of vaginal prolapse surgery. Women not having a posterior vaginal repair were excluded. Six of the 100 women included were excluded from analysis due to incomplete data collection, meaning data were assessed for 94 women. Patients were assessed using the POP-Q system with Valsalva maneuver in the left lateral position. The POP-Q points Aa, Ba, Ap, Bp, C, and D were repeatedly assessed pre- and post-procedure under general anesthesia, in the lithotomy position, with mechanical traction. Total vaginal length, GH, and PB were measured without traction. All POP-Q points were measured in centimeters using a ruler. The maximum extent of prolapse was confirmed in the clinic during the third maximal Valsalva maneuver,[9] or intraoperatively using an Allis clamp applied to the relevant POP-Q point and performing mechanical traction until no further descent occurred. All measurements were documented to the nearest 0.5 cm. Additionally, ISA was measured by multiplying the longitudinal and transverse distance of the area obtained between two 90º London retractors (internal part 25 mm wide and 50 mm long) inserted in the vagina and retracted anteriorly and posteriorly at the time of examination. ISA was measured only pre- and postoperatively under general anesthesia, to ensure adequate capacity of the vaginal introitus following repair. All patients were followed up postoperatively in the outpatient department, where measurements apart from ISA were repeated.

The primary outcome measure was the difference between GH, PB, and ISA measurements pre- and postoperatively, and at 2 and 8 months' follow-up. This was assessed using paired Wilcoxon signed-rank test. The ISA was not recalculated at follow-up visits because use of London retractor is not part of routine outpatient assessment. The secondary outcome measure was the correlation between ISA and all POP-Q measurements assessed using Pearson's correlation test. All sets of parameters were obtained from patient's clinical notes and entered into a Microsoft Excel 2007 database. Statistical analysis was performed with IBM SPSS version 21.0 (IBM Corp; Armonk, NY, USA). $P<0.05$ was considered statistically significant.

3 RESULTS

Table 1 shows demographic characteristics of included women and the surgical procedures performed. The mean age of patients was 60.7 years and most were white. The initial median follow-up time was 61 days (range 43–96), when measurements were documented in 87 patients. The second median follow-up time was 238 days (range 177–313), when measurements were available for 44 patients.

A statistically significant mean difference was noted between pre- and postoperative measurements of GH, PB, and ISA (Table 2). All measurements improved postoperatively. The mean PB increased and GH measurement decreased, both by approximately 6 mm, while the ISA value decreased by 9 mm. However, the initial success deteriorated over time (Table 3). Although PB and GH had a statistically significant better measurement at 2 months' follow-up, only PB change remained significant at 8 months follow-up. The distribution of GH, PB, and ISA measurements pre- and postoperatively, and at 2 months' follow-up, is shown in Table 4.

There was no statistically significant correlation between ISA and prolapse stage among the majority of POP-Q points. The small exceptions were mild to moderate correlations of ISA with GH measurements pre- and postoperatively, and composite GH and PB measurements postoperatively (Table 5).

4 DISCUSSION

In the present study we aimed to determine how GH and PB measurements change after posterior compartment repair, and to investigate the potential role of ISA in assessment and management of POP. We demonstrated a statistically significant change in perioperative measurements of GH, PB, and ISA, which was maintained at follow-up visits. Both PB and GH measurements improved postoperatively, although with slight deterioration of GH measurement at midterm follow-up. The ISA measurement was not correlated to the state of prolapse at follow-up visits.

The perineal body is considered to be short if less than 3 cm and long if greater than 5cm, with values between limits deemed normal[10]. The mean preoperative PB in our study (3.01 cm) was at the lower limit of normal. However, considering the standard deviation, this would label at least half of patients as having deficient perineum. This finding is consistent with previous data.[5,11] A significant increase in PB was noted postoperatively, with the effect maintained at 8 months. The mean PB length slightly decreased at the second versus the first follow-up visit; however, it still remained higher than preoperatively.

Similarly, preoperative values of GH decreased postoperatively and the effect was maintained to some extent at the second follow-up visit, albeit non-significantly. This loss of significance can be explained by initially increased PB values, which then decreased over time. Here, the undiagnosed levator ani muscle trauma could also be a contributing factor.[6]

We evaluated the role of ISA change as a representation of introital capacity—a different measure from introital length determined with the GH landmark. The ISA demonstrated no statistically significant correlation with most POP-Q points apart from GH measurement and its derivative composite GH and PB. This can be explained by the fact that ISA describes a similar anatomical area with GH. However, ISA measurement had a significant difference between preoperative and postoperative measurements shifting measurement distribution towards smaller values post-operatively. Previous studies demonstrated that a GH greater than 5 cm was associated with higher failure rates of prolapse surgery of up to 35% at 5 months' follow-up.[12] In our study, in some cases GH increased after the operation, but none to more than 5 cm. In most of these cases the PB increased in size. No studies to our

knowledge have investigated the role of ISA in diagnosis and management of POP, which prevents comparison with our findings.

Although ISA does not appear to be associated with stage of prolapse, it could be a useful tool in the assessment of operation efficacy and possibly predicting failure in the future. We could not evaluate this hypothesis, since none of our patients had a recurrence of prolapse at 8 months' follow-up. Moreover, we recognize that some possible confounders may bias the result. It has been demonstrated that levator ani muscle avulsion is associated with a combined GH and PB measurement of more than 8.5 cm.[13] Additionally, we recognize that elastic properties and distensibility of introital and vulval tissue may depend on age, menopausal status, and possibly family genetic ancestry.[14] This should be considered when future research is planned.

A strength of this study was that the cohort of women was assessed and treated using a similar technique by the same group of doctors. Furthermore, a validated assessment of prolapse was used (the POP-Q system). We prospectively collected the data and ensured consistent assessment. This study, however, had several limitations. The major limitation was the high loss to follow-up at the second postoperative assessment. The sample size could be considered overall relatively small, and a larger sample may have produced different results. Introital surface area is not a validated measurement. More than half the patients were lost to midterm follow-up. Some demographic parameters that may affect the results, such as parity and information about mode of previous deliveries, were not recorded. Parity and number of births may affect the degree of descent due to ligament or fascial defects in a different way to in women with prolapse secondary or aging, chronic constipation, or other causes. Information about body mass index would have also been useful.

Future studies could evaluate the associations of the ISA measurements with clinical symptoms, using questionnaires and with other POP surgery outcomes. While assessing the postoperative change in GH, it would be useful to control the confounding role of levator ani muscle status, which could be assessed clinically or using ultrasound. It would also be interesting to compare the changes in GH and PB values after vaginal surgery versus abdominal approach techniques.

In conclusion, the posterior compartment surgery and perineorrhaphy are associated with significant improvement of PB measurement at midterm follow up. GH is associated with significant initial improvement, which diminishes over time. The ISA did not correlate with degree of POP. ISA measurement could be a useful tool in assessment of operation efficacy and potentially predict future failure. However, its diagnostic value is unclear at this stage, compared with GH and PB measurement separately. Further research is required to evaluate the role of the above landmarks further.

AUTHOR CONTRIBUTIONS

CMD contributed to data analysis, data interpretation, manuscript writing, and manuscript editing. MB, NG, and AK contributed to data collection, data management, and manuscript editing. KD contributed to data management, data analysis, manuscript writing, and manuscript editing. YVG contributed to data management, data analysis, and manuscript writing. SKD conceived the study, developed the project, and contributed to data collection, data analysis, and manuscript editing.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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TABLE 1 Patient demographics and procedures performed (n=94)

Demographics and procedures	**Value**[a]
Age, y	60.7 ± 12.9
Race	
White	55 (59)
Asian	8 (9)
Black	7 (7)
Other	5 (5)
Not stated	19 (20)
Weight, kg	74.0 ± 13.6
Procedure type	
Posterior vaginal repair	89 (95)
Perineorrhaphy	94 (100)

[a]Values are given as mean ± SD or number (percentage)

TABLE 2 Differences in measured landmarks[a]

Measurements	No. of patients	Mean difference, cm[b]	*Z* value	*P* value	Mean length change postoperatively, %
GH preoperatively/postoperatively	92	–0.59	–4.88	<0.001	13.5
GH preoperatively/2 months' follow-up	75	–0.42	–3.54	<0.001	9.6
GH preoperatively/8 months' follow-up	41	–0.30	–1.82	0.068	6.8
PB preoperatively/postoperatively	92	0.56	–6.32	<0.001	18.6
PB preoperatively/2 months' follow-up	75	0.40	–3.47	0.01	13.2
PB preoperatively/8 months' follow-up	41	0.43	–2.88	0.04	13.7
ISA preoperatively/postoperatively[c]	84	–0.87	–6.37	<0.001	16.3

Abbreviations: GH, genital hiatus; PB, perineal body; ISA, introital surface area.

[a]Assessed using paired Wilcoxon signed-rank test.

[b]Mean difference between postoperative and preoperative measurements.

[c]ISA was measured only pre- and postoperatively under general anaesthesia, to ensure adequate capacity of the vaginal introitus following repair

TABLE 3 Mean values of GH, PB, and ISA.[a]

		Pretreatment measurement		Post-treatment measurement	
Landmark	**No. of patients**	**Mean, cm**	**95% CI**	**Mean, cm**	**95% CI**
GH in all operated patients	92	4.37 ± 0.89	4.21–4.52	3.78 ± 0.63	3.62–3.93
GH in those attending 2 months' follow-up	75	4.39 ± 0.91	4.21–4.58	3.97 ± 0.75	3.78–4.16
GH in those attending 8 months' follow-up	41	4.42 ± 0.88	4.18–4.67	4.12 ± 0.69	3.88–4.37
PB in all operated patients	92	3.01 ± 0.79	2.84–3.18	3.57 ± 0.85	3.41–3.74
PB in those attending 2 months' follow-up	75	3.03 ± 0.74	2.88–3.19	3.43 ± 0.64	3.27–3.86
PB in those attending 8 months' follow-up	41	2.92 ± 0.73	2.71–3.14	3.35 ± 0.64	3.14–3.56
ISA in all operated patients	84	5.35 ± 0.82	5.18–5.53	4.48 ± 0.85	4.31–4.66

Abbreviations: GH, genital hiatus; PB, perineal body; ISA, introital surface area; CI, confidence interval.

[a]Values are given as mean ± SD, unless indicated otherwise.

TABLE 4 Distribution of GH, PB, and ISA measurements preoperatively, postoperatively, and at 2 month follow-up[a]

	GH			PB			ISA	
Length	**Preoperative**	**Postoperative**	**At 2 month follow-up**	**Preoperative**	**Postoperative**	**At 2 month follow-up**	**Preoperative**	**Postoperative**
2 cm				19	1	3		
3 cm	12	26	0	45	42	41	1	6
4 cm	33	47	64	16	29	33	7	41
5 cm	31	11	15	3	9	3	41	25
6 cm	7	0	0	1	3	0	27	12
7 cm	1	0	0				8	0

Abbreviations: GH, genital hiatus; PB, perineal body; ISA, introital surface area.

[a]Values shown are number of patients.

TABLE 5 Pearson correlation between ISA and POP-Q measurements

	Preoperative correlation		Postoperative correlation	
Measurement	**Correlation coefficient**	**P-value**	**Correlation coefficient**	***P* value**
Aa	0.126	0.252	0.006	0.954
Ap	0.006	0.958	–0.044	0.694
Ba	0.081	0.466	0.022	0.839
Bp	0.032	0.776	0.075	0.491
C	0.177	0.108	–0.113	0.309
D	–0.002	0.990	–0.163	0.143
TVL	0.157	0.154	0.128	0.239
GH	0.498	<0.001	0.5115	<0.001
PB	–0.153	0.165	0.175	0.106
PB+GH	0.296	0.006	0.421	<0.001

Abbreviations: ISA, introital surface area; POP-Q, Pelvic Organ Prolapse Quantification system; TVL, total vaginal length; GH, genital hiatus; PB, perineal body.

[a]Values shown are number of patients.