A Prospective Observational Study of the Classification of the Perineum and Evaluation of Perineal Repair at the Time of Posterior Colporrhaphy

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Objective: The aim of this prospective observational study was to obtain a better understanding of the anatomy and to classify the observed different perineal presentations at the time of posterior colporrhaphy and to describe specific surgical techniques used.

Methods: To classify the observed perineal findings, the Pelvic Organ Prolapse Quantification System with a newly introduced additional measurement of the perineal ridge (PR) was taken intraoperatively and postoperatively in 121 consecutive women undergoing posterior colporrhaphy. Dependent on the preoperative classification of the perineum as being normal (type 1), deficient (type 2), or with a PR (type 3), a specific surgical repair was performed for each type of perineal presentation.

Results: The perineal presentations were categorized into 3 defined groups. Type 1 (normal perineum) was seen in 40%, type 2 (deficient perineum) in 13%, and type 3 (PR) in 47%. A type 1 correlates with prior cesarean section ($P = 0.29$), a type 2 correlates with prior vaginal delivery ($P = 0.05$), and type 3 perineum with prior pelvic floor surgery ($P < 0.0001$). When perineal type–specific surgical techniques were performed, the perineal body length increased postoperatively in type 2 ($P < 0.05$), decreased in type 3 ($P < 0.05$), and remained unchanged in those with type 1 defects.

Conclusions: This study demonstrates that the perineal region can be clearly defined into 3 categories. The distinct perineal presentation correlates with the previous gynecological history. With a specific perineal repair at the time of posterior colporrhaphy, the perineal anatomy can be restored in the short term.

Key Words: perineal presentation, perineorrhaphy, posterior compartment prolapse

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Surgical intervention for pelvic organ prolapse (POP) is undertaken in 13% of women and repair of the posterior vaginal compartment accounts for approximately one third of these interventions.[1] Although there is much written regarding the various surgical interventions for posterior colporrhaphy,[2–4] the presentation of the perineum and the precise surgical techniques to correct perineal defects are poorly described. The perineal body is clinically described as being situated between the distal posterior vaginal wall and the anterior anal wall.[5,6] The longitudinal position of the perineal body is described to extend from the superficial transverse perineal muscle and external anal sphincter reaching to the longitudinal muscle of the rectum with the internal anal sphincter.[6] According to O'Boyle et al,[7] the perineal body in nulliparous women measures 3.1 (0.5) cm.

In women with posterior compartment prolapse undergoing surgical correction with a posterior colporrhaphy, the perineum is frequently described as deficient or torn but can also be intact or scarred.[2,4] Currently, the different types of perineal defects have not been formally described nor clearly defined in the literature of women undergoing surgical correction of posterior compartment prolapse.

The primary aim of this prospective observational study is to obtain a better understanding of the anatomy and characteristics of the perineum at the time of posterior colporrhaphy and to describe and classify the observed different perineal presentations.

The secondary aim of this study was to evaluate the surgical intervention undertaken to restore the normal perineal anatomy.

MATERIALS AND METHODS

Between April and December 2012, consecutive women with symptomatic posterior compartment prolapse of stage 2 or higher according to the Pelvic Organ Prolapse Quantification System (POP-Q),[8] defined as Point Bp of −1 cm or greater from the introitus, and undergoing a posterior colporrhaphy at our tertiary referral urogynecology unit (Royal Brisbane and Women's Hospital, Urogynaecology, Brisbane, Australia) were included in this prospective observational study.

Exclusion criteria were any associated colorectal intervention, those unable to comprehend questionnaires, to return for evaluation, or to give informed consent.

Preoperatively, in the operating room, defined measurements of the female pelvic floor using POP-Q[8] with an additional measurement of the perineal ridge (PR) were taken. The standardized POP-Q system describes the topographic position of 9 vaginal sites. All women were examined under general or regional anesthesia in the supine lithotomy position. The considered static measurements of the POP-Q system of the genital hiatus (GH), the perineal body (PB), and the total vaginal length (TVL) were recorded. In addition to these defined positions, a PR measurement is reported. The term *perineal ridge* is a neologism and is not an acknowledged anatomic measurement. It is introduced to define the different perineal findings. The PR is a measurement performed at the hymeneal ring and describes the distance in centimeters from the midline of the mid-hymeneal ring to the commencement of the posterior vaginal skin on the vaginal side of the PR as distinct from the perineal side (perineal body) as illustrated in Figure 1.

Patients were allocated into 3 groups dependent on the observational examination findings: type 1 are those with a normal perineum classified as PB greater than 2.5 cm and PR less than 1 cm. Those with a PB less than 2.5 cm are classified as type 2 defects according to O'Boyle et al[7] and have a deficient perineum and those with PB greater than 2.5 cm and PR greater than 1 cm are

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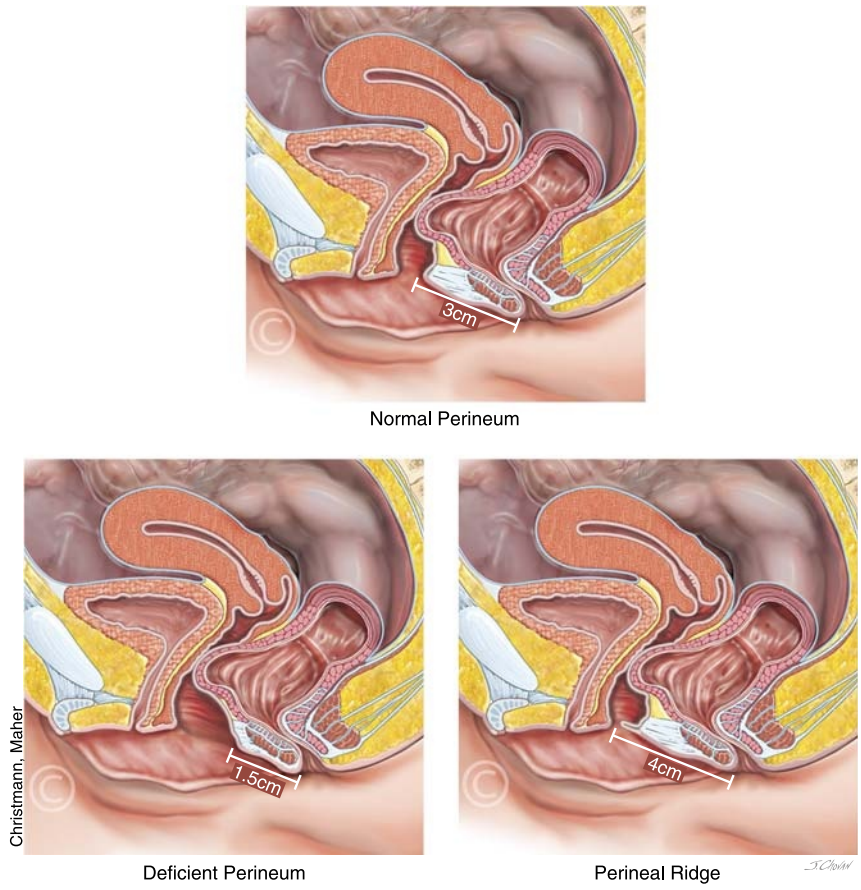

FIGURE 1. Additional PR measurement.

classified as type 3 perineal defects, or PR, as demonstrated in Figures 2 and 3. A PR is greater than 1 cm because small (<1 cm) PRs over small excessive vaginal skin are frequently seen.

After classification of the type of the perineal presentation, a specified surgical approach was used for each of the 3 groups to allow restoration of normal perineal anatomy to be included in a standard posterior colporrhaphy as demonstrated in Figure 4 and described subsequently.

In all cases, 20 mL of 0.25% Marcaine and adrenaline was injected into the perineum and posterior vaginal mucosa.

For Those With Normal Perineum (Type 1)

A 3-cm to 4-cm horizontal incision was made on the vaginal introitus. The vaginal mucosa was then opened in the midline to the vaginal apex using metzibaum scissors. A midline fascial plication of the rectovaginal fascia was performed from the apex of

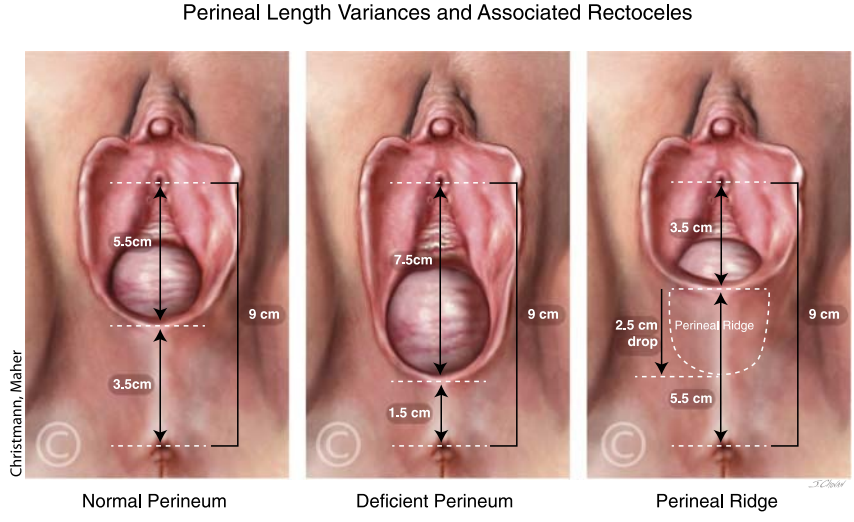

FIGURE 2. Side view of the perineal measurements of the 3 types.

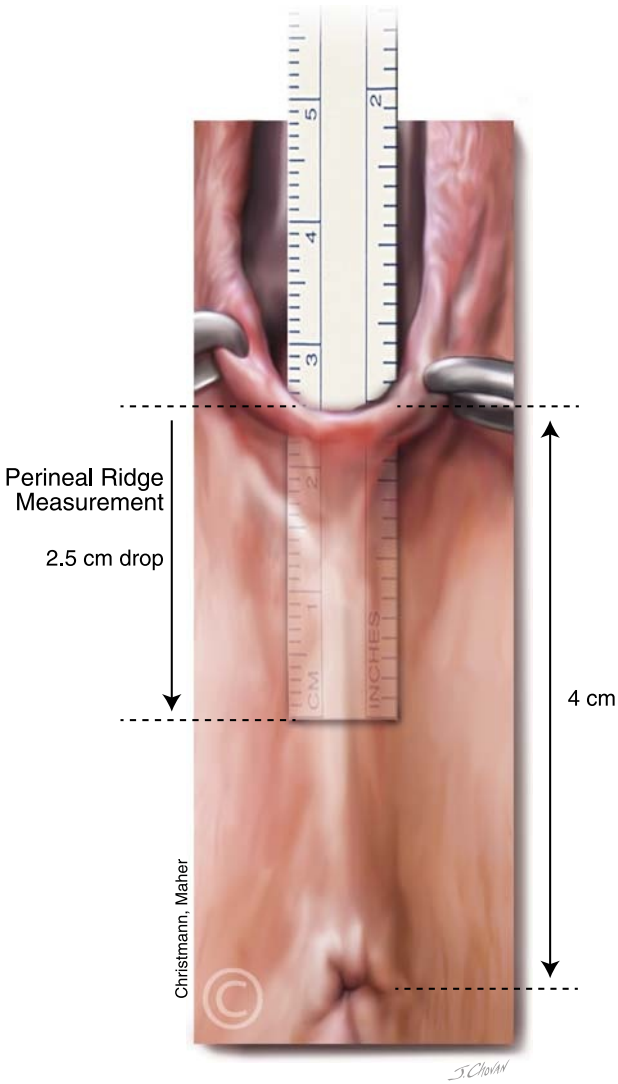

FIGURE 3. Frontal perineal view measurement of the 3 types.

the vagina to the introitus using a continuous 2.0 polydioxanon (Ethicon, Somerville, NJ) suture as previously described.[2] The vaginal mucosa was closed using a continuous 2.0 vicryl (Ethicon) suture to the introitus and the vaginal mucosa reapposed to the anterior perineal skin with a subcuticular 3.0 monocryl (Ethicon) suture as seen in Figure 3a.

Deficient Perineum (PB <2.5 cm) (Type 2 Defect)

A diamond-shaped area of vaginal and perineal mucosa was excised that was 3 to 4 cm wide at the introitus. The perineal incision extended close to the anal verge and vaginal tip of the diamond extended 2 to 3 cm into the vagina. The posterior repair was performed as previously described. The perineum was reconstituted with 2 layers of interrupted 2.0 vicryl sutures. The deep sutures[2,3] secured the deep transverse perineal muscles and the second layer of sutures apposed the more superficial perineal tissue. The vaginal mucosa was closed with a continuous 2.0 vicryl suture, and the perineal skin apposed with a continuous 3.0 monocryl as seen in Figure 3a.

Type 3 Perineal Defect (PB >2.5 cm and PR <1.0 cm): (PR)

A midline vertical incision was made into the PR until the distal point of the posterior vaginal wall was reached, leaving a u-shaped incision on the perineal skin. The posterior vaginal wall and repair was performed as previously mentioned. The perineum was reconstituted using 2 layers of 2.0 vicryl interrupted sutures as described for type 2 defects. The perineal skin was closed in a horizontal subcuticular 3.0 monocryl suture as seen in Figures 4 and 5.

The primary and the senior author recorded intraoperatively and 6 weeks postoperatively the objective vaginal assessment findings using POP-Q including the additional assessment point of the PR. To assess the subjective success rate, all women completed preoperatively and 6 weeks postoperatively the validated Australian Female Pelvic Floor Questionnaire (APFQ)[9] that integrates bladder, bowel, prolapse, and sexual function domain and assesses severity and bothersomeness as well as condition-specific quality of life. It consists of 42 questions and the higher the score the more bothersome the symptoms. Asymptomatic or symptomatic superficial dyspareunia or vaginal outlet stenosis were recorded separately before surgery and postoperatively.

At final review, patient satisfaction was evaluated using the Patient Global Impression of Improvement.[10]

The relationship of the 3 categories of perineal defects to the previous mode of delivery and previous vaginal repairs was recorded and subsequently analyzed using *t* test and Pearson χ^2 test.

Results were summarized as the following: mean (standard deviation [SD]) for continuous variables and percentages for categorical variables. The *t* test or analysis of variance test was performed to detect changes between and within the groups. A value of $P < 0.05$ was considered as statistically significant. Because there are no comparable available data in literature for the formal description of the perineum, no sample size was calculated. Therefore, consecutive women undergoing posterior colporrhaphy during the study period were included into this observational study to determine the normal distribution of the 3 different perineal presentations. Data analysis was performed using statistical software SPSS (Chicago, Ill).

The study was supported by a competitive research grant from the Wesley Research Institute of Brisbane (PORC REF2011_04). The study was approved by the Royal Brisbane and Women's Hospital Ethics Committee on November 22, 2010, and written consent was obtained from each patient. The clinical trial has been registered at http://www.anzctr.com.au ACTRN12611000007932.

RESULTS

During a period of 9 months, 121 consecutive women with symptomatic posterior compartment prolapse (≥ stage 2) undergoing a posterior colporrhaphy were identified. All 121 women provided anatomical and functional outcomes preoperatively and 6 weeks postoperatively.

As described in Table 1, when the perineal presentations were classified and categorized as described previously, the most frequent perineal body presentation was type 3 (PR) and accounted for 47.1% (57/121), followed by type 1 (normal perineum) with 40% (48/121), and the least frequent presentation was found with type 2 (deficient perineum) with 13% (16/121). The POP-Q findings with additional PR are summarized in Table 1 and significant differences preoperatively between all the 3 groups were found for PB and PR (0.00 and 0.00, respectively, for all the 3 groups) and for TVL and GH between type 2 and type 3 ($P = 0.03$ and 0.13, respectively).

The demographic characteristics including mode of delivery of the 3 groups are described in Table 2.

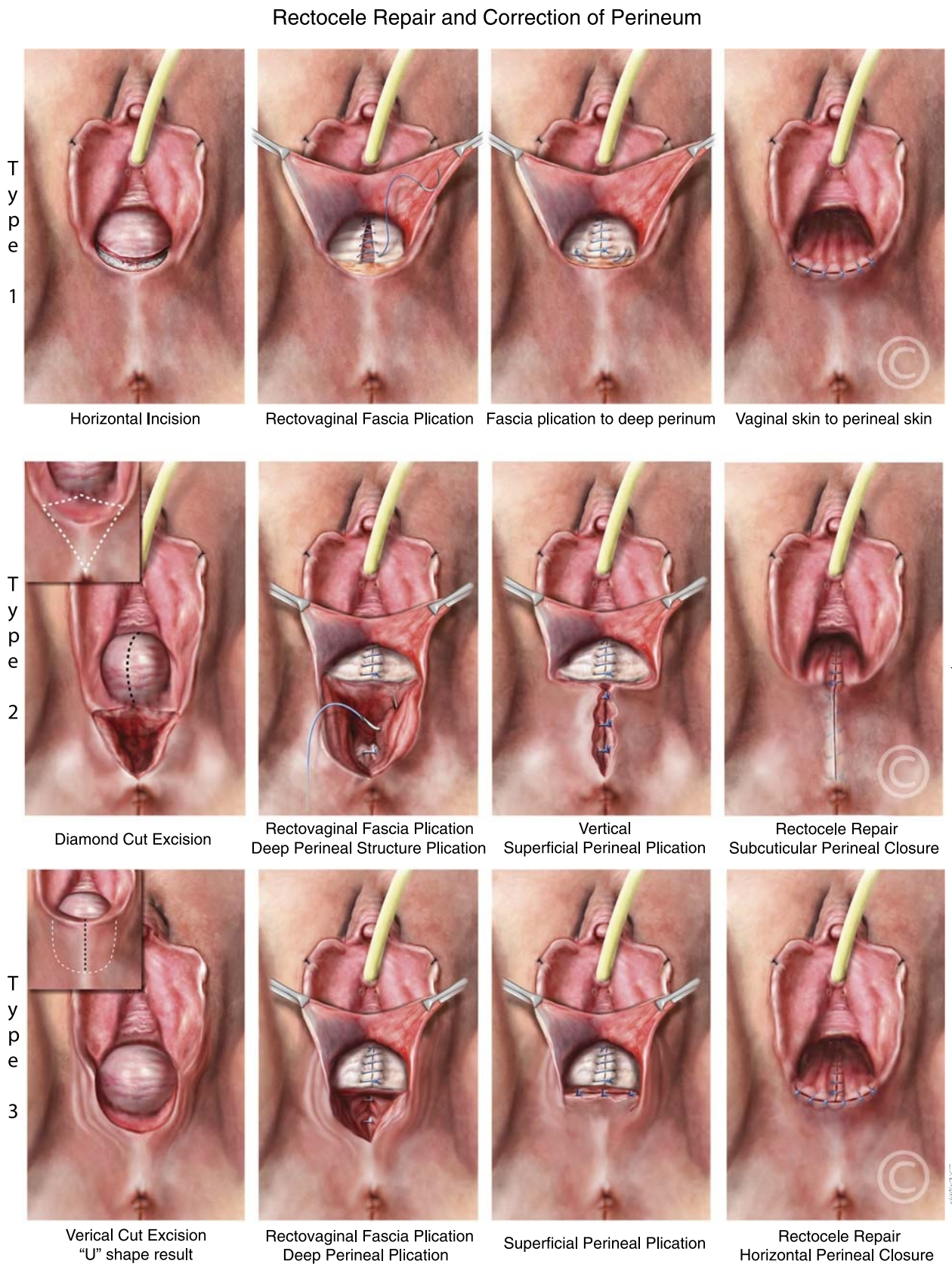

FIGURE 4. Technique of perineal-specific repair at time of posterior colporrhaphy.

TABLE 1. Summary of Preoperative and Postoperative Changes (POP-Q Findings) Between and Within the Groups With Additional Measurement PR

POP-Q Findings	Type 1 n = 48	Type 2 n = 16	Type 3 n = 57	*P*
GH, pre:	3.9 (0.8)	4.2 (1.1)	3.68 (0.9)	*0.25; †0.26; ‡0.13
post:	3.6 (0.7)	3.7 (0.8)	3.51 (0.7)	*0.59; †0.07; ‡0.47
P	<0.05	0.07	0.01	
PB, pre:	3.6 (0.7)	2.4 (0.4)	4.36 (1.045)	*0.00; †0.00; ‡0.00
post:	4.0 (0.7)	3.3 (0.7)	4.21 (0.795)	*0.001; †0.19; ‡0.00
P	0.09	<0.05	<0.05	
TVL, pre:	8.3 (0.8)	8.0 (0.8)	8.6 (0.1)	*0.23; †0.10; ‡0.03
post:	8.5 (0.7)	7.9 (0.9)	8.6 (0.9)	*0.02; †0.29; ‡0.06
P	0.07	0.84	0.5	
PR, pre:	0.00	0.00	2.3 (0.8)	*na; †0.00; ‡0.00
post:	0.00	0.00	0.06 (0.3)	*na; †0.13; ‡0.13
P	na	na	<0.05	

*Type 1 vs type 2; †type 1 vs type 3; ‡type 2 vs type 3
Na indicates not aplicable.

Women with type 1 perineum had undergone significantly more cesarean section as compared with women with type 2 perineum ($P = 0.03$), and those with a type 2 perineum had significantly more vaginal deliveries compared with those with a type 3 perineum ($P = 0.01$). However, those classified with a type 3 perineum had a significantly higher rate of prior pelvic floor surgery as compared with both type 1 (31/57 vs 4/48; $P < 0.001$) and type 2 perineal defects (31/57 vs 5/16/4; $P < 0.001$). Significant correlations between the 3 types were detected for vaginal delivery ($P = 0.05$), cesarean section ($P = 0.29$) and prior POP surgery ($P < 0.0001$) as demonstrated in Table 2. Prior pelvic floor surgeries had been performed in 32% (40/121) and included hysterectomy and repair (n = 17), anterior and posterior vaginal repair (n = 8), vaginal mesh repair (n = 1), posterior repair (n = 4), and mid-urethral slings (n = 10).

TABLE 2. Demographics and Mode of Delivery

Characteristics	Type 1 (n = 48)	Type 2 (n = 16)	Type 3 (n = 57)	*P* < 0.05
Age, y	61.6 (8.0)	57.6 (11.0)	57.7 (11.1)	>0.05
BMI, kg/m^2	26.7 (4.6)	24.9 (5.0)	25.8 (3.8)	*0.21
				†0.29
				‡0.54
Vaginal delivery	2.4 (1.5)	3.0 (1.0)	2.1 (1.2)	*0.17
				†0.28
				‡0.01
				0.05 (PC)
Cesarean section	0.2 (0.5)	0.0 (0.0)	0.2 (0.4)	*0.03
				†0.92
				‡0.01
				0.29 (PC)
Parity, median (range)	2 (0–5)	3 (0–7)	2 (0–7)	*0.27
				†0.45
				‡0.03

Values are presented as mean (SD)
*Type 1 vs type 2; †type 1 vs type 3; ‡type 2 vs type 3
PC indicates Pearson χ^2 test

Statistically and clinically significant changes occurred preoperatively and 6 weeks postoperatively in POP-Q points as demonstrated in Table 1. When perineal type–specific surgical techniques were performed, the perineal body length increased postoperatively in type 2 ($P < 0.05$), decreased in type 3 ($P < 0.05$), and remained unchanged in those with type 1 defects.

The GH length reduced postoperatively within all groups, and these changes were statistically significant in perineal types 1 and 3. Transvaginal lengths remained clinically unchanged postoperatively and between the groups. Statistically and clinically, a significant reduction in PR length was seen postoperatively in type 3 (<0.05) perineal repair.

Functional outcome measurements demonstrated significant improvements of all domain scores of the APFQ with the bladder ($P < 0.001$), bowel ($P < 0.001$), prolapse ($P < 0.001$), and sexual function ($P < 0.001$), but there was no significant improvement in the subanalysis of the dyspareunia rate preoperatively and postoperatively ($P = 0.512$) as seen in Table 3. In total, 72 of the 121 women were sexually active at the time of surgery with 66 women reporting dyspareunia. Patient satisfaction at 6 weeks using the Patient Global Impression of Improvement indicated that 98% (42/43) of those with type 1 perineum, 95% (20/21) with type 2 perineum, and 95% (54/57) with type 3 rated the outcome as "very much" or "much better".

Concomitant surgery included a sacrospinous colpopexy in 80% (vaginal hysterectomy with sacrospinous colpopexy, 46%; sacrospinous hysteropexy, 26%; and sacrospinous colpopexy, 8%) and sacral colpopexy in 11%. Only 9% underwent an isolated posterior repair.

There were no transfusions or visceral injuries in the group.

DISCUSSION

Although significant evidence exists for the management of posterior compartment defects, the anatomy of the perineum in women at the time of undergoing repair for posterior compartment defects is poorly described.[2–4,7] The description of the perineal body and its attachments in anatomical or imaging studies are often not conclusive.[11–13]

TABLE 3. Preoperative and Postoperative Changes of the APFQ

Domain (n)	Mean (SD)	*P*
Bladder pre-post (121)	3.8 (7.1)	0.001
Bowel pre-post (121)	2.3 (4.1)	0.001
Prolapse pre-post (121)	6.9 (3.7)	0.001
Sexual function pre-post (72)	1.2 (3.2)	0.001
Dyspareunia pre-post (66)	0.9 (1.1)	0.51

Post indicates postoperative ; Pre, preoperative.

Some authors suggest that the perineal body should be reconstructed with several horizontal mattress sutures in the soft tissue medial to the pubococcygeus muscle,[14] or a triangular flap of perineal skin should be removed with reapproximation of the subcutaneous skin.[15]

A recent survey of surgeons[16] demonstrated clearly that perineorrhaphy is commonly performed, but significant heterogeneity in surgical techniques exists. Most responders (60%) indicated they reapproximate the bulbocavernosus and the transverse perineal muscle en bloc, and techniques to close the perineal skin varied widely. However, we have not been able to find a recommendation of different perineal interventions dependent on the preoperative perineal architecture.

Firstly, this article describes the anatomical variations of perineal defects observed in 121 consecutive women undergoing posterior colporrhaphy for posterior compartment prolapse.

We were able to classify the different perineal presentations into 3 distinct categories: a normal perineum (type 1), deficient perineum (type 2), and PR (type 3). The findings are interesting, for although many articles on the surgical technique of posterior colporrhaphy refer to correction of a deficient perineum,[2–4] we found that at least 40% had a normal perineal anatomy. This type 1 defect strongly correlated with prior cesarean section, which logically protects the perineum. The classical presentation of a deficient and short perineum was the most infrequent presentation seen in 17% and correlated with vaginal delivery. Most surprising was the type 3 PR defect being the most frequent perineal presentation. In this defect, although the perineal body length is normal, most of the length is only perineal skin without any structural integrity on a deficient perineum. This defect correlates with prior pelvic floor surgery and intimates that this group may actually be those with type 2 deficient perineum that have not been adequately addressed at prior pelvic floor surgeries or childbirth.

The correlation between the different perineal defects and prior mode of delivery and vaginal repairs indicates that the distribution of perineal defects at time of posterior colporrhaphy is likely to vary significantly within practices. The frequency of a deficient perineal defect is likely to increase in areas with high rates of vaginal delivery and in those that have not undergone prior vaginal repair. In communities with high rates of cesarean

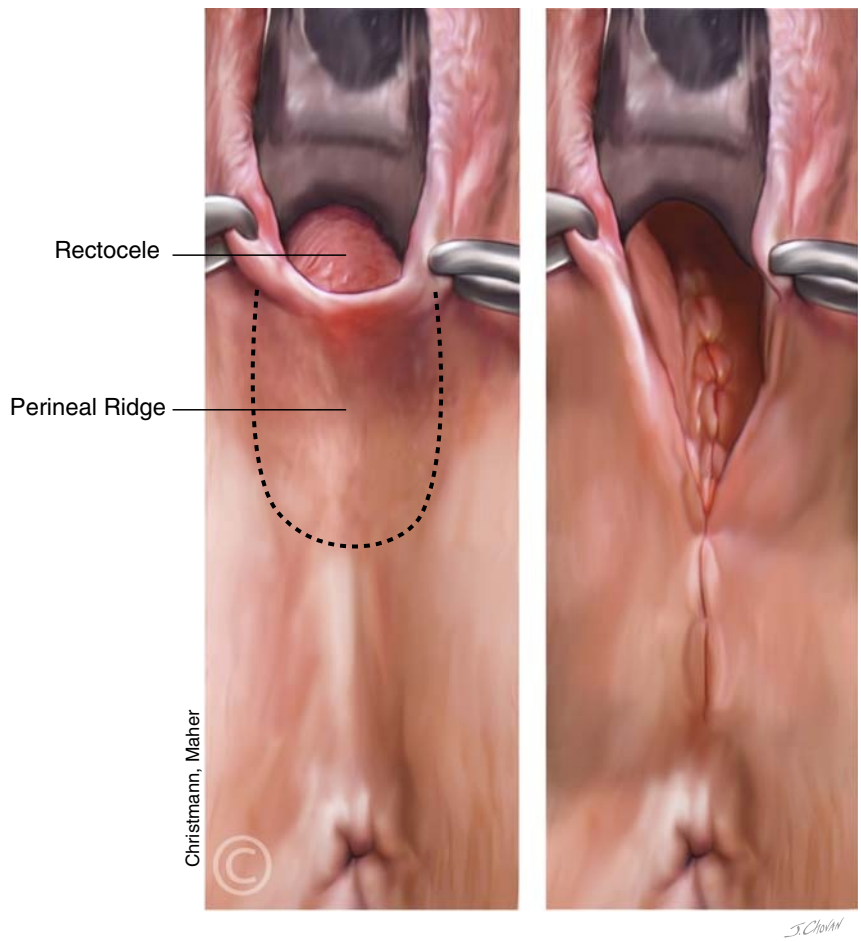

FIGURE 5. Perineal ridge at rectocele repair type 3 perineum.

section, we could expect to see a higher proportion of those undergoing posterior colporrhaphy with a normal or type 1 perineum.

Secondly, this article describes the different surgical techniques used to restore the normal perineum anatomy at the time of posterior colporrhaphy based on preoperative perineal classification into a normal perineum (type 1), deficient perineum (type 2), and PR (type 3). The aim was to obtain in all cases continuity in support between the level 2 fascial plication and the level 3 perineal defect. In the type 1 defect, this simply involves reconnecting the normal perineum with fascial plication. In the deficient perineum (type 2), this involves significant plication of the deep transverse and bulbocavernosous muscles to restore normal perineal body length such that the fascial plication and the perineal repair are continuous. The perineal and vaginal mucosa is then closed in 1 vertical line. In the type 3 defect, although the perineal body length is normal, the structural integrity of the perineum is poor because much of the length is simply redundant perineal mucosa that is detached from the level 2 fascial support. The aim here is retain the perineal body length and to rebuild the perineal body as in the type 2 repair. The closure then involves apposing the vaginal and perineal mucosa as in the type 1 defect.

Postoperatively, PB increased in type 2 (deficient) perineum and decreased in type 3 (PR), demonstrating that using a specific surgical technique for each individual perineal presentation, as seen in Figures 4 and 5, allows reconstitution of a normal perineum at the time of posterior colporrhaphy in the short term.

Furthermore, the posterior colporrhaphy with restoration of the perineum did not result in any shortening of the vagina as measured by TVL in any group.

The deficiencies of the manuscript include the short-term nature of the follow-up and the study being conducted at a single unit. The lack of a comparative group undergoing posterior colporrhaphy without a perineal-specific repair also limits the strengths of the initial observations. A further review with 3-year outcomes is planned.

The strengths include that this is an initial prospective study that formally describes and classifies the different types of perineal anatomy in women with symptomatic posterior compartment prolapse of stage 2 or higher.

We have articulated a specific surgical intervention for each different perineal presentation to ensure restoration of a normal perineum at the time of posterior colporrhaphy. The perineal types correlate with prior obstetric and gynecological history. Recognizing that significant perineal variations exist at the time of posterior colporrhaphy allows the surgeon to plan the surgery to ensure that the perineal anatomy can be restored or retained.

In conclusion, this observational prospective study demonstrates that different surgical techniques based on classification of the perineum can be applied to restore the normal perineal anatomy. However, further long-term clinical evaluation with comparative interventions is required to fully understand the pathophysiology of the perineal body and the lower posterior vaginal compartment.

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