Preoperative Stratification in Pelvic Organ Prolapse: Can POP-Q Measurements Predict Surgical Outcome?

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ABSTRACT

Objective: *The study aimed to determine if a single preoperative objective measure of the Pelvic Organ Prolapse Quantification (POP-Q) system, the Ba, (which represents the distal leading point of the anterior vaginal wall), predicts a successful outcome in patients presenting with ≥ stage 3 pelvic organ prolapse (POP) who undergo a transvaginal repair.*

Methods: *Patients with ≥ stage 3 POP managed with transvaginal mesh implantation were divided into 2 groups based on preoperative Ba measurement (Group 1; Ba = 2-3 cm and Group 2; Ba ≥ 4 cm). An anatomically successful outcome was defined as Ba <1cm.*

Results: *There were 138 women surgically managed between 2009 and 2013 with complete follow-up available on 113 cases (median age 62.5 years; range 42-83 years). The median follow-up period was 29 months (range 8-38 months). Of 89 women with stage ≥ 3 POP there were 39 cases in Group 1 and 50 patients in Group 2. There was a significantly lower postoperative Ba in Group 1 cases when compared with Group 2 patients (-2.61 cm vs. -1.74 cm; P = 0.03). Logistic regression analysis failed to discern any effect on a successful outcome of factors normally responsible for prolapse (age, parity, BMI, prior surgery or operative delivery).*

Conclusion: *A favorable anatomic outcome after transvaginal surgery for POP can be anticipated with a preoperative Ba < 4 cm. Future studies are required assessing the value of the preoperative POP-Q measurements in patients with ≥ 3rd degree POP using different types of surgery.*

Keywords
POP-Q, Anterior wall prolapse, Ba measurement.

Introduction
It is generally accepted that up to 50% of women will develop pelvic organ prolapse (POP) with between 10-20% seeking formal evaluation for this clinical problem [1]. The risk factors for primary POP include parity, a higher BMI, advanced age, the mode of delivery [2-5] and in one series, evidence of unilateral or bilateral levator avulsion [6]. The Pelvic Organ Prolapse Quantification System (POP-Q) was described by Bump et al. [7] and represented the recommendations of the standardization subcommittee of the 1996 International Continence Society (ICS). This method uses 6 defined dynamic points of midline vaginal measurement each located with a reference plane to the hymenal ring, defining both prolapse severity and the leading prolapse site. The POP-Q staging method has been shown to be reproducible [8] and is the most commonly used and most widely reported postoperative classification system which assesses surgical results [9,10].

The POP-Q measurements are traditionally translated into stages (Table 1) with stage 2 POP cases in relation to the hymenal ring defined so as to span a 2 cm. difference in the leading point (i.e. from -1 to + 1cm). By contrast, stage 3 POP patients have a wide measurable range of prolapse of the leading part (i.e. +2 to +7cm). Since there is the presumption that the degree of POP should

correlate with the severity of pelvic floor damage, it is anticipated that preoperative POP-Q measurement should also correspond to a higher likelihood of an unfavorable postoperative outcome. Data confirming such an association are, however, currently lacking where it is accepted that the definition of operative success has been variable [11]. The POP-Q measurements are generally considered important for patient counseling but not for the prediction of surgical outcome. In this respect, stage ≥3 POP is the commonest surgical indication although these patients typically span a wide range of measurable distances of the leading point from the hymenal ring and therefore represent a diversity of pelvic floor injuries. The more severe the soft-tissue damage the more difficult the repair and it would seem intuitive that the greater the preoperative POP-Q measurements the potentially less favorable the postoperative outcome. The aim of this study was to assess the anatomical surgical outcome in an unselected group of women presenting with stage ≥ 3 prolapse managed with the same type of transvaginal surgical technique, separating the cases according to the objective extent (the Ba measurement) of their preoperative anterior vaginal wall prolapse.

Stage	Definition
I	No prolapse
II	The most distal part of the prolapse is > 1 cm above the hymen
III	The most distal part of the prolapse is > 1 cm below the hymen
IV	the most distal part of the prolapse is at least 2 cm less than the total vaginal length.

Table 1: POP Staging based on the POP-Q Grid Measurement.

Materials and Methods

This retrospective study was conducted with the prospective accumulation of data from a cohort of women attending the Division of Pelvic Floor Medicine in Maynei Hayeshua Hospital, Bnei Brak, Israel (a 300-bed Community referral hospital). The conduct of the study was approved by the local hospital ethics committee. Subjects were included in the trial who underwent vaginal surgery using mesh implant for symptomatic stage ≥3 POP between January 2009 and December 2013.

Asymptomatic patients with any degree of POP were not offered surgical correction with all patients provided conservative therapy using a pessary as part of the preoperative consultation. Patients with an increased risk for prolapse recurrence were offered mesh surgery whereas all other patients were scheduled for surgical correction using native tissue options. All participating patients were provided with a detailed explanation concerning vaginal mesh implants and signed an informed consent for surgery. The Unit policy is generally to preserve the uterus if there are no risk factors for uterine malignancy, where in these circumstances a surgical POP repair alone is performed. Patients excluded from analysis were those who had a preoperative symptomatic stage 2 prolapse and those patients with a history of previous mesh reconstructive surgery.

A trained urogynecologist conducted the clinical examination using a Sim's speculum with the patient placed in the lithotomy position and performing a maximal Valsalva maneuver. Each vaginal compartment was assessed in a standardized manner for any defect in pelvic support recording all nine points of the POP-Q system including measurement of the perineal body (pb), the vaginal length (tvl) and the genital hiatus (gh). Attention was focused on the Ba measurement which represents the most distal (i.e. the most dependent) position of any part of the upper anterior vaginal wall (either from the vaginal cuff or of the cervix).

Measurement was also made of the Aa point located in the midline of the anterior vaginal wall 3 cm proximal to the external urethral meatus. The POP-Q was measured before surgery dividing patients into 2 groups. Group 1 included patients with a preoperative POP-Q Ba = 2-3 cm measurement whereas Group 2 included those patients with a pre-operative POP-Q Ba ≥ 4 cm. Comparison between the 2 groups correlated the preoperative Ba measurement with post-operative Ba measurements. Success was defined as a POP-Q Ba measurement < 1 cm in an asymptomatic case.

After surgery, patients were routinely followed up in the clinic and reviewed at 2 weeks and then between 6-8 postoperative weeks. All patients were contacted by telephone and invited to the clinic where POP-Q measurements were made. Demographic data were collected on all patients including age, BMI, parity, comorbidity, a prior or current history of smoking and a previous history of hysterectomy. The surgical procedure was essentially identical in all patients consisting of the insertion of Grade A polypropylene mesh which was anchored at 4 corners of the pelvis by bilateral sutures fixating the mesh to the sacrospinous ligament proximally and with distal anchoring sutures to the obturator membrane.

Statistics

Analysis of data was performed with the SPSS Version 12.0 software package (Chicago, IL). Categorical variables were presented as medians (and ranges) with comparisons made using the Fisher's exact test. A logistic regression analysis was performed in order to determine those factors implicated in a successful outcome (as defined). P values < 0.05 were considered significant.

Results

Over the period there were 138 women surgically managed for POP with vaginal polypropylene mesh. Complete follow-up data were documented in 113 cases (median age 62.5 years; range 42-83 years) with patients considered lost to follow-up when a postoperative examination was either declined or where the patient was unable to be contacted despite several attempts. The median follow-up of the cohort was 29 months (range 8-38 months). Overall, 89 women were diagnosed with Stage ≥3 anterior wall prolapse before surgery (i.e. POP-Q 8 cm > Ba > 1 cm). Of the 89 cases with stage ≥3 POP, 39 were in Group 1 and 50 in Group 2. Within the cohort, 9 women (10.1%) had undergone prior Caesarean deliveries (with 2 undergoing a second Caesarean delivery) and 11 had instrumental deliveries. Basic patient demographic data are shown in Table 2. There were 3 patients (2.6%) with significant intraoperative bleeding (>500 mL) with the need for a laparotomy

in one case in order to secure hemostasis. There were no cases of symptomatic vaginal wall hematomas. In this cohort, 19 women (16.8%) had postoperative mesh erosions, some of which were symptomatic, with 3 undergoing local resection and the remainder responding to topical estrogen therapy. Secondary surgery was performed in 12 patients including one rectocele repair, one case requiring mesh removal for erosion and one laparoscopic abdominal sacrocolpopexy for recurrence with 9 patients undergoing a vaginal hysterectomy and anterior colporrhaphy following their initial vaginal mesh repair. The overall anatomical failure rate (including reoperations for recurrent prolapse) was 14%.

	Group 1 (n=50)	Group 2 (n=39)	P value
Mean Age (years)	62	62.7	0.8
Parity	4.9	5.3	0.82
Mean BMI	27.2	27.3	0.89
Smokers (%)	1 (2)	2 (7.8)	0.61
Coronary Heart Disease (%)	12 (2.4)	13 (3.3)	0.72
Diabetes Mellitus (%)	5 (10)	5 (12)	0.88
Prior Hysterectomy (%)	5 (10)	6 (15)	0.72
Prior POP surgery (%)	0	1 (2)	0.9
Prior operative delivery (%)	5 (10)	6 (15)	0.64
Prior Caesarean Section (%)	4 (8)	5 (12)	0.57

Table 2: Demographic data of the Patient Cohort (n = 89).

Table 3 summarizes the list of surgical procedures and type of implants used showing comparability in both groups. Table 4 shows the POP-Q Ba measurements after surgery. There was a significant difference noted in the mean postoperative Ba measurement between the groups with a lower Ba recorded in Group 1 cases. This finding was unaccompanied by any coincident changes between the groups in either Aa or C measurements. Logistic regression analysis was performed in order to determine the impact of other possible parameters on an anatomically outcome with those factors normally affecting the risk for POP development (age, parity, BMI, previous surgery or operative delivery), exerting no effect on outcome.

Procedure	Group 1 (n=50)	Group 2 (n=39)
SSLF	20 (40)	15 (38)
TVT-O	29 (58)	22 (56)
TVT-RP	7	3
Anterior Mesh Graft	2	-
Augmented Colporrhaphy*		
Anterior Elevate ®	3	3
Anterior Prolift ®	44	36
Anterior Endofast ®	1	-

Table 3: List of Surgical Procedures Performed in the Stage 3 POP cohort.

Legend: SSLF: Sacrospinous ligament fixation, TVT-O: Tension-free vaginal tape – trans-obturator, RP: Retropubic, Elevate: American Medical Systems, Minnetonka MN, Prolift: Ethicon Somerville, NJ USA, Endofast: Allium Medical Caesarea, Israel, *: Customized 4-cornered mesh anchoring (see Materials and Methods).

Parameter value		Group 1 Ba=2-3cm	Group 2 Ba= >4cm	P
Post-Operative	Mean Aa (cm)	-2.63	-2.16	NS
	Mean Ba (cm)	-2.61	-1.74	0.03
	Mean C (cm)	-6.36	-5.3	NS

Table 4: Postoperative POP-Q measurements: Comparison between Group 1 and Group 2.

Discussion

This retrospective study of 89 women undergoing transvaginal mesh repair for stage > 3 anterior vaginal wall prolapse shows that the preoperative Ba measurement (< 4 cm) is a favorable predictor for surgical outcome. Pelvic organ prolapse (POP) is a common problem with a moderate lifetime risk of surgery varying between 6-19% [12]. The need for POP surgery increases with age, with a nearly 50% expected increase over the next 4 decades as the population ages [13]. This represents a substantial economic and social burden with the projected annual cost of surgeries growing at approximately twice the rate of population growth and where presently the direct costs of POP surgery in the United States amount to more than a billion dollars annually [14,15]. Our practice serves a unique group of Orthodox Jewish women where parity is high and where there is an increased population per capita of women presenting with stage ≥ 3 POP and hence an expectedly greater degree of pelvic floor damage.

Patients with ≥ stage 3 POP have a wide POP-Q measurement range reflecting a diverse variety of pelvic floor injuries [16]. The Ba point represents the most distal position of the anterior vaginal wall and the focal point of an anterior wall prolapse repair. The pathophysiology of POP is thought to result from vaginal delivery which damages the connective tissues primarily responsible for pelvic organ support. In this regard the effects are cumulative with increasing vaginal parity compounding connective tissue damage and leading to increasing vaginal descent [17]. The POP-Q score reflects the degree of pelvic floor damage and should be a logical surrogate marker for surgical success. As far as we are aware, this is the first report where a POP-Q measurement within a subcategory of POP cases has been predictive of anatomical outcome. This finding has significance given the standardization of surgery (a 4-corner vaginal mesh fixation) between cases, however, it will require validation in other surgical environments. It is accepted that our focus was on the clinical predictive value of the objective POP-Q measurement before surgery and not as such on the specific success rate of mesh implantation which would traditionally be rated by the level of subjective patient satisfaction [18].

Traditionally, gynecologists will base their decisions concerning surgery upon reported surgical outcome of the different procedures, overall patient satisfaction and the likely postoperative complications. This is particularly the case for anterior vaginal wall prolapse associated with a significant defect of the apical level [19] where decision making regarding the surgical procedure has not been traditionally based on the POP-Q score [20,21]. Our study suggests that acceptable postoperative anatomical outcomes

with different surgical techniques may be judged by the specific preoperative Ba measurement and not by the overall POP stage. This premise will need future validation in larger numbers of patients undergoing a range of surgical approaches. Our study has several limitations one of which is its retrospective design which may have incurred a bias in clinical reporting. Our high parity population may also result in a different outcome when comparing other surgical environments even when a standardized operation has been used.

In this respect, Shalom et al. [22] have reported a complex correlation between parity and POP-Q measurements in women presenting with greater degrees of POP where it appears that it is only before the POP has become symptomatic that parity has any effect on prolapse severity. It is accepted that none of the available grading systems correlate worsening grade with clinical impact and that they do not strictly direct the surgeon as to how best to correct the vaginal position or even when to decide if surgical treatment is indicated [23]. Our aim was to determine if the pre-operative Ba measurement could guide surgical decision making resulting in a better anatomical outcome. The use of anterior vaginal mesh in particular has been associated with a higher apical recurrence rate as opposed to the SSLF procedure where there appears to be more of a risk for a recurrent cystocele [24]. It is also appreciated that the present clinical methods do not sufficiently predict the outcome of specific operative approaches [25,26] particularly where there is no consensus regarding what represents a surgical success. Future prospective work will be required to define whether symptoms relate more readily to the measurable ordinal POP-Q values rather than to a particular POP stage with the most distal point more closely reflecting an anatomical (as opposed to a stage) correction [27].

In summary, the preoperative severity of prolapse in a patient with stage $\geq$ 3 POP as measured by a Ba value of < 4cm predicts the likelihood of a better anatomical outcome following a transvaginal mesh repair. We would suggest that there is merit in redefining stage 3 POP as 1 < Ba < 4 cm and stage 4 POP as Ba $\geq$ 4cm with the determination of outcomes according to an anatomical and a symptom-based measure of success. Further prospective study of a larger number of stage $\geq$ 3 POP patients stratifying cases according to their preoperative POP-Q measurements may better delineate the suitability for surgery and the optimal operation required.

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