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Laparoscopic promontofixation: Where to stop the anterior dissection?

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ABSTRACT

Background: Laparoscopic promontofixation is the gold standard to treat apical defects but the dissection of the anterior compartment is variable since based on surgical judgment only. We therefore evaluate the placement of the anterior mesh using an ultrasonographic measurement after promontofixation.
Design: A prospective cohort study (Canadian Task Force Classification II-1) was conducted between January 2015 and September 2015. 63 women that underwent a promontofixation for prolapse were included. Pelvic floor descent was evaluated with POP-Q. The distance between the bladder neck, and the anterior mesh was measured by ultrasound at the end of surgery. The placement of the mesh was subsequently correlated to the anatomical repair 1 month after surgery, and the occurrence of de novo symptoms as stress urinary incontinence.
Results: Ultrasound permitted to measure the distance between bladder neck and Mesh (BMD = Bladder neck-Mesh Distance) in all patients with variation between repeated measurements ranging for 0.6 to 1.2 mm. The BMD was highly variable from 0 to 13 mm (mean ± SD; 5.3 ± 3.1 mm). The BMD inversely correlated with the difference between C ($P = 0.01$) and Bp ($P = 0.04$) after and before surgery respectively, with the complication rate ($P = 0.01$) but not with the difference of Ba. A BMD of more than 6 mm predicted the absence of post-operative de novo symptoms. De novo" stress urinary incontinence occurred in 23.8%.
Conclusion: BMD can be accurately measured by ultrasound. BMD predicts the apical repair but not the anterior repair. A short BMD predicted postoperative de novo stress urinary incontinence.

Introduction

Promontofixation has become the standard of care for symptomatic anterior and apical prolapse grade 3 and 4. In comparison with a laparotomy, the laparoscopic promontofixation has a lower surgical morbidity, but otherwise similar anatomical and functional results [1,2], similar re-operation rates and similar recurrence rates between 1.7 and 11.5% [3–6].

The meshes used today are wide pore, low weight, non-braided polypropylene meshes since postoperative complications and erosions are less [7]. The technique of promontofixation is still poorly standardized. The fixation of the mesh to the promontory is performed with 1 or 2 non-absorbable sutures, or with Tackers. It is widely accepted that traction on the promontory should not be excessive.

The peritoneum is closed over the mesh with sutures or with staples. The dissection of the posterior compartment varies from the mid-vaginal level to the pubo-rectalis muscle. The dissection of the anterior compartment is judged clinically guided by the idea, 'as low as possible' to prevent recurrences but not too low under the trigone in order to avoid bladder irritation [8].

In our practice, in all cases, we respect the tension free mesh fixation on the promontory, the posterior mesh is fixed on the puborectalis muscle and to the uterosacral ligaments without any tension, and we perform a nerve sparing technique, described since 2014, by identifying the hypogastric plexus and the inferior right hypogastric nerve since the beginning of the surgery avoiding its injury when opening the peritoneum at the level of the promontory and staying medial to the right uterosacral ligament respecting the inferior hypogastric plexus, in order to decreases the functional complications related to these parameters [9,10].

The concept of ultrasound assessment of pelvic organ prolapse is not new. It provides a dynamic evaluation of the pelvic floor [11,12]. Since

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2010, 2D transvaginal ultrasound was used to evaluate mesh retraction after transvaginal insertion [13], and recently 2D and 3D transperineal ultrasound were used also to assess mesh placement after promontofixation, not only to evaluate mesh folding and shrinking [14,15], but also to assess the mesh position on the vagina [23].

The hypothesis

a) Transvaginal ultrasonography is a reliable method for detecting and locating the mesh
b) A deep fixation of the anterior mesh can lead to postoperative complications

Evaluation of the hypothesis

The overall results and recurrence rates of promontofixation are excellent. However, the technical aspects of surgery, such as the degree of anterior and posterior dissection, mesh positioning and traction on the promontory are based on clinical judgment only. Also, their effect on outcome and recurrence rates are limited to common wisdom and experience. The widely accepted "rules" for anterior dissection are limited to 'more is better to prevent recurrences' and 'avoid the trigone to prevent postoperative bladder irritation and incontinence'.

This absence of solid data for the surgical technique might be surprising. However, in the absence of an animal model, randomized controlled trials (RCT) in the human are hampered by ethical concerns preventing to do suboptimal surgery. In addition, considering the excellent overall results and the low complication and recurrence rates, the endpoints to judge a trial will be relatively rare, occurring often after long time.

Moreover, pelvic floor problems and the result of surgery vary besides the surgical technique with age, parity, BMI, menopause, hormone replacement and many others. Hence, it becomes unrealistic to perform a trial with strict inclusion criteria to limit variability, and sufficiently large to take into account all variables.

Despite the need of a referential landmark to locate the mesh and a mesure to standardize the fixation to the vagina the use of ultrasound has been investigated only in recent time. Wong et al described a transperineal approach to locate the more caudal part of the mesh with respect to a line from the inferior margin of the symphysis. He reported a low detection rate of 62% only, especially when the mesh was too cranial. He concluded that a cranial fixation of the mesh results in a higher risk of recurrence, estimated to be close to 7% per mm [23].

However, he didn't evaluate the risk of complication related to a too caudal placement.

The ultrasonographic measurement we propose is based on a transvaginal approach that would be more accurate and increase the detection rate due to the proximity of the probe to the mesh itself.

Furthermore, we decided to change the referential point to plot the measure of the mesh from the one proposed by Wong, based in the inferior margin of the symphysis, to the distance from the bladder neck located thanks to the catheter balloon (BMD = Bladder neck - Mesh Distance). Since this distance increases with the insufflation of the balloon of the bladder catheter and when the bladder is not empty, the distance was measured between the mesh and a plane tangentially below the balloon and perpendicular to the urethra (Fig. 1).

In our hypothesis the use of the balloon over the symphysis is preferable for two main reason, first it can be used also to guide the dissection during the procedure and second it can be taken as a landmark to locate the bladder neck (Fig. 2).

Empirical data

To evaluate our hypothesis, we conducted a prospective cohort study (Canadian Task Force Classification II-1) between January 2015 and September 2015 including women that underwent a nerve sparing laparoscopic promontofixation for genital prolapse. We excluded the women with comorbidities requiring additional surgery such as fibroids and previous abdominal surgery with adhesions, and diseases that may affect recurrence rate or impair postoperative satisfaction such as pulmonary diseases or chronic inflammatory bowel syndrome. We performed at the end of the surgery a transvaginal ultrasound using the vaginal probe to measure the distance between the bladder neck, and the anterior mesh. Of the 63 women included (Table 1) 85.7% had a POP stage 3. The BMD could be measured accurately in all women with a variability between 0.6 and 1.2 mm for BMD's ranging from 0 to 13 mm with a median of 5.5 mm (mean ± SD; 5.3 ± 3.1 mm) (See Table 2).

One month after surgery, 60.3% women experienced a complete recovery of the symptoms related to the prolapse such as bulge or heaviness, with "de novo" urinary incontinence (SUI) in 15 (23.8%) and dysuria in 6 (9.5%) women. BMD inversely correlated with the difference between C ($P = 0.01$) and Bp ($P = 0.04$) after and before surgery respectively, but not with the difference of Ba.

Interestingly, a deeper fixation (shorter BMD) is associated with more postoperative de novo SUI, dysuria, pain and constipation. Women with these complaints had a mean BMD of 4.0 mm versus 6.1 mm in those without ($p = 0.01$). A BMD of more than 6 mm predicted the absence of these postoperative de novo symptoms with a sensitivity of 83% and a specificity of 44% (Fig. 3).

Discussion

Our preliminary data confirm the empirical hypothesis that dissection of the bladder should not be too low. Indeed, postoperative symptoms as de novo SUI, dysuria, pain and constipation increase with a deeper dissection and are rare when the distance to the bladder neck (BMD) is 6 mm or more.

The widely accepted "rules" for anterior dissection are limited to 'more is better to prevent recurrences' and 'avoid the trigone to prevent postoperative bladder irritation and incontinence' resulting in de novo bladder or bowel symptoms strongly correlated with postoperative satisfaction.

The absence of solid data and literature on anterior mesh placement is surprising and it needs to be further investigated to create a standard.

The 2D transvaginal ultrasound resulted to be a suitable tool to assess the mesh placement with a detection rate of 100% and a short variance between repeated measurements.

The finding that a deeper dissection does not improve the anatomical result of the anterior wall seems surprising but is probably due to a small range of BMD that was only 13 mm.

Surgically this is an advantage, as the dissection of the lower part of the vesico-vaginal plane is the most challenging to avoid bleeding and risk of bladder injury. A third argument that bladder dissection should not be too low is that postoperative satisfaction strongly decreases when de novo bladder or bowel symptoms occur.

Consequences of the hypothesis

Proving our hypothesis could open new scenarios for future researches to validate the BMD in accurately evaluating the mesh positioning; it may be used intraoperatively to identify the exact level of fixation to improve postoperative outcome.

If this hypothesis will be confirmed, transvaginal ultrasound and BMD would become a routine examination during and after laparoscopic promontofixation to define the mesh positioning and predict postoperative complications.

In addition, it would be interesting to investigate the correlation between the BMD and the recurrence rate after longer follow-up.

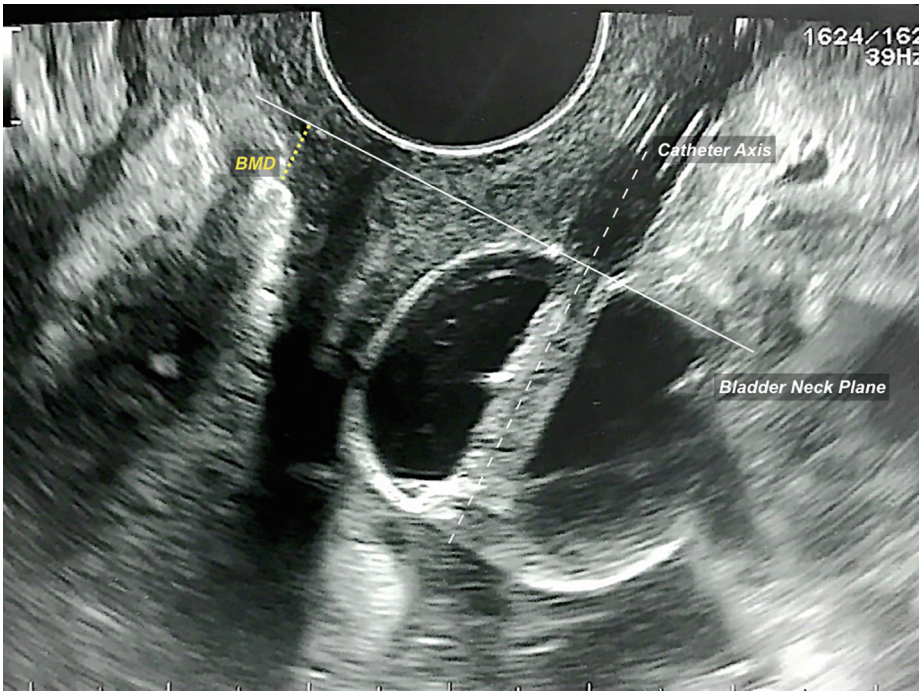

Fig. 1. The scheme represents the method used to assess the Bladder neck - Mesh Distance (BMD, mm) by transvaginal ultrasound.

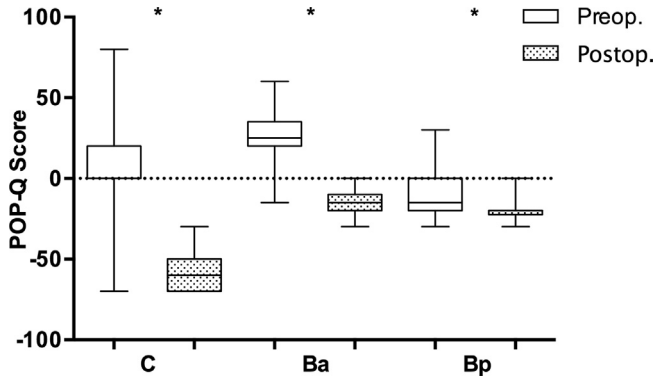

Fig. 2. The graph represents the pre and postoperative POP-Q scores in C Ba and Bp points. (*p < 0.0001).

Table 1
Patients characteristics and surgical details.

Patients characteristics	Total (n = 63) Mean (± SD)/n (%)
Age (years)	64.1 (8.5)
BMI (kg/m^2)	24.7 (3.5)
Mean parity	2.8 (1.3)
Number of vaginal deliveries	
1	11 (17.5)
2	17 (27.0)
3 or more	35 (55.5)
Menopausal status	
No	6 (9.5)
Yes, no HRT	9 (14.3)
Yes, with HRT	48 (76.2)
Smoking status	
No	61 (96.8)
Yes	2 (3.2)
Surgical history	
None	28 (44.4)
Abdominal surgery	16 (25.4)
Laparoscopic surgery	12 (19.1)
Vaginal surgery	5 (7.9)
Other surgeries	2 (3.2)
Preoperative SUI	
No	47 (74.6
Yes	16 (25.4)
Laparoscopic sacrocolpopexy	
Anterior mesh	19 (30.2)
Anterior and posterior mesh	44 (69.8)
Supracervical hysterectomy	
No	58 (92.1)
Yes	5 (7.9)

Conflict of interest

The authors have no proprietary, financial, professional or other personal interest of any nature in any product, service or company.

The authors alone are responsible for the content and writing of the paper.

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Declarations

The study was approved by the ethic committee of Poissy Hospital and the patients agreed to participate in the study.

The manuscript doesn't contain any individual data

The datasets generated and/or analysed during the current study are not publicly available because the property belong to Poissy University Hospital but are available from the corresponding author on reasonable request.

None of the authors have competing of conflict of interest.

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All the authors contributed substantially to the development and the writing of the study, in addition NA and GB designed the study, NA, ACP and CB recruited the patients and collected the data, GC and IA made the statistical analysis, CB and GB were responsible for the surgeries

The authors declare no conflict of interest and that no founding was received

Table 2
Per and postoperative complications according to the Clavien Dindo classification.

Complications (Clavien-Dindo classification)	n (%)
Peroperative complications	0
Postoperative complications	
No complications	38 (60.3)
Grade I	
Pelvic pain	5 (7.9)
Lasting tiredness	1 (1.6)
« De novo » stress incontinence	15 (23.8)
Voiding dysfunction	6 (9.5)
Grade II	
Constipation	13 (20.6)
Iterative urinary tract infection	1 (1.6)
Urinary retention with intermittent catheterisation	1 (1.6)

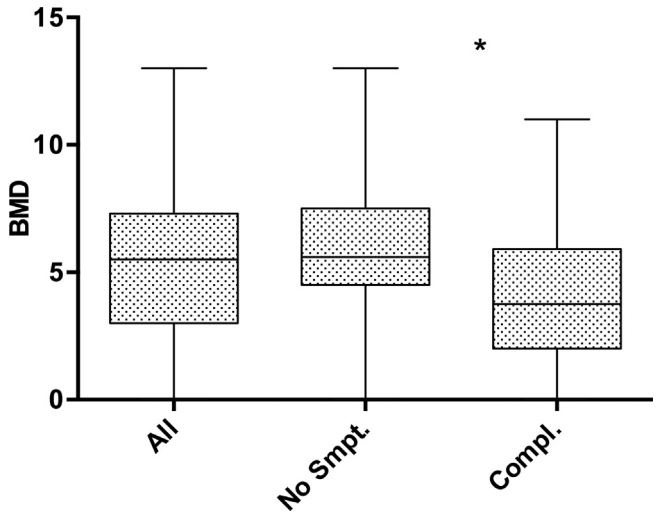

Fig. 3. The figure represents the bladder to mesh distance (BMD) expressed in mm in the totality of cases, in patients without and with postoperative complications. (*p < 0.05).

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