Original Article

Manometric Comparison of Anorectal Function after Posterior Vaginal Compartment Repair with and without Mesh

Shuo Liang[1], Lan Zhu[1], Lei Zhang[1], Zhi-Jing Sun[1], Xu Tao[2], Jing-He Lang[1]

[1]Department of Obstetrics and Gynecology, Peking Union Medical College Hospital, Peking Union Medical College, Chinese Academy of Medical Sciences, Beijing 100730, China

[2]Department of Epidemiology and Statistics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences and School of Basic Medicine, Peking Union Medical College, Beijing 100730, China

Abstract

Background: Although repair augmented with mesh has been proved its priority in anatomical and functional recovery after anterior compartment reconstruction, the data about posterior compartment are scarce. The aim of this study was to compare bowel functional outcome of posterior vaginal compartment repair with and without mesh in patients with pelvic organ prolapse (POP).

Methods: This was a prospective, double-blind, clinical pilot study of 22 postmenopausal women with symptomatic POP (overall POP-quantification [POP-Q] Stage III-IV) who underwent total pelvic floor reconstruction. Patients were grouped according to the use of mesh for posterior vaginal compartment repair: A mesh group and a nonmesh group. POP-Q stage, the pelvic floor impact questionnaire short form-7 (PFIQ-7) and anorectal manometry were evaluated before and 3 months after surgery. Anatomical success was defined as POP-Q Stage II or less. A *t*-test was used to compare preoperative with postoperative data in the two groups.

Results: Totally, 17 (71%) were available for the follow-up. POP-Q measurements improved significantly compared to baseline ($P < 0.05$) in both groups. No recurrence was observed. Subjects in both groups reported improvement in pelvic floor symptoms, and there was no significant difference in the PFIQ-7 score between groups at follow-up ($P > 0.05$). Compared with baseline, the nonmesh group exhibited a statistically significant decrease in anal residual pressure, a significant increase in the anorectal pressure difference during bowel movement, and a reduced rate of dyssynergia defecation pattern ($P < 0.05$).

Conclusions: Provided there is sufficient support for the anterior wall and apex of vagina with mesh, posterior compartment repair without mesh may be as effective as repair with mesh for anatomical recovery while providing better anorectal motor function.

Key words: Anorectal Manometry; Constipation; Mesh; Pelvic Organ Prolapse; Posterior Vaginal Compartment Repair

Introduction

Pelvic organ prolapse (POP) is extremely common, affecting up to 50% of parous women.[1] Unfortunately, treatment of POP is associated with high recurrence rates. A reoperation rate within 10 years of the primary prolapse surgery has been reported as high as 17%.[2] The unacceptable surgical failure rate led surgeons to enforce the native tissue repairs with biological graft or synthetic mesh. Level 1 evidence has proved that the use of synthetic mesh increased the anatomical cure rate in anterior vaginal wall repair but not in posterior vaginal wall repair.[3] Yet, mesh-related complications, including dyspareunia, mesh exposure, and mesh erosion are being reported with increasing frequency and negatively impacted patient quality-of-life. These findings suggest that urogynecologists should make a balance between anatomical cure and patient quality-of-life when using synthetic mesh to repair the pelvic floor. Improvement in patient quality-of-life involves functional recovery, such as improvement of urinary, bowel, and sexual function. However, few studies have looked at the effect of posterior vaginal wall repair with mesh on bowel function.

The aims of the study were to use anorectal manometry to compare bowel function outcome in POP patients who underwent prolapse repair with or without trans-vaginal synthetic mesh in the posterior vaginal compartment and specifically to determine whether the use of mesh was better for retention and improvement of anorectal function.

Methods

Between December 2011 and May 2012, 22 women were referred to our outpatient clinic at the Peking Union Medical College Hospital for trans-vaginal mesh surgical correction

Access this article online

Quick Response Code:

Website: www.cmj.org

DOI: 10.4103/0366-6999.151065

Address for correspondence: Prof. Lan Zhu, Department of Obstetrics and Gynecology, Peking Union Medical College Hospital, Peking Union Medical College, Chinese Academy of Medical Sciences, Beijing 100730, China
E-Mail: zhu_julie@vip.sina.com

of severe symptomatic POP (overall Stage III or IV) using trans-vaginal mesh; all 22 were enrolled in the study.[4] All enrolled patients were postmenopausal with no history of hormone replacement therapy. Exclusion criteria were gynecological pathology in addition to prolapse and previous prolapse surgery or hysterectomy. In addition, patients would be excluded from the study if they had medical conditions, such as diabetes mellitus, hypothyroidism or irritable bowel syndrome that could affect anorectal physiology or cause bowel symptoms. The study was approved by the medical ethics board at the Peking Union Medical College Hospital (S-453). Informed consent was obtained from all patients.

This was a prospective, double-blind, clinical pilot study. Preoperative evaluations included medical history, the POP-quantification (POP-Q) score measured determining prolapse severity, a Chinese validated quality-of-life questionnaire (the pelvic floor impact questionnaire short form-7 [PFIQ-7])[5] and anorectal manometry. Two surgeons performing all the procedures were blinded to the allocation, and another urogynecologist who neither participated in the surgeries nor knew the mesh status achieved anorectal measurements, PFIQ-7 and POP-Q scores pre- and post- operatively. The data were finally collected and analyzed by the investigator who knew the group information.

Anorectal manometry was performed using the Solar GI pressure measurement system (MMS, Enschede, The Netherlands). All anorectal manometry was performed by the same doctor following a standard protocol.[6] The rectum was emptied before anorectal manometry, and the patient was put in the left lateral decubitus position. During the test, a catheter with four water-perfusion channels was inserted into the anus and placed in the zone of the anal canal with the highest pressure. The maximal anal resting pressure (MARP, a function of the internal anal sphincter) and the maximal anal squeeze pressure (MASP) (a function of the external anal sphincter) were measured by asking the subjects to rest for 2 min and voluntarily contract the anal sphincter as long as possible. The subject was then instructed to voluntary bowel movements (straining test) so we could measure intra-rectal pressure and anal canal residual pressure during defecation. While straining to defecate, the maximal intra-rectal pressure (A) clearly exceeded the anal residual pressure (B) in order for a bowel movement to occur, so the pressure difference (ΔP) between A and B reflected defecation physiology. The straining test result was considered a dyssynergic defecation pattern if there was an inappropriate increase or if the relaxation was <20% of the basal resting pressure.[7] The data were displayed on the computer monitor and stored on a PC.

Operative procedures

The senior author performed all POP procedures. The operative methods included posterior compartment repair with or without synthetic mesh along with anterior and apical compartment reconstruction if necessary. The choice of operation method was made based on each patient's POP-Q stage, age, and sexual function, and the patient's preference was considered as well. Based on the use of mesh, the patients were divided into two groups that are, a mesh group and a nonmesh group. In the mesh group, we performed total pelvic floor reconstruction with commercial mesh kits such as total Prolift™ (Ethicon, Somerville, NJ, USA) or Prosima™ (Ethicon, Somerville, NJ, USA). For the nonmesh group, we performed traditional colporrhaphy for posterior pelvic floor, but reinforced the anterior and the apical pelvic floor using the modified pelvic floor reconstructive surgical method[8] or sacrospinous ligament fixation (SSLF).[9] Modified pelvic floor reconstructive surgery is a method for repairing the anterior and apical vaginal wall using two pieces of mesh that are cut from one 15 cm × 10 cm piece of Gynemesh (Ethicon, Somerville, NJ, USA). The surgical procedures were performed as described previously.[8-11] Concomitant total vaginal hysterectomy, midurethral sling, and perineorrhaphy were performed as necessary.

Postoperative follow-up

The same subjective and objective assessments of surgical outcome were repeated 3 months after surgery. Anorectal manometry values were also reexamined, including anal canal resting and maximal squeeze pressures, rectal and anal pressure change during defecation. POP-Q Stage II or a greater prolapse in any compartment postoperatively was usually defined as failure of the procedure. Both surgeon and observer were blinded to the patients' mesh or nonmesh status.

Statistical analysis

Results are reported as mean ± standard deviation (SD). A two-tailed *t*-test was used for comparison of continuous data between posterior repair in the mesh and nonmesh groups. The two-tailed, paired *t*-test was used to calculate probability values for change from baseline to the 3 months postoperative follow-up. A value of $P < 0.05$ was considered as statistically significant. All statistical analyses were performed using statistical software (SPSS version 17.0; SPSS Inc., Chicago, IL, USA).

Results

In this study, 22 patients underwent surgery for POP. Of these, 17 patients were available for a 3 months follow-up examination. The dropout rate was thus 23%. Of the 17 patients, 5 underwent pelvic floor reconstruction with Prosima, 2 underwent using total Prolift, 8 had modified pelvic floor reconstructive surgery, and 2 underwent SSLF. Concomitantly, we performed vaginal hysterectomies in all 17 patients [Figure 1].

Based on whether mesh was used to reinforce the posterior compartment, the subjects were divided into two groups, the mesh group ($n = 7$) and the nonmesh group ($n = 10$). The baseline patient characteristics are shown in Table 1; none of the characteristics were significantly different between the groups ($P > 0.05$ for all comparisons). A total of 3 patients (42.9%) in the mesh group and 5 patients (50%) in the nonmesh group had constipation according to the Rome III criteria.[12]

There were no significant differences between the mesh group and the nonmesh group in terms of the POP-Q measurements and PFIQ scores either at baseline or at the 3 months follow-up. At follow-up, the POP-Q measurements Aa, Ba, Ap, Bp, C, and D had improved significantly in both two groups compared to baseline ($P < 0.05$) [Table 2]. None of the patients in either group showed anatomic recurrence. The PFIQ-7 scores were lower at the 3 months follow-up than at baseline in both groups, but the difference was only significant for the nonmesh group ($P < 0.05$).

The anorectal manometry results are shown in Table 3. For the mesh group, the preoperative maximum anal resting pressure (MARP) and the MAS*P* values were 38.27 ± 19.56 mmHg and 85.29 ± 37.88 mmHg, respectively. For the nonmesh group, the preoperative MARP and MAS*P* values were 39.61 ± 11.36 mmHg and 93.78 ± 20.67 mmHg, respectively. Postoperatively, the MAR*P* value or the MAS*P* value increased slightly from the baseline level in the two groups, but the differences were not significant ($P > 0.05$).

At baseline, the anal residual pressure during defecation was significantly higher than the maximal resting level ($P < 0.05$) for the nonmesh group. Postoperatively, the anal residual pressure had decreased significantly compared with the preoperative level ($P < 0.05$) and became not significantly different from the resting status ($P > 0.05$). There was a statistically significant increase in rectal pressure in the mesh group 3 months after surgery ($P < 0.05$). The postoperative ΔP increased from 8.12 ± 22.19 mmHg to

Table 1: Patient characteristics

Variable	Mesh group ($n = 7$)	Nonmesh group ($n = 10$)	*P*
Age, mean (SD; range), years	65.6 (4.5; 60–73)	65.5 (4.8; 56–73)	>0.05
Parity, median (range)	2 (2–3)	2 (1–3)	>0.05
BMI, mean (SD; range)	24.02 (2.23; 20.70–26.22)	24.09 (2.93; 19.92–30.02)	>0.05
Maximum fetus weight, mean (SD; range), kg	3.81 (0.63; 3.10–4.95)	3.48 (0.60; 2.50–4.30)	>0.05
Constipation	3/7 (42.9%)	5/10 (50.0%)	>0.05
POP-Q stage III or IV of anterior prolapse	7	10	>0.05
POP-Q stage III or IV of uterus	6	9	>0.05
POP-Q stage of posterior prolapse			
I or II	5	9	>0.05
III or IV	2	1	

SD: Standard deviation; BMI: Body mass index; POP-Q: Pelvic organ prolapse-quantification.

Table 2: Objective and subjective measures before and 3 months after surgery

Variable	Mesh group ($n = 7$)			Nonmesh group ($n = 10$)		
	Preop	Postop	*P*	Preop	Postop	*P*
Aa	2.1 ± 1.0	−2.9 ± 0.4	<0.05	2.4 ± 0.5	−2.7 ± 0.5	<0.05
Ba	4.3 ± 1.3	−2.9 ± 0.4	<0.05	4.4 ± 0.8	−2.7 ± 0.5	<0.05
Ap	0.3 ± 2.0	−2.9 ± 0.4	<0.05	−1.1 ± 1.2	−2.8 ± 0.4	<0.05
Bp	1.1 ± 3.4	−2.9 ± 0.4	<0.05	−1.0 ± 1.5	−2.8 ± 0.4	<0.05
C	3.0 ± 3.1	−7.3 ± 0.8	<0.05	2.3 ± 2.8	−6.4 ± 0.7	<0.05
D	−2.1 ± 1.7	-		−2.8 ± 1.1	-	
PFIQ-7	51.7 ± 49.6	12.9 ± 16.9	>0.05	79.5 ± 57.2	23.3 ± 26.0	<0.05

SD: Standard deviation; PFIQ-7: Pelvic floor impact questionnaire short form-7; Preop: Preoperative; Postop: Postoperative (3 months after surgery). Values are reported as mean ± SD.

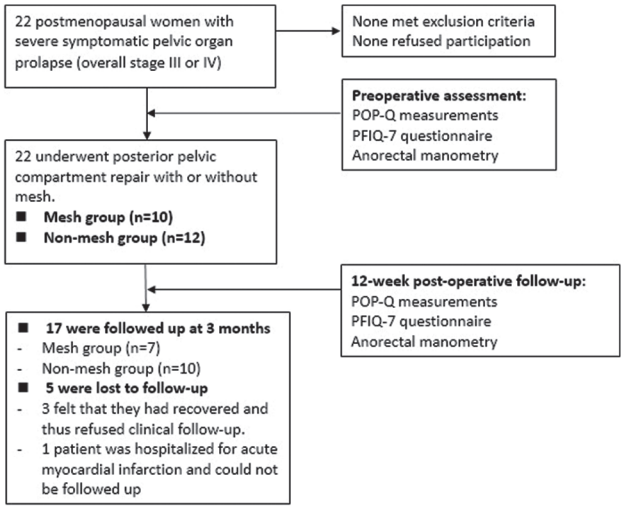

Figure 1: Study flowchart.

Table 3: Anorectal manometry outcomes before and 3 months after surgery

Variable	Mesh group ($n = 7$)			Nonmesh group ($n = 10$)		
	Preoperative	Postoperative	*P*	Preoperative	Postoperative	*P*
Anal sphincter pressure (mmHg)						
MARP	38.27 ± 19.56	45.96 ± 13.92	>0.05	39.61 ± 11.36	44.84 ± 11.41	>0.05
MASP	85.29 ± 37.88	93.86 ± 29.03	>0.05	93.78 ± 20.67	94.00 ± 22.02	>0.05
Anal pressure during voluntary defecation (mmHg)						
Maximal rectal pressure (A)	46.64 ± 6.51	72.61 ± 23.48	<0.05	63.84 ± 11.21	57.18 ± 11.06	>0.05
Anal residual pressure (B)	38.52 ± 24.06	46.89 ± 24.44	>0.05	62.97 ± 25.32*	39.52 ± 20.57	<0.05
Δ*P* = A − B	8.12 ± 22.19	25.71 ± 27.20	>0.05	0.87 ± 25.47	17.66 ± 16.19	<0.05
Dyssynergic pattern (%)	2/7 (28.6)	2/7 (28.6)		8/10 (80.0)	2/10 (20.0)	

MARP: Maximum anal resting pressure; MASP: Maximum anal squeeze pressure; Δ*P*: Anorectal pressure difference during defecation. *$P < 0.05$ compared with preoperative MARP for the nonmesh group.

25.71 ± 27.20 mmHg and from 0.87 ± 25.47 mmHg to 17.66 ± 16.19 mmHg in the mesh and nonmesh groups, respectively; only the difference in the nonmesh group was significant ($P < 0.05$).

Before the surgery, 2 of the 7 patients (28.6%) in the mesh group had dyssynergic defecation and had not improved at all 3 months after the surgery; however, in the nonmesh group, the percentage of patient with defecation dyssynergia decreased sharply from 80.0% (8/10) to 20.0% (2/10).

Discussion

In China, posterior colporrhaphy is considered the standard procedure for correcting the prolapse of the posterior compartment. However, this procedure carries a high risk of failure, especially for advanced POP.[13,14] To date, a number of synthetic meshes have been used in posterior pelvic compartment repair to reinforce the intrinsic tissue defect. Notably, repairs that use synthetic mesh have an 81–97% anatomical success rate at >1-year follow-up[8,10,11] and have lower recurrence rates compared with traditional vaginal colporrhaphy.[3]

Although the evidence shows better anatomical cure of prolapse with the use of synthetic mesh, the short- and long-term functional effects after repair must also be considered in clinical practice as mesh-related complications can develop. Huang *et al*.[11] reported that trans-vaginal pelvic reconstructive surgery using the Prolift™ kit improves urogenital distress inventory-6 scores significantly after a median of 24.5 months of postoperative follow-up. Another study demonstrated that the vaginal repair using the Prosima™ system offers significant improvements in pelvic symptoms, quality-of-life, and sexual function 1-year after surgery.[10] However, a Cochrane review that was updated in 2010 and that included 40 randomized or quasi-randomized controlled trials concluded that there was no improvement in functional and patient-centered outcomes, as measured by validated pelvic floor questionnaires, for anterior compartment repair using polypropylene mesh.[3]

Research related to improved function or improved quality-of-life outcomes after posterior vaginal wall repair is sparse, and very few manometry studies have evaluated anorectal function after POP correction surgery. To our knowledge, this is the first study to compare bowel functional outcome of posterior vaginal wall repair with mesh versus without mesh using both subjective and objective measures. We found that the nonmesh group had a significantly lower anal residual pressure and a significantly increased rectum-anus ΔP postoperatively. These changes suggest that when self-tissue rather than synthetic mesh is used in posterior vaginal wall repair, the anal sphincter could relax more during evacuation, helping the rectum squeeze contents out of the anus and improving defecation coordination toward normal physiology.[15] In the mesh group, however, relaxation of the anus remained impaired after the operation, as there was no significant alteration in anal pressure during defecation. These patients had to increase rectal pressure to compensate in order to maintain the anorectal ΔP and therefore achieve a bowel movement.[15,16] This is why the percentage of patients with defecation dyssynergia decreased sharply from 80.0% to 20.0% in the nonmesh group, while no such decrease was seen in the mesh group. These findings indicate that posterior vaginal wall repair without mesh could improve the anorectal motor function of POP patients better than repair using mesh.

There are two possible explanations for the differences we found between mesh versus nonmesh repairs. First, a bridge repair that reconstructs the posterior vaginal wall using self-tissue has less of an effect on anorectal physiology compared to repair with synthetic mesh, which involves the placement of foreign material into the retro-vaginal space. In fact, some patients in the mesh group complained that they felt incapable of straining during evacuation after undergoing posterior pelvic repair with mesh. Second, the vaginal bridge repair benefited from apical support with mesh even when there was no synthetic mesh to enforce the posterior pelvic floor. These outcomes illustrate Petro's Integrity Theory that there is a complex interplay that is, independence but divergence, among different pelvic compartments and DeLancey levels. The support that was given to the most important level, the vagina apex, was strong and sufficient; therefore, this support indirectly helped reinforce the other levels.

However, our measures did not show corresponding changes in the maximal anal resting pressure and squeeze pressure following anatomical repair, either with or without mesh. Thornton *et al*.[17] and van Tets *et al*.[18] also reported that there is no relationship between preoperative manometry pressure changes and postoperative surgery outcome. Taken together, these data suggest that there are factors other than structural changes that are involved in the development of pelvic floor dysfunction and may further suggest that the anorectal ΔP might be a better index than resting and squeeze pressure for predicting the effects of posterior pelvic floor repair.

Repair with and without mesh both successfully cured POP, and no surgical failure was found in either group at the 3 months follow-up. Furthermore, the PFIQ-7 scores for both groups improved postoperatively, but only the nonmesh group showed a significant change ($P < 0.05$). These results indicate that as long as there is adequate apical/middle compartment support, posterior repair without mesh can achieve the same anatomic recovery as that of repair with mesh, along with better improvement in pelvic floor symptoms. Moreover, repairs without the use of mesh avoid mesh-related complications and provide greater improvement in anorectal function. This is rarely mentioned in other reports, which simply note that these symptoms improve satisfactorily with the use of the Prolift™ and Prosima™ systems.[10,11] One possible explanation for the difference we saw in anorectal function is that subjective symptom improvement does not necessarily mirror changes in objective parameter changes; in addition, mesh exposure or erosion impairs bowel function recovery.

One strength of this study was the use of an objective measure to assess the recovery of bowel function after pelvic floor reconstructive surgery, thus avoiding bias from subjective measures. The major drawbacks are the relatively small sample size and the relatively short follow-up time of 3 months. A larger sample size and/or randomized study with longer follow-up is needed to confirm our findings. In addition, the two study groups were not the same size. Despite the limitations, these objective anatomical and functional data will be useful for physicians to consider when counseling patients about the procedures used to treat posterior vaginal wall prolapse.

In conclusion, as long as there is sufficient support for the anterior wall and apex of vagina with synthetic mesh, posterior vaginal compartment repair without mesh may be as effective as repair with mesh for anatomical recovery while providing better postoperative anorectal motor function and while avoiding mesh-related complications.

References

1. Bradley CS, Zimmerman MB, Qi Y, Nygaard IE. Natural history of pelvic organ prolapse in postmenopausal women. Obstet Gynecol 2007;109:848-54.
2. Denman MA, Gregory WT, Boyles SH, Smith V, Edwards SR, Clark AL. Reoperation 10 years after surgically managed pelvic organ prolapse and urinary incontinence. Am J Obstet Gynecol 2008;198:555.e1-5.
3. Maher CM, Feiner B, Baessler K, Glazener CM. Surgical management of pelvic organ prolapse in women: The updated summary version Cochrane review. Int Urogynecol J 2011;22:1445-57.
4. Abrams P, Blaivas JG, Stanton SL, Andersen JT. The standardisation of terminology of lower urinary tract function. The International Continence Society Committee on Standardisation of Terminology. Scand J Urol Nephrol Suppl 1988;114:5-19.
5. Zhu L, Yu S, Xu T, Yang X, Lu Y, Li B, *et al.* Chinese validation of the pelvic floor impact questionnaire short form. Menopause 2011;18:1030-3.
6. Rao SS, Singh S. Clinical utility of colonic and anorectal manometry in chronic constipation. J Clin Gastroenterol 2010;44:597-609.
7. Pucciani F, Ringressi MN. Obstructed defecation: The role of anorectal manometry. Tech Coloproctol 2012;16:67-72.
8. Zhu L, Lang J, Sun Z, Ren C, Liu X, Li B. Pelvic reconstruction with mesh for advanced pelvic organ prolapse: A new economic surgical method. Menopause 2011;18:328-32.
9. Yazdany T, Wong K, Bhatia NN. Sacrospinous ligament fixation for pelvic organ prolapse in the era of vaginal mesh kits. Curr Opin Obstet Gynecol 2011;23:391-5.
10. Zyczynski HM, Carey MP, Smith AR, Gauld JM, Robinson D, Sikirica V, *et al.* One-year clinical outcomes after prolapse surgery with nonanchored mesh and vaginal support device. Am J Obstet Gynecol 2010;203:587.e1-8.
11. Huang WC, Lin TY, Lau HH, Chen SS, Hsieh CH, Su TH. Outcome of transvaginal pelvic reconstructive surgery with Prolift after a median of 2 years' follow-up. Int Urogynecol J 2011;22:197-203.
12. Rome Foundation. Guidelines – Rome III Diagnostic Criteria for Functional Gastrointestinal Disorders. J Gastrointestin Liver Dis 2006;15:307-12.
13. Carey M, Higgs P, Goh J, Lim J, Leong A, Krause H, *et al.* Vaginal repair with mesh versus colporrhaphy for prolapse: A randomised controlled trial. BJOG 2009;116:1380-6.
14. Paraiso MF, Barber MD, Muir TW, Walters MD. Rectocele repair: A randomized trial of three surgical techniques including graft augmentation. Am J Obstet Gynecol 2006;195:1762-71.
15. Wang Z, Ke M, Sun X, Guo X, Fang X. Effect of anorectal motility and perception on patients with functional constipation (in Chinese). Chin J Dig 2004;24:526-9.
16. Ratuapli SK, Bharucha AE, Noelting J, Harvey DM, Zinsmeister AR. Phenotypic identification and classification of functional defecatory disorders using high-resolution anorectal manometry. Gastroenterology 2013;144:314-22.e2.
17. Thornton MJ, Lam A, King DW. Bowel, bladder and sexual function in women undergoing laparoscopic posterior compartment repair in the presence of apical or anterior compartment dysfunction. Aust N Z J Obstet Gynaecol 2005;45:195-200.
18. van Tets WF, Kuijpers JH. Pelvic floor procedures produce no consistent changes in anatomy or physiology. Dis Colon Rectum 1998;41:365-9.

Received: 25-09-2014 **Edited by:** Li-Shao Guo
How to cite this article: Liang S, Zhu L, Zhang L, Sun ZJ, Tao X, Lang JHL. Manometric Comparison of Anorectal Function after Posterior Vaginal Compartment Repair with and without Mesh. Chin Med J 2015;128:438-42.

Source of Support: Nil. **Conflict of Interest:** None declared.