Transvaginal Use of Monofilament Polypropylene Mesh for Anterior and Posterior Repair: Review of the Literature

Anterior ve Posterior Onarımda Transvajinal, Monofilament Polipropilen Mesh Kullanımı: Literatür Gözden Geçirilmesi

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ABSTRACT Monofilament polypropylene meshes can be used easily and safely in sacrocolpopexy and midurethral sling. These procedures with mesh are the treatment standards. However, there has been debate about the use of meshes in anterior and posterior vaginal repairs. The aim of this article was to investigate the outcomes coming with monofilament polypropylene mesh use in these repairs. MEDLINE was searched for all articles written in English literature from 1990 to April 2013. Reports were collected systematically and all the references were also reviewed. Surgical repair with mesh had higher anatomical cure rates compared with the traditional approaches. However, its complication rates are high in anterior and posterior repair. Erosion rate is 9-17% in anterior and posterior vaginal repairs. Genital atrophy, large vaginal incisions, prior surgical skin damage, diabetes, steroid use, aging, concomitant vaginal hysterectomy, bladder perforation and smoking are the risk factors that may contribute to mesh erosion. Voiding dysfunction, dyspareunia, sexual dysfunction, vaginal wall hematoma, granuloma and de novo stress urinary incontinence may also be associated with mesh surgery. Visceral injuries such as bladder and rectal injuries and necrotising fasciitis are rarely seen complications. In addition, mesh surgery did not improve subjective outcomes or quality of life. There's still an inadequate data to look for the role of transvaginal mesh for apical or posterior vaginal wall prolapse. Adequately powered randomised controlled clinical trials with a longer follow-up period are needed in this era.

Key Words: Surgical mesh; complications

ÖZET Monofilament poliprolen meshler, sakrokolpopeksi ve midüretral sling operasyonlarında standart olarak güvenle kullanılmaktadır. Bununla beraber, anterior ve posterior onarımlarda mesh kullanımıyla ilgili tartışmalar devam etmektedir. Bu derlemenin amacı, monofilamet polipropilen meshler ile yapılan anterior ve posterior onarımların sonuçlarını tartışmaktır. MEDLINE, 1990 ile Nisan 2013 arasında, İngilizce dilinde tarandı ve değerlendirildi. Mesh ile onarımlarda, geleneksel onarıma göre daha yüksek anatomik başarı oranına rastlanmaktadır. Bununla beraber, komplikasyon oranları özellikle mesh ile yapılan anterior ve posterior onarımlarda yüksektir. Bu operasyonlarda mesh erozyonu %9-17 oranında gerçekleşirken, genital atrofi, geniş vajinal insizyonlar, önceki cerrahi hasar, diyabet, steroid kullanımı, ileri yaş, eş zamanlı vajinal histerektomi, mesane perforasyonu ve sigara içiciliği riski arttıran faktörler olarak görülmüştür. Bunun yanında miksiyonda zorluk, disparoni, seksüel disfonksiyon, vajinal duvar hematomu ve de novo stres üriner inkontinans, mesh cerrahisiyle ilişkili komplikasyonlara da rastlanılmaktadır. Mesane yaralanması ve rektal yaralanma gibi visseral hasarlar ve nekrotizan fasit, vaka sunumları olarak bildirilmiş oldukça nadir görülen komplikasyonlardır. Bu olası komplikasyonların yanı sıra, mesh cerrahisinin yaşam kalitesini arttırıcı etkisi gözlenmemiştir. Günümüzde, transvajinal meshin, ön ve arka duvar onarımlarındaki rolü ile ilgili yeterince bilgi yoktur. Bu alanda, hastaların uzun süreli takip edildiği, randomize kontrollü çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Cerrahi mesh; komplikasyonlar

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Pelvic organ prolapse (POP) is a significant problem in females worldwide. In a study, the incidence of uterine prolapse, cystocele and rectocele was found to be 14.2, 34.3 and 18.6%, respectively.[1] The lifetime risk of having surgery for pelvic organ prolapse or incontinence is 11.1%.[2] Traditional vaginal repair of anterior, posterior, or apical prolapse that utilizes the patient's own tissue is a compensatory procedure with high failure rates, and may lead to vaginal shortening and constriction. Furthermore, plication or colporrhaphy techniques on the anterior or posterior walls address only midline defects and fixation of poor-quality tissue under tension may contribute to the high failure rates.[3] Poor surgical technique, advanced level of prolapse, or patient factors including age, hormonal status and chronic health conditions leading to increased intra-abdominal pressure may also be associated with these failure rates. Therefore, the use of synthetic mesh to enhance transvaginal prolapse surgery has gained popularity nowadays.[4,5] The ideal material should be strong, sterile, permanent, nonallergenic, inert and be cost effective. Tolerance of monofilament, polypropylene mesh is excellent and long lasting and its mechanical characteristic is stable. For that reason, monofilament, polypropylene mesh is widely used in pelvic floor reconstruction. Abdominal sacrocolpopexy and midurethral slings with mesh are both known to be extremely effective and widely accepted as the treatment standards. However, high recurrence and complication rates may be seen with the use of mesh in anterior and posterior repairs. The aim of the article was to investigate the outcomes coming with monofilament polypropylene mesh use in these repairs.

We searched the MEDLINE (Pubmed) database between 1990 and April 2013 using the keywords 'polypropylene mesh', 'transvaginal', 'anterior repair', 'posterior repair' and 'complications'.

The main outcomes were the mesh erosions, infections, voiding dysfunction, dysparenuia, vaginal wall hematoma, de novo prolapse and stress urinary incontinence (SUI) symptoms. In addition, visceral injuries and granulomas were also found.

SUCCESS RATES FOR VAGINAL MESH VS TRADITIONAL NATIVE TISSUE REPAIR

Synthetic grafts used vaginally have been shown to have greater cure rates than traditional repairs and type I, soft, macroporous, monofilament, polypropylene mesh seems to be the best-tolerated material up to now. It is reasonable and provides satisfactory results. Although transvaginal mesh use in posterior repair has not been fully accepted, it has been shown that mesh use for anterior wall leads to enhanced anatomic final results despite greater rate of complications comparing to traditional native tissue repairs. However, the addition of mesh may not improve subjective outcomes or quality of life (QoL).

A Cochrane review of surgical management of pelvic organ prolapse showed that traditional repair was associated with more anatomic failure than for polypropylene mesh procedures in anterior vaginal wall prolapse; however, mesh erosions were reported to be 10%.[6] We have no sufficient data for the use of mesh in posterior repair.

COMPLICATIONS WITH MONOFILAMENT POLYPROPYLENE MESH REPAIRS

The studies about transvaginal mesh use in anterior and posterior vaginal repair, and its complications were summarised in Table 1.[7-16]

Although apical repair has proven its success, there has been much debate about the graft use in anterior or posterior repair. Many studies have been done about the use of monofilament polypropylene mesh in anterior and/or posterior compartment prolapse.[10,13,14,17,18] Surgical repair with mesh had higher anatomical cure rates compared with the traditional approaches.[7,17,19] Although enhanced cure rates in comparison to traditional repairs, mesh use for anterior and posterior prolapse may require advanced surgical abilities, dissection of the surgical area may be difficult and may also carry the risk of increased complications. Therefore, Moore and Miklos has recommended the use of vaginal mesh in patients with recurrent prolapse and failed previous procedures, larger prolapse (Stage III or greater), and in elderly patients or those with poor tissue quality (postmenopausal or older).[3]

TABLE 1: Studies that review of the outcomes of transvaginal polyprolene mesh in anterior and posterior vaginal repair.

Journal and year published or presented	Author,location	Participants	Follow up time	Complications and their rates
Int Urogynecol J -2012	Sayer T et al., UK[7]	110 patients; 21 anterior mesh repair, 27 posterior mesh repair, 62 combined mesh repair.	29 months (range 24–34 months)	De novo SUI: 5% Mesh exposure: 9.1%
J Obstet Gynaecol-2012	Bondili A. et al., UK[8]	40 patients; 19 anterior mesh repair, 20 posterior mesh repair, 1 combined repair	27 months (range 20– 36 months)	De novo SUI:5% Mesh exposure: 10%
Int Urogynecol J-2009	Farnaz A et al., USA[9]	127 patients; 74 anterior vaginal mesh repair, 27 posterior vaginal mesh repair, 26 combined anterior and posterior vaginal mesh repair	18.7± 6.1 months	De novo SUI: 18.1% Mesh erosion: 10.2% Vaginal hematoma: 5.5%
Int Urogynecol J-2006	Ali S et al., Singapore[10]	108 patients with grade 3 or 4 cystourethrocele; 54 patients anterior colporraphy with polypropylene mesh repair and 54 patients anterior colporraphy without mesh	6 months	Recurrence: 6.5% in group with mesh,11.6% in group without mesh Mesh erosion: 6.5%
J Obstet Gynaecol Res-2010	Lin TY et al., Taiwan[11]	39 patients underwent anterior and posterior colporrhapy with Gynemesh	18 months	Recurrence: 1 patient Mesh erosion: 1 patient Dyspareunia: 1 patient Prolonged emptying bladder: 2 patients
J. Obstet. Gynaecol. Res-2008	Caquant F.et al,[12]	684 patients; 475: anteroposterior mesh use, 108: anterior mesh use, 101: posterior mesh use	3.6 months (2-18 months)	Retraction: 17.6% in anterior repair; 5% in posterior repair; 11.8% in anteroposterior repair Relapse of prolapse : 7.4% in anterior repair; 4% in posterior repair ; 5.1% in anteroposterior repair De novo SUI: 3.7% in anterior repair; 4% in posterior repair; 6.1% in anteroposterior repair Pelvic cellulitis: 1 patient Perineal abcess: 2 patients Pelvic hematoma: 13 patients 1.9% Visceral injuries: 3 patients
Obstet Gynecol-2007	Hiltunen et al.[13]	107 patients underwent anterior vaginal prolapse repair with mesh.	12 months	Mesh erosion: 17.3% De novo SUI: 23% Recurrence: 6.7%
BJOG-2005	Milani R.et al.[14]	63 patients; 32 patients anterior repair with mesh, 31 patients posterior repair with mesh	17 months	The overall efficacy rate, in terms of anatomical reconstruction: 94%. In anterior repair group, De novo dyspareunia: 4 cases, mesh erosion rate: 13%. In posterior repair group, de novo faecal incontinence: 1 case, mesh erosion rate: 6.5%, pelvic abscess: 1 patient.
Int Urogynecol J-2007	Deffieux X. et al.[15]	138 patients of transvaginal repair of cystocele	32.1 months	Anatomically success rate: 95%. Vaginal erosion rate: 20%.
Int Urogynecol J Pelvic Floor Dysfunct-2004	Hung et al.[16]	38 patients of anterior vaginal wall repair	21 months	Mesh erosion rate: 10.5% De novo SUI: 16.7%

SUI: Stress urinary incontinence.

MESH EROSIONS

It has been known that there is a close relationship between erosion rate and the type of the surgery. Erosion rate was reported to be as low as 2.3% in sacrocolpopexy, while its rate was 9-17% in anterior and posterior vaginal repairs.[10-13,20-22] Genital atrophy, large vaginal incisions, prior surgical skin damage, diabetes, steroid use, aging and smoking are the other risk factors that may contribute to mesh erosion.[23] Furthermore, there is a close relationship between severe mesh retraction and a lack of prosthetic covering from the distal area of the vaginal walls and anterior and posterior vaginal wall prolapse recurrence. It has been hypothesized that, when severe mesh retraction occurs, an essential part from the bladder or rectum (usually distal part) becomes uncovered through the mesh, permitting prolapse recurrence, specifically in cases of weak native tissue.[18]

There's variation within the timing of mesh erosion. The report shows that mesh erosion may occur within 6 days or even 7 years after surgery.[14,24] Concomitant vaginal hysterectomy, bladder perforation, age more than 70 were the risk factors for mesh erosion. Cystocele stage >2 may be a protective factor against mesh erosion.[9,15] Limited dissection with gentle handling of tissue and special focus on hemostasis should be needed to avoid mesh erosion. These would prevent hematoma formation and bacterial colonisation. Peri-operative antibiotic use and the perineal and vaginal antisepsis are preventive factors from infection. There's no evidence that embedding the mesh in antiseptic solution may play a role in infection prophylaxis.[25] The type of the mesh is also important since monofilament polypropylene meshes with large pore size (>75 μm) have been associated with reduced risk of infection.[15,25-27]

VOIDING DYSFUNCTION

One of the most common complications of transvaginal mesh surgery is voiding dysfunction. In a single review, it has been reported that voiding disfunction rate,immediately after surgery, is 28.3%.[9] Age is an important risk factor for this complication. It has been recommended that pelvic floor therapy might be useful to improve the urethral detrusor voiding reflex.[9] In another study, voiding dysfunction is reported to be as high as 34% after the surgery.[28] Although the rate of voiding dysfunction in postoperative period was high, in another study, persistent difficulty emptying the bladder rate was discovered to be 9.8%.[22] Voiding dysfunction, especially occuring in the early postoperative period usually does not require intervention, so this complication can be considered as less important than others.

DYSPAREUNIA

Dyspareunia is another complication associated with transvaginal mesh use. It remains unclear whether dyspareunia is associated with the size, type, site and route of positioning of mesh or through the repair technique.[29] Although its prevalance ranges from 4.6% to 12.5% in the literature, it has been reported that genital pain and impaired sexual function was experienced in 20.8% and 33.3% of women undergoing mesh vaginal surgery respectively.[14,30-34]

Getting concomitant operation might be a confounding risk factor in the development of dyspareunia. The prevalance of de novo dyspareunia was 7.7% in women who had rectocele repair with sacrospinous ligament fixation with polypropylene mesh.[31] Furthermore, it is possible that dyspareunia additionally to defecatory and urinary disorder could be resulted from stiffened vaginal walls.[35] Vaginal epithelium should be excised minimally and also the vagina should be well estrogenized pre- and postoperatively to minimize risk of dysparenuia.[3]

DE NOVO SUI

Signs and symptoms of de novo SUI are also important after the mesh surgery because of its effect on quality of life. Especially, in patients, who had anterior repair with mesh augmentation, de novo SUI appears to be high. It has been reported that de novo SUI exists in 16.7% of women after anterior repair.[16] In another study, de novo SUI rate was 23% who had mesh repair compared with 10% in

patients who had underwent traditional repair.[13] Hiltunen et al. reported that the rate of de novo SUI was 14.4% after 1 year follow up.[22] However, according to Caquant et al., de novo SUI rates were 3.7% in anterior group, 4% in posterior group and 6.1% in anterior and posterior groups.[12]

OTHER COMPLICATIONS

Vaginal wall hematoma should be identified by pelvic exam after the surgery. It has been reported that vaginal wall hematomas were observed in 5.5% of patients who underwent anterior, posterior or combined anteroposterior vaginal repair that were handled conservatively and resolved in 6-8 weeks.[9]

In addition , there are also some other complications with transvaginal monofilament polypropylene mesh use. Fatton et al. reported that the incidence of granuloma was 2.7%.[36] Necrotising fasciitis was seen after the mesh surgery in another study.[37] Visceral injuries are also rare complications. In aforementioned study, bladder and rectal injuries were 1.6% and 1.1% respectively. Other studies reported that visceral injury rates were 3.5% and 6.6%.[19,38] These postoperative adverse events should be kept in mind.

SEXUAL FUNCTION FOLLOWING TRANSVAGINAL MESH SURGERY

The relationship between vaginal mesh surgery and sexual function remains controversial. Bondili et al stated that all sexual function symptoms improved following anterior and/or posterior repair.[8] This may be due to smaller incisions, deeper dissection, tension free placement, flat placement and no vaginal skin excision.[8] In another study it has been suggested that transvaginal mesh surgery does not negatively influence sexual function.[39] Furthermore, it has been claimed that women undergoing mesh had significantly better objective and subjective outcomes at 12 months.[19] However another study has showed that the dyspareunia and the lubrication domains worsened significantly. There was no significant change in other domains; desire, arousal, orgasm, satisfaction and total score.[40]

THE FDA WARNING ABOUT MESH USE IN UROGYNECOLOGY

In 2011, the FDA has warned about the vaginal mesh use in pelvic organ prolapse and stress urinary incontinence. They have stated that: 'it is not clear that transvaginal POP repair with mesh is more effective than traditional non-mesh repair in all patients with POP and it may expose patients to greater risk'. They provide clear guidance to clinicians and patients, which should be adhered to. While, considering the quality of life (QoL), in a double-blind randomized clinical trial comparing transvaginal repair with and without mesh, QoL improved in both traditional and mesh repair groups and did not differ significantly ($p>0.05$).[41]

CONCLUSIONS

There's presently inadequate data to look for the role of transvaginal mesh for apical or posterior vaginal wall prolapse. We think that adequately powered randomised controlled clinical trials with a longer follow-up period are needed in this era.

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