

Polypropylene Mesh in Stress Urinary Incontinence

Liqa R Al-Khuzae, *FICOG*

Dept. of Obstetrics & Gynecology, College of Medicine, Al-Nahrain University

Abstract

Background The pubovaginal sling (PVS) is a safe and durable surgical procedure for stress urinary incontinence (SUI) of all types. Among numerous modifications of the procedure is using synthetic sling material to decrease surgical morbidity and increase long-term success.

Objective To present the results of pubovaginal sling with a polypropylene mesh in women with SUI.

Methods We studied 12 consecutive patients who underwent PVS procedure using polypropylene mesh for SUI between January 2008 and April 2009. Stress urinary incontinence was demonstrated by positive cough test, filling cystometry. Urethral hyper mobility was demonstrated with straining cotton swab ($\geq 30\%$), with different grades of vaginal wall prolapse. Urodynamic study was not performed. All these patients were treated with pubovaginal sling (PVS) with a low-cost polypropylene mesh confectioned by the surgeon. The sling was placed at the level of the proximal half of the urethra and tied with adequate tension, but not obstructing the bladder outlet. Postoperatively, the patients were evaluated at 6-month with a symptom questionnaire, physical examination, and postvoid residual volume determination. Demographic criteria, complications during surgery and post operative period, and subjective cure rate at three months were assessed.

Results Twelve patients with mean age of 55.5 years and median parity of 4 years underwent bladder neck sling surgery using polypropylene mesh. Body weight range was 45-68 kg. No intraoperative or major postoperative complications were reported. Mean duration of surgery was 65.5 minutes (60-120 minutes). Concomitant procedures were performed, including cystocele repair (n= 10) rectocele repair (n=11). Mean duration of hospital stay was 2 days (1-5 days). Ten patients had complete cure of SUI, one patient had significant decrease in the severity of stress urinary incontinence. One patient had persistent SUI.

Conclusions The construction of a pubovaginal sling using a low-cost polypropylene mesh is a safe and effective technique for the relief of SUI. It should be considered an alternative, especially in patients with weak rectus fascia.

Key words stress urinary incontinence; pubovaginal slings; polypropylene

Introduction

Stress urinary incontinence (SUI) is a disorder commonly affecting females of all age groups compromising their quality of life. The bothersome symptoms of SUI adversely affect the social relationships and activities, restrict physical pursuits, impair personal hygiene and lead to avoidance of sexual relationship⁽¹⁾. Several risk factors have been implicated in causation of SUI: weak collagen, age, childbearing, obesity, constipation,

advanced pelvic organ prolapse and chronic obstructive airway disease⁽²⁾. SUI is thought to occur as a result of bladder neck/urethral hypermobility and/or neuromuscular defects⁽³⁾. Neuromuscular defects lead to the intrinsic sphincter deficiency. Pubovaginal slings (PVS) have become standard modality of treatment in last decade after work of Delancy et al who had shown that the anterior vaginal wall acts as a hammock for the vesical neck and urethra⁽⁴⁾. Over last few years many procedures using

autologous material (rectus sheath, fascia lata) or synthetic material (polypropylene, mersilene) have been reported in literature^(5,6). Mersilene was the first synthetic material to be used as pubovaginal sling⁽⁷⁾, while polypropylene has been recently described. The main advantage of the use of synthetic material is avoidance of morbidity of harvesting autologous material and avoids the risk of transmission of an infective disease of cadaveric tissue. Furthermore, they are not biodegradable and the tensile strength does not decrease with passage of time⁽⁸⁾. The main disadvantage of the synthetic material is the risk of erosion of the sling to the vaginal mucosa or urethra and infection^(6,9).

The main indication to use polypropylene mesh is in patients with previous pelvic surgery in which there will be difficulty in preparing flaps from the rectus fascia and also in patients with weak rectus fascia. The aim of the present study was to evaluate the surgical results, intraoperative and postoperative complications in patients with stress urinary incontinence undergoing a pubovaginal sling procedure using a low-cost polypropylene mesh.

Methods

Between January 2008 and April 2009, a total of 12 consecutive women with stress urinary incontinence (SUI) underwent pubovaginal sling procedure with polypropylene mesh in Al-Kadhimiya Teaching Hospital.

Inclusion criteria were primary treatment of stress urinary incontinence (SUI) and showing SUI on filling cystometry without detrusor over activity. Straining Cotton swab $\geq 30\%$ test was used indicating urethral hyper mobility. Urodynamic study was not performed.

Preoperative assessment consisted of recording patient's demographic details, detailed urinary history, and physical examination, vaginal examination to assess for bladder neck mobility, prolapse and obvious incontinence. Neurological examinations and urinalysis were also performed.

Exclusion criteria were recurrent and difficult-to-treat urinary tract infections, significant symptoms of urge urinary incontinence, a history of, or detrusor over activity detected at cystometry, post voiding residual >150 mL, bladder capacity <200 mL, or physical/mental impairment.

The following complications were recorded: excessive blood loss, bladder perforation, urethral lesion, and other intraoperative complications. Postoperative complications that were considered were the need for catheterization >24 hours, postoperative bleeding, retropubic hematoma, wound infection, difficulty in bladder emptying, urinary obstruction, suprapubic pain, mesh erosion, and dysparunia .

All patients were asked to restrict any lifting after surgery and abstinence from sexual intercourse for 12 weeks.

Follow-up:

All patients were asked to come in for a follow-up at the outpatient department 1 week after being discharged. Postoperative outcome variables were assessed at each office visit included SUI symptoms, de novo or worsening urge incontinence, and urinary retention.

Surgical outcome in the continence status was defined at six or more months during follow-up after surgery using a questionnaire assessment reported by patients themselves when patients were interviewed. A patient was classified as cured if she was dry and without urinary complaints. If the patient still suffers from some degree of stress incontinence, she is classified as improved, and failure is registered if urinary incontinence was unchanged or worse. They were also asked about their voiding condition.

The pelvis was examined thoroughly for any vaginal erosion of the sling and a stress test undertaken when the patients had a full bladder.

Operative technique:

The patients were placed in the dorsal lithotomy position allowing free access to the perineum and lower abdomen. Eighteen Fr Foleys was placed in urinary bladder and balloon was palpated at bladder neck. Two lower abdominal transverse incisions 2cm in length on either side of the midline to the abdominal apponeurosis above the upper border of the symphysis pubis were done. Two parts of polypropylene mesh of 10 x 1.5 cm in size were prepared and soaked in gentamicin solution. Saline was infiltrated into the anterior vaginal wall to facilitate dissection.

A midline vertical incision is made in the anterior vaginal wall. This was deep enough to cut through the vaginal skin and pubocervical fascia. Separation of pubocervical fascia from the vaginal skin was done.

A long curved forceps (Robert forceps) was introduced through the sub pubic fossa to bring the tip of the mesh to the vaginal wound. The same procedure is repeated on the other side and the straps of polypropylene mesh were drawn down in to the vagina. Cystoscopy was performed after that to check for any injury in the bladder. The two flaps crossed over each other under the urethrovesical junction and suturing of the mesh to the pubocervical fascia was done. The tension on the sling is avoided by placing a hemostat between the bladder neck and sling. Cutting the excess of mesh and suturing its tip to the rectus fascia was done.

The excess vaginal skin was removed and the vaginal skin was closed by a series of interrupted no. 1 polyglycolic acid. Vaginal pack was inserted. The suprapubic incision was closed with a running 3-0 monofilament suture. Vaginal pack was removed 24hr. after the operation.

Foley catheter was removed morning after the operation and a voiding trial was initiated 4 hours after that and measurement of voided urine volume and catheterization then was performed to assess the post voiding residual

urine volume, If it was less than 50 ml the catheter was removed.

Results

A total of 12 consecutive patients, with a mean age of 55.5 years (range 33-60) and a median parity of 4 (range 1-6) were included in this study. One patient had a history of prior three cesarean sections and another patient had prior one cesarean section. No patient had undergone prior anti-incontinence surgery. The body weight range was 45-68 kg. Two (33.3%) patients were menopausal. The Clinical characteristics of patients are shown in Table 1.

Table 1 Patient's Characteristics

Characteristics	
mean Age (range) years median	55.5 (33-60)
Parity (range)	4 (1-6)
median Vaginal deliveries (range)	2 (0-4)
Body weight (kg)	45-68
menopausal state	2 (33.3%)
Prior cesarean section	2 (33.3%)

Mean operating time was 65.5 min (60-120 minutes). Concomitant surgery was anterior colporrhaphy and colpoperineorrhaphy. The operative data are shown in table 2. There was no bladder or urethral injury. Only one patient have blood loss of about 500 cc from dissection of the retropubic space the haemostasis was ensured with suturing of the bleeding areas.

Table 2. Operative Data

Characteristics	Median	Range
Operation time (min)	65.5	60-120
Hemoglobin change (g/dL)	1.8	0.4-2.7
Hospital stay (days)	2	1-5
Concomitant surgery		
Anterior colporrhaphy (No.)	10	
Colpoperineorrhaphy (No.)	11	

Overall SUI was cured in 10 (83.3%) and improved in 1 (8.3%). One patient had persistence of SUI with at least 6 months follow

up. Overall patient's satisfaction rate was 91.6 % as shown in table 3.

One patient developed difficulty in the initiation and maintenance of voiding following surgery. Post voiding residual urine volume was 50 ml.

Before pubovaginal sling surgery, 3 patients (25%) had urgency, of which urgency resolved in 2 and persisted in 1 after surgery. De novo urgency appeared in one patient (8.3%). Short and long term complications and overall patient's satisfactions are shown in table 3.

Table 3. Complications

COMPLICATIONS	N	%
Bladder perforation	0	0
De novo urgency (transient)	1	8.3
Retropubic hematoma	0	0
Difficulty emptying	1	8.3
Long-term complications	N	%
Urinary obstruction	0	0
Suprapubic pain	0	0
Mesh erosion	0	0
Dyspareunia	0	0
Patients' satisfaction	11	91.6

Discussion

Stress urinary incontinence is a common condition affecting females of all ages. Numerous surgical procedures have been described in literatures for the treatment of SUI, but in last decade there has been increased inclination of urologists towards use of pubovaginal slings. Numerous materials are available for use in PVS - synthetic and autologous^(5,6). The use of these graft substitutes have flourished in recent years. It has been shown that the females suffering from SUI have higher plasma proteolytic activity in comparison to age and sex matched controls, thus use of autologous material to treat SUI becomes questionable⁽¹⁰⁾.

Choosing an artificial sling simplifies the operative procedure, in that the graft is readily available and does not require harvesting from a second operative site. The readiness and ease

of preparation decreases the operative time, patient discomfort and potential postoperative complications. Synthetic materials also bypass the potential problems of inadequate length and strength associated with autologous grafts. Furthermore the synthetic sling is non degradable, tensile strength does not decrease with passage of time and allows tissue ingrowth between the interstices of the mesh⁽⁸⁾.

Studies confirm that the choice of a tension free vaginal tape(TVT) polypropylene mesh allow high success rates and the TVT simplified the SUI therapy, becoming one of most common options for the treatment of this disease^(6,11). Thus, the industry has offered different kits to make the slings, but most of the time the costs are prohibitive for public health systems with few financial resources. Fransberet al and Jung Hun Lee et al also used pubovaginal sling with low cost polypropylene mesh for correction of stress urinary incontinence^(12,13).

In this study, the results for PVS procedure, using polypropylene mesh slings in the treatment of female SUI, are comparable with what has been previously reported in the literature⁽¹⁴⁾. Our results also uphold previous findings that most concomitant urge symptoms can be resolved or improved after a successful sling operation⁽¹⁴⁾. Morgan et al⁽¹⁵⁾ reported a 74% cure rate of preoperative urge incontinence using the PVS procedure. However, they did not find any preoperative variable that predicted the resolution of urge incontinence postoperatively except for concomitant anterior colporrhaphy, which correlated most closely with the resolution of urge incontinence.

Use of polypropylene mesh is yielding encouraging results but major concern remains erosion into the urinary tract. Tying the sutures at the end of the mesh loosely can minimize the erosion. Creation of adequate vaginal mucosal flaps prevents ischemic necrosis of the flaps. We did not encounter any such instance of mesh erosion in any of the patient till last

follow up, while a recent study has shown that the erosion rate with use of the polypropylene mesh is less than 5%^(16,17). These findings correlate well with decreased incidence of infection or urinary retention and our study correlates well with these findings. Also the urethral erosion can be minimized by loosely anchoring the sutures at the rectus sheath level. It also helps in decreasing the incidence of postoperative urinary retention and urgency. Careful dissection of the vaginal epithelium from the endopelvic fascia is important because a dissection which extends too deep will compromise the thickness of the endopelvic fascia. While applying the sling beneath the urethra, the endopelvic fascia acts as a buffer between the sling and the urethra. An adequate thickness of fascial buffer can prevent direct compression of the sling on the urethra, avoiding the eventual development of urethral obstruction or erosion.

There were few steps taken to reduce the infection like removing vaginal pack within 24 hours, soaking the mesh with antibiotic saline and intra-operatively wound was repeatedly washed with antibiotic saline.

Assessment of the outcome of the sling procedure basically depends upon the patient subjective assessment. Our preoperative work up of the patient did not include routine urodynamic testing. Urodynamic assessment of the patient was done in cases where there was history suggestive of detrusor over activity. Our assessment regarding outcome of the procedure was subjective. In immediate postoperative period subjective cure rates was 91%. Jarvis et al had reported a subjective cure rate of 82.4% in their study on use of synthetic slings in treatment of SUI⁽¹⁸⁾. Synthetic slings have been shown to produce durable results both objective and subjective 81.63% and 81.2% respectively in patients with SUI⁽¹⁹⁾.

The present results suggest that polypropylene mesh can be a good sling material for treating female SUI, although the conclusion is tentative, as possible complications of sling infection and erosion of the synthetic sling

from the vaginal epithelium may occur in the long term. Careful dissection of the vaginal epithelium and providing a thick endopelvic fascia buffer between the sling and urethra might prevent these serious complications.

References

1. Futz NH, Burgio K, Diokno AC, Kinchen KS, Obenchain R, Bump RC. Burden of stress incontinence for community dwelling women. *Am J Obstet Gynecol*, 2003; 189(5): 1275-82.
2. Viktrup L. Female stress and urge incontinence in family practice: insight into lower urinary tract. *Int J Clin Pract*, 2002; 56(9): 694-700.
3. Koeble H, Mostwin J, Boiteux JP. Pathophysiology. In: Abrams P, Cardozo L, Khoury S, Weins A, editors. *Incontinence*, 2nd (eds.) Health Publication Ltd: Plymouth UK; 2000. p. 165-201.
4. Delancy JO. Structural support of the urethra as it relates to stress urinary incontinence: The Hammock Hypothesis. *Am J Obstet Gynaecol*, 1994; 170(6): 1713-23.
5. McGuire EI, Lytton B. Pubovaginal sling procedure for stress incontinence. *J Urol*, 1978; 119(1): 82-6.
6. Leach GE, Dmochowski RR, Appell RA, Blaivas JG, Hadley HR, Lubner KM, et al. Female stress incontinence clinical guidelines panel summary report on surgical management of female stress incontinence. *J Urol*, 1997; 158(3): 875-80.
7. Moir JC. The gauze-hammock operation. *J Obstet Gynaecol Br Commonw*, 1968 Jan; 75(1): 1-9.
8. Law NW, Ellis H. A comparison of polypropylene mesh and expanded polypropylene mesh and polypropylene mesh for repair of contaminated abdominal wall defect- an experimental study. *Surgery*, 1991; 109(5): 652-5.
9. Cross CA, Cespedes RD, McGuire EJ. Treatment results using pubovaginal slings in patients with large cystoceles and stress incontinence. *J Urol*, 1997; 158(2): 431-4.
10. Corujo M, Badlani G. The use of synthetic material in the treatment of women with SUI lends strength and disability. *Contemp Urol*, 1999; 11(3):76-80.
11. Rodriguez LV, Raz S: Prospective analysis of patients treated with a distal urethral polypropylene sling for symptoms of stress urinary incontinence: surgical outcome and satisfaction determined by patient driven questionnaires. *J Urol*, 2003; 170(3): 857-63.
12. Rodrigues FR, Filho RM, Marocolo RR, Paiva LC, Diaz FA, Ribeiro EC, et al. Pubovaginal Sling with a Low-Cost Polypropylene Mesh. *Internat Braz J Urol*, 2007; 33 (5): 690-694.
13. Lee JH, Kim KH, Lee HW, Kim KH, Choi JS, Yoon SJ, et al. Distal Urethral Polypropylene Sling Surgical

- Management for Urodynamic Stress Incontinence in Korean Women. *Urol Int*, 2009; 82(2): 191-195.
14. Young SD, Howard AE, Baker SP. Mersilene mesh sling: Short and long term clinical and urodynamic outcomes. *Am J Obstet Gynecol*, 2001 Jul; 185(1): 32-40.
15. Hom D, Desautel MG, Lumerman JH, Feraren RE, Badlani G. Pubovaginal sling using polypropylene mesh and vesica bone anchors. *Urology*, 1998; 51(5): 708-12.
16. Jarvis GJ. Stress urinary incontinence. In: *Urodynamics Principles, Practice and Application*, 2nd (eds.) Edited by AR Mundy, TP Stephenson and AJ Wein. Churchill Livingstone: New York; 1994. p. 299-326.
17. Shah DK, Paul EL, Amukele S, Eisenberg ER, Badlani G. Broad based tension free synthetic sling for stress urinary incontinence: 5 year outcome. *J Urol*, 2003; 179(3): 849-51.

Correspondence to Dr. Liqaa R Al-Khuzae

E-mail: liqaaalkhuzae@yahoo.com

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