Local Hospital Experience of Treating Vaginal Vault Prolapse with Posterior Intravaginal Slingplasty: Intermediate-term Results

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Objective:
To review the efficacy of a minimally invasive surgical procedure, posterior intravaginal slingplasty (IVS), for the treatment of vaginal vault prolapse in a local population.

Methods:
In this retrospective case series, 32 patients with symptomatic vaginal vault prolapse who underwent posterior IVS from June 2003 to June 2007 in the Urogynaecology Unit of Queen Elizabeth Hospital, Hong Kong were reviewed. Cure rate was measured. Patients were considered subjectively cured if they were free of prolapse symptoms. The Pelvic Organ Prolapse Quantification (POPQ) system was used for objective clinical outcome measurement. Urinary symptoms, and short- and long-term complications were also assessed.

Results:
32 cases of posterior IVS were performed during the study period. The median operating time was 62 minutes (range, 31-115 minutes), the median blood loss was 150 ml (range, 50-750 ml), and the median haemoglobin drop was 18 g/l (range, 2-41 g/l). Most patients were able to mobilise on day 1 and discharged on day 5. Apart from the two cases of recurrent prolapse, POPQ system showed that all the parameters of anterior, middle, or posterior compartment were converted from positive values before operation to negative values after posterior IVS ($p < 0.05$). The success rate at median follow-up of 36 months was 93.7%. The first two patients who underwent posterior IVS had recurrent vault prolapse. One case of sling erosion requiring excision was reported. All women did not develop de-novo detrusor overactivity.

Conclusions:
Posterior intravaginal slingplasty is a safe and effective treatment for vaginal vault prolapse in the study population. Long-term results are still awaited.

Introduction

Gynaecologists are seeing more and more cases of pelvic organ prolapse because of the ageing population. By the age of 80 years, approximately 11 to 12% of women need to undergo pelvic floor surgery. In a large epidemiology study[1], one in three women with previous prolapse surgery underwent a second operation within 4 years. The cause of vaginal vault prolapse is multifactorial. Well-known predisposing factors include

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menopause, chronic increase in intra-abdominal pressure in women with obesity or chronic cough, and pelvic floor muscle weakness[2,3]. According to our hospital statistics, there were 13 cases of surgeries for vaginal vault prolapse from 1998 to 2000, compared to 32 cases from 2003 to 2006.

A literature search revealed that more than 40 different operations have been described for vaginal apical support[4]. These included abdominal sacrocolpopexy with mesh, sacrospinous ligament fixation, laparoscopic procedures, intravaginal sling, and vaginal obliteration procedures[5]. It is difficult to compare the cure rate because different definitions were used in the studies. The surgical decision should be individualised for different patients after considering their medical condition, age, and coital function. Two techniques were used more frequently than the others: abdominal sacrocolpopexy and transvaginal sacrospinous ligament fixation. Only few prospective randomised studies have been published comparing these two operations[6,7]. Even though better results were observed in abdominal sacrocolpopexy, complication rates and length of hospital stay did not differ between the two groups. Major complications such as haemorrhage or nerve damage and other life-threatening events were seen in 2% of sacrocolpopexy and 2.5% of sacrospinous ligament fixation. Laparoscopic procedures require higher skills and extensive specialised training, with only a minority of surgeons achieving competence in these methods[8].

A new minimally invasive technique for treating vaginal vault prolapse using a mesh sling called infracoccygeal sacropexy (ICS) or posterior intravaginal slingplasty (IVS) [Tyco Healthcare Group, US] was developed by Pappa Petros in 1997 and results were first published in 2001[9]. The IVS Tunneller Device offers tension-free procedures for stress urinary incontinence and vaginal vault prolapse. The tape used is an 8-mm wide polypropylene multifilament to provide a large surface area for tissue ingrowth. Compared to traditional operations of either abdominal or vaginal approach, posterior IVS has advantages of shorter operating time, less surgical risk, shorter hospital stay, and earlier return to work. It has probably fewer postoperative complications[10]. Since the introduction of this new procedure, several studies evaluating its safety have been published. While a high mesh erosion rate of up to 17%

was observed in a few studies[11,12], a recent prospective multicentre study reported good results with a low risk of mesh extrusion (2.1%)[13]. The aim of our study was to review the clinical outcomes and complications of posterior IVS in the repair of vaginal vault prolapse in our local population.

Methods

Records of all patients with vaginal vault prolapse with posterior IVS performed in Queen Elizabeth Hospital between June 2003 and June 2007 were reviewed. All patients had initial assessment in urogynaecology clinic by either one of the two urogynaecologists who were responsible for performing all the posterior IVS procedures. Patients' demographic data, symptoms, and physical findings were recorded in a standard data sheet. Urodynamic study was arranged if urinary incontinence was present. Patients diagnosed of having urodynamic stress incontinence would undergo concomitant continence surgery together with posterior IVS. Operative details including mode of anaesthesia, operating time, intra-operative blood loss and complications were entered into computer database by our anaesthetists. All patients were followed up routinely at 3 months, 6 months and yearly after the operation.

The primary outcome measure was the cure rate of vaginal vault prolapse. It was objectively measured by the Pelvic Organ Prolapse Quantification (POPQ) system, which was adopted by the International Continence Society to improve intra-observer and inter-observer agreement in 1994. This quantitative grading system measures positions of vaginal structures in relation to hymen. All measurements are made in cm and recorded while the patients are straining. Negative measurements refer to structures above the hymen ring, whereas prolapsed structures below the hymen ring represent positive values. Structures at hymen ring are recorded as 0 cm. There are nine measurements: two anterior, two apical, two posterior, two external and one total vaginal length. These measurements are formatted on a 3x3 board. It can be graded into four stages according to the extent of prolapse relative to the hymen.

POPQ was measured by one of the two urogynaecologists (Figure 1)[14]. Patients were considered cured when all of their symptoms disappeared and the

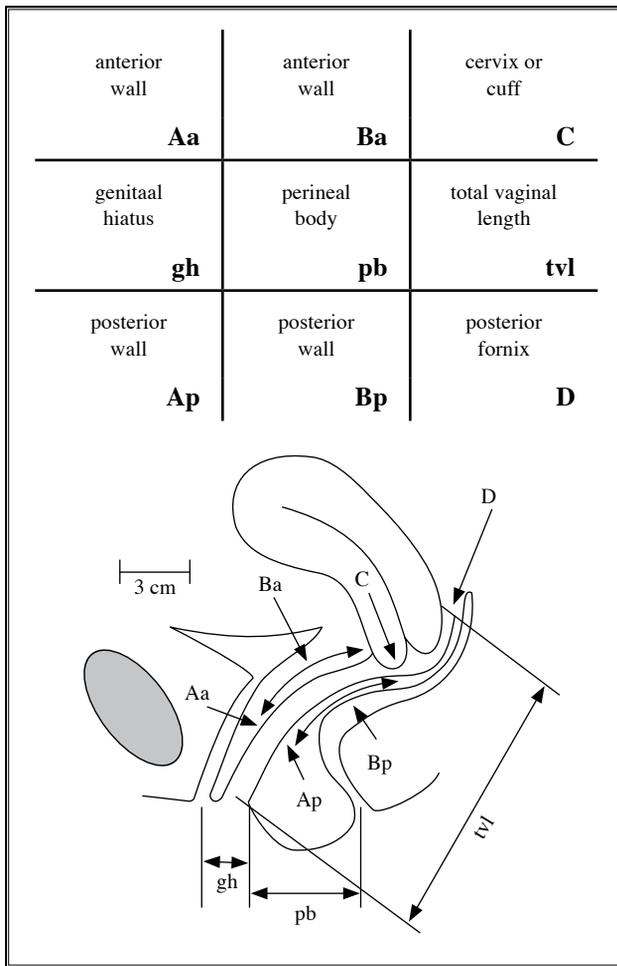| anterior wall **Aa**	anterior wall **Ba**	cervix or cuff **C**
genitaal hiatus **gh**	perineal body **pb**	total vaginal length **tvl**
posterior wall **Ap**	posterior wall **Bp**	posterior fornix **D**

Figure 1. The Pelvic Organ Prolapse Quantification system for pelvic organ prolapse

latest POPQ parameters of anterior, middle, and posterior compartments were of negative values.

Posterior Intravaginal Slingplasty Procedure

All 32 patients had bowel preparation. On the day before operation, only fluid diet was taken. In the evening, one sachet of Klean Prep dissolved in 2 litres of water was given, followed by fleet enema. Prophylactic antibiotics (Zinacef [2nd generation cepharosporin] and Flagyl [Metronidazole]) were routinely given intravenously, one dose immediately before the procedure and two doses after. Two of our experienced qualified urogynaecologists were responsible for all the 32 operations. Standard posterior IVS was either performed alone or combined with pelvic floor surgeries such as anterior or posterior colporrhaphy. If there was coexisting urodynamic stress incontinence, tension-free vaginal tape (TVT) surgery would be performed concomitantly.

All operations were performed as recommended

by the Tyco Healthcare Group, US. The procedures could be performed under general or regional anaesthesia. Patients were put under a lithotomy position, with the vagina adequately exposed by a ring retractor (Lone Star Retractor). The deepest part of vagina was identified as the vaginal apex and was marked with a stitch (Figure 2a). Vaginal vault was pulled down to its lowest point by the Littlewood forceps. A vertical incision was made along the anterior vaginal wall, extending to the apex and posterior vaginal wall. The length of the incision depended on size of the co-existing cystocele and rectocele. Vaginal epithelium was carefully dissected off from the perivesical fascia until the bladder was separated from the anterior vagina. At the posterior vaginal wall, an inverted T incision was made. The vaginal epithelium was lifted up from the underlying rectovaginal fascia (Figure 2b). The underlying rectum could be clearly identified and ischial spines were palpable on both sides. Cystocele, if present, was managed by combined anterior colporrhaphy. Hernia sac of the enterocele was removed. Rectocele, if present, was reduced and repaired by posterior colporrhaphy. The rectovaginal septum was also reconstructed.

Then, a small stab incision of about 5 mm was made on each side of the buttock 3 cm lateral and 3 cm inferior to the anal verge. The IVS tunneller was placed as described in Figure 2c. The rectum was guided away from the operative field by surgeon's finger. This could prevent the rectum from being perforated accidentally. Rectal examination was done routinely to exclude perforation into the rectum. The mesh tape was then threaded through the tunneller by the stylets on both sides. The tape should be carefully handled to keep it lying flat and not twisted (Figure 2d).

The next step was to suture the tape to the vaginal apex which was marked with the stitch. We usually placed two sutures to ensure security and good suspension. Tension was adjusted by tightening the two ends of the tape. The vaginal apex was then pulled upwards to the uppermost position. One loosely applied anchoring stitch was put subcutaneously at both stab wounds of the buttock in order to prevent tape retraction. Redundant tape was cut at both ends. Rectal examination was repeated to ensure no perforation or excessive tension on the rectum. Vaginal skin incision was closed with delayed absorbable sutures. A suction drain was inserted
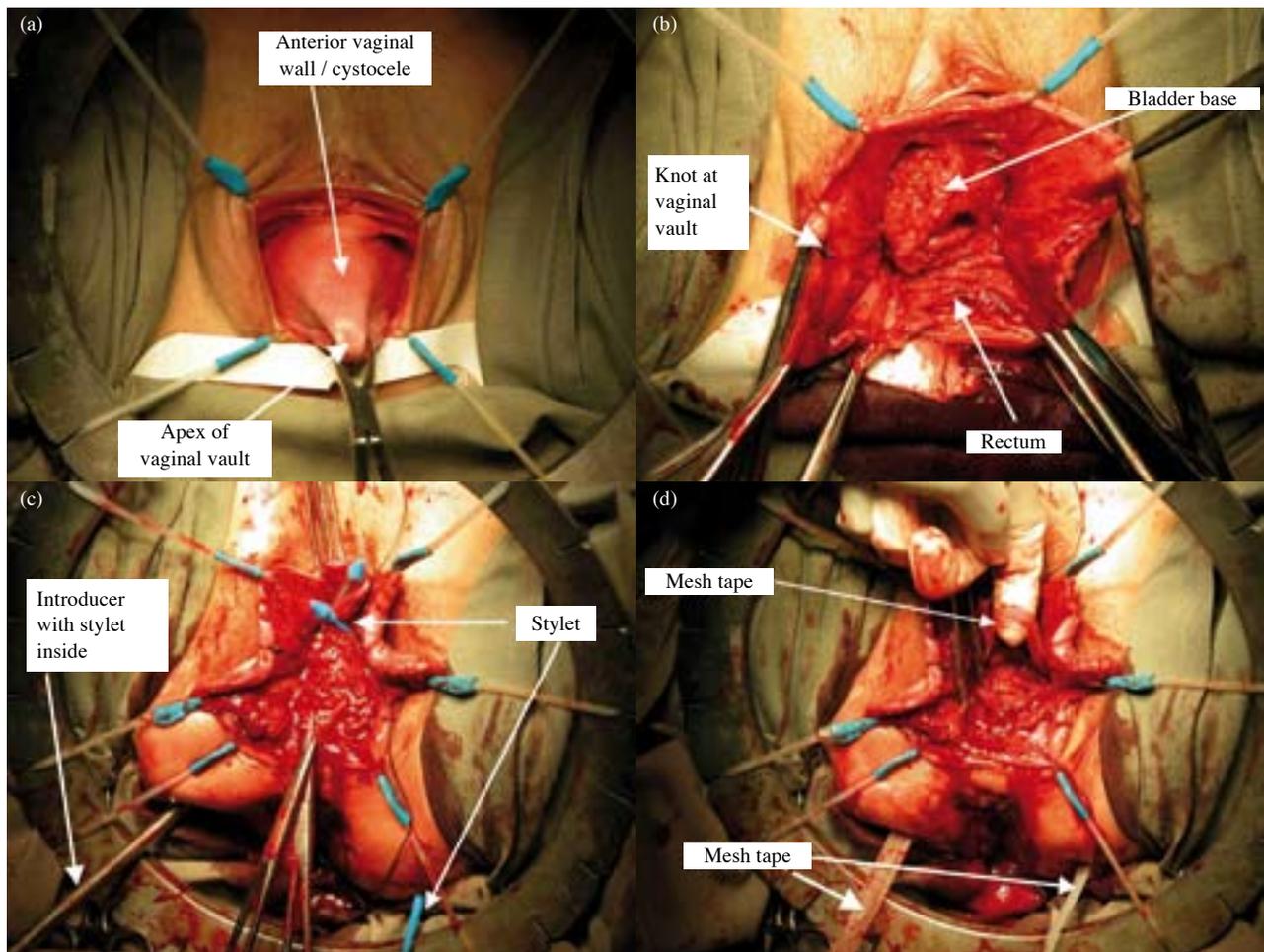
Figure 2. The surgical procedure of posterior intravaginal slingplasty (IVS) for treatment of vaginal vault prolapse
(a) Vaginal apex is identified by the Littlewood forceps and is marked by a stitch. (b) Vaginal mucosa is carefully dissected away from bladder anteriorly and rectum posteriorly. (c) Bilateral posterior IVS stylets pass through stab incisions at buttocks into ischiorectal fossa and are brought into vagina 1 cm distal to ischial spine. (d) The mesh tape is threaded through the tunnel by the stylets. It should be carefully handled to make sure that it is lying flat beneath the vaginal mucosa

into the dead space between vagina and rectum.

Data Analysis

Descriptive data were used to describe patients' demographic data and operative details. Cure rate was presented in a descriptive statistics measured by POPQ system. Wilcoxon signed rank test was used to compare anterior, apical, and posterior compartments scores. A p value of less than 0.05 was considered statistically significant. Statistical analysis was performed using statistical package for the social sciences (Window version 13.0; SPSS Inc, Chicago [IL], US)

Results

A total of 32 cases of posterior IVS were performed during the study period (Table 1). They were followed up for 8 to 56 months (median, 36 months). All patients were multiparous Chinese women, with age ranging from 40 to 92 years. Of the 32 patients, 18 had previous total abdominal hysterectomy, 11 had vaginal hysterectomy, and one had caesarean hysterectomy. One woman had prophylactic posterior IVS done together with vaginal hysterectomy because of severe procidentia. Three had concomitant TVT for urodynamic stress incontinence. Another patient had prophylactic posterior IVS with vaginal hysterectomy and TVT.

The median duration of operation was 62 min (range, 31-115 min) and median blood loss was 150 ml (range, 50-750 ml). The median haemoglobin drop was 18 g/l (range, 2-41 g/l). After excluding the five cases with other concomitant surgery, there were 27 cases of sole posterior IVS. The median operating time was then 60 min (range, 31-105 min), median blood loss was 100 ml (range, 50-750 ml), and median haemoglobin drop was 16 g/l (range, 2-41 g/l). 29 of all patients could be mobilised on or before day 2 after the operation. Two patients could get out of bed on the third day because one

Table 1. Demographic data and operative details of patients undergoing posterior intravaginal slingplasty (IVS)

	Median (range)	
	Posterior IVS + concomitant surgery (n=32)	Posterior IVS (n=27)
Age (years)	70 (40-92)	70 (50-92)
Parity	3 (1-8)	4 (1-8)
Body weight (kg)	57 (43-70)	55 (45-70)
No. of vaginal delivery	3 (1-7)	4 (1-7)
Operating time (min)	62 (31-115)	60 (31-105)
Blood loss (ml)	150 (50-750)	100 (50-750)
Haemoglobin drop (g/l)	18 (2-41)	16 (2-41)
No. of days to mobilisation	1 (1-3)	1 (1-3)
Duration of hospital stay (days)	4 (3-14)	4 (3-13)
Duration of follow-up (months)	36 (8-56)	37 (8-56)

Table 2. Comparison of anterior, apical, and posterior compartment of vaginal vault prolapse by the Pelvic Organ Prolapse Quantification (POPQ) system before and after posterior intravaginal slingplasty

Compartment	POPQ score Median (range)[*]			
	All patients (n=32)		Patients after excluding vault prolapse recurrence (n=30)	
	Preoperative	Postoperative	Preoperative	Postoperative
Aa	2 (-3 to 4)	-2 (-3 to 0)	2 (-3 to 4)	-2 (-3 to 0)
Ba	3 (-3 to 8)	-2 (-3 to 0)	2 (-3 to 8)	-2 (-3 to 0)
C	2 (-3 to 8)	-6 (-8 to 4)	2 (-3 to 8)	-6 (-8 to -2)
Ap	-1 (-3 to 3)	-3 (-3 to -1)	-1 (-3 to 3)	-3 (-3 to -1)
Bp	0 (-3 to 8)	-3 (-3 to -1)	0 (-3 to 8)	-3 (-3 to -1)

[*] p<0.05 for all compartments, Wilcoxon signed rank test

had postoperative acute pulmonary oedema and the other had severe wound pain. 27 women were discharged on or before day 5 after the operation; three women needed to stay for 13 days because two had chest infection and one had pulmonary oedema. Two other patients had voiding problem after TVT operation, thus they were discharged on day 14. One case had sling erosion at 12 months after the operation, and excision of the exposed tape was done under local anaesthesia.

Table 2 showed that all women had positive POPQ score in either anterior, middle (vault), or posterior compartment preoperatively. Except for the two cases of vault prolapse recurrence, all the POPQ scores were converted to negative values after posterior IVS. The differences were statistically significant (p<0.05) for all the compartments. Moreover, all patients did not complain of prolapse symptom during follow-up except the two patients who had recurrence of vault prolapse. The overall success rate was 93.8% (30/32). Indeed, the failure cases were the first two posterior IVS performed. One of them had a second posterior IVS done with good results. The other woman preferred using vaginal ring pessary. Four other patients had asymptomatic cystocele. Postoperative Aa and Ba were from -1 to -2 level. Two of the patients also had mild rectocele with postoperative Ap and Bp at -1 level. None of our cases had urinary symptoms worsened or de-novo detrusor overactivity.

A second operation after IVS was required in 6.2% (2/32) of our study population. One (3.1%) patient required excision of tape because of mesh erosion.

Another patient (3.1%) had a second IVS after recurrence of vault prolapse.

Discussion

Women suffering from pelvic organ prolapse always have symptoms like abdominal discomfort, problems with intercourse, or urinary leakage. These symptoms are commonly encountered in elderly women, especially multiparous women. In the 2006 Hong Kong statistics census[15], 12.8% of the female population was 65 years old or above. There was a 1% increment of this female age-group population comparing to year 2001. Increase in elderly female population implies an increased demand on surgeries for pelvic organ prolapse. In our series, the median age was 70 (range, 40-92) years. Hysterectomy for prolapse appeared to be a particular risk factor. Prolapse occurred in equal number after abdominal or vaginal hysterectomies[5]. Post-hysterectomy apical vaginal compartment prolapse often required surgical treatment because conservative management like ring pessary might be inefficient due to lax perineum. Experts who were familiar with various methods of repair would give the best outcome. The commonest procedures were abdominal sacrocolpopexy, vaginal sacrospinous ligament fixation, and laparoscopic procedures. A new technique with the insertion of an intravaginal sling (posterior IVS) has been invented by Petros[9]. Thereafter, few papers were published on the treatment of vaginal vault prolapse by using this new minimally invasive surgical procedure. The connective tissue that reacts to this multifilamentous polypropylene mesh is different from the monofilamentous mesh. Collagen fibres were thicker and more tightly compacted around the multifilamentous mesh and provided better tensile strength[16].

There is no ideal procedure for vaginal vault suspension[7,17]. Abdominal sacrocolpopexy is a major abdominal surgery requiring graft material. It is associated with longer operating time of 2 to 4 hours, slower return to daily activities, and higher cost. Potential complications include difficulty to control bleeding from the sacral vessels (1.2-2.6%), ureteric injuries, postoperative stress incontinence, and mesh rejection or erosion (5-9%)[18]. Vaginal sacrospinous ligament fixation is relatively quicker and easier to perform. Nevertheless, if the vagina is shortened from previous surgery, it may create tension on vaginal apex. There remains the risk of anterior wall defect. It also has increased risk of nerve, vascular, and ureteric injury[5]. Posterior IVS is a minimally invasive technique for vaginal apex fixation. Petros[9] reported successful treatment of vault prolapse of 94%. Mean blood loss was 120 ml. Patients were discharged within 24 hours with minimal pain and without indwelling catheter. Most patients resumed normal activities within 7 to 10 days. Our data were quite comparable to those published[13] in terms of operating time, blood loss, resumption of normal activities, and success rate. However, all of our patients needed to stay in the hospital for more than 24 hours and most of them were discharged on day 5. It was because vaginal gauze rolls and suction drains were routinely used for haemostasis after the operations. They were only removed on the second day when bleeding was not excessive.

Increased hospital stay could also be explained by the difference in the practice of the Hong Kong health care system and difference in patients' expectation. The charge of hospitalisation to patients in Hong Kong was low due to high subsidy from the government. Moreover, gender and ethnicity have variation in pain sensitivity[19]. Chinese women usually consider themselves very ill soon after any operation. It is therefore very difficult for patients to go home within 24 hours after operation.

Complications like vaginal infection, urinary tract infection within 1 week after operation, and mild postoperative pain were reported but not commonly seen. There was no reported incidence of postoperative micturition problem, dyspareunia, or incomplete bowel evacuation, which were the main problems after abdominal sacrocolpopexy or vaginal sacrospinous ligament fixation. Only few studies reported severe complications such as rectal injury and mesh erosion[5,9,10]. All our patients did not suffer from bowel injury. Rectal injury could be treated conservatively and could be avoided by experience and improved surgical technique[9].

Mesh erosion usually presents with increased vaginal bleeding, pain, or abnormal heavy vaginal discharge. The reported incidence was 2.1 to 17%[10,11,13,20]. The risk of mesh erosion decreased with time. Age above 60 years and diabetes are reported risk factors associated with mesh erosion[11]. We did have one case of

sling erosion. The patient was 64 years old, but she did not have diabetes. She did not complain of any symptom at all. The eroded tape was only identified during follow-up at 12 months. It was a 1-cm tape exposed at vaginal vault with no sign of infection. Eroded tape was easily trimmed and undermined under general anaesthesia. The portion of exposed tape was grasped and trimmed and vaginal mucosa was then closed with absorbable sutures. There was no recurrence of vault prolapse after the tape was cut.

Our overall clinical success rate of 93.7% was comparable to worldwide figures. The two cases of vault prolapse recurrence were the first two posterior IVS performed in our unit. No obvious risk factor like heavy manual work, chronic cough, constipation or wound infection was present. Postoperative infection was an independent and most important risk factor for recurrence after vaginal sacrospinous fixation[21]. Therefore, we believe that prophylactic antibiotics may be effective in reducing the rate of postoperative infections and thus vault prolapse recurrence. Starting from the third case, we had modified the technique by putting loose anchoring stitch to the tape at both stab wound of the buttock to prevent tape retraction. This modification was first tried by our surgeons and it had never been described before. Since then, there was no vault prolapse recurrence.

Unlike abdominal sacrocolpopexy or vaginal sacrospinal ligament fixation, urinary symptoms will not deteriorate after posterior IVS. De-novo stress urinary incontinence occurred in 9% of the abdominal group and 33% of the vaginal group. De-novo voiding difficulties occurred in 2% of patients in both groups[7]. Our patients did not experience de-novo bladder overactivity,

worsened urinary symptom, or voiding dysfunction.

Occult stress urinary incontinence is reported in 23% of patients with pelvic organ prolapse in the literature[22]. It is, therefore, a good practice to perform full urodynamic study before the operation to document any urinary problem so that concomitant continence surgery can be performed if there is urodynamic stress incontinence.

In our series, we have achieved a relatively high cure rate with a low mesh erosion rate. We postulate that it may be because Chinese women are less likely to resume sexual activity soon after operation[23]; this might reduce the infection rate, hence increase the cure rate and decrease the mesh erosion rate. Larger series of cases are needed in order to verify this phenomenon. The use of antibiotics in our series and difference in proportion of obese women between Chinese and Caucasian may help achieve this high cure rate and low mesh erosion rate.

Conclusion

Gynaecologists / surgeons who perform pelvic floor repair should be able to offer different types of procedures tailor-made for individual need of their patients. Posterior IVS is a minimally invasive and safe procedure with shorter operating time and less blood loss. Complications are relatively uncommon in our series. Patients can be discharged and resume daily activities earlier. However, larger prospective randomised studies are still awaited for better understanding of the long-term results.

Acknowledgement

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