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Original Article

A 52-month follow-up on the transvaginal mesh surgery in vaginal cuff eversion

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ABSTRACT

Objective: Transvaginal mesh anterior–posterior (TVM-AP) provides better cure rates in the surgical treatment of vaginal cuff eversion than anterior transvaginal mesh combined with sacrospinous ligament fixation (TVM-A). We determine the outcomes after TVM-A and TVM-AP surgeries in advanced vaginal cuff prolapse.

Materials and methods: The charts of 796 women who underwent pelvic organ prolapse (POP) surgery from July 2006 to January 2012 in Chang Gung Memorial Hospitals were reviewed. We included women who presented with advanced cuff eversion and treated with TVM surgery. Data were analysed after three years post-surgery. Descriptive statistics were used for demographic and perioperative data. The paired-samples t test was used for comparison of preoperative and postoperative continuous data. The outcomes measured were objective cure (POP-Q stage $\leq$ 1) and subjective cure (negative response to question 2 and 3 on POPDI-6).

Results: A total of 97 patients was analysed. 61 patients had TVM-A and 36 patients had TVM-AP insertion. Mean follow-up was 52 months. The objective cure rate for TVM-AP was significantly higher than TVM-A, 94.4% versus 80.3%. TVM-AP also showed a higher subjective cure rate (91.7%) though there was no significant difference from TVM-A ($p = 0.260$). The mesh extrusion rate was low at 3.1% with no major complications seen. In TVM-A the blood loss was lesser and the operation time was shorter.

Conclusion: TVM-AP showed better objective cure rate than TVM-A at 52 months. However, TVM-A is less invasive in comparison with an acceptably good cure rates.

Introduction

Vaginal cuff eversion or vaginal vault prolapse occurs when the vaginal cuff scar descends below a point that is 2 cm less than the total vaginal length above the plane of the hymen [1]. The incidence has been estimated to be 0.36 per 1000 women or cumulative incidence of 0.5% [2]. Higher parities, difficult deliveries, heavy physical activities, neurological diseases and previous hysterectomy for pelvic organ prolapse are among the identified risk factors for the development of vaginal wall prolapse post-hysterectomy [3]. Various surgical techniques had been described for the treatment of cuff eversion such as sacrospinous ligament fixation (SSF), uterosacral ligament fixation and McCall culdoplasty [4]. SSF for the suspension of the vaginal apex is one of the popular techniques [5]. In an advanced pelvic organ prolapse, SSF can be performed as single procedure or combined with mesh surgery [6].

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The success of minimally invasive mid-urethral tapes for stress urinary incontinence inspired the use of transvaginal mesh. However, the issues on safety and recurrence still remain controversial. In spite of various mesh kits developed to reduce surgical failures, many faced with medicolegal issues on their complications. This leads to the FDA ruling in 2011 on mesh complications and voluntary withdrawal of some of the meshes [7]. The success rates of the transvaginal mesh (TVM) procedures had been studied, but many involved short-term follow-ups and no comparison on the use of anterior mesh (combined with SSF) and total mesh solely for the cuff eversion. The purpose of this study is to evaluate the outcomes in the surgical treatment of vaginal cuff eversion using anterior TVM combined with SSF (TVM-A) and combination of anterior and posterior TVM (TVM-AP).

Methods and materials

The charts of 796 women who underwent pelvic organ prolapse (POP) surgery using TVM from July 2006 to January 2012 in Chang Gung Memorial Hospitals (Taipei, Linkou and Keelung branches) were screened for eligibility for this study. We included women presenting with advanced vaginal cuff eversion after hysterectomy where the Pelvic Organ Prolapse Quantification (POP-Q) stage was ≥stage III and treated with TVM during the pelvic reconstructive surgery. Women who had no previous hysterectomy and those with incomplete data were excluded.

Surgical procedures were performed by the same experienced surgeon. The choices of TVM used depended on the type of TVM available at the institution. Chang Gung Memorial Hospital institutional review board approval was obtained for the evaluation of this study (IRB: 102-2976B). All patients underwent baseline preoperative assessment as per standard protocol of our department which consisted of detailed medical history, physical examination, urinary analysis/cultures and multichannel urodynamic examination (UDS). Patients also completed a 72-hour voiding diary and filled up the questionnaires on Pelvic Organ Prolapse Distress Inventory (POPDI-6), Urinary Distress Inventory (UDI-6), Incontinence Impact Questionnaire (IIQ-7) and Pelvic Organ Prolapse/Incontinence Sexual Questionnaires (PISQ-12). Surgical procedures performed were either under regional or general anaesthesia. TVM-A surgery used Perigee® (AMS, Inc., Minnetonka, MN, USA) or Avaulta Plus (C.R. Bard, Inc., Murray Hill, NJ, USA) [8] while TVM-AP surgery used Prolift® (Ethicon, Somerville, NJ, USA). The TVM-A surgery was combined with SSF, adopting the right unilateral posterior approach as described by Miyazaki with a little modification where the suture attached to the vaginal apex was sutured through the proximal end of the anterior mesh. Posterior repair was performed on all TVM-A patients.

For the TVM-AP, the operative procedure was the same as described by Lo [9]. Cystoscopy was performed post-procedure to evaluate the integrity of the lower urinary tract. Intravenous Cefazolin of 500 mg was given as prophylactic antibiotic and then continued 6 hourly for 24 hours post-operatively. Foley's catheter was inserted and a Povidone Iodine-soaked gauze was packed in the vagina for 24 hours. Patients were discharged once she is able to pass urine comfortably with acceptable residual urine after the removal of catheter.

Follow-ups were scheduled at 1 week, 1 month, 3 months, 6 months, and annually after the operation. The data were analysed after 3 years which included history taking, same questionnaires used preoperatively and vaginal examination. Cure was objectively defined as POP-Q stage ≤1 on all compartments during vaginal examination (the primary outcome). Patients' negative responses to questions 2 and 3 of the (POPDI-6) were considered subjective success (the secondary outcome).

Descriptive statistics were used for demographics and perioperative data. Paired-sample t test and either the chi-square or Fisher exact test were applied for comparison of pre and post-operative continuous and categorical data, respectively. Repeated measures analysis of variance (ANOVA) was used to determine whether a difference in continuous follow-up measures exists between groups in order to decrease the chance of type 1 error. Values of $p < 0.05$ were considered statistically significant for all comparisons. The Kaplan–Meier method and the Mantel–Haenszel log-rank test were used to compare post-operative prolapse event-free survival. Patients were followed and censored when prolapse with POP-Q > 1 developed or recurred. All statistical methods were performed using the commercial software SPSS, version 17.

Results

Out of 796 patients, 695 were excluded due to presence of uterus (Fig. 1). 101 patients with POP-Q stage III and IV cuff eversion who had TVM surgeries were included in the study. Out of this, 4 patients with Perigee mesh were lost to follow-up and excluded due to incomplete data. Therefore, a total of 97 patients were analysed where 61 had TVM-A (47 Perigee and 14 Avaulta Plus) and 36 had TVM-AP (all Prolift anterior and posterior). The median period of follow-up was 52.5 ± 17.3 months. Both groups were demographically similar (Table 1). There was no difference between the two groups with regards to age, parity, body mass index (BMI), previous method of hysterectomy, POP stages, concomitant procedures and mean hospital stay. In both groups, majority of the patients had history of total abdominal hysterectomy. We also found that in TVM-A, there were statistically significant shorter operating time, lesser intraoperative blood loss and hence, lesser haemoglobin change. There were no major complications in both

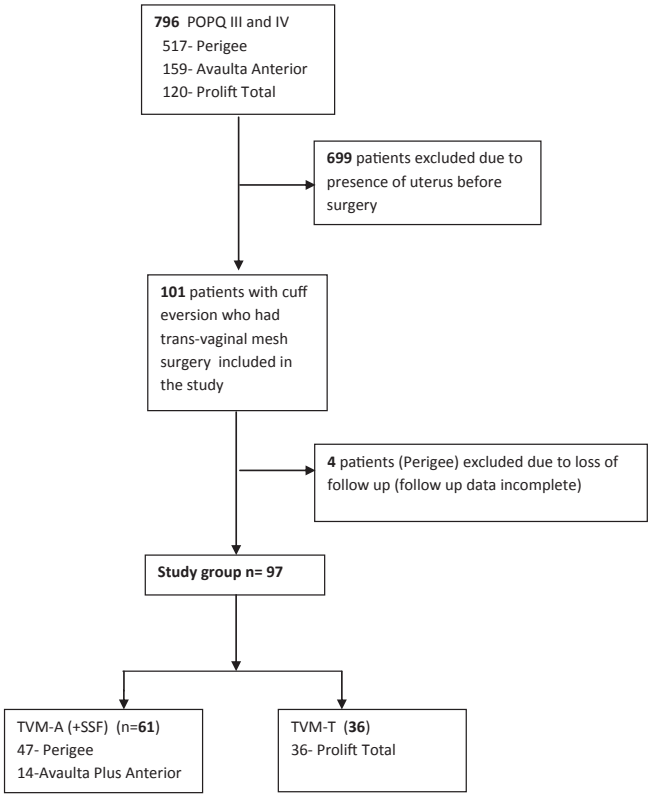

Fig. 1. Flowchart on patients screening. POPQ = pelvic organ prolapse quantification system; TVM-A = transvaginal mesh anterior; SSF = sacrospinous ligament fixation; TVM-T = transvaginal mesh total.

Table 1
Baseline characteristic of **97** cuff eversion patients undergoing vaginal reconstructive surgery, further divided into subgroup of TVM-A (anterior mesh with sacrospinous ligament fixation surgery) and TVM-AP (total mesh surgery).

	Total n = 97	TVM-A n = 61	TVM-AP n = 36	p-Value
Mean age (year)	65.2 ± 9.5 (61.8–68.3)	64.9 ± 9.8 (61.2–67.2)	66.7 ± 8.0 (63.4–69.3)	0.209
Mean parity	3.5 ± 1.5 (3.1–3.9)	3.4 ± 1.1 (3.1–3.7)	3.8 ± 1.5 (3.3–4.3)	0.132
Mean BMI (kg/m2)	25.2 ± 3.4 (24.1–26.4)	25.5 ± 3.4 (24.4–26.6)	25.0 ± 3.4 (24.0–26.4)	0.449
Prior pelvic surgery				
TAH	61	41	20	0.282*
VH	32	17	15	0.158*
LH	4	3	1	0.525**
Mean operating time (min)	64.3 ± 14.6 (61.5–69.4)	61.1 ± 13.6 (56.5–66.4)	83.2 ± 16.9 (76.5–86.4)	**0.042**
Mean intraoperative blood loss (ml)	71.2 ± 105.0 (48.2–107.6)	67.4 ± 61.7 (48.3–87.4)	101.4 ± 62.9 (88.1–127.8)	**0.012**
Mean haemoglobin difference (g/dl)	1.1 ± 0.8 (0.8–1.4)	0.4 ± 0.9 (0.2–0.6)	1.7 ± 0.8 (1.3–2.1)	**0.001**
Mean hospital stay (days)	4.9 ± 1.0 (4.4–5.2)	4.9 ± 0.9 (4.4–5.2)	4.7 ± 1.0 (4.3–5.0)	0.163
Median period of follow-up (months)	52.5 ± 17.3 (44.1–57.8)	50.8 ± 20.1 (42.3–56.2)	56.8 ± 11.5 (42.1–59.4)	0.109
Concurrent surgery				
TVT/TOT	24	16	8	0.659*
Preoperative POP-Q n (%)				
Stage 1				
Stage 2				
Stage 3	57 (58.7%)	37 (60.7%)	20 (55.6%)	0.622
Stage 4	40 (41.2%)	24 (39.3%)	16 (44.4%)	0.622
(Pulsion enterocoele)	47 (48.5%)	28 (45.9%)	19 (52.8%)	0.328
Complications, Major	0	0	0	
Complication, pain	3 (3.1%)	2 (3.2%)	1 (3.3%)	0.531**
Mesh extrusion	3 (3.1%)	3 (4.9%)	0 (0%)	0.293**
Secondary surgery (prolapse)	1 (1.0%)***	1 (1.6%)	0 (0%)	0.629**
Obj. cure (n) at third year	85.6% (83/97)	80.3% (49/61)	94.4% (34/36)	**0.044****
Fail		19.7% (12/61)	5.6% (2/36)	
(Pulsion enterocoele)		7	1	
Sub. cure (n) at third year	86.6% (84/97)	83.6% (51/61)	91.7% (33/36)	0.260**
Fail		16.4% (10/61)	8.3% (3/36)	

Data are listed as mean ± standard deviation with 95% CI in parentheses or number with percentage within parentheses. Bold numbers are those p values that are significant. BMI, (body mass index); TAH, (total abdominal hysterectomy); VH, (vaginal hysterectomy); LH, (laparoscopic hysterectomy); TVT, (tension-free vaginal tape); TOT, (trans-obturator tape); Paired-samples t test; * Chi-square test; ** Fisher exact test; $p < 0.05$ was considered statistically significant; *** posterior colporrhaphy.

groups such as organ injuries or mortality. Post-operative pain (groin pain, dyspareunia and also pain during physical activity) were comparable between the two groups with overall incidence of only 3.1%. This was assessed on each follow-up. At the end of 3 years, there were 3 (3.1%) cases of mesh extrusion, all from the TVM-A group. All the three cases of mesh extrusion were asymptomatic and therefore were managed conservatively with local oestrogen cream daily. Despite the mesh extrusion were persistent for all, there were no other adverse condition over the following period.

The objective cure rates at 3rd year follow-up for TVM-AP were significantly higher at 94.4% versus 80.3% for TVM-A, whereas the subjective cure rates did not show a significant difference between the 2 groups ($p = 0.260$). However, the improvement of POPDI-6 total scoring and subdomain on question 2 (Usually experience heaviness or dullness in the pelvic area?) has shown a significant higher score for the TVM-A than TVM-AP (−3.97 vs. −5.65, <0.001; −2.10 vs. −2.68, 0.001) (Table 2). Further data analysis at 5th year showed that the cumulative objective cure rate for all types of surgery was 81.4% where the objective cure rate for the TVM-AP group remained significantly high at 91.7% ($p = 0.039$). Among the failures, 7 in TVM-A and 1 in TVM-AP had associated recurrent pulsion enterocoele. The enterocoele was all asymptomatic except two. Therefore, pessary treatment was offered on the two symptomatic patients.

The POP-Q analysis in Table 3 showed there was significant deepening in point Ap and Bp in TVM-AP ($p = 0.041$) but no significant difference seen in other points where both groups showed similar improvement. Therefore, TVM-AP produced better results in the posterior compartment 91.7% versus 75.4% in TVM-A (Table 1). Both groups yielded 100% cure rate in the anterior compartment and similar cure rates at the apex. Table 2 showed there was no significant difference in the UDI-6 and IIQ-7 scores in both groups. POPDI-6 showed a more favourable score in TVM-AP (more cure) with $p < 0.001$, whereas PISQ-12 score was more favourable towards TVM-A (less foreign body sensation) with $p < 0.001$.

The cumulative proportion of cure for TVM-A and TVM-AP was 75.4% and 91.7% at median follow-up period of 50.8 ± 20.1 months and 56.8 ± 11.5 months with log rank $p = 0.007$ (Fig. 2). Fig. 3 showed at specific compartment (anterior, apex and posterior) the cure for TVM-A and TVM-AP was 100% and 100%, 94.4% and 97.2%, and 75.4% and 91.7% at the same median follow-up period with log rank $p = 1.000$ (anterior); $p = 0.641$ (apex); $p = 0.007$ (posterior) in favour of TVM-AP. The difference between the 2 groups became significant at the third year post-operation where TVM-A showed an earlier decline in the cure rate.

Discussion

An adequate support for the vaginal cuff is a recognized essential component for a durable surgical repair in advanced prolapse. Though, abdominal sacrocolpopexy was identified to have superior outcomes in treating cuff eversion [10], vaginal approach provides a shorter operating time and lower morbidity. SSF is a popular choice for apical support since it was reported by Randall and Nichols in the United States in 1971 [11]. In an overview involving 9 studies, it was found that SSF provided good long-term objective-subjective outcomes, improved the quality of life of women with lesser rate of complications than TVM and more cost-effective [12]. However, trocar-guided mesh kits and

Table 2
UDI-6, IIQ-7, POPDI-6 and PISQ-12 scores pre and postoperative (at last visit) between TVM-A (anterior mesh with sacrospinous ligament fixation surgery) and TVM-T (total mesh surgery). Data listed as mean ± standard deviation with 95% CI in parentheses.

	TVM-A n = 61		TVM-AP n = 36		p value Inter group
UDI-6					
Pre op	14.04 ± 3.81	(12.88–15.10)	13.54 ± 4.12	(12.16–15.22)	0.463
Post op	9.48 ± 2.64	(8.58–10.34)	9.26 ± 2.58	(7.96–10.32)	0.608
Difference [% change]	−4.56 ± 3.30 (33.5)	(−5.51–3.47)	−4.38 ± 3.62 (32.3)	(−5.25–3.11)	0.702
p value (intra)	<0.001		<0.001		
IIQ-7					
Pre op	13.25 ± 4.21	(11.89–14.46)	12.14 ± 4.32	(10.74–13.56)	0.391
Post op	8.89 ± 4.35	(7.52–10.27)	7.76 ± 4.49	(6.35–9.41)	0.141
Difference [% change]	−4.36 ± 4.65 (32.9)	(−5.17–3.47)	−4.38 ± 3.72 (36.1)	(−5.35–3.14)	0.862
p value (intra)	<0.001		<0.001		
	TVM-A n = 23		TVM-AP n = 12		p value Inter group
PISQ-12					
Pre op	22.81 ± 5.43	(20.16–24.21)	23.42 ± 4.98	(21.94–24.69)	0.247
Post op	29.64 ± 5.90	(27.63–31.72)	28.41 ± 5.12	(26.59–29.78)	0.139
Difference [% change]	6.83 ± 4.56 (29.9)	(4.94–8.26)	4.99 ± 3.63 (21.3)	(3.72–6.02)	<0.001
p value (intra)	<0.001		<0.001		
	TVM-A n = 61		TVM-AP n = 36		p value Inter group
POPDI-6					
Pre op	14.92 ± 2.41	(13.99–15.81)	15.47 ± 3.96	(14.12–16.56)	0.206
Post op	8.95 ± 1.75	(7.81–10.39)	7.82 ± 1.44	(6.63–9.49)	0.023
Difference [% change]	−3.97. ± 1.17 (26.6)	(−4.73–2.13)	−5.65 ± 1.28 (36.1)	(−6.76–4.47)	<0.001
p value (intra)	0.001		<0.001		
POPDI-Q1					
Pre op	2.51 ± 1.41	(1.74–3.23)	2.62 ± 1.63	(1.83–3.46)	0.749
Post op	1.95 ± 0.61	(1.73–1.41)	1.81 ± 0.64	(1.43–2.14)	0.521
Difference [% change]	−0.56. ± 0.28 (22.0)	(−0.67 to −0.43)	−0.81 ± 0.32 (31.0)	(−0.98 to −0.65)	0.264
p value (intra)	0.001		<0.001		
POPDI-Q2					
Pre op	3.92 ± 1.23	(3.38–4.31)	3.97 ± 1.12	(3.41–4.34)	0.611
Post op	1.82 ± 0.41	(1.68–2.04)	1.27 ± 0.52	(0.98–1.56)	0.241
Difference [% change]	−2.10 ± 0.32 (54.0)	(−2.32 to −1.95)	−2.68 ± 0.62 (68.0)	(−2.72 to −2.34)	**0.001**
p value (intra)	<0.001		<0.001		
POPDI-Q3					
Pre op	3.51 ± 1.16	(2.98–3.96)	3.58 ± 1.03	(3.03–3.94)	0.801
Post op	1.47 ± 0.44	(1.14–1.73)	1.34 ± 0.62	(1.18–1.72)	0.103
Difference [% change]	−2.04. ± 0.41 (58.0)	(−2.36 to −1.75)	−2.40 ± 0.38 (67.0)	(−2.77 to −2.15)	0.141
p value (intra)	<0.001		<0.001		
POPDI-Q4					
Pre op	1.98 ± 1.02	(1.52–2.56)	2.10 ± 1.13	(2.43–2.78)	0.758
Post op	1.42 ± 0.67	(1.03–0.86)	1.27 ± 0.49	(1.51–1.51)	0.304
Difference [% change]	−0.56. ± 0.35 (28.0)	(−0.78 to −0.42)	−0.83 ± 0.38 (40.0)	(−1.08 to −0.64.)	0.108
p value (intra)	0.018		<0.001		
POPDI-Q5					
Pre op	1.47 ± 1.11	(0.98–1.87)	1.55 ± 1.04	(1.02–2.02)	0.802
Post op	0.92 ± 0.47	(0.71–1.24)	0.80 ± 0.51	(0.34–1.12)	0.342
Difference [% change]	−0.55. ± 0.33 (37.0)	(−0.84 to −0.26)	−0.75 ± 0.38 (48.0)	(−0.94 to −53)	0.247
p value (intra)	<0.001		<0.001		
POPDI-Q6					
Pre op	1.53 ± 0.84	(1.14–1.93)	1.65 ± 0.78	(1.23–1.95)	0.521
Post op	1.37 ± 0.32	(1.16–1.58)	1.33 ± 0.31	(1.07–1.55)	0.639
Difference [% change]	−0.16. ± 0.20 (12.0)	(−0.09 to −0.39)	−0.32 ± 0.28 (19.0)	(−0.11 to −0.48)	0.421
p value (intra)	0.035		0.013		

Bold numbers are those p values that are significant.
UDI-6, Urinary Distress Inventory; IIQ-7, Incontinence Impact Questionnaire; POPDI-6, Pelvic Organ Prolapse Distress Inventory 6; PISQ-12, Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire; SSF, sacrospinous fixation; POPDI-Q1, "Usually experience pressure in the lower abdominal?"; POPDI-Q2, "Usually experience heaviness or dullness in the pelvic area?"; POPDI-Q3, "Usually have a bulge or something falling out that you can see or feel in your vaginal area?"; POPDI-Q4, "Ever have to push on the vagina or around the rectum to have or complete a bowel movement?'; POPDI-Q5, "Usually experience a feeling of incomplete bladder empting?"; POPDI-Q6, "Ever have to push on a bulge in the vaginal area with your fingers to start of complete urination?".
Paired-samples t test; $p < 0.05$ was considered statistically significant.

synthetic mesh implants are also possible options for recurrent cuff eversion [13].

Various studies on trocar-guided mesh kits had been reported but similar issues arose which were small number of study subjects, short duration and lack of randomised controlled trials as to verify their long-term efficacy and safety [8,14–16]. The International Urogynecological Association (IUGA) Grafts Roundtable in 2010 had identified this shortcoming and highly suggested for more quality research [17]. Our study involved a longer period of follow-up up to 52 months as data analysis at a shorter period may not portray the true efficacy of these procedures. As patients aged, the quality of vaginal tissue and ligamentous support would be reduced, increasing the risk of mesh extrusion and recurrent prolapse. Deffieux et al. reported an increased risk of polypropylene mesh

Table 3
Magnitude of the difference in improvement on pelvic organ prolapse quantification measurement at preoperative and postoperative follow-up (at last visit) according to types of surgery.

	Total n = 97	TVM-A n = 61	TVM-AP n = 36	p-Value
Cum. obj. cure rate*****				
Anterior**	97 (100%)	61 (100%)	36 (100%)	1.000
Apical**	94 (96.9%)	59 (96.7%)	35 (97.2%)	0.528
Posterior**	79 (81.4%)	46 (75.4%)	33 (91.7%)	**0.039**
Overall**	79 (81.4%)	46 (75.4%)	33 (91.7%)	**0.039**
POP-Q (cm)				
Aa	4.13 ± 1.59 (3.79–4.58)	4.12 ± 1.54 (3.85–4.41)	4.16 ± 1.70 (3.78–4.52)	0.566
Ba	7.28 ± 2.65 (6.55–8.21)	7.24 ± 2.69 (6.69–8.24)	7.36 ± 2.59 (6.53–8.16)	0.307
C	11.92 ± 3.93 (11.04–12.87)	11.85 ± 3.23 (11.01–12.91)	12.04 ± 4.23 (11.13–13.74)	0.450
Ap	2.62 ± 1.82 (1.63–2.71)	2.16 ± 1.79 (1.54–2.79)	3.41 ± 1.93 (2.64–4.26)	**0.041**
Bp	4.81 ± 3.17 (3.41–6.27)	4.21 ± 2.91 (3.37–5.16)	5.83 ± 3.36 (4.61–6.59)	**0.014**
TVL	0.17 ± 1.06 (−0.01–0.51)	0.16 ± 0.99 (0.06–0.47)	0.18 ± 1.17 (−0.03–0.54)	0.793
Gh	0.34 ± 0.77 (0.21 to −0.46)	0.32 ± 0.59 (0.21 to −0.43)	0.37 ± 0.91 (0.23 to −0.47)	0.387
Pb	0.28 ± 0.63 (0.19–0.38)	0.29 ± 0.71 (0.20–0.36)	0.27 ± 0.49 (0.18–0.39)	0.459

Data are listed as mean ± standard deviation with 95% CI in parentheses or number with percentage within parentheses. Bold numbers are those p values that are significant.
Aa anterior wall 3 cm from hymen; *Ap* posterior wall 3 cm from hymen; *Ba* anterior wall, most dependent part (cm); *Bp* posterior wall, most dependent part (cm); *C* cervix or vaginal cuff (cm); *D* posterior fornix (if cervix is present) (cm); *Gh* genital hiatus, meatus to fourchette (cm); *Pb* perineal body, posterior fourchette to mid anus (cm); *TVL* total vaginal length (cm).
Paired-samples t test; $p < 0.05$ was considered statistically significant.
Cumulative objective cure rate (POP-Q stage ≤ 1) between TVM-A and TVM-AP at median follow-up period of 50.8 ± 20.1 and 56.8 ± 11.5 months, respectively.
Magnitude of the difference in improvement on POP-Q measurement at preoperative and postoperative follow-up (at last visit) between TVM-A and TVM-AP at median follow-up period of 50.8 ± 20.1 and 56.8 ± 11.5 months, respectively.

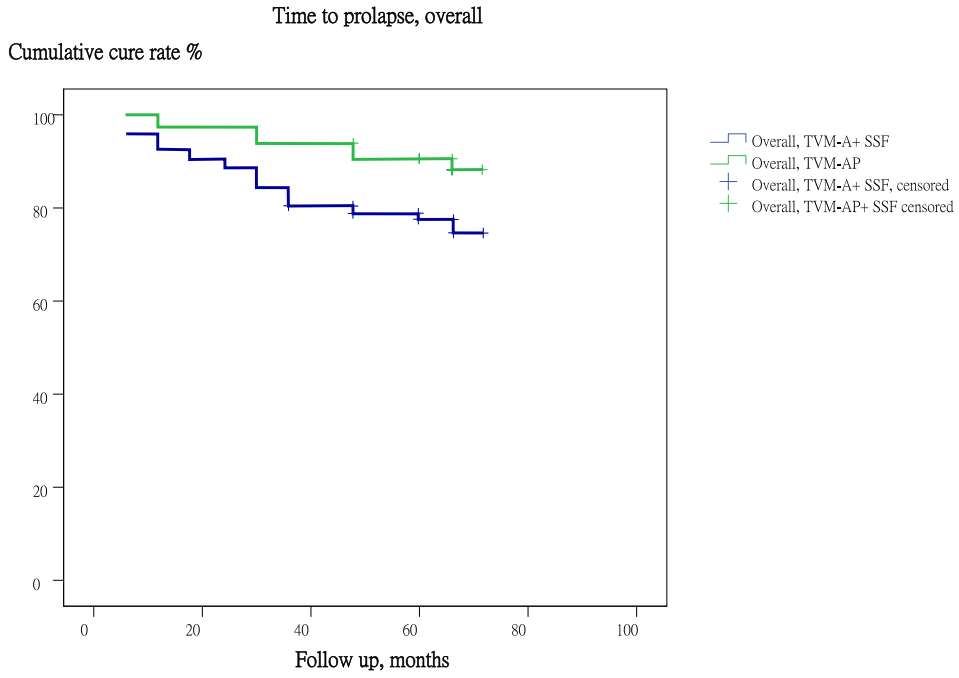

Fig. 2. Time to prolapse for compartments (overall). TVM-A, anterior vaginal mesh; SSF, sacrospinous fixation; TVM-AP, total vaginal mesh. The cumulative proportion of cure for AVM-A + SSF and TVM-AP group was 75.4% and 91.7% at median follow-up period of 50.8 ± 20.1 months and 56.8 ± 11.5 months. Log Rank p = 0.007.

extrusion after 70 years of age [18]. We had to exclude 4 patients from the TVM-A (Perigee) as they did not turn up for the subsequent follow-ups. Through telephone conversation, patients claimed to be well. However, as there was no clinical assessment made, these cases were dropped due to incomplete data. The number of those lost to follow-up was considered small because we implemented prolapse surgery protocol on every patient and they were counselled about the necessity of follow-ups before and after the procedure.

In a study comparing the use of transobturator anterior mesh combined with SSF versus anterior colporrhaphy only, the overall objective and subjective cure rates in the first group were significantly higher, 90.3% and 88.6%, respectively [19]. Our overall objective cure rate in the TVM-A group with the same technique was lower at 75.4%. This could be explained by a different group of patients involved in our study, where 56% of patients had vaginal hysterectomy for POP and it was reported that recurrence was higher in women with previous POP surgery [3]. In our study, further analysis at 5 years showed that the success rate for TVM-AP remains high (>90%) compared to the TVM-A where the cure rate decreased after 3 years. Milani et al. and Fatton et al. reported a similar success rate [14,20] while in a more recent study, it was reported as 93.5% [21]. In our assessment on the quality of life of the women post-operatively, there was significant improvement (sense of cure) in the TVM-AP even after 52 months and a study is ongoing to determine whether this improvement is able to sustain

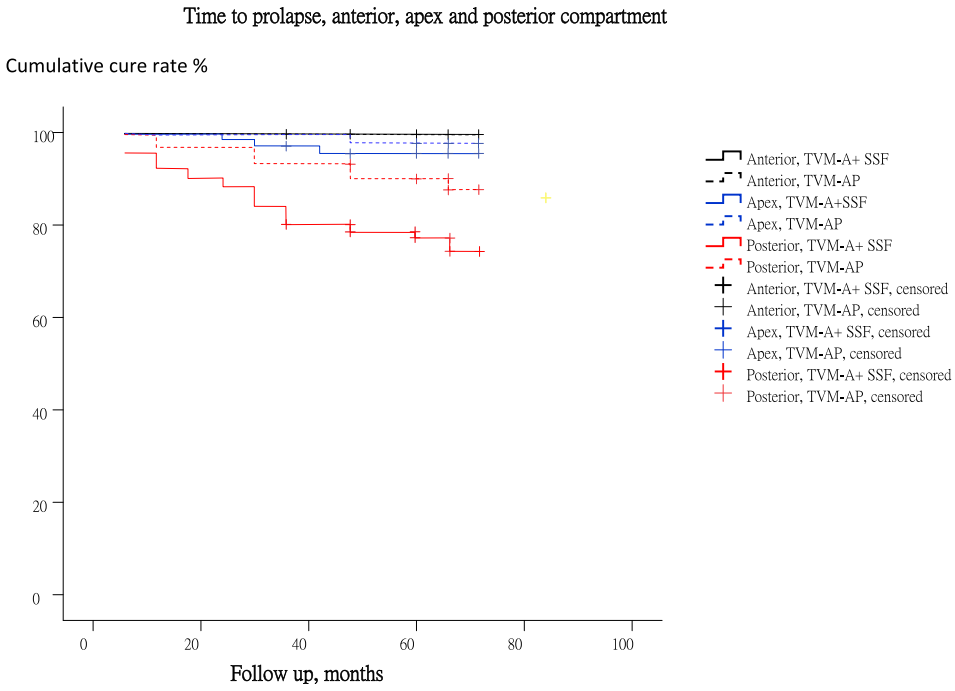

Fig. 3. Time to prolapse for anterior, apex and posterior compartment. TVM-A, anterior vaginal mesh; SSF, sacrospinous fixation; TVM-AP, total vaginal mesh. The cumulative proportion of cure at anterior, apex and posterior compartment for AVM-A + SSF and TVM-AP group was 100% and 100%, 94.4% and 97.2% and 75.4% and 91.7% at median follow-up period of 50.8 ± 20.1 months and 56.8 ± 11.5 months, respectively. Log Rank was p = 1.000 (anterior); p = 0.641 (apex); p = 0.007 (posterior).

thereafter. Miller D. et al. reported the concomitant improvement in quality of life was sustained over 5-year follow-up with Gynemesh (Johnson & Johnson, New Brunswick, NJ, USA) [22].

Advanced uterine prolapse and lack of surgical experience were 2 significant predictors of failure following TVM surgeries [23]. The complications seen in our study were small with no major events encountered. All cases were performed by the same experienced surgeon. Only 3 cases of mesh extrusion were seen, all in the TVM-A and none required surgical intervention. No such complication was seen in TVM-AP. This is comparable to our previous study on concurrent anterior and posterior mesh where the mesh extrusion rate was very small, 2.3% [8] and none seen at the apex as we had left the vaginal cuff intact with no tunnelling undertaken. Another study reported that after 4 years, the rates of mesh complications and prolapse recurrences are relatively low in experienced hand (3.6%) [24]. Sokol et al. however, reported mesh resulted in higher reoperation rate [25]. In our study, the number of failures (POP-Q stage >1 in any compartment) was more in the TVM-A. TVM-AP showed better improvement in the posterior compartment with only 3 cases of recurrent cuff eversion which were successfully treated conservatively.

We would like to highlight the issue on enterocoele development either primarily with cuff eversion or as a recurrence post-surgical intervention of POP. Our study showed that pre-operatively, the number of enterocoele was similar between the 2 groups but post-operatively, recurrence was definitely lower in the TVM-AP. Enterocoele has usually been overlooked, as POP-Q avoids assigning a specific label to the prolapsing part of the vagina, acknowledging that the actual organ(s) above the prolapse frequently cannot be determined. This issue was originally mentioned when the article on POP-Q was published back in 1996 [26]. If enterocoele identified during the examination, it should be commented on the POP-Q grid e.g: Bp = +5 [pulsion]. Unfortunately, this was always dropped out from the grid in clinical practice due to difficulty in diagnosis and also to avoid discomfort to the patient during the rectal-vaginal examination. However, it is time to look back at our practice as differentiating the type of prolapse is important. It directly relates to patient symptoms, their severity and the necessary treatment [27]. A deep Pouch of Douglas along with the change in vaginal axis such as post-Burch colposuspension and disruption of the endopelvic fascia had been related to the development of enterocoele [28]. Therefore, plication of the fascia is important in enterocoele repair. Apart from McCall culdoplasty, laparoscopic approach had been reported to be very successful in enterocoele repair [29,30].

Our study did not give solid evidence that TVM will help in the treatment of enterocoele but it showed that the recurrence was lower post-TVM-AP and this is supported by our previous study [8] on the same procedure. It seems that the compression effect on the vagina from TVM-AP provided protection against the development of enterocoele. Even though Prolift is no longer available, its efficacy on anatomical cure was well supported by various studies [8,14,16,21,24,31]. Other types of mesh which combined anterior and posterior meshes can be used in the management of cuff eversion. However, anterior mesh combined with SSF remains an alternative as the subjective cure rate was similar to TVM-AP in the long run and it was less invasive, with shorter operating time.

Usage of mesh on both anterior and posterior compartments for cuff eversion has led to a good objective outcome over anterior alone through the attachment of cuff tissue to the mesh implanted and in effect create an apical support for the mesh. The judicious use of anterior and posterior mesh over anterior mesh alone may have reduced the recurrence and possibly improve the severity of heaviness or dullness perception in the pelvic area. Despite that the subjective cure rate has shown an improvement although it was not statically significant, this does not mean it has no effect on subjective perception. The relatively better overall improvement in POPDI-6 score and question 2 after surgery may imply that the mesh on both anterior and posterior compartments has a better subjective outcome. Furthermore, both the objective and subjective cure showed different significant outcomes on anterior and posterior mesh which may reflect a fact that the subjective perception

is a complex and multifactorial issue. The subjective evaluation, however, needs further evaluation and study.

There were limitations in this study as it was a retrospective study and the number of subjects in TVM-AP arm was small but the study was strengthened by the large number of patients where the sample was retrieved from and also by the long period of follow-up where all patients were seen for an average of 52 months.

Conclusion

TVM-AP surgery in cuff eversion is more beneficial objectively in the long-term. However, the cure rate of TVM-A was still acceptably good with the benefits of reduced risks and morbidities. Controlled studies may be able to address the efficacy and safety issues better.

Authors' contribution

TS Lo: Protocol/Project development, Data collection, Data analysis, Manuscript editing.

FM Yusoff: Data analysis, Manuscript writing/editing.

PY Wu: Data collection, Manuscript editing.

S Jaili: Data analysis, Manuscript editing.

MC Uy-Patrimonio: Data analysis, Manuscript editing.

Financial disclaimer/Conflict of interest

None.

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