Mesh-related complications from reconstructive surgery for pelvic organ prolapse in Chinese patients in Hong Kong

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ABSTRACT

Introduction: Mesh-related complications from reconstructive surgery for pelvic organ prolapse are of international concern. The present study aimed to review the incidence, management, and surgical outcomes of mesh-related complications in a Chinese population compared with existing studies involving Western populations.

Methods: This was an analysis of a prospectively collected cohort. Laparoscopic sacrocolpopexy, laparoscopic hystercolposacropexy, or transvaginal mesh surgery were offered with or without concomitant vaginal hysterectomy or continence surgery. Patients were followed up and mesh-related complications were noted.

Results: Overall, 276 Chinese women who received mesh surgery were included for data analysis. There were 22 mesh-related complications found during a mean follow-up period of 40 months. Mesh exposure accounted for 20 these complications; significantly more occurred after transvaginal than after abdominal mesh surgery (16 vs 4; P=0.01). Median duration from primary operation to the time of mesh exposure detection was 12 months (interquartile range=4.8-32.8 months). Ten patients required surgical excisions of exposed mesh. The re-operation rate after mesh complications was 6.7% (9/134) for transvaginal mesh surgery and 1.4% (2/142) for laparoscopic sacrocolpopexy (P=0.03). All excisions were performed transvaginally and 95% remained well after surgery. Occurrence of mesh exposure was higher in transvaginal mesh surgery (adjusted odds ratio=6.1; P=0.008), in sexually active patients (adjusted odds ratio=5.4; P=0.002), and in obese patients (adjusted odds ratio=3.7; P=0.046). Over 90% were satisfied with the outcome, regardless of mesh complications.

Conclusions: The rates of mesh exposure and re-operation were consistent with those reported in the literature, suggesting no significant differences in outcome between Chinese and Western patients for this type of surgery.

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New knowledge added by this study

- This is among the first studies to report the intermediate incidence and management outcomes of mesh-related complications in the Chinese population in Hong Kong.
- Transvaginal mesh surgery, coital activity, and obesity were associated with a higher rate of mesh exposure and subsequent need of re-operation.
- Vaginal excisions of exposed mesh were usually successful; this can be done as an out-patient procedure with satisfactory outcome.
- A high satisfaction rate (97%) was noted.
- Dyspareunia and pelvic pain were rare complaints among Chinese women after mesh surgery, despite being common in Western populations.

Implications for clinical practice or policy

- The rates of mesh exposure and re-operation for mesh-related complications tended to be lower for abdominal mesh surgery than for transvaginal mesh surgery, although the latter is less invasive and has a shorter operating time.
- Careful selection of patients, ie, patients with advanced stage of pelvic organ prolapse, older than 65 years, and sexually inactive, would benefit more from selecting transvaginal mesh surgery.
- Weight optimisation before operation may reduce mesh-related complications due to obesity.

Introduction

Traditional repair of pelvic organ prolapse has a high recurrence risk of up to 30%, leading to development of mesh that decreases anatomical recurrence.[1-3] However, there has been recent public interest and media reports on adverse events experienced by

香港骨盤底器官脫垂人造纖維網重建手術引起的相關併發症

温綺琪、陳丞智、張優嘉、鍾國衡

引言：骨盤底器官脫垂人造纖維網重建手術引起的相關併發症是國際關注的問題。本研究旨在回顧與人造纖維網重建手術相關併發症的發生率、治療和手術結果，並與西方人口研究結果作比較。

方法：這項前瞻性研究納入所有接受腹腔鏡下骶骨固定術、腹腔鏡下骶骨岬子宮固定術或陰道人造纖維網懸吊手術，伴隨或不伴隨陰道子宮切除術或治療失禁手術的患者進行研究跟進並檢視是否出現與人造纖維網狀相關的併發症。

結果：研究共納入276名接受骨盤底器官脫垂人造纖維網重建手術的華籍女性患者。在平均40個月的隨訪期內發現22宗與人造纖維網相關的併發症。人造纖維網移位至陰道內佔20宗，經陰道的人造纖維網手術出現的併發症比腹部人造纖維網手術明顯較多（16比4；P=0.01）。從初次手術到檢出人造纖維網移位至陰道的時間中位數為12個月（四分位數間距：4.8至32.8個月）。10名患者須以手術修復移位的網狀物。陰道人造纖維網懸吊手術後因併發症的再手術率為6.7%（9/134），腹腔鏡下骶骨固定術後因併發症的再手術率則為1.4%（2/142）〔P=0.03〕。所有手術修復均經陰道進行，術後95%效果良好。經陰道手術（校正比值比=6.1；P=0.008）、性生活較活躍（校正比值比=5.4；P=0.002）以及肥胖患者（校正比值比=3.7；P=0.046）其人造纖維網移位發生率均較高。不論人造纖維網相關的併發症如何，超過90%患者對手術結果表示滿意。

結論：人造纖維網移位和再次手術的發生率與文獻的結果一致，表明中西方患者對此類手術的結果無顯著差異。

women after mesh reconstructive surgery, especially in Western populations.[4,5]

Sacrocolpopexy was formerly the gold standard treatment for apical compartment or vaginal vault prolapse and had adequate evidence and support.[3,6] However, sacrocolpopexy has a longer learning curve and operating time than vaginal surgery.[3,7] Transvaginal mesh surgery was promoted as a good alterative option in terms of anatomical correction and shorter operative time.[3,7,8] A previous report on transvaginal mesh surgery for pelvic organ prolapse showed a high rate of patient satisfaction and success in the Chinese population in Hong Kong.[9] The incidence of mesh exposure has been reported to be 2% to 12% in sacrocolpopexy,[1,2,10,11] and 2.7% to 24% in transvaginal mesh surgery.[12-15] Most reports, including those from the United States Food and Drug Administration[4] and the New Zealand Accident Compensation Corporation,[5] have involved patients from Western countries and have advised caution regarding the use of transvaginal mesh. There is limited information on transvaginal mesh surgery in Asian populations. Ethnic differences have been suggested as a significant factor for explaining differences in prevalence of pelvic organ prolapse and in pelvic organ mobility.[16,17] Possible differences in response and complications from mesh surgery in different populations may exist.

Some studies have reported that mesh exposure usually occurs in the first few months after surgery[13,14,18,19] but studies with a longer follow-up are required to confirm this. Most studies reporting mesh complications have focused on the time interval between insertion of mesh and excision of the exposed mesh instead of detection of mesh exposure.[20,21] The exact location and size of the mesh exposure are sometimes inadequately reported.[14,20]

Many studies have investigated mesh-related complications from mesh reconstructive surgery for pelvic organ prolapse. However, there is limited information on such complications in Asian populations. The aim of the present study was to evaluate the incidence, management, and surgical outcomes of mesh-related complications from mesh reconstructive surgery for pelvic organ prolapse in a tertiary centre in a Chinese population in Hong Kong.

Methods

The present study was an observational cohort study conducted at the urogynaecology training centre at the Prince of Wales Hospital, Hong Kong. All patients receiving mesh reconstructive surgery for pelvic organ prolapse between 2005 and 2016 in the study centre were recruited. Those who did not return for any postoperative follow-up were excluded from the data analysis.

Laparoscopic sacrocolpopexy was offered to patients with vaginal vault prolapse. In patients with stage III/IV uterine prolapse, medically fit and sexually active, the option of concomitant vaginal hysterectomy with laparoscopic sacrocolpopexy was offered. Laparoscopic hystercolposacropexy was performed if patients requested uterine preservation. Transvaginal mesh surgery, either anterior, posterior, or total vaginal mesh, was available to patients with anterior and posterior compartment prolapse, at least stage III or above, who were aged ≥65 years, were more likely sexually inactive, or had recurrence of pelvic organ prolapse after previous sacrocolpopexy/hystercolposacropexy. Transvaginal mesh surgery was also offered with concomitant vaginal hysterectomy or with uterine preservation. Insertion of vaginal mesh in the posterior compartment was not performed after January 2013, after evidence was published that showed no improvement from posterior vaginal mesh compared with native tissue repair alone.[22,23] Concomitant continence surgery in terms of mid-urethral sling or laparoscopic colposuspension was performed if patients had urodynamically confirmed stress incontinence. All operations were performed by urogynaecologists or by urogynaecology subspecialty trainees under direct supervision by

urogynaecologists. All demographic data, intra-operative findings, and immediate postoperative events were documented in the patients' medical records.

Patients were followed up at 2 to 4 months and 12 months after surgery, then annually after that. Earlier follow-up was offered if the patient requested. During the follow-up consultation, the attending gynaecologist asked patients about vaginal bleeding, pain, dyspareunia, and the severity of any present symptoms. Vaginal examination was performed to determine whether there was recurrence of pelvic organ prolapse or mesh exposure, as recommended by International Continence Society (ICS) and the International Urogynecological Association (IUGA).[24,25] Patients were asked to subjectively assess the treatment outcome during every postoperative clinic visit. Patients rated the outcome as "worse, same, or better" compared with their preoperative condition. Location, size, and area of mesh exposure were documented. Complications related directly to the insertion of mesh were classified according to the joint project of the IUGA and the ICS during the analysis of the database.[24] Vaginal oestrogen cream was offered to patients with mesh exposure if not contra-indicated.[26] The option of conservative management or surgical excision of exposed mesh was discussed with patients, depending on the severity, symptoms, and their wishes. Treatment outcome with or without mesh-related complications was also studied. All patients underwent the same study protocol and had the same postoperative assessment on mesh complications according to a standardised datasheet. The postoperative assessment was carried out by urogynaecologists or trained gynaecologists.

Different variables were studied to investigate any association with mesh complications. Patients were evaluated according to whether they received abdominal or transvaginal mesh surgery.

Statistical analyses

Data were analysed using the SPSS Windows version 22.0 (IBM Corp, Armonk [NY], United States). Descriptive analysis was used to study the demographics and incidence of mesh complications. Fisher's exact test, Chi squared test, student's *t* test, and Mann-Whitney *U* test were used for statistical comparisons between different study groups. A P value of <0.05 was considered statistically significant. Multiple logistic regression was performed for variables found to be statistically significant in univariate analysis; odds ratio (OR) and 95% confidence interval (CI) were also studied.

Results

A total of 280 Chinese women received mesh reconstructive surgery from March 2005 to December 2016. Four patients were lost to follow-up. Therefore, 276 (98.6%) patients were included for data analysis (Fig).

The demographics and background data of the study population are presented in Table 1. Abdominal mesh surgery and transvaginal mesh surgery, all with concomitant pelvic floor repair, were performed in 142 and 134 patients, respectively. Concomitant continence operation was performed in 81 (29.3%) patients. Mean follow-up duration was 40 ± 1.47 months (range, 1-131 months).

Mesh-related complications were identified in 22 (8.0%) patients, including vaginal mesh exposure in 20 (7.2%) patients and intra-operative and perioperative complications in one (0.4%) patient each (Table 2).

Intra-operatively, there was one bladder injury during insertion of inferior trocar of the anterior vaginal mesh. The involved trocar was immediately removed and re-inserted in another correct surgical plane. Cystoscopy showed a small site of bladder perforation without active bleeding nor urine leakage. No repair was necessary. No mesh material was seen inside bladder. The patient recovered uneventfully without other mesh-related complications in subsequent follow-up.

Perioperatively, one patient had mesh infection after anterior vaginal mesh repair with abscess formation in the vulva, requiring mesh removal 18 days after the primary operation. The infection subsided with antibiotics and drainage, but the patient passed away at 7 weeks postoperatively due to other medical morbidities.

The incidence of mesh exposure was 2.8% in abdominal and 11.9% in transvaginal mesh surgery (Table 2). Mesh exposure was most commonly found in posterior vaginal wall (33.3%) followed by anterior vaginal wall (27.8%), middle part of vaginal vault (22.2%), left and right vaginal vault (16.7%). The mean ± standard deviation size of the exposed mesh was 1.2 ± 0.6 cm (range, 0.3-2 cm). Median duration from primary operation to the time of first detection of mesh exposure was 12 months (interquartile range [IQR]=4.8-32.8 months); the longest duration was 63 months. Median time of detection was 11.5 months (IQR=5.8-31.8 months) in transvaginal mesh surgery and 34.5 months (IQR=15.0-59.0 months) in abdominal mesh surgery (P=0.081; Table 2). All patients with mesh exposure presented with intermittent vaginal spotting and all involved only the vaginal epithelium. None complained of dyspareunia, or vaginal or pelvic pain, although half of them were sexually active.

Vaginal oestrogen cream was given to all 20 patients with mesh exposure; this treatment was successful in eight (40%) patients. Two others were asymptomatic and opted for conservative management. The remaining 10 required surgical

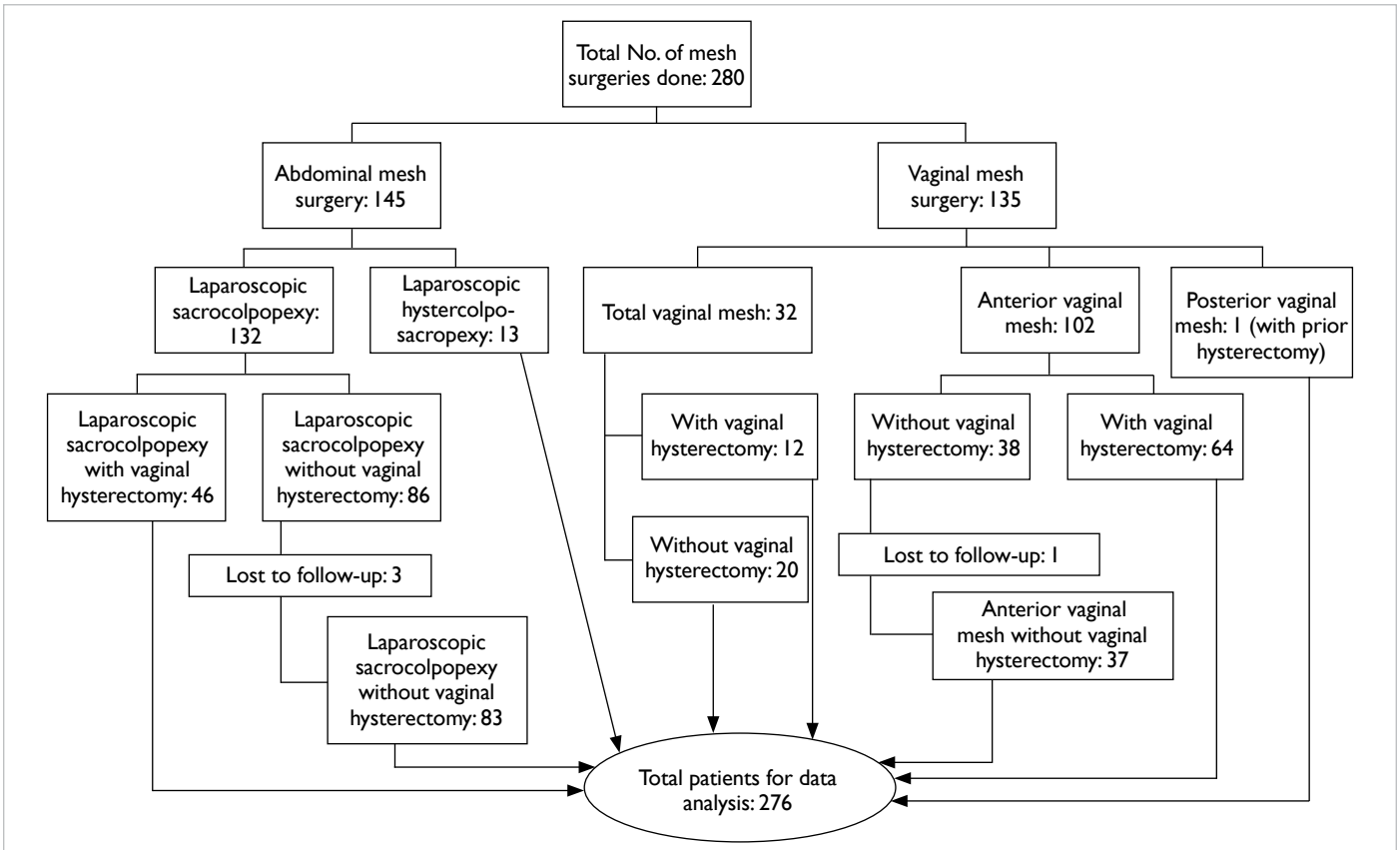

FIG. Recruitment and data analysis of patients according to route of mesh surgeries

TABLE 1. Patient demographics and study results of mesh-related complications in overall, and abdominal and transvaginal mesh surgeries for pelvic organ prolapse (n=276)*

	Overall	Abdominal mesh surgery (n=142)	Transvaginal mesh surgery (n=134)	P value
Age at primary operation (years)	62.9 ± 10.3 (range, 32-87)			
Age at time mesh exposure was found or last follow-up (years)	69.3 ± 9.9 (range, 37-90)			
Age >70 years	105 (38.0)	20 (14.1)	85 (63.4)	<0.01
Age >65 years	155 (56.2)	49 (34.5)	106 (79.1)	<0.01
Parity	3 (2-4)	3 (2-3)	3 (2-5)	0.001
Parity >2	157 (56.9)	70 (49.3)	87 (64.9)	<0.01
Body mass index (kg/m^2)	25.7 ± 3.6 (range, 16.8-37.6)			
Obese (ie, body mass index of ≥30 kg/m^2)	22 (8.0)	9 (6.3)	13 (9.7)	0.30
Smoker	2 (0.7)	1 (0.7)	1 (0.7)	0.93
Sexually active	78 (28.3)	59 (41.5)	19 (14.2)	<0.01
Menopause	234 (84.8)	114 (80.3)	120 (89.6)	0.03
Concomitant vaginal hysterectomy	121 (43.8)	45 (31.7)	76 (56.7)	<0.01
Concomitant mid-urethral sling continence surgery	72 (26.1)	30 (21.1)	42 (31.3)	0.053
Concomitant laparoscopic colposuspension	9 (3.3)	9 (6.3)	0	<0.03
Overall continence surgery	81 (29.3)	39 (27.5)	42 (31.3)	0.48
Subjective outcome, compared with preoperation				0.40
Same	6 (2.2)	2 (1.4)	4 (3.0)	
Better	270 (97.8)	140 (98.6)	130 (97.0)	
Worse	0	0	0	

* Data are shown as mean ± standard deviation, No. (%) of subjects, or median (interquartile range), unless otherwise specified

TABLE 2. Summary of mesh-related complications (n=276)*

	Overall	Abdominal mesh surgery (n=142)	Transvaginal mesh surgery (n=134)	P value
Mesh-related complications	22 (8.0)	4 (2.8)	18 (13.4)	0.003
Mesh exposure	20 (7.2)	4 (2.8)	16 (11.9)	0.01
Time of detection of mesh exposure (months)	12 (4.8-32.8)	34.5 (15.0-59.0)	11.5 (5.8-31.8)	0.081
Total No. of patients requiring re-operation for exposed mesh	10 (3.6)			0.04
With VH		2 (1.4)	3 (2.2)	
Without VH		0	5 (3.7)	
Re-operation for all mesh complications	11 (4.0)			0.03
With VH		2 (1.4)	3 (2.2)	
Without VH		0	6 (4.5)	
Total No. of re-operations for exposed mesh	15 (5.4)			-
1		2 (1.4)	5 (3.7)	
2			1 (0.7)	
3			2 (1.5)	

Abbreviation: VH = concomitant vaginal hysterectomy

* Data are shown as No. (%) of subjects or median (interquartile range), unless otherwise specified

excision of the exposed mesh. The main indication for re-operation was vaginal spotting; no re-operations were related to pelvic pain or dyspareunia. All surgical excisions of exposed mesh were performed vaginally under local anaesthesia on the same day, except for one patient who opted for general anaesthesia. The median time between primary operation to first surgical excision of exposed mesh was 14 months (IQR=8.8-37.3 months); the longest was 66 months. Mean ± standard deviation operating time for the surgical excisions of exposed mesh was short, around 20 ± 6 minutes (range, 10-30 minutes) with estimated blood loss of 2 to 10 mL. Three patients required repeated excisions with operating times of 22 ± 2 minutes (range, 20-23 minutes) and estimated blood loss of 7 to 12 mL. Another three, in whom mesh exposure remained after first excision, opted not to have a second excision because they were asymptomatic. Most (95%) patients were well at their latest follow-up. Clinical details of all the mesh-related complications are listed with IUGA/ICS codes[24] in Table 3.

The relationships between various factors and mesh exposure were explored (Table 4). Mesh exposure was more common in transvaginal than in abdominal mesh surgery (OR=4.7; 95% CI=1.5-14.3; P=0.007). Transvaginal mesh with posterior insertion was found to be associated with increased risks of mesh-related complications (OR=4.3; 95% CI=1.6-11.5; P=0.002). Total vaginal mesh surgery was also found to be a significant factor (OR=5.0; 95% CI=1.8-13.6; P=0.002). Coital activity (OR=2.8; 95% CI=1.1-6.9; P=0.03) and obesity (OR=4.7; 95% CI=1.5-14.4; P=0.007) were also found to be associated with mesh exposure. No other factors studied were associated with mesh exposure (Table 4).

Multiple logistic regression was performed on these significant variables. This revealed that transvaginal mesh surgery (adjusted OR=6.1; 95% CI=1.6-16.1), coital activity (adjusted OR=5.4; 95% CI=1.8-16.1), and obesity (adjusted OR=3.7; 95% CI=1.0-13.3) remained the significant factors associated with mesh exposure (Table 4).

Discussion

Our study aimed to evaluate the incidence of mesh-related complications from mesh reconstructive surgery for pelvic organ prolapse and associated surgical outcomes in a tertiary unit over the past 11 years. This objective was fulfilled with the study carried out according to its initial design.

The main mesh-related complication reported was vaginal mesh exposure, which is consistent with previous studies on mesh-related complications.[2,4,20] The findings in this study concur with other reports that the most important risk factor of mesh exposure is route of surgery.[11,20] Total vaginal mesh repair was associated with a higher rate of mesh exposure than was anterior vaginal mesh insertion, in agreement with a previous study.[13] The posterior vagina was the most common site of mesh exposure in the present study; therefore, avoiding posterior vaginal mesh repair might reduce the incidence of mesh exposure. A lower rate of mesh exposure from transvaginal mesh surgery is expected in future if insertion of posterior vaginal mesh is stopped; studies will be required to confirm this.

TABLE 3. List of IUGA/ICS system CTS codes and clinical details of mesh-related complications

Patient No.	IUGA/ICS CTS code	Index operation	Duration from index operation (months)	Need of surgical excision	Surgical outcome after first excision	Total No. of excisions	Outcome noted at latest assessment
1	2A T3 S1	VH + AVM	11	No	N/A	0	Well
2	2A T3 S1	VH + AVM	12	Yes	Re-exposure	1	Asymptomatic, no need re-operation
3	2A T4 S1	TVM	13	No	N/A	0	Well
4	2A T4 S1	VH + AVM	32	No	N/A	0	Well
5	2A T4 S1	VH + Lap SCP	23	No	N/A	0	Well
6	2B T3 S1	VH + TVM	3	Yes	Re-exposure	1	Asymptomatic, no need re-operation
7	2B T3 S1	AVM	40	No	N/A	0	Treated with oestrogen cream alone, did not come back for follow-up
8	2B T4 S1	TVM	35	Yes	Successful	1	Well
9	2B T4 S1	VH + Lap SCP	47	No	N/A	0	Well
10	2B T4 S1	AVM + VH	46	No	N/A	0	Well
11	2B T4 S2	AVM	24	Yes	Successful	1	Well
12	3A T3 S2	VH + TVM	3	No	N/A	0	Well
13	3A T4 S1	AVM	33	No	N/A	0	Well
14	3A T4 S1	VH + TVM	13	No	N/A	0	Well
15	3A T4 S1	VH + Lap SCP	63	Yes	Re-exposure	1	Asymptomatic, no need re-operation
16	3B T2 S1	TVM	2	Yes	Re-exposure	2	Well
17	3B T3 S1	TVM	3	Yes	Re-exposure	3	Well
18	3B T3 S2	TVM	4	Yes	Re-exposure	3	Well, no more mesh exposure after last excision
19	3B T3 S2	VH + TVM	12	Yes	Successful	1	Well
20	3B T4 S1	VH + Lap SCP	13	Yes	Successful	1	Well
21	4A T1 S3	VH + TVM	During same primary operation	Involved trocar removed and re-inserted, checked no more bladder perforation	Successful	0	Well, no other complications, good recovery
22	7C T2 S0	AVM	0.5	Yes	No more vulvar abscess	1	Infection subsided. Patient passed away at 7 weeks postoperatively due to other medical morbidities

IUGA/ICS mesh complications CTS codes[24]

Category		Time		Site	
1	Mesh contraction/prominence without vaginal epithelial separation	T1	Intra-operative to 48 hours	S0	No site applicable
2	≤1-cm mesh exposure	T2	48 Hours to 2 months	S1	Vaginal: area of suture line
3	>1-cm mesh exposure or extrusion	T3	2 Months to 12 months	S2	Vaginal: away from area of suture line
4	Urinary tract complications	T4	Over 12 months	S3	Trocar passage (except intra-abdominal)
5	Rectum/bowel compromise or perforation (prosthesis/graft perforation or fistula)			S4	Other skin site or musculoskeletal site
6	Skin/musculoskeletal complications			S5	Intra-abdominal
7	Patient compromise including haematoma/ systemic compromise				
A	Asymptomatic				
B	Symptomatic, eg, discomfort, pain, dyspareunia, bleeding				
C	Infection				
D	Abscess				

Abbreviations: AVM = anterior vaginal mesh; CTS = category, time, and site; ICS = International Continence Society; IUGA = International Urogynecological Association; Lap SCP = laparoscopic sacrocolpopexy; N/A = not applicable; TVM = total vaginal mesh; VH = vaginal hysterectomy

TABLE 4. Different variables relating to mesh exposure (n=276)*

	No mesh exposure (n=256)	Mesh exposure (n=20)	P value (univariate analysis)	Odds ratio (95% CI)	P value (multivariate analysis)	Adjusted odds ratio (95% CI)
Age at primary operation (years)	66.6 ± 9.9	66.9 ± 9.1	0.91			
Age at time mesh exposure was found or last follow-up (years)	69.4 ± 9.9	68.1 ± 9.1	0.56			
Age >70 years at mesh operation	99 (38.7)	8 (40.0)	0.91			
Age <65 years at mesh operation	109 (42.6)	9 (45.0)	0.83			
Parity	3 (2-4)	3 (2-4)	0.72			
Parity >2	146 (57.0)	11 (55.0)	0.65			
BMI (kg/m^2)	25.7 ± 4.8	26.5 ± 4.0	0.52			
Obese (ie, BMI of ≥30 kg/m^2)	17 (6.6)	5 (25.0)	0.007	4.7 (1.5-14.4)	0.046	3.7 (1.0-13.3)
Smoker	2 (0.8)	0	0.70			
Sexually active	68 (26.6)	10 (50.0)	0.03	2.8 (1.1-6.9)	0.002	5.4 (1.8-16.1)
Menopause	219 (85.5)	15 (75.0)	0.21			
Concomitant vaginal hysterectomy	110 (43.0)	11 (55.0)	0.30			
Concomitant mid-urethral sling continence surgery	67 (26.2)	5 (25.0)	0.91			
Concomitant colposuspension	9 (3.5)	0	1.0			
Overall continence surgery	76 (29.7)	5 (25.0)	0.66			
Route of surgery			0.007	4.7 (1.5-14.3)	0.008	6.1 (1.6-16.1)
Abdominal mesh surgery	138 (53.9)	4 (20.0)				
Transvaginal mesh surgery	118 (46.1)	16 (80.0)				
Total vaginal mesh done	25 (9.8)	7 (35.0)	0.002	5.0 (1.8-13.6)	1.0	
At posterior vaginal wall		6 (30.0)				
At left and right vaginal vault		1 (5.0)				
Posterior vaginal mesh†	26 (10.2)	7 (35.0)	0.002	4.3 (1.6-11.5)	1.0	
Anterior vaginal mesh only	92 (35.9)	9 (45.0)	0.42			
Subjective outcome, feeling better than before operation	251 (98.0)	18 (90.0)	0.03			

Abbreviations: 95% CI = 95% confidence interval; BMI = body mass index

* Data are shown as mean ± standard deviation, No. (%), or median (interquartile range)

† All had total vaginal mesh done except 1 patient who had posterior vaginal mesh insertion only

The rates of mesh exposure in transvaginal mesh surgery and in laparoscopic sacrocolpopexy in the present study were within the range of rates reported in the literature. The re-operation rates for mesh-related complication were similar to those reported in other studies: 2% to 13.2% for transvaginal[14,20] and 1.3% to 5% for abdominal mesh surgery.[1,20,26] All mesh surgeries in the present study were performed by or with trained urogynaecologists, but that might not be the case in other hospitals.[14,20,21]

Coital activity was associated with higher risks of mesh exposure, in agreement with other study populations.[12,18,20] Obesity is known to have many implications for health, including as an independent risk factor for perioperative surgical site infection in vaginal surgery,[27] although this is not mentioned specifically in other studies on mesh-related complications. Patients ought to be counselled to attempt weight reduction before a prolapse operation because weight loss might lower the risk of mesh-related complications, in addition to the general benefits of maintaining a body mass index in the normal range.

Dyspareunia, pelvic, or vaginal pain are among the most common distressing symptoms reported in the literature[4,11,20,21] but these were not reported in this study cohort. This might be explained by differences in the interpretation of 'discomfort' from mesh-related complications between Chinese and Western populations.

The median time between surgery and detection of mesh exposure in the present study was within the range reported in other studies.[12,13,17,18] Mesh exposure tended to be found earlier in transvaginal than abdominal mesh surgery, but

this difference was not significant. Patients should be informed about the possible symptoms of mesh exposure and advised to seek medical advice should they experience them.

There was one mesh infection with abscess formation and one mild bladder injury over the 11 years of study. Otherwise there were no serious mesh-related complications, such as mesh exposure to the bladder or bowel, or spondylodiscitis.[15,19,21]

Demographic differences were found between the two groups of patients receiving abdominal and transvaginal mesh surgery due to the different selection criteria, as anticipated from the beginning of the study design. Younger patients tend to have higher risks of re-interventions from mesh surgery.[28,29] Thus, younger patients are more often offered abdominal instead of vaginal mesh surgery.

Concomitant vaginal hysterectomy and concomitant continence surgery were not associated with mesh complications in this study, consistent with one review on abdominal sacrocolpopexy[10] but in contrast to another.[11] Smoking has been found to be associated with mesh exposure.[12] However, the prevalence of smoking was low in this cohort and this association was not detected. Different ages have been found to be associated with higher risk of mesh exposure in other studies,[20,26] but this was not confirmed in the present study population.

Strengths

The objective was clearly defined and fulfilled. The loss to follow-up rate was low (only 1.4%) and data collection was complete without missing data, reducing possible bias in results analysis. The high follow-up rate could be due to the low medical cost for follow-up and geographical convenience in Hong Kong. A search of the literature suggests that the present study is among the first with a low loss-to-follow-up rate investigating the incidence of mesh-related complications from mesh reconstructive surgery in a Chinese population.

Limitations

The 11-year duration of the present study, although long, could be too short for all complications or recurrences of mesh exposure to become apparent. No power calculation was used, because patients only with an advanced stage of pelvic organ prolapse are be offered mesh surgeries, and not all women with advanced pelvic organ prolapse opt for mesh surgery, knowing the possible risks. This study might be underpowered to detect other possible factors associated with mesh complications. However, this study can provide important information on the complications associated with mesh surgeries from a population that has not been well investigated.

This was a single-centre study with specific selection criteria for different routes of mesh surgery. All types of mesh surgery for pelvic organ prolapse were performed by the urogynaecology team; this might limit the generalisability of the results to other centres in which operations are performed by non-urogynaecologists.[14,20,21] However, it is common practice in other study centres in Hong Kong for urogynaecologists or gynaecologists experiences in vaginal surgery to perform mesh surgery for pelvic organ prolapse.

The IUGA/ICS coding[24] for mesh-related complications was performed retrospectively during database analysis. However, all data needed for the coding were available. Finally, the follow-up assessment was performed by the same team of surgeons; this might lead to potential reporting bias (on the part of the patient and the clinician). However, the reporting of mesh exposure or complication was an objective clinical decision, with the use of a standardised datasheet and would not be largely affected.

Conclusions

Careful selection of patients and intensive training for surgeons would help to reduce the incidence of mesh-related complications from reconstructive surgery for pelvic organ prolapse. The present study found that the incidence of mesh-related complications and the re-operation rate after mesh surgery in Chinese women were consistent with those reported in the Western populations. The incidence of mesh-related complications tended to be lower after abdominal than after transvaginal mesh surgery. Pelvic pain and dyspareunia were rare complaints independent of the occurrence of mesh complications. Surgical outcomes after mesh surgery were satisfactory despite some cases of mesh exposure. Longer-term studies with more patients are needed before definitive conclusions can be drawn.

Author contributions

Concept or design: OYK Wan, SSC Chan, RYK Cheung.
Acquisition of data: OYK Wan, SSC Chan.
Analysis or interpretation of data: OYK Wan.
Drafting of the article: OYK Wan.
Critical revision for important intellectual content: SSC Chan, RYK Cheung, TKH Chung.

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Declaration

The authors have no conflicts of interest to disclose. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity. Part of this study was presented as a poster at the International Continence Society 47th Annual Meeting in Florence, Italy, 12-15 September 2017.

Ethical approval

Ethical approval was obtained from local institute (The Joint Chinese University of Hong Kong–New Territories East Cluster Clinical Research Ethics Committee) [CREC 2015.125].

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