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Factors affecting salvage rate of infected prosthetic mesh

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ABSTRACT

Background: Prosthetic mesh infection (PMI) is a challenging complication of ventral hernia repair (VHR). The sparsity of data leaves only experience and judgment to guide surgical decision-making.
Methods: Retrospective review of patients diagnosed with PMI. Subsequent abdominal operation (SAO) constitutes any intraabdominal operation occurring after the index hernia repair prior to PMI presentation. Any mesh removal was considered salvage failure. Analysis was performed using Chi-square test, Fishers Exact, or Mann-Whitney *U* test. Analyses completed using R Version 3.0.2.
Results: We identified 213 instances of PMI. Most cases (58.7%) involved intraperitoneal mesh. Thirty-seven percent of patients had an SAO, only 25.3% of which were clean cases. Enteroprosthetic fistula occurred in 38 patients (17.8%). Mean time to presentation was 19.9 mos after index hernia repair or SAO for infection alone, and 48.1 mos when a fistula was present ($p < 0.001$). Percutaneous drainage was used to treat 29 cases, successfully in 10 (34.5%), 8 of which were macroporous polypropylene and 2 biologic mesh. Negative pressure wound therapy (NPWT) was used in 46 patients, but successful in only 16 (34.8%), all of which were macroporous polypropylene. Local wound care alone successfully salvaged only 16 of 85 meshes (18.8%), 13 of which were macroporous polypropylene. Macroporous polypropylene mesh was salvaged in 65% of cases overall, and 72.2% when in an extraperitoneal position. Mesh salvage was not possible in any case involving composite or PTFE mesh, and rarely for microporous polypropylene (7.7%) multifilament polyester (4.2%), or intraperitoneal mesh (2.4%). Closure of the defect after mesh removal significantly lowers recurrence rate ($p < 0.001$).
Conclusion: PMI involving composite, PTFE, multifilament polyester, or microporous polypropylene mesh requires explantation in nearly all cases. Infected macroporous polypropylene mesh in an extraperitoneal position is salvageable in most cases. Furthermore, the risk of secondary mesh infection after SAO, particularly with intraperitoneal mesh, should be considered during index VHR.

Introduction

Prosthetic mesh infection (PMI) is a potentially devastating complication of ventral hernia repair (VHR). Reported incidence ranges from 0.7 to 25.6%, depending on a number of factors including patient comorbidities, surgical technique, mesh selection and nomenclature used in reporting clinical outcomes.[1–7] Conventional teaching advocates early mesh removal, often requiring multiple operations and long-term, often complex wound care, eventually resulting in hernia recurrence, beginning the cycle again. Advancing technology and resurgence of hernia-specific research is challenging this notion, and mesh salvage is possible with several described methods with varying rates of success. However, there remains a lack of quality data to guide surgeons in the management of mesh infection.

As our understanding of material properties and surgical technique improve, our understanding of the pathophysiology and management of PMI is also improving. Bacterial adherence and clearance vary according to mesh material and its 3-dimensional

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architecture, with monofilament, large-pore materials outperforming multifilament and microporous materials and mesh constructs in experimental and animal studies.[3,5,8–11] Additionally, mesh position within the abdominal wall impacts the salvageability of PMI.[12–14] For this study, we sought to review our experience with PMI to determine the material, antimicrobial and patient factors that permit successful salvage. We hypothesize that large-pore, monofilament mesh in an extraperitoneal position can be routinely managed without mesh explantation.

Methods

A retrospective review of all cases of PMI managed at our institution (Prisma Health Upstate) from January 2006 through December 2018 was performed. Patients were identified by query of the Department of Surgery database, a prospectively maintained database of all cases performed. Additionally, all VHR repairs performed by the authors (JAW, WSC, AMC), included in an internal, prospectively maintained database (prior to 2013) or contained within the Americas Hernia Society Quality Collaborative (AHSQC) database (since 2013) were reviewed. All patients who developed any SSI were reviewed to identify additional cases of PMI.

Criteria for diagnosis of PMI were, 1) exposed mesh, 2) chronic draining sinus confirmed as mesh infection at time of intervention, 3) periprosthetic, culture positive fluid collection, 4) periprosthetic fluid collection with clinical finding consistent with infection (cellulitis, purulent wound drainage, fever, leukocytosis), or 5) enterocutaneous fistula through area of the abdominal wall containing mesh. Secondary mesh infection (SMI) was defined as PMI developing after a subsequent abdominal operation (SAO). Common demographic data was collected on all patients. Hernia specific data was collected regarding the date of index hernia repair, surgical technique, including mesh type and location, incidence of SAO, time to presentation with PMI, and management. For the majority of patients whose index hernia repair was performed at an outside facility, operative reports were obtained and reviewed. Data regarding repair date, operative technique and mesh type were collected. In cases in which specific mesh name and brand were unavailable, these were simply classified based on the material and porosity at the time of intervention for PMI based on the documentation of the operating surgeon.

A mesh was considered salvaged if treatment did not require removal of any portion of the mesh. We defined failure of mesh salvage as removal of any portion of the implanted mesh. Partial mesh salvage was defined as removal of only a portion of the infected mesh, such as exposed or unincorporated mesh. This was included in our analysis as this is a common practice. Microporous mesh was defined as pore size <75 μm, and macroporous defined as pore size >75 μm.[15] Composite mesh was any combination of multiple mesh types. In our study, all composite meshes were a combination of a PTFE tissue separating layer and polypropylene layer. Analysis was performed using Chi-square test, Fishers Exact, or Mann-Whitney *U* test. Analyses completed using R Version 3.0.2.

Results

We identified 213 unique cases of PMI following VHR in 193 patients. Mean age was 57.8 ± 12.6 years, 57.5% were female, and mean BMI was 34.9 ± 9.1 kg/m^2. Comorbidities included diabetes mellitus (DM – 39.9%), chronic obstructive pulmonary disease (COPD – 13.2%), and smoking (28.7%) [Table 1]. Index hernia repairs were clean in the majority of cases (64.8%). Repair was performed with an open approach in 78.4%, laparoscopically in 18.3%, robotically in 0.9%, and unknown in 2.3%. Mesh was placed as an intraperitoneal onlay of mesh (IPOM) in 58.7% of cases, inlay in 2.8%, and extraperitoneal in the remainder (onlay - 12.2%; retromuscular – 18.3%; preperitoneal 7.0%). Biologic mesh was used in 5.6% of cases, barrier-coated permanent synthetic in 54.5%, and non-barrier coated permanent synthetic in 40.4%. Mesh type was unknown in 6.6%. Fifteen patients had more than one type of mesh placed. Of the 202 patients in which permanent synthetic mesh was used, 46.0% were polypropylene (PP), 18.9% polyester (PE), 19.8% polytetrafluoroethylene (PTFE), and 30.2% composite mesh (PP + PTFE) [Table 2]. Culture results were available in 53.5% of cases. Gram positive bacteria were present in 63.2% of cases, of which Staphylococcus species were the causative organism n 65.2% (57.4% methicillin resistant). Gram negative bacteria were cultured in 36.0% of cases.

Secondary mesh infection (SMI), defined as PMI occurring *after* subsequent abdominal operation (SAO), occurred in 79 (37.1%) of patients. Only 25.3% of SAOs were clean cases. Gastrointestinal surgery was the most common indication for SAO (53.2%), followed

Table 1
Patient demographics.

Demographics	N(%)
N Cases of PMI	213
N Patients	193
Age, Mean ± SD	57.8 ± 12.6
Gender	
Male	82 (42.5)
Female	111 (57.5)
Race	
White	159 (82.4)
Black	23 (11.9)
Other	11 (5.7)
ASA	
1	3 (1.41)
2	47 (22.1)
3	143 (67.1)
4	20 (9.4)
BMI (kg/m^2)	34.9 ± 9.1
DM	85 (39.9)
COPD	28 (13.2)
Smoker	
Current	60 (28.2)
Former	65 (30.5)
Never	87 (40.9)

PMI – Prosthetic mesh infection; *ASA* – American Society of Anesthesiology score; *BMI* – Body Mass Index; *DM* – Diabetes Mellitus; *COPD* – Chronic Obstructive Pulmonary Disease.

Table 2
Operative/mesh characteristics of patients with PMI.

Mesh Position	N (%)
Onlay	26 (12.2)
Inlay	6 (2.8)
Preperitoneal	15 (7.0)
Retromuscular	39 (18.3)
Intraperitoneal	125 (58.7)
Mesh Type	
Permanent Non-barrier coated	86 (40.4)
Permanent barrier coated	116 (54.5)
Absorbable Synthetic	0 (0)
Biologic	12 (5.6)
Unknown	14 (6.6)
Wound Class of Index VHR	
Clean	138 (64.8)
Clean-contaminated, Contaminated, Dirty	43 (20.2)
Unknown	26 (12.2)

by recurrent VHR (32.9%), unknown (17.8%), gynecologic or urologic (6.3%), and hepatobiliary (4.2%) [Table 3]. Time to presentation of PMI after VHR in the absence of SAO was 32.9 mos. In patients with SMI, mean time to presentation with PMI was 68.5 mos from index VHR, but was just 21.1 mos from the time of most recent SAO. Of the 79 cases of SMI, 52 (65.8%) involved intraperitoneal mesh.

Patients who had delayed presentation of PMI from index VHR or most recent SAO were more likely to present with erosion of mesh into the viscera, creating an enteroprosthetic fistula (EPF). This occurred in 38 patients (17.8%) with a mean time to presentation of 48.1 mos. In patients who presented with PMI in <24 mos, 14.1% (20 of 142) were found to have EPF. However, in those presenting with PMI in >24 mos, 32.1% (18 of 56) were found to have EPF ($p = 0.036$). Thirty-one (87.5%) of these involved IPOM and included composite mesh ($n = 16$; 42.1%), PTFE ($n = 5$; 13.2%), microporous PP ($n = 7$; 18.4%), macroporous PP ($n = 4$; 10.5%), multifilament PE ($n = 10$; 26.3%), unknown mesh ($n = 2$; 5.3%) Six patients had more than one mesh type involved with the EPF. In the 5 patients who developed a fistula after retromuscular repair, all occurred acutely after VHR, 1 mesh was completely salvaged, 1 required complete removal, and 3 required only local excision (partial mesh salvage) Table 4 depicts time to presentation and EPF characteristics.

Multiple interventions were used in attempts to salvage PMI. Antibiotic therapy was documented in 55.5% of cases, though this is likely an underestimate due to the retrospective nature of the study. Of the 116 patients known to have received antibiotic treatment, only 25 (21.6%) were salvaged. Percutaneous drainage of periprosthetic abscess was employed in 13.6%, wound opening and local wound care in 39.9%, and negative pressure wound therapy (NPWT) in 21.6%. These interventions were effective in achieving salvage in only 34.5%, 18.8% and 34.8% of cases respectively. Ultimately, mesh removal was required in 85.5% of cases (complete mesh removal in 165 cases, and partial mesh excision in 17), with mesh salvage possible in only 14.6% of cases overall. Analysis of the factors allowing for salvage very clearly demonstrated a link to the mesh properties and the position of the mesh within the abdominal wall. Overall, macroporous PP mesh was able to be salvaged in 65% of cases, microporous PP mesh in only 3.1%, multifilament PE in 3.2%, and no composite or PTFE mesh was able to be salvaged. Regarding mesh position, no inlay mesh was salvaged, and only 2.4% of IPOM mesh was able to be salvaged (multifilament PE, 1 microporous barrier coated PP, 1 biologic). Extraperitoneal mesh was salvageable 28.9% of the time overall (19.2% onlay, 13.3% preperitoneal, 53.8% retromuscular). The greatest impact on salvageability was the combination of macroporous PP mesh in an extraperitoneal position, which was salvaged in 72.2% of cases. When considering partial mesh removal as a successful therapy, as other authors suggest,[16] this increased to 86.1%. Tables 5 and 6 summarize salvageability of mesh by type and position.

The ability to salvage PMI impacted the risk of subsequent hernia recurrence. Hernia recurrence was 16.1% ($n = 5$) in patients whose mesh remained intact, but was 47.8% after complete mesh explantation, and 46.7% after partial mesh removal. In patients whose mesh was salvaged who developed a hernia recurrence, three were due to central mesh failure (all light-weight PP mesh), one developed a parastomal recurrence with intact midline repair, and one patient repaired with human cadaveric mesh recurred in the midline. In patients who required complete mesh removal, some attempt should be made to close the resulting defect. Not surprisingly, all patients whose fascia was left unclosed after mesh removal developed a recurrent hernia. Nine patients were noted to have an intact fascia at the time of mesh removal, and 33.3% of these went on to develop hernia recurrence. Ninety-one patients were closed primarily, recurring in 48.4% of cases. Only 4 patients were repaired with component separation without mesh reinforcement, with one recurrence (25%). Fifty-six patients were closed with mesh reinforcement, of whom 30.4% recurred. Of these, permanent synthetic mesh was used in 13 patients, absorbable synthetic mesh in 12, and biologic in 30. Recurrence occurred in 2 patients after permanent synthetic mesh repair (15.4%), 2 after absorbable synthetic repair (16.7%), and 13 after biologic mesh repair (43.3%). More importantly, no patients repaired with permanent synthetic mesh after PMI explantation went on to develop a subsequent mesh infection. Table 7 summarizes abdominal wall management after mesh removal.

Table 3
Characteristics subsequent abdominal operations.

SAO Type	N(%)
Hepatobiliary	9 (4.2)
Gastric	8 (3.8)
Small Intestine	18 (8.5)
Colorectal	16 (7.5)
GYN	4 (1.9)
Urologic	1 (0.5)
Recurrent Hernia	26 (12.2)
Other	14 (6.6)
SAO Wound Classification	
Clean	20 (25.3))
Clean-Contaminated, Contaminated, Dirty	53 (67.1)
Unknown	6 (7.6)

Discussion

Mesh properties and position within the abdominal wall are the primary determinants in the ability to salvage mesh in the event of PMI. Mesh placed in an intraperitoneal position is rarely salvageable. Similarly, microporous, multifilament, and composite mesh constructs required complete mesh removal in most cases. However, macroporous, monofilament PP mesh in an extraperitoneal position can be salvaged in 72.2% of cases, positively impacting both the need for reoperation for mesh removal and subsequent hernia recurrence.

The retromuscular space is a well vascularized compartment, allowing separation of mesh from the viscera by the posterior rectus sheath, with musculofascial coverage over the mesh to separate it from the skin and subcutaneous tissue. This seems to be an ideal space for mesh placement, potentially decreasing the incidence of infection, and improving the ability to salvage PMI.[11,12,14,17,18] Mesh placed in the preperitoneal space seems to behave similarly to the retromuscular space. The subcutaneous space used for onlay placement is less vascular, and creation of this space often disrupts the periumbilical perforating vessels, further impairing tissue perfusion. However, local wound care, including NPWT, are often successful in managing PMI. Intraperitoneal mesh was rarely salvaged in our study (4%). This is likely multifactorial, resulting from difference in mesh properties, tissue integration, and impact of subsequent abdominal operations (SAO). Blatnik et al., demonstrated the inability of three common barrier coatings (PTFE, poliglecaprone-25, and sodium hyaluronate + carboxymethylcellulose + polyethylene glycol) to clear bacterial contamination with Methicillin-resistant *Staphylococcus aureus*[19] The clinical impact of these and other common barrier coatings is otherwise unknown. Additionally, many constructs do not truly integrate into the abdominal wall, but rather form a neoperitoneum around the mesh, which may impact the ability for host defenses to clear PMI. Despite the overall salvagability of macroporous PP in this series, the only two of this type placed in an IPOM position, both of which

Table 4
Enteroprosthetic fistula.

Patients with EPF		
n	38 (14.5%)	
Time to presentation	48.1mos	
Presentation <24 mos	20 (14.1% of all PMI)	
Presentation >24 mos	18 (32.1% of all PMI)	p = 0.032
Mesh type[a]		
Composite	16 (42.1%)	
microporous PP	7 (18.4%)	
multifilament PE	10 (26.3%)	
unknown mesh type	2 (5.3%)	
macroporous PP	4 (10.5%)	
PTFE	5 (13.2%)	
Mesh position		
IPOM	31 (87.5%)	
RM	5 (13.1%)	
Preperitoneal	1 (4.2%)	
Onlay	1 (4.2%)	

PP – polypropylene; PE – polyester; PTFE – polytetrafluoroethylene; IPOM – intraperitoneal onlay of mesh; RM – retromuscular.
[a] 6 patients had more than one mesh type present.

were poliglecaprone-25-coated macroporous PP, were not salvaged. Based on this limited data, no definitive conclusion can be drawn as to whether this was due to the intraperitoneal position, or simply inadequate sample size to have seen successful salvage.

Mesh material and construct still plays an important role, however. For each extraperitoneal position, only macroporous PP mesh was consistently salvaged. Overall, 72.7% of all macroporous, extraperitoneal PP mesh was salvaged, compared to 4.1% for all other mesh type and positions. Similar trends have been reported by other authors.[11,20–22] A recently published review of mesh infection management demonstrated similar findings to our own, with few reported cases of PTFE or multifilament mesh salvage, but approximately 95% of PP mesh was salvaged.[23]

The basis for these clinical findings lie with the ability of bacteria to adhere to the mesh itself, and the ability of host immunity to clear the bacterial contamination. While clinical presentation of PMI may be delayed for months or even years after index hernia repair,[12,24–26] bacterial inoculation typically occurs at the time of mesh implantation and most often involves common skin flora. The size of the bacterial inoculum and the virulence of the organism are important factors in development of PMI. Multifilament, microporous (<75 μm), PTFE and laminar structures exhibit the greatest amount of bacterial adherence and least ability to clear bacterial infection once it occurs.[9,10,27,28] Patient comorbidities, such as poorly controlled diabetes, obesity, chronic obstructive pulmonary disease (COPD), tobacco abuse and immunomodulatory therapy also impair host response to infection and impair normal healing.

The impact of SAO is substantial. Almost 40% of all PMI in our study had an intervening operation between their index VHR and presentation with PMI, and over 70% of those operations had some degree of contamination. Furthermore, of these 79 cases of SMI, 52 (65.8%) involved intraperitoneal mesh. Secondary mesh infection is not well reported in the literature. The differences in time to presentation with PMI compared to those with SMI support our assumption that these infections are the result of the SAO and not simply delayed infection from the index VHR. We previously published a large, consecutive, single-institution series demonstrating a 17% incidence of SAO after laparoscopic VHR, which demonstrated a 2.5% rate of secondary mesh infection after SAO with intraperitoneal mesh.[29] This is similar to SAO rates reported elsewhere.[7,30] Several authors have noted increased risk of enterotomy and post-operative wound complications with SAO after initial VHR, though secondary mesh infection is not specifically reported.[31,32] The true impact of SAO and the effects of mesh type and location on PMI after SAO remain largely unknown, and this should encourage long-term follow-up after VHR and be a focus of further research. The high proportion of patients in this study with an IPOM technique who developed SMI after SAO should prompt careful consideration of mesh selection and its position within the abdominal wall at the time of initial VHR.

Thirty-eight patients presented with an EPF in our study. Somewhat surprisingly, only 13 (26.3%) of these had a subsequent abdominal operation. All but 7 of these were repaired initially with IPOM technique; one onlay and one preperitoneal repair required complete mesh removal. Of the 5 index retromuscular repairs that presented with a fistula, 3 were successfully treated with partial mesh excision, and one required no explantation of the mesh and had spontaneous closure of the fistula. Patients with EPF presented much later than other PMIs, on average 4 years after index VHR. There are a few reports of mesh erosion into viscera, but the incidence of this complication is unknown.[33–35] Importantly, the diagnosis of EPF is not always obvious prior to mesh removal. In patients presenting with delayed PMI, particularly more than 2 years after index VHR or SAO, enteroprosthetic fistula must be strongly considered. Management ultimately requires complete mesh removal and bowel resection, as any other measures will fail.

There are several limitations to this study. First, a significant majority of these patients had their index VHR elsewhere, thus there is no way to determine the actual incidence of PMI and whether there is any difference between mesh types and abdominal wall position and the initial development of PMI. Also, while the difference between macroporous, extraperitoneal PP mesh and all other types is significant (72.2 v 2.8%; $p < 0.001$), these patients accounted for only 16.9% of all patients in the study. The relatively small sample size, numerous mesh type-mesh position combinations, and variable microbiologic data limited our ability to perform

Table 5
Impact of mesh characteristics & position on complete mesh salvage.

Complete mesh salvage by position and mesh group - salvaged/total (%)						
Mesh Type	*n*	Mesh Position				
		Onlay	Inlay	Preperitoneal	Retromuscular	Intraperitoneal
		26	6	15	39	125
MacroPP	40	4/6 (66.7)	na	2/3 (66.7)	20/27 (74.1)	0/4 (0)
MicroPP	32	0/8 (0)	0/2 (0)	0/7 (0)	0/2 (0)	1/13 (7.7)
MultiPE	31	0/2 (0)	na	na	0/5 (0)	1/24 (4.2)
Composite	41	0/1 (0)	0/1 (0)	0/2 (0)	na	0/37 (0)
PTFE	28	0/2 (0)	0/1 (0)	na	na	0/25 (0)
Other	22	0/4 (0)	0/2 (0)	0/2 (0)	1/5 (20)	1/9 (11.1)
Multiple Mesh	17	1/3 (33.3)	na	0/1 (0)	0/1 (0)	0/13 (0)

MacroPP – Macroporous polypropylene; *MicroPP* – microporous polypropylene; *MultiPE* – multifilament polyester; *PTFE* – polytetrafluoroethylene.

Table 6
Impact of mesh characteristics & position on complete *or* partial mesh salvage.

Complete *or* partial mesh salvage by position and mesh group - salvaged/total (%)						
Mesh Type	*n*	Mesh Position				
		Onlay	Inlay	Preperitoneal	Retromuscular	Intraperitoneal
		26	6	15	39	125
MacroPP	40	5/6 (83.3)	na	2/3 (66.7)	24/27 (88.9)	0/4 (0)
MicroPP	32	0/8 (0)	0/2 (0)	2/7 (28.6)	0/2 (0)	3/13 (23.1)
MultiPE	31	1/2 (50)	na	na	0/5 (0)	2/24 (8.3)
Composite	41	0/1 (0)	0/1 (0)	1/2 (50)	na	1/37 (2.7)
PTFE	28	0/2 (0)	0/1 (0)	na	na	0/25 (0)
Other	22	0/4 (0)	2/2 (100)	0/2 (0)	1/5 (20)	1/9 (11.1)
Multiple Mesh	17	1/3 (33.3)	na	0/1 (0)	0/1 (0)	0/13 (0)

MacroPP – Macroporous polypropylene; *MicroPP* – microporous polypropylene; *MultiPE* – multifilament polyester; *PTFE* – polytetrafluoroethylene.

Table 7
Management of abdominal wall after mesh removal.

Management of Abdominal Wall	N	Hernia Recurrence: N (%)
No recurrent hernia, no repair required	9	3 (33.3)
Defect present, no closure performed	20	20 (100)
Defect present, closed primarily	91	44 (48.4)
Defect present, closed primarily after CST	4	1 (25)
Defect present, repaired with mesh reinforcement	56	17 (30.4)
Unknown	33	6 (18.2)
Mesh placed at time of removal		
Permanent synthetic mesh	13	2 (15.4)
Absorbable synthetic mesh	12	2 (16.7)
Biologic mesh	30	13 (43.3)

Table 8
Impact of patient comorbidities on mesh salvage.

	OR	95% CI
Intercept	0.715	(0.03, 15.151)
Age	0.975	(0.935, 1.017)
Female	Reference	
Male	0.707	(0.274, 1.797)
BMI	1.011	(0.963, 1.06)
Non-Smoker	Reference	
Smoker	0.638	(0.214, 1.737)
ASA $\leq$ 2	Reference	
ASA $\geq$ 3	2.019	(0.613, 7.723)
DM*	0.353	(0.119, 0.94)*
COPD	2.352	(0.712, 7.285)
SAO*	0.098	(0.015, 0.351)*

BMI – body mass index; *ASA* – American Society of Anesthesiology score; *DM* – diabetes mellitus; *COPD* – chronic obstructive pulmonary disease; *SAO* – subsequent abdominal operation.

multivariate analysis to more thoroughly explain which factors allow a PMI to be salvaged. Multivariate analysis of patient factors alone indicated that only SAO and DM impacted mesh salvage. Other common comorbidities, such as smoking, COPD and ASA score did not affect mesh salvage. This is likely because of the high percentage of intraperitoneal mesh (Table 8). Finally, no specific protocol was used to determine when to proceed with mesh explantation versus continuing attempts at salvage, and was rather based on clinical experience. For example, percutaneous drainage can successfully salvage intraperitoneal PMI, but was unsuccessful in all 8 patients with IPOM VHR in our study and was largely abandoned in these cases in favor of proceeding to complete removal. Complex analysis of the relationship of intervention for PMI relative to mesh type and abdominal wall position was limited by small sample size.

Conclusion

Mesh properties and position within the abdominal wall are the primary determinants of the ability to salvage mesh in the event of prosthetic mesh infection. Macroporous polypropylene mesh in an extraperitoneal position can be reliably salvaged in most cases, while intraperitoneal, multifilament, microporous, and composite mesh require removal in almost all cases. The incidence of subsequent abdominal operations and risk of secondary mesh infection, along with the patients underlying risk factors for surgical site infection, warrant careful consideration of mesh selection and surgical technique at the time of ventral hernia repair.

Declaration of competing interest

Author Warren JA receives honoraria for teaching from Intuitive Surgical, Ethicon, CMR Surgical.

Author Cobb WS receives honoraria for teaching from W.L. Gore, Maquet/Getinge, Lifecell/Allergan, and Ethicon.

Author Carbonell AM receives honoraria for teaching from W.L. Gore and Intuitive Surgical.

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