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Polyester Composite Versus PTFE in Laparoscopic Ventral Hernia Repair

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ABSTRACT

Introduction: Both polyester composite (POC) and polytetrafluoroethylene (PTFE) mesh are commonly used for laparoscopic ventral hernia repair. However, sparse information exists comparing perioperative and long-term outcome by mesh repair.

Methods: A prospective database was utilized to identify 116 consecutive patients who underwent laparoscopic ventral hernia repair at The Mount Sinai Hospital from 2004-2009. Patients were grouped by type of mesh used, PTFE versus POC, and retrospectively compared. Follow-up at a mean of 12 months was achieved by telephone interview and office visit.

Results: Of the 116 patients, 66 underwent ventral hernia repair with PTFE and 50 with POC mesh. Patients were well matched by patient demographics. No difference in mean body mass index (BMI) was demonstrated between the PTFE and POC group (31.8 vs. 32.5, respectively; P=NS). Operative time was significantly longer in the PTFE group (136 vs.106 minutes, P<.002). Two perioperative wound infections occurred in the PTFE group and none in the POC group (P=NS). No other major complications occurred in the immediate postoperative period (30 days). At a mean follow-up of 12 months, no significant difference was demonstrated between the PTFE and POC groups in hernia recurrence (3% vs. 2%), wound complications (1% vs. 0%), mesh infection, requiring removal (3% vs. 0%), bowel obstruction (3% vs. 2%), or persistent pain or discomfort (28% vs. 32%), respectively (P=NS).

Conclusion: Our study demonstrated no significant association between types of mesh used and postoperative complications. In the 12-month follow-up, no differences were noted in hernia recurrence.

Key Words: Laparoscopic ventral hernia repair, Mesh repair, PTFE, Polyester, Ventral hernia.

INTRODUCTION

Incisional hernias develop in 10% to 20% of patients following abdominal surgery. While several operative approaches have been developed to repair these defects, no consensus on the optimal method for repair exists.[1–4] Laparoscopic ventral herniorrhaphy has gained popularity since it was first introduced in the early 1990s. Several studies demonstrate decreased hernia recurrence rates and decreased wound complications with the laparoscopic approach.[5–7] In contrast to open repairs, however, all laparoscopic repairs do require placement of a synthetic mesh.[5,6]

Although several options of synthetic mesh exist, polytetrafluoroethylene (PTFE) and polyester composite (PCO) are often chosen. Studies suggest decreased adhesion formation, hernia recurrence, fistula formation, and wound complications with the use of either mesh.[8] In addition, both PCO and PTFE stimulate successful tissue ingrowth, though by different mechanisms. PCO creates a fibrin-collagen response and PTFE creates a mesothelial like cellular monolayer.[9] Currently, no data directly comparing short- or long-term outcome following PCO versus PTFE mesh repair exist. The purpose of this study was to compare PCO to PTFE repair to determine optimal mesh use for laparoscopic incisional herniorrhaphy.

METHODS

Following approval by The Mount Sinai School of Medicine Institutional Review Board, a retrospective chart review was performed of 116 patients with incisional hernias who underwent laparoscopic repair at The Mount Sinai Medical Center from 2005 to 2009. Patients were identified from an administrative database by using ICD-9 codes (553.20 - 553.29, 552.20 - 552.29, 551.20 - 551.29) and CPT codes (49652-49657). Ventral hernias were diag-

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nosed by clinical examination or by radiographic findings. All patients over the age of 18 with a prior history of abdominal surgery, who underwent laparoscopic ventral herniorrhaphy with either PCO or PTFE, were included in the study. Minors, patients who underwent open herniorrhaphy, or who had primary ventral hernias were excluded from the study. Incisional hernias were defined as a defect in the abdominal wall arising in a previous incision site.

Data Collection

A total of 116 cases performed by 4 board certified surgeons were reviewed. Electronic medical records were reviewed for patient demographics, medical and social history, clinical presentation, and radiologic examinations. Operative and anesthesia records were also reviewed for operative time, estimated blood loss, intraoperative fluid status, mesh use (PCO vs PTFE), size of defect, and extent of mesh overlap and method of mesh fixation. Choice of mesh and method of fixation (suture or tack) were left to the individual surgeon. All surgeons used sutures to fix the 4 corners of the mesh to the abdominal wall. Tacks were then placed in between sutures in an inner and outer row.

Patient follow-up was achieved by office records and phone interview to determine hernia recurrence or other operative complications including wound complications, bowel obstruction, or fistula development.

Statistical Analysis

Statistical analysis was performed using the Student unpaired *t* test with 2-tailed distribution for quantitative variables and chi-square test for categorical variables. P-values $<.05$ were considered to confer significance. PRISM version 4.0 statistical software was used for all analyses (October 2003, San Diego, CA).

RESULTS

Of the 116 patients, 74 were female and 42 were male. The mean age was 52.5 years. Sixty-six (57%) patients underwent ventral hernia repair with PTFE and 50 (43%) with PCO. Comparison of preoperative patient demographics demonstrated no difference in body mass index (BMI) between the PTFE versus PCO group (31.8 vs. 32.5, P=NS), respectively. No further difference was demonstrated by patient demographics, comorbidity, presentation, social or operative history **(Table 1)**.

Table 1.
Patient Demographics

	PTFE[a] (N)	POC[a] (N)	P Value
Age	53	51	NS
Sex	39	30	NS
Female	27	20	NS
Male			
Presentation			
Emergent	1	4	NS
Elective	65	46	NS
Comorbidities			
Hypertension	29	25	NS
Diabetes	11	7	NS
CAD[a]	9	4	NS
IBD[a]	1	2	NS
Other	49	36	NS
BMI (m)	31	32	NS
Social			
Tobacco	11	9	NS
Alcohol	9	4	NS
Steroid Use	2	3	NS
Presentation			
Pain	17	20	NS
Incarceration	7	8	NS
Obstruction	1	2	NS
ASA[a]	2	2	NS

[a]ASA=American Society of Anesthesiology; CAD=cardiac artery disease; IBD=inflammatory bowel disease; POC=polyester composite mesh; PTFE=polytetrafluoroethylene.

The defects were divided according to hernia size: <5cm, 5cm to 10cm, and >10cm. Defects <5cm were significantly more likely to be repaired with POC (66% vs. 26%, P=0.007), and those >10cm were significantly more likely to be repaired with PTFE (51% vs. 16%, P=0.0001). Only one piece of mesh was used in each case. No difference in PTFE or PCO use was demonstrated for defects between 5cm to 10cm. PTFE versus PCO repair was significantly more likely to be performed by suture alone (76% vs. 38%, P=<.01), and polyester repair was commonly made with suture and tacks (62% vs. 27% in polyester); P=.0002.

Table 2 represents intraoperative comparison of PTFE to PCO repair. Operative time was significantly prolonged in the PTFE versus the POC group [137 versus 107 minutes; P=.0012), respectively. No data were available to report

Table 2.
Operative details.

	PTFE[a] (N)	POC[a] (N)	P Value
Converted to Open	1	0	NS
Location			
Midline			
Periumbilical			
Epigastric			
Other			
Hernia Size (cm)			
<5	16	32	<.01
5–10	16	10	NS
>10	34	8	<.01
Mesh Size (cm)			
5–10	7	1	NS
10–20	43	44	<.01
> 20	16	5	<.05
Anchoring Technique			
Suture only	47	19	<.01
Suture/Tacks	19	31	<.01
Operative Time (min)	137	106	<.01
EBL[a]	27	29	NS
Complication	2	0	NS

[a]EBL=estimated blood loss; POC=polyester composite mesh; PTFE=polytetrafluoroethylene.

how much of the intervention time was dedicated to adhesiolysis. No other operative difference was demonstrated by mesh type used for repair.

Three cases of mesh infection occurred in the PTFE group and none in the POC group (P=0.12) within 30 days of the operation. One infection required reoperation and mesh removal with a subsequent development of hernia. The other patients were treated with enteral antibiotics, and no further intervention was necessary. No other major complications occurred in the immediate postoperative period. Mean duration of follow-up was 12 months, and results are represented in **Table 3**. No significant difference was demonstrated between the PTFE and polyester group in hernia recurrence (3% vs. 2%), wound complications (1% vs. 0%), mesh infection (3% vs. 0%), infection requiring removal (1% vs. 0%), development of bowel obstruction (3% vs. 2%), or persistent pain or discomfort (28% vs. 32%) (P=NS).

Table 3.
Postoperative and Long-term Findings

	PTFE[a] (n=)	POC[a] (n=)	P Value
LOS[a]	2	2	NS
Readmission	6	1	NS
Mortality	0	0	n/a
Persistent pain	19	20	NS
Seroma	1	1	NS
Wound infection	3	0	NS
Mesh infection requiring removal	1	0	NS
Recurrence	2	1	NS
Bowel Obstruction	2	1	NS
Re-operation	2	0	NS

[a]LOS=Length of stay in days; POC=polyester composite mesh; PTFE=polytetrafluoroethylene.

DISCUSSION

This study demonstrated no significant difference in short-term or 12-month outcome by mesh utilized. In the postoperative course, the PTFE group had 3 complications with wound infection. As stated above, in one case the mesh was infected and the patient underwent reoperation for removal. The patient subsequently had a recurrence but no mesh was left in place (this patient was not included in the total of recurrences since it occurred without the mesh).

Six patients in the PTFE group and 1 in the POC group were readmitted after surgery. One patient was diagnosed with postoperative ileus in the PTFE group and another in the POC group. The other 5 patients in the PTFE group were readmitted for mesh infection (n=1), nausea, and vomiting with subsequent dehydration (n=2) and pain control (n=2). When comparing the 2 procedures, there was no difference in postoperative outcomes or symptoms.[10,11]

Patients were followed-up for 12 months (mean) by office visits or phone interview. Bowel obstruction developed in 2 patients in the PTFE group and in 1 in the POC group. This was treated in a conservative manner with gastric decompression and bowel rest. The return of bowel function was seen within the 2 following days. The cause for second operations of the 2 patients in the PTFE group was one mesh infection and a second repair for hernia recurrence. During this time, only 2 recurrences were identified in the PTFE group and 1 in the POC group. None of the

above findings were statistically significant, demonstrating that one product is not superior to the other.

Certain differences, however, were evident during surgical intervention. First, we noted that different techniques were preferred over others that could lead to the significance of these findings. When the sizes of hernias were compared, we noticed that smaller sizes were regularly fixed with the use of POC. When investigating further, we found that there was greater availability of POC in smaller sizes than there was for PTFE. This could also affect the overall time of operation, because smaller defects can be repaired rapidly. Another significant finding was that the PTFE group was more commonly repaired with sutures only as opposed to the POC group in which tacks and 4 anchoring sutures were used for the repair. This was explained by the surgeon's preference of one technique over the other.

This study has some limitations. The study was a retrospective analysis of data with follow-up. Patients or surgeons were not actively enrolled as in a prospective study or in a randomized blinded trial. It also has a considerably short follow-up, and definitive conclusions can only be made for the short period. We have seen that recurrence rate in the short-term follow-up is around 5%,[12] and less than half will develop a recurrence 5 years after the procedure.[13] Longer follow-up would be needed to conclude on the rate of adhesions (as a source of obstruction), fistulas, and infection, because they can occur several years after the intervention.[8]

Another limitation is the inability to standardize the operative technique, fixation method, and defect sizes. No data have shown the superiority of suture versus tacks or the long-term complications that could be associated.[10] This, however, could also be a significant factor that could influence the outcomes.

Defect size is another variable that should be considered, because it has been shown that a relationship exists between hernia size and recurrence rate.[11] The outcomes shown in this study could potentially be affected by this variance. One could argue that a particular mesh could be superior to the other when adjusting for defect sizes, but due to the retrospective nature of this study, these variables could not be randomized.

CONCLUSION

Our study demonstrated no significant association between type of mesh used and perioperative or 12-month outcome. Choice of either mesh appears to result in equivalent outcomes and can be left up to the surgeon or to institutional preference.

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