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Abdominal reoperation and mesh explantation following open ventral hernia repair with mesh

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Abstract

BACKGROUND: This study sought to identify the incidence, indications, and predictors of abdominal reoperation and mesh explantation following open ventral hernia repair with mesh (OVHR).

METHODS: A retrospective cohort study of all patients at a single institution who underwent an OVHR from 2000 to 2010 was performed. Patients who required subsequent abdominal reoperation or mesh explantation were compared with those who did not. Reasons for reoperation were recorded. The 2 groups were compared using univariate and multivariate analysis (MVA).

RESULTS: A total of 407 patients were followed for a median (range) of 57 (1 to 143) months. Subsequent abdominal reoperation was required in 69 (17%) patients. The most common reasons for reoperation were recurrence and surgical site infection. Only the number of prior abdominal surgeries was associated with abdominal reoperation on MVA. Twenty-eight patients (6.9%) underwent subsequent mesh explantation. Only the Ventral Hernia Working Group grade was associated with mesh explantation on MVA.

CONCLUSIONS: Abdominal reoperation and mesh explantation following OVHR are common. Overwhelmingly, surgical complications are themost common causes for reoperation and mesh explantation.

In the United States, over 365,000 ventral hernias are repaired every year.[1] If left untreated, the natural history of hernias includes complications such as pain, increasing size, poor cosmesis, poor function, and risk of incarceration and strangulation.[2–4] Because of these symptoms and risks, elective repair is recommended for most patients.

Although the optimal approach to hernia repair is yet to be identified, one consensus is clear: mesh repair improves long-term outcomes by decreasing hernia recurrence.[3,5–8] The recurrence rate after open suture repair for primary hernias[6] has been reported to be as high as 12% to 20%, while mesh repair has been reported to be <5%.[9] The long-term recurrence rate after open suture repair for incisional hernias may be as high as 63%, but decreases to 32% with the use of mesh.[3,8]

Although mesh has reduced hernia recurrence rates, it has its own set of complications. Potential complications include

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small bowel obstruction, surgical site infection (SSI), sinus formation from the mesh to skin, and enterocutaneous fistula.[10,11] Cases resulting in SSI often necessitate a second operation to remove the mesh, representing a failure of the original surgery. Regardless of the indication, reoperation following ventral hernia repair presents unique challenges. The associated scar tissue, adhesions, and incorporated mesh increase the complexity of the procedure and elevate the rate of postoperative complications.[12]

The factors that lead to abdominal reoperation and mesh explantation following open ventral hernia (OVHR) repair with mesh are not well understood. The purpose of this study is to identify the incidence, etiologies, and independent predictors of abdominal reoperation and mesh explantation following OVHR with mesh.

Methods

Following the Institutional Review Board approval, all patients at a single Veterans Affairs Medical Center who underwent an OVHR with mesh placement from 2000 to 2010 were reviewed.

Electronic medical records were reviewed for patient demographics, comorbidities, hernia characteristics, surgical histories, operative details, imaging data, and surgical outcomes. Patient demographics including patient's age, sex, and ethnicity were collected. The following medical comorbidities were reported: body mass index, prostate disease, abdominal aortic aneurysm, chronic obstructive pulmonary disease, steroid use, immunosuppression (steroid use, chemotherapy within 1 month, autoimmune deficiency syndrome), diabetes mellitus, hemoglobin A1c level within 6 months of surgery, smoking history, and alcohol use disorder ($\geq$2 drinks per night). Surgical comorbidities reviewed included prior SSI (based on guidelines defined by the Center for Disease Control),[13] prior ventral hernia repairs, and prior abdominal surgeries. Hernia characteristics collected included hernia type,[6] emergency repair, concomitant repair (where another procedure was performed at the same time such as colectomy and ventral hernia repair), incarceration, recurrent hernia, and hernia area. Perioperative risk scores such as American Society of Anesthesiologist score, Ventral Hernia Working Group (VHWG) grade (hernia grade),[14] National Nosocomial Infection Score,[15] and wound class were documented in the comparison of the 2 cohorts. Surgical data including duration of surgery (min), component separation, elevation of skin flaps, bridged repair (repair without closure of the fascial defect), drain placement, and mesh type were reviewed.

Medical records from the entire Veterans Integrated Service Network were accessed to evaluate for abdominal reoperation and mesh explantation. Abdominal reoperation was defined as any surgery that involved the abdominal fascia, mesh, or re-entry into the peritoneal cavity. Mesh explantation was defined as any surgery where the mesh was partially or completely removed in a subsequent procedure. Reasons for abdominal reoperation and mesh explantation were documented.

Data analysis

Patients who underwent subsequent abdominal reoperation following the index OVHR with mesh were compared with patients who required no subsequent reoperation. Further analysis of patients who required subsequent mesh explantation following the index surgery was compared with patients who did not require mesh explantation. Univariate analysis was used to compare the 2 groups in each study. Normal continuous data were analyzed with unpaired, 2-tailed t test, while nonparametric data were evaluated with a Mann Whitney U test. Categorical data were compared with chi-square test or Fisher's exact test.

Kaplan–Meier method was used to evaluate the abdominal reoperation-free survival. A multivariate logistic regression model was built to assess the effect of a given predictor on mesh explantation while controlling for other predictors in the model.[16] To identify the most significant predictors, all predictors with a P value of $<.20$ from the initial assessment of patient characteristics were included for evaluation. Model selection with internal validation was performed using internal resampling (bootstrapping) with the Regression Modeling Strategy package in R software. Diagnostics of the model were assessed and validation was performed using a 10-fold cross-validation. All statistical analysis was performed on the statistical software R.[17]

Results

Over the 10-year study period, 888 OVHRs were performed, of which 407 had mesh placed. Patients were followed for a median (range) of 57 (1 to 143) months.

Table 1 Reasons for abdominal reoperation

Etiology	n = 69
Hernia recurrence	39 (56.5%)
Surgical site infection, overall	30 (43.5%)
Superficial/deep	24 (37.0%)
Mesh infection	15 (21.7%)
Organ/space	6 (8.7%)
Enterocutaneous fistula	2 (2.9%)
Noninfectious wound complication	
Seroma	7 (10.1%)
Hematoma	1 (1.4%)
Nonhealing wound	1 (1.4%)
Small bowel obstruction	7 (10.1%)
Cholecystitis	6 (8.6%)
Malignancy	3 (4.2%)
Other	3 (4.2%)

Some patients had more than one reason for abdominal reoperation.

Other = abdominal compartment syndrome, planned stoma reversal, and massive gastrointestinal bleed.