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A dual-stage approach to contaminated, high-risk ventral hernia repairs

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ABSTRACT

Background: The Modified Hernia Grading System (MHGS) was developed to risk stratify complex ventral hernia repairs (VHRs). MHGS grade 3 patients have mesh infections, dirty or contaminated fields, and/or violation of the alimentary tract. Reported surgical site infection (SSI) rates are over 40% after single-stage VHR in contaminated fields. In an attempt to decrease the SSI rate in MHGS grade 3 patients, we developed a dual-stage VHR (DSVHR) approach.

Methods: We reviewed adult general surgery patients undergoing DSVHR between January 2010 and June 2014. All patients were MHGS grade 3. Primary end point was 30-d superficial and deep SSI. Secondary end points included other surgical site occurrences, 6-mo recurrence, and mesh excision rates.

Results: Fifteen patients underwent DSVHR. Mean age was 56 y, and median body mass index was 38.3 kg/m^2. Operative indication included enterocutaneous fistulas (ECF; $n = 6$), ECF with infected mesh ($n = 2$), infected mesh ($n = 2$), and VHR requiring bowel resection ($n = 5$). Thirty-one operative procedures were performed with median of 2.5 d between procedures. Fascial closure was re-established in 12 patients; five patients had underlay biologic mesh placement; seven underwent component separation with retrorectus mesh placement (synthetic [$n = 2$], biologic [$n = 5$]). The remaining patients underwent bridging repair with biologic mesh. One patient developed a recurrence after 6 mo, whereas a single patient had a recurrence of their ECF. Four (27%) patients developed a SSI, with an additional four (27%) experiencing a surgical site occurrence. There were no postoperative mesh infections.

Conclusions: DSVHR in MHGS grade 3 patients is associated with a lower SSI rate than previously reported for those undergoing single-stage repairs.

Introduction

Nearly two million Americans undergo an abdominal operation annually after which nearly 10%-23% develop incisional hernias. Despite advances in technology, materials, and technique, recurrence rates remain as high as 60%.[1-7] Options for repair in the setting of contaminated- and dirty-infected fields are limited. Although synthetic mesh decreases recurrence rates, use in the setting of even clean-contaminated and contaminated operations remains controversial with a majority of surgeons opting for utilization of biologic mesh.[8] Multiply recurrent hernias, mesh infections, enterocutaneous

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fistulas (ECF), and enteroatmospheric fistulas (EAF) are some of the most severe complications of ventral hernia repair (VHR). Treatment of mesh infections, ECF, and EAF is complicated often mandating transfer of care to specialized centers for definitive management.

The Ventral Hernia Work Group (VHWG) devised a classification system for patients undergoing VHR in which individuals are stratified according to patient- and case-specific factors.[9] Rosen *et al.* sought to validate the findings of the VHWG; however, subsequently developed the MHGS. Evaluation of the VHWG grade 3 patients revealed two distinct categories: those with surgical site infection (SSI) rates similar to VHWG grade 2 and those at increased risk similar to VHWG grade 4 patients. Thus, the MHGS encompasses all aspects of the VHWG system; however, reclassification defined three distinct categories: low risk (grade 1), comorbid (grade 2), and contaminated (grade 3).[10] The MHGS is outlined within Figure.

As a referral center for patients with complications after VHR, we have adopted a staged approach to repair for those suffering the most severe complications, particularly infected mesh, ECF, and EAF. This approach involves an initial operation focused on source control with antibiotic therapy before implantation of permanent or biologic mesh with definitive closure at a second operation. Most patients who undergo a staged repair fall within the highest risk category (grade 3) of the Modified Hernia Grading System (MHGS).[10] We hypothesized that a true dual-stage approach to VHR in the setting of an MHGS grade 3 case would decrease the rate of SSI compared with traditional single-stage approach. The aim of this study was to review our institutional experience with the dual-stage repair and assess both its safety and efficacy in these complicated hernia patients.

Methods

This retrospective review was approved by the Medical College of Wisconsin's Institutional Review Board. All operations were performed at Froedtert Memorial Lutheran Hospital, a tertiary referral center serving the suburban and urban population of Milwaukee, Wisconsin, and the surrounding communities. The review included all adult trauma and acute care surgery patients with an MHGS grade 3 ventral hernia who underwent VHR using a dual-stage technique between January 1, 2011 and June 30, 2014. A review of all eligible patients' hospital, operative, and clinical records was performed. Medical records were reviewed for preoperative, inpatient, and outpatient antibiotic utilization. Operative reports and nursing records were used to identify the level of contamination at the time of the initial operation. The primary end point for the study was the 30-d incisional SSI rate as defined by the National Surgical Quality Improvement Program. Secondary end points include 30-d surgical site occurrence rate, hernia recurrence rate, and mesh infection rate. Descriptive statistics were used including mean with standard deviation for all normally distributed variables and median with interquartile range (IQR) for all skewed distribution variables.

	Grade 1	Grade 2	Grade 3
Description	Low Risk of Complications No History of Wound Infection	Smoker Obese DM History of Wound Infection	Clean-Contaminated Contaminated Dirty
Expected SSO	14%	27%	46%

Figure – Modified hernia grading system.

Results

Fifteen patients were identified who met the previously stated eligibility criteria underwent a dual-stage VHR for the management of MHGS grade 3 hernias. The cohort was majority male (53.3%) with a median age of 52 y (IQR; 48.5, 67.2), median body mass index 38.3 kg/m^2 (IQR; 27.9, 43.5), and the majority (87%) demonstrating a history of abdominal SSI. The main indication for dual-stage intervention was management of an ECF and/or EAF in the setting of a ventral hernia. Five patients had a staged repair due to bowel resection, two the result of gross contamination with associated peritonitis, whereas the remaining three were staged due to prolonged operations with associated contamination. Additional cohort and operative characteristics are outlined in Tables 1 and 2, respectively. Most (86.7%) patients underwent repair with biologic mesh. In twelve patients, Strattice mesh was placed while a single patient underwent repair with BIO-A. Of the two patients who underwent repair with synthetic mesh, a light-weight macroporous partially absorbable polypropylene mesh (ULTRAPRO) was used.

Table 1 – Cohort characteristics.

Age (y)	52 (48.5, 67.2)
Sex, *n* (%)	
Male	8 (53)
Female	7 (47)
Body mass index (kg/m^2)	38.3 (27.9, 43.5)
Comorbidities, *n* (%)	
Hypertension	12 (80)
Diabetes	5 (33)
Immunosuppression	3 (20)
COPD	3 (20)
CKD	2 (13)
CHF	1 (7)
Smoking history, *n* (%)	7 (47)
Active	2 (13)
ASA score	3 (3, 3)
History of SSI, *n* (%)	13 (87)
Prior abdominal operation	4 (2.5, 5)
Prior ventral hernia repair	11 (73)

COPD = chronic obstructive pulmonary disorders; CKD = chronic kidney disease; CHF = congestive heart failure.
All values median/IQR unless otherwise stated.