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The routine use of prosthetic mesh in austere environments: dogma vs data

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Abstract

BACKGROUND: Mesh repair has become the standard in adult hernia repairs. Mesh infection is an uncommon but potentially devastating complication. Currently, there is widespread dogma against the use of prosthetic mesh (PM) in deployed or austere environments but little available data to support or refute this bias.

METHODS: Retrospective review of all hernia repairs over 1 year in a forward deployed surgical unit in Afghanistan. Demographics, hernia type, repair performed, and mesh type were evaluated. Follow-up was completed up to 6 weeks and then as needed for up to a year, and complications to include infection were recorded.

RESULTS: Sixty-six patients were identified, mean age was 38 (range 3 to 80) and 98% were male. Single-dose perioperative antibiotics and standard sterile technique were used in all cases. The majority (70%) had PM placed. The mean operative time was 54 min, and mean estimated blood loss was less than 25 cm^3. The vast majority of our hernias were inguinal (95%) with 1 ventral and 2 umbilical hernias. In the PM group, there were no surgical site infections, no mesh infections, and no mesh explantation or reoperation. There were no recurrences in either group identified at up to 1-year postoperation. There was no statistically significant difference in any outcome measure between the PM and no-PM groups.

CONCLUSIONS: The use of PM for hernia repairs in the austere or forward environment appears safe and did not increase the risk of wound infection, mesh infections, or recurrence.
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The past decade-plus of military combat and subsequent stability operations in both Iraq and Afghanistan has required the most prolonged continuous deployment of US military medical forces in history. Although previous conflicts had primarily relied on large and relatively fixed hospital units with robust surgical and medical capabilities, the current conflicts have been marked by the widespread deployment of smaller and more mobile units known as Forward Surgical Teams (FST). These specialized units are primarily staffed and supplied to perform initial trauma resuscitation and emergent life- and limb-saving operations for wounded combatants. These units have frequently assumed a variety of secondary missions including elective or humanitarian procedures. There is a relative paucity of

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literature examining elective, humanitarian surgical care, and outcomes in these settings. In one analysis of survey data from 266 military surgeons with combat deployment experience, the majority had performed elective procedures while deployed and the estimated total elective/humanitarian case volume from this small cohort was nearly 6,000 procedures.[1] Among the most common of these elective procedures were repairs of inguinal, umbilical, or abdominal wall hernias.

Surgeons who are deployed with an FST or similar unit will frequently be asked to evaluate patients with a known or suspected hernia. The evaluation and treatment of an asymptomatic hernia can become much more complex in the environment of a combat zone (or any truly austere setting). One of the primary concerns about hernia repairs in this type of setting involves the use of prosthetic mesh (PM) and the risk of local infectious complications. In the civilian setting, PM has been accepted as the preferred repair technique for most adult inguinal and abdominal wall hernias and carries an exceedingly low rate of infection.[2,3] However, up to a 6-fold increase risk of mesh infection has been reported when PM is used in potentially contaminated or infected surgical fields with predictably high associated morbidity.[4–6] Although standard sterile preparation and draping and the use of full sterile surgical attire is used during operations in an FST, the austere conditions and environment may be less than ideal. This includes the use of tents or temporary structures to house the operating room, extremes of temperature with variable environmental control, difficulty controlling dust and debris, and the risk of colonization with multidrug resistant organisms.[7–9] For these reasons, there is a widely held belief that elective or humanitarian procedures that require the use of PM should not be performed in these types of austere environments. This belief is based purely on dogma and is without any current evidence known to the authors to confirm or refute its bias. The objective of this study was to analyze a cohort of patients who underwent repair of inguinal or abdominal wall hernias using PM in the deployed setting, with a particular focus on the risk of subsequent infectious complications, need for re-intervention or reoperation, or need for mesh explantation.

Methods

A retrospective review of a prospectively collected quality assurance database was completed for all patients undergoing surgery at the 250th FST deployed at Shindand Airbase in the Herat province of Afghanistan from December 2009 through January 2011. Patients selected for analysis included all patients with symptomatic inguinal or abdominal wall hernias that were treated with operative hernia repair at the FST facility. Choice of hernia repair technique and mesh was at the discretion of the attending surgeon and was limited to polypropylene or polyester sheet mesh. All patients received 1 dose of preoperative antibiotics, and sterile technique was maintained in all cases. All patients were instructed to return for routine follow-up at 2 and 6 weeks after surgery and then as needed for any problems or concerns. Postoperative care and follow-up information after discharge were available for all patients through January of 2011. Outside referrals were made for patients unable to follow-up at the FST.

Preoperative evaluation, operative records, and postoperative follow-up notes were reviewed for each patient. Specific data extracted for evaluation included age, gender, comorbidities, hernia type and location, hernia size, operation performed, use of mesh vs primary tissue repair, type of mesh placed, operative times, intraoperative blood loss, anesthesia type, intraoperative intravenous fluids, length of hospital stay, and any postoperative complications discovered in follow-up. Patients receiving PM were directly compared with those receiving tissue repair alone with descriptive and univariate statistics. The primary end points included the incidence of any surgical site infection, need for any re-intervention or operation, need for partial or complete mesh removal, and any hernia recurrences. Within the PM group, subgroup analyses by the type of hernia repaired and type of mesh used were performed. Fisher's exact and Student *t* test were performed to evaluate for any significant differences between our 2 groups with respect to age, operative factors, and hernia type to evaluate for any impact on the primary outcome measures. Statistical analysis was performed with SPSS, v. 22 (IBM Corp., Chicago, IL).

Results

Operative reports of 747 patients treated at the facility were reviewed. Of these, 72 hernia repairs were performed on active duty and local–national civilians. Of these 72 hernia repairs, 7 patients (10%) were lost to follow-up and were excluded. Age, gender, cause of hernia, type of hernia, and type of mesh results are highlighted in Table 1. Average age was 40 years old with an age range of 3 to 85 years. All but 1 patient was male (98%). Acquired (nontraumatic) or congenital hernia was the primary diagnosis in 63 patients (97%) with 2 cases being caused by combat-related trauma (1 motor vehicle collision and 1 helicopter crash). Most hernias were inguinal (95%) and 8 (13%) of these were bilateral. The remainder of repairs consisted of 2 umbilical hernia repairs and 1 ventral hernia repair.

Prosthetic mesh was placed in 46 patients (70%), and tissue repair was completed in the remaining 30%. Polypropylene (55%) and polyester (15%) were the 2 types of PM that were used. There was no concern for nerve injury or entrapment documented in postoperative follow-up. Seven patients (10%) completed follow-up at a separate facility, with the remaining 90% completing follow-up at the study facility. Postoperative follow-up revealed no (0%)