

## Clinical Science

# Predictors of recurrence of umbilical hernias following primary tissue repair in obese veterans



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Ventral hernia;  
Incisional hernia;  
Recurrent hernia

**Abstract**

**BACKGROUND:** Factors that determine recurrence and complications following primary tissue repair of umbilical hernias (UHs) and the approach to repair UHs in obese patients need further analysis.

**METHODS:** A retrospective review of UH repair (UHR) conducted at our institution was undertaken. Patients were grouped by body mass index (BMI) and compared for recurrence and complications. Univariate and multivariate analyses were performed.

**RESULTS:** In total, 199 patients (BMI 32.3 kg/m<sup>2</sup>, 97% male, 77% Caucasian, American Society of Anesthesiologists class III/IV 59.2%) underwent primary tissue UHR. There were 8 recurrences (4.0%); average follow-up 3.9 ± 2.4 years (range 30 days to 9.2 years). There were no recurrences among normal BMI patients (0/11); 3 in overweight (3/54), 2 in class I obese (2/73), 2 in class II obese (2/47), and 1 in morbidly obese (1/14) patients ( $P = .84$ ). Albumin and American Society of Anesthesiologists were similar in all groups. Recurrence rates among obese and nonobese patients were not significantly different (3.7% vs 4.6%,  $P = .72$ ). There were 18 (9.0%) complications. BMI was not associated with complications.

**CONCLUSION:** Primary tissue repair is a feasible approach for UHR in obese patients.

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Umbilical hernias (UHs) are the second most common abdominal wall hernias.<sup>1</sup> In 2003, 175,000 UHs were repaired in the United States accounting for an incidence of 2.0% in all adults and 10% of all hernias repaired.<sup>2</sup> UHs in combination with groin and epigastric hernia repairs constitute the most common operations performed by general surgeons.<sup>3</sup>

For adults, UHs develop as acquired defects through the umbilical canal, which is bordered by the umbilical fascia

posteriorly, the linea alba anteriorly, and the medial edge of the 2 rectus borders on each side.<sup>4</sup> Therefore, the umbilical ring is devoid of the protection and support of striated muscle. An increase in intra-abdominal pressure leads to gradual dilation of the borders that close the umbilical ring.<sup>4</sup> Factors that lead to increased intra-abdominal pressure and can result in a higher risk of developing an UH include multiple pregnancies,<sup>4</sup> obesity,<sup>5</sup> ascites,<sup>6</sup> and malignancy.<sup>7</sup>

In regards to the academic study of UHs, the majority of attention has been given to UH in the setting of ascites.<sup>6</sup> However, UHs in the obese population have been gaining increasing attention as the incidence of obesity increases.<sup>1</sup> For example, a study from the United Kingdom indicated that an increased incidence of UH in men compared with

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women was postulated to be because of increases in obesity in men and a decrease in pregnancy overall.<sup>1</sup>

In obese patients, there is an increase in opening pressure of .07 mm Hg proportionally to every 1.0 kg/mm<sup>2</sup> in body mass index (BMI) posing an increased strain on the umbilicus leading to a higher incidence of UH.<sup>5</sup> Thus, the higher the BMI, the more likely an UH might develop. For instance, obese patients with a BMI of 30 to 39 kg/m<sup>2</sup> have a 2.6 odds ratio of developing an UH, which increases to 5.2 for patients with a BMI greater than 60 kg/m<sup>2</sup>.<sup>8</sup> An increase in BMI in patients with UHs also leads to a higher likelihood of incarceration.<sup>8</sup>

While there is compelling evidence documenting increased likelihood of developing UH and incarceration in obese patients<sup>8</sup> because of elevated intra-abdominal pressure,<sup>5</sup> the incidence of recurrence and the appropriate method for repair in obese patients remain unclear. This retrospective review was undertaken to assess the recurrence rate in a veteran cohort of patients with obesity compared with nonobese patients. We also performed univariate and multivariate analyses to determine if there were predictors of recurrence and complications following primary tissue repair. We hypothesized that the rate of recurrence and complications in obese patients is not different from patients with a normal BMI, when controlled for surgeon, technique, and institution.

## Methods

This is a retrospective, single institution study performed at the VA North Texas Health Care System (VANTXHCS). We reviewed hernia repair outcomes in the Computer Patient Record System (CPRS) for all patients with an UH repaired by a single surgeon (S.H.) exclusively via open primary tissue repair. The time period examined spanned from August 2005 to July 2014. This study was approved by the Institutional Review Board at the VANTXHCS. All data were reviewed and entered in an excel spreadsheet by J.J.Y., T.P., and S.H.

### Umbilical hernia repair

All hernias were repaired by a standardized method by a single surgeon and a surgical resident (post-graduate year (PGY)-1 to PGY-5). All UH repairs (UHRs) were performed under general anesthesia and expected to be discharged the same day with the exception of emergent cases. All patients received preoperative antibiotics per Surgical Care Improvement Protocol and institutional protocol.

The surgical technique consisted of an infraumbilical incision followed by uncoupling of the umbilical ring, skin, and subcutaneous tissue from the fascia. The hernia sac was isolated and reduced. Repair of the defect was performed with #1 polydioxanone sutures in a figure-of-eight fashion until the defect was closed in its entirety. The sutures were

undertaken at least 1.0 cm from the hernia defect and the orientation of the closure was performed in a manner that accomplished the least amount of tension. All hernia defects were measured intraoperatively. The wound was not irrigated. The deep dermis was closed in an interrupted fashion with 3-0 Vicryl. Subcutaneous bupivacaine was infused before skin closure. The skin was closed with 4-0 Monocryl and Dermabond. Nonsteroidal anti-inflammatory drugs were not provided postoperatively.

### Identification of recurrence

All charts were reviewed for recurrence. Veterans' patient records are stored in CPRS and are easily retrievable. Patients with recorded postoperative visits to our institution were noted. Assessment for recurrence was investigated in all these postoperative visits. We also investigated patients who had a documented computed tomography (CT) scan following repair of their hernia, regardless of indication. Forty patients (20%) in our study had undergone CT analysis for the management of various issues (ie, prostate cancer follow-up, diverticulitis, etc).

All consecutive patients with repair of an UH (199) that was identified was entered into an excel spreadsheet. Patient demographics as well as potential factors leading to a recurrence were included. Factors included were age, BMI, follow-up, albumin, duration of hernia, length of stay, intensive care unit length of stay, intraoperative time, American Society of Anesthesiologists (ASA) class, race, sex, elective vs emergent repair, history of chronic incarceration, history of pain on presentation, history of prior UHR, incidence of bowel obstruction at presentation, need for bowel resection during the repair, hypertension, diabetes, renal disease, chronic obstructive pulmonary disease, cardiac disease, history of smoking, need for chronic anticoagulation, and postoperative complications. All variables were analyzed against recurrence by univariate analysis and significant variables by multivariate analysis. A parallel approach was undertaken with complication as the constant variable.

Patients were then grouped by BMI according to the guidelines set by the National Institutes of Health: normal = 18.5 to 24.9 kg/m<sup>2</sup>; overweight = 25.0 to 29.9 kg/m<sup>2</sup>; class I obesity = 30.0 to 34.9 kg/m<sup>2</sup>; class II obesity = 35.0 to 39.9 kg/m<sup>2</sup>; class III obesity greater than or equal to 40 kg/m<sup>2</sup>. All patients were separated by BMI as measured at the time of presentation for hernia repair. We compared the rate of recurrence by BMI. All variables were also analyzed among groups using one-way analysis of variance.

### Statistical analysis

Data are expressed as mean  $\pm$  standard deviation. PRISM statistical analysis software (GraphPad Software, Inc, San Diego, CA) was used for contingency table

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