

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.JournalofSurgicalResearch.com

Impact of hernia volume on pulmonary complications following complex hernia repair

Elwin H.H. Mommers, MD,^{a,b,*} Johannes A. Wegdam, MD,^a
Sander van der Wolk, MD,^c Simon W. Nienhuijs, MD, PhD,^d
and Tammo S. de Vries Reilingh, MD, PhD^a

^a Department of Surgery, Elkerliek Hospital, Helmond, The Netherlands

^b Department of Surgery, Maastricht University Medical Center, Maastricht, The Netherlands

^c Department of Radiology, Elkerliek Hospital, Helmond, The Netherlands

^d Department of Surgery, Catharina Hospital, Eindhoven, The Netherlands

ARTICLE INFO

Article history:

Received 7 July 2016

Received in revised form

15 October 2016

Accepted 29 November 2016

Available online 7 December 2016

Keywords:

Hernia volume

Evisceration

Protrusion

Postoperative complications

(Endoscopic) components separation technique

ABSTRACT

Background: Despite a multitude of evidence-based prediction models and risk factors for postoperative complications after ventral hernia repair, estimating a patient's risk of postoperative complications after ventral hernia repair remains challenging. In an attempt to improve the preoperative assessment of complex hernia patients, some studies have examined pulmonary changes after hernia repair hypothesizing that large hernias lead to pulmonary changes and increased pulmonary complication rates. Some studies have described a correlation between hernia volume and pulmonary changes, although none provided compelling evidence to identify hernia volume as a risk factor for pulmonary complications. This study evaluates the relationship between hernia volume and postoperative pulmonary complications using computed tomography (CT)-based volume measurements.

Materials and methods: Analysis of a prospectively maintained database of consecutive complex hernia patients from 2011 to 2014 undergoing endoscopic (ECST) or open component separation technique (CST) for a hernia defect with a minimum width of 6 cm and visual protrusion of the hernia sac ventral of the rectus abdominis muscles in supine position was performed. Hernia volume was calculated using multiple plane reconstruction of a standard abdominal CT-scan. Noted endpoints were pulmonary complications.

Results: Thirty-five patients underwent ECST ($n = 20$) or CST ($n = 15$) with a median defect volume of 474 cm^3 (range, $114\text{--}2086 \text{ cm}^3$). Observed complications were pneumonia ($n = 4$), pulmonary infiltrate ($n = 3$), aspiration pneumonia ($n = 2$), and acute respiratory distress syndrome ($n = 1$). Univariate and multivariate analyses showed that pulmonary complications were associated with "hernia volume" ($P = 0.045$; 95% CI: $1.008\text{--}1.910$).

Conclusions: Hernia volume is a promising risk factor for postoperative pulmonary complications and can be calculated using a standard abdominal CT-scan.

© 2016 Elsevier Inc. All rights reserved.

The results published in this article have been presented during the "best abstract session" of the 2015 World Hernia Congress, Milan, Italy.

* Corresponding author. Department of Surgery, Maastricht University Medical Center, Maastricht, The Netherlands. Tel.: +31 433881497.

E-mail address: e.mommers@maastrichtuniversity.nl (E.H.H. Mommers).

0022-4804/\$ – see front matter © 2016 Elsevier Inc. All rights reserved.

<http://dx.doi.org/10.1016/j.jss.2016.11.051>

Introduction

Reducing large ventral hernias is accompanied with a postoperative complication rate up to 57%, depending on the technique, the patients' comorbidity and complexity of the hernia.¹⁻⁷ Despite a multitude of evidence based prediction models and risk factors for postoperative complications, estimating a patient's risk of complications following ventral hernia repair remains challenging.⁸ Hernia repair centers use preoperative multidisciplinary assessments to evaluate patients and estimate their postoperative risk for complications.⁹ These assessments include variables such as body mass index (BMI), percentage of glycosylated hemoglobin (HbA1C), age, comorbidity, and smoking.⁹ In an attempt to improve the aforementioned assessment, several studies have analyzed pulmonary changes after ventral hernia repair.¹⁰⁻¹² These studies hypothesized that when a large ventral hernia is reduced inside the abdominal cavity, the intra-abdominal volume will rise. Since the abdominal wall limits the abdomen in expanding outward, the intra-abdominal pressure will increase, causing pulmonary compliance to decline.¹² Despite experts agreeing on the validity of this theory, none of the previously mentioned studies directly evaluated the correlation between hernia volume and the risk of pulmonary complications.^{10,13} This study evaluates the relationship between hernia volume and pulmonary complications using computed tomography (CT)-based volume measurements and a prospectively maintained database of pulmonary complications.

Methods

During 2011-2014, all patients undergoing complex ventral hernia repair were registered at a hospital specialized in abdominal wall surgery.^{1,14} Patient characteristics, pulmonary function, and postoperative complications were registered prospectively. Thirty-five consecutive patients with ventral hernias were extracted from the aforementioned database if they fulfilled the following criteria. Any patient with a midline hernia ≥ 6 cm in width that underwent "endoscopically assisted" (ECST) or "open" components separation technique (CST), with evident protrusion of the hernia content ventral of the rectus abdominis muscles in a relaxed supine position. Exclusion criteria were as follows: any patient with rectus diastasis without a true ventral hernia, previous subcutaneous dissection, American Society of Anesthesiologists classification IV or V,¹⁵ BMI > 30 kg/m², and patients with a reduced forced expiratory volume ($\leq 80\%$) and/or vital capacity ($\leq 70\%$) when compared with the predicted value.^{16,17}

All patients underwent a standard preoperative abdominal CT-scan without Valsalva maneuver. All hernias were classified using the European Hernia Society guidelines for hernia classification.¹⁸

The endoscopic component separation technique was performed as described by Mommers *et al.*¹⁴ All operations were performed by three experienced gastrointestinal surgeons trained in abdominal wall reconstructions (J.W., S.N., and T.D.V.R.). Patients were followed at the outpatient clinic

(2 and 6 wk, and 3, 6, 12, and 24 mo postoperative). Recurrence was assessed during physical examination in standing and supine position, if a clinical recurrence was uncertain, an abdominal CT-scan was performed.

Volume measurements

Hernia volume was expressed as a percentage of the total abdominal volume (hernia sac volume [HSV] + abdominal cavity volume [ACV]) that resided inside the hernia sac during standard abdominal CT-scan without Valsalva maneuver and calculated by dividing HSV through the total abdominal volume. HSV was defined as the volume in front of the ACV, demarcated by the parietoperitoneum of the hernia sac.

All volumes were measured using volume analysis software (ViewForum R6.3V1L3 version 2008) from Philips Healthcare/Philips Medical System (Figure). Outlining of the volume was done partially by hand using the "contour stack" method to calculate volume within a multiple plane reconstruction of a standard abdominal CT-scan. A slice thickness of 2 mm was used; after every 4-5 slices, a new outlining was made by hand. The software interpolated the contours between the outlined areas based on Hounsfield units of the outlined areas. All measurements were performed by the same author (E.M.), blinded for patient outcome.

Statistical analysis

Univariate and multivariate analyses were performed to identify statistically significant risk factors for postoperative pulmonary complications. Only known confounders or variables that showed a statistical significance of ≤ 0.06 (approaching alpha of 0.05) in the univariate analysis were included in a multivariate logistic regression analysis to correct for any interactions between the variables.

Statistical analysis was performed with IBM corp. SPSS statistics for windows, version 24, released 2014, Armonk, NY: IBM corp. Correlations were calculated using Pearson's coefficient R. Regression analysis was performed using binomial multivariate logistic regression analysis, standard distribution was tested with the Shapiro-Wilk test, Wilcoxon Signed Rank test, or paired two-sided Students t-test was used to compare means depending on the probability distribution of the included variables.

Results

Thirty-five patients (13 female, 22 male) with a median age of 63 y (range, 39-77), mean BMI of 27 kg/m² (standard deviation ± 6.4 kg/m²), and median American Society of Anesthesiologists classification II (range, 1-3) were included (Table 1). All but three patients received mesh augmentation. The median hernia volume was 5.4% (range, 1%-25%) with an absolute volume of 474 cm³ (range, 114-2086 cm³). Two patients had chronic obstructive pulmonary disease Gold II, and one patient had asthma. All patients fulfilled the criteria for complex hernia as formulated by Slater *et al.*, "minor" ($n = 11$), "moderate" ($n = 18$), and "major" ($n = 6$).¹⁹

Download English Version:

<https://daneshyari.com/en/article/5734223>

Download Persian Version:

<https://daneshyari.com/article/5734223>

[Daneshyari.com](https://daneshyari.com)