



Original Research

Primary and incisional ventral hernias are different in terms of patient characteristics and postoperative complications - A prospective cohort study of 4,565 patients



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ABSTRACT

Background: Primary and incisional hernias are often pooled in publications studying hernia symptoms, treatment, or surgical outcomes. The question rises whether this is justified or if primary and incisional hernia should be considered as two separate entities. The aim of this prospective cohort study is to compare primary and incisional ventral hernias regarding patient characteristics, hernia characteristics, surgical characteristics, and postoperative complications.

Materials and methods: A registry-based, prospective cohort study was performed. All patients undergoing primary or incisional hernia repair surgery between September 1st, 2011 and February 29th, 2016 were included. Patient baseline characteristics, hernia characteristics, surgical characteristics, and postoperative outcomes were collected and analyzed.

Results: A total of 4565 patients were included, of whom 2374 had a primary hernia and 2191 had an incisional hernia. All patient, hernia, and surgical characteristics were statistically significantly different between primary and incisional hernias except for corticosteroid use, history of inguinal hernia, incarceration, and emergency surgery. Overall complication rates (wound, surgical, and medical) were significantly different (105/2374 (4.4%) for primary hernia versus 323/2191 (15%) for incisional hernia, $p < 0.001$).

Conclusion: Primary and incisional hernia are statistically significantly different for almost all patient, hernia, surgical, and postoperative characteristics analyzed. Given these differences, data on primary hernias and incisional hernias should not be pooled in studies reporting on hernia repair.

1. Introduction

Primary (PH) and incisional ventral hernias (IH) are very common conditions. In the USA alone, over 300,000 ventral hernia repairs are performed annually [1]. Around 75% of these hernia repairs are performed for primary ventral hernias (mainly epigastric and umbilical hernias) and around 25% are performed for incisional hernias [2]. The associated costs of these hernia repairs are estimated to be US\$3.2 billion a year [1]. Currently, incisional hernias occur in 10–30% of all patients undergoing midline laparotomies, depending on risk factors [3–8].

Primary and incisional ventral hernias have many similarities. They are both abdominal wall defects predominantly located in the linea

alba, and share similar symptoms like discomfort, pain, and potentially incarceration [9]. However, despite these similarities, the etiology of both types of hernias is thought to be different. Primary hernias can be considered as a congenital condition, whereas incisional hernias represent an iatrogenic technical or wound healing problem.

Regardless of these potential differences, primary and incisional ventral hernias are most often pooled in publications reporting on hernia surgery outcomes [10–15]. Stirlor et al. [16] and Köckerling et al. [17] addressed this issue of pooled data analysis. Stirlor et al. compared the characteristics and outcomes of patients undergoing laparoscopic ventral hernia repair. Köckerling et al. compared surgical techniques and complication rates of primary and incisional hernia surgery. Both studies found statistically significant differences. These

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articles are an important first step in comparing both types of hernias, but unfortunately, almost no patient characteristics were included in the comparison between both groups. These characteristics are among the most important features to take into account because they are associated with postoperative outcomes: many patient characteristics, like age, American Society of Anesthesiologists (ASA) score, smoking, and steroid use, but also factors like operative time and emergency surgery, are associated with postoperative complications and recurrences [18–21].

The objective of this study was to compare primary and incisional hernias regarding patient characteristics, hernia characteristics, surgical characteristics, and postoperative complications after hernia repair surgery, by using a large-scale database.

2. Material and methods

2.1. Study design

A registry-based, prospective cohort study was performed. All adults undergoing ventral hernia surgery in the French Hernia-Club registry from September 1, 2011, until February 29, 2016, were compared.

The Hernia-Club registry is approved by the French 'Commission Nationale de l'Informatique et des Libertés' (CNIL; registration number 1993959v0). Because the study is a registry-based study, and patient data is anonymized, additional participant consent and institutional review board approval were not required in accordance to the French and Dutch national ethical standards.

STROBE (Strengthening the Reporting of Observational studies in Epidemiology) recommendations for the reporting of observational studies, STROCSS criteria, as well as the European Registry of Abdominal Wall Hernias (EuraHS) recommendations were used for this study [22–24].

2.2. Hernia-Club registry

The Hernia-Club registry is a collaborative, prospective, anonymized online database of all the hernia surgery procedures performed by 42 French surgeons (both public and private, academic and non-academic) with a specific interest in abdominal wall surgery. Each participating surgeon must accept and sign the Charter of Quality, which states that: "all input must be registered in a consecutive, unselected, and exhaustive manner and in real time". The registration is performed before outcomes are known. A total of 164 parameters are collected prospectively from screening, pre-, peri- and postoperative periods. Parameters are directly collected online by the operating surgeon in real time. Participants consent to random peer review of original medical charts. Postoperative outcomes are collected by the surgeon and are further checked by an independent clinical research associate (CRA) during the 2-year follow-up. In case of discrepancies, the medical record is checked.

The collected parameters in this database are compatible with the European Hernia Society (EHS) classification of primary and incisional abdominal wall hernias [25] and the EuraHS international online platform [26].

2.3. Data collection

Patient characteristics extracted from the registry included patient age, sex, body mass index (BMI), smoking habits, diabetes mellitus (DM), corticosteroid use, preoperative radio- or chemotherapy, history of aneurysm of the abdominal aorta (AAA), connective tissue disorders, anticoagulants use or coagulopathies, previous history of hernias, and American Society of Anesthesiologists (ASA) score. Hernia characteristics included location, width, length, EHS width class, primary or recurrent hernia, and symptoms. Surgical characteristics included open or laparoscopic approach, emergency surgery, mesh use and technique

of mesh placement, duration of surgery, and Altemeier wound classification [27]. Finally, postoperative data (admission duration, complications, and reoperations) were also collected. Postoperative complications (wound, surgical, and medical) were graded using the Clavien-Dindo grading system [28].

2.4. Statistical methods

SPSS 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, version 21.0. IBM Corp, Armonk, NY, USA) was used for all statistical analyses. To test normal distribution of continuous variables, Levene's test for equality of variances was used. Continuous variables are presented as means with standard deviations (SDs). Categorical variables are presented as numbers with percentages. Missing data are presented in all Tables. Mann-Whitney *U* (continuous data) and chi-squared tests (categorical data) were used to compare primary and incisional hernia patients. In case of small groups ($n < 5$), Fisher's exact test was used. *P*-values < 0.05 were considered statistically significant. To demonstrate the overall comparison and to avoid emphasis on one particular factor, it was chosen to do this by performing univariate analysis without additional multivariate or sensitivity analysis.

3. Results

A total of 4565 patients were included. Of these patients, 2374 (52%) had a PH and 2191 (48%) had an IH. The rate of missing data for a single variable was no more than 3.7% (Tables 1–3).

3.1. Baseline patient characteristics

All baseline patient characteristics are presented in Table 1. PH and IH patients were statistically significantly different for thirteen of the sixteen [nearly all] baseline characteristics analyzed. Most notable different factors were age (55.61 for PH versus 62.86 for IH, $p < 0.001$), sex (61% males for PH versus 48% males for IH, $p < 0.001$), smoking (22% for PH versus 18% for IH, $p = 0.001$), diabetes mellitus (6.1% for PH versus 12% for IH, $p < 0.001$), and a family history of abdominal wall hernia (4.3% for PH versus 0.8% for IH, $p < 0.001$).

The only factors that were not different were corticosteroid use (3.4% for PH versus 3.5% for IH, $p = 0.867$), presence of ascites (0.9% for PH versus 0.6% for IH, $p = 0.344$), and a history of inguinal hernia (9.4% for PH versus 11% for IH, $p = 0.248$).

3.2. Hernia and surgical characteristics

Hernia and surgical characteristics are presented in Table 2. Hernia width (1.62 ± 1.50 cm for PH versus 4.85 ± 4.22 cm for IH, $p < 0.001$) and hernia length (1.79 ± 1.73 cm for PH versus 6.10 ± 5.59 cm for IH, $p < 0.001$) were statistically significantly different.

PH patients had more asymptomatic hernias (22% for PH versus 15% for IH, $p < 0.001$) and fewer hernias causing pain (69% for PH versus 73% for IH, $p < 0.001$).

The duration of surgery was significantly longer for IH patients (24.45 ± 16.58 min for PH versus 65.04 ± 52.20 min for IH, $p < 0.001$), PH patients had more laparoscopic procedures (29% for PH versus 26% for IH, $p = 0.037$), and PH patients had more primary suture repairs (33% for PH versus 11% for IH, $p < 0.001$). Mesh location ($p < 0.001$), Altemeier wound class ($p = 0.010$), and antibiotic treatment ($p < 0.001$) were also significantly different between PH and IH, demonstrating that IH patients had more contaminated or dirty wounds and received more antibiotic treatment than PH patients. The rate of emergency procedures was not significantly different between the two groups.

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