Prospective Evaluation of Surgeon Physical Examination for Detection of Incisional Hernias

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BACKGROUND: Surgeon physical examination is often used to monitor for hernia recurrence in clinical and research settings, despite a lack of information on its effectiveness. This study aims to compare surgeon-reviewed CT with surgeon physical examination for the detection of incisional hernia.

STUDY DESIGN: General surgery patients with an earlier abdominal operation and a recent viewable CT scan of the abdomen and pelvis were enrolled prospectively. Patients with a stoma, fistula, or soft-tissue infection were excluded. Surgeon-reviewed CT was treated as the gold standard. Patients were stratified by body mass index into nonobese (body mass index <30) and obese groups. Testing characteristics and real-world performance, including positive predictive value and negative predictive value, were calculated.

RESULTS: One hundred and eighty-one patients (mean age 54 years, 68% female) were enrolled. Hernia prevalence was 55%. Mean area of hernias was 44.6 cm^2. Surgeon physical examination had a low sensitivity (77%) and negative predictive value (77%). This difference was more pronounced in obese patients, with sensitivity of 73% and negative predictive value 69%.

CONCLUSIONS: Surgeon physical examination is inferior to CT for detection of incisional hernia, and fails to detect approximately 23% of hernias. In obese patients, 31% of hernias are missed by surgeon physical examination. This has important implications for clinical follow-up and design of studies evaluating hernia recurrence, as ascertainment of this result must be reliable and accurate. (J Am Coll Surg 2014;218:363−366. © 2014 by the American College of Surgeons)

Currently, there exist no standardized criteria for the physical or radiologic diagnosis of incisional hernia. One widely accepted definition formulated by the European Hernia Society is, "any abdominal wall gap with or without a bulge in the area of a postoperative scar, palpable or perceptible by clinical examination or imaging."[1] Until the advent of high-quality CT, surgeon physical examination (SPE) was the primary modality used for diagnosis of incisional hernias. Traditionally, this clinical examination includes abdominal wall inspection and palpation with the patient supine and standing, as well as during Valsalva maneuvers. The examiner looks for a bulge and, if a hernia is believed to be present, the examiner attempts to define the fascial edges. In cases where the fascial defect is small and/or the patient obese, hernias can be missed on physical examination.

Within the past several years, CT has been increasingly used to diagnose and characterize hernias, particularly those that necessitate a complex operative repair. Using this imaging technique, one can determine the contents of the hernia sac and the relationship of the hernia to other abdominal wall landmarks, such as bony structures and the linea semilunaris. A few small studies from Greece and Spain evaluating the use of CT as a follow-up after incisional hernia repair have found that CT has a sensitivity of 100% and specificity of 97% for detection of recurrence.[2,3] However, due to the relatively high cost and the exposure to ionizing radiation, CT is not widely used in follow-up after hernia repair, particularly if the patient is asymptomatic. Our group has previously demonstrated the use of ultrasound to detect incisional hernia formation using dynamic abdominal sonography for hernia with results comparable with CT.[4]

Several experts have questioned the need to rely on any adjunct imaging test to detect incisional hernia. Research studies have primarily relied on SPE for determination of recurrence after repair. However, in the few published studies evaluating SPE for detection of hernia recurrence,

Disclosure Information: Nothing to disclose.

Presented at the 99th Annual Clinical Congress, American College of Surgeons, Surgical Forum, Washington, DC, October 2013.

Received October 4, 2013; Revised December 3, 2013; Accepted December 8, 2013.

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ISSN 1072-7515/13/$36.00
http://dx.doi.org/10.1016/j.jamcollsurg.2013.12.007

Abbreviations and Acronyms
BMI = body mass index
NPV = negative predictive value
PPV = positive predictive value
SPE = surgeon physical examination

SPE has a sensitivity of only around 75%.[3] If this finding is duplicated in larger, prospective studies, the implications for the ascertainment of recurrence after repair are considerable. It is imperative that one of the primary outcomes measures used to judge the success of hernia repairs (recurrence) be accurately measured. This study aims to evaluate the accuracy of SPE for detection of incisional hernias compared with CT.

METHODS

Study design

Patients who presented to a tertiary care center's General Surgery Clinic were eligible for enrollment in this prospective study if they had a history of an earlier abdominal operation and a viewable CT scan within 6 months of their clinic visit. Results of SPE were compared with the CT scan to determine the testing characteristics of the SPE for detection of an incisional hernia. This study was approved by the Vanderbilt University Institutional Review Board.

Patient population and study procedures

All patients were general surgery patients with a history of an earlier abdominal operation, open or laparoscopic. Patients were referred for multiple indications, including incisional hernia. Patients were excluded if they had evidence of an active soft-tissue infection, a known abdominal wall fistula, or stoma. A single surgeon performed a physical examination evaluating for the presence of an incisional hernia. This surgeon, blinded to the indication for referral, was made aware of the patient's participation in the study and was instructed to evaluate for the presence or absence of an abdominal wall hernia. Surgeons were free to obtain patient histories as per usual practice in a real-world setting, and they were free to use all typical maneuvers, such as Valsalva and patient positioning, during their examination. All surgeons involved in the study were experienced abdominal wall surgeons familiar with complex incisional hernia repair and abdominal wall anatomy. A second surgeon, blinded to the results of the physical examination, reviewed the patient's CT images for the presence of a hernia. Previous work determined that a radiology report for a CT scan fails to mention a hernia in 22% of patients who had a hernia on surgeon review of the images. Given this, and the fact that CT is the most common radiographic modality used in clinical hernia follow-up, surgeon-reviewed CT was used as the gold standard for hernia detection in this study.

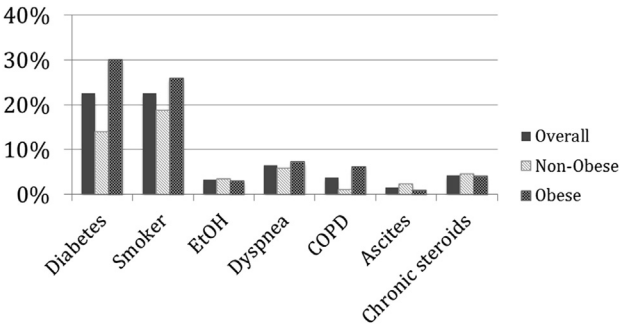

Figure 1. Comorbidities of the study population. Current smoker was defined as smoking within the previous 12 months. Alcohol use (EtOH) was defined as more than 2 drinks per day within the last 6 months.

Statistical analysis

Descriptive statistics for the overall patient population were calculated. Testing characteristics including sensitivity and specificity were determined for SPE. Real-world performance was estimated by calculation of positive predictive value (PPV) and negative predictive value (NPV), and 95% confidence intervals for each statistic were then calculated. To help determine the effect of body mass index (BMI) on predictive values and testing characteristics, additional analyses were performed with patients stratified into nonobese and obese groups, with a BMI $\geq$30 defined as obese. A BMI of 30 was chosen as a cut-off according to the CDC's definition of obesity.[5] SPSS Statistics software, version 21.0 (IBM Corporation) was used for statistical analysis.

RESULTS

Overall

Prospective enrollment was completed for 181 patients with mean age of 54 $\pm$ 13 years; 68% were women. Patient comorbidities for this population are summarized in Figure 1. There were 99 patients with a hernia, and hernia prevalence was 0.55 (95% CI, 0.47–0.62). Patients had a mean BMI of 31.3 $\pm$ 6.7. Mean area of the hernia defects was 44.6 $\pm$ 78 cm^2, with a range of 0.2 to 468 cm^2, and a mean transverse dimension of 5.2 $\pm$ 4.4 cm, as measured by CT. Thirty-three percent of patients (n = 59) had a history of hernia repair.

Testing characteristics for SPE detection of incisional hernia are summarized in Table 1. Of the 99 patients with a hernia detected by CT, 76 were found on SPE. There were 82 patients with no hernia seen on CT, and of those, 78 also had a negative SPE. Surgeon physical examination showed markedly decreased sensitivity compared with