A Study of the Clinical Manifestation of Subclinical Inguinal Hernias

Keisuke Ida, Shinjiro Kobayashi, Takehito Otsubo, Natsuko Sasaki, and Satoshi Koizumi

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Abstract

Contralateral inguinal hernias that occur after inguinal hernia repair may include so-called subclinical inguinal hernias (SIH). These latent hernias are not accompanied by symptoms such as swelling. However, few studies have investigated the prevalence and incidence of SIH using imaging. This paper documents a study of SIH incidence detected on hernia studies and risk factors for the clinical manifestation of SIH. These hernia studies comprised computed tomography images obtained prior to inguinal hernia repair with the patient in a prone position to decompress the inguinal region. Our subjects were 77 patients diagnosed as having a contralateral asymptomatic SIH before inguinal hernia repair between January 2006 and December 2015. Clinical manifestation occurred in 27.3% (21 patients), and the 5-year incidence was 23.3%. We investigated risk factors and found that the size of the hernia that was surgically repaired first was a significant factor (mean value of 157.6 cm$^3$ in the incidence group and 77.8 cm$^3$ in the non-incidence group; p=0.029). We also found that the cut-off value for hernia size on the symptomatic side was 44.5 cm$^3$; above this value, the 5-year incidence was 32.5% (13 patients), whereas below it, the incidence was 13.5% (5 patients) (p=0.0205). SIH incidence is relatively high, and patients with large symptomatic hernias tend to experience clinical manifestation of contralateral SIH. We therefore believe that careful follow-up should be performed, and single-stage or early surgery should be considered.

Key words

Inguinal hernia, subclinical inguinal hernia, hernia study

Introduction

A latent inguinal hernia that is not associated with symptoms such as swelling is known as a subclinical inguinal hernia (SIH). The diagnosis of SIH has increased in recent years due to diagnostic imaging methods such as herniography and transcutaneous ultrasound and the popularization of transabdominal preperitoneal repair (TAPP). However, few studies have investigated the clinical manifestation of SIH.

We perform our own unique hernia studies at our hospital that comprise computed tomography (CT) images obtained prior to inguinal hernia repair with the patient in a prone position to decompress the inguinal region. This has enabled us to diagnose SIH preoperatively. We used hernia study images obtained prior to inguinal hernia repair to diagnose SIH in the present study. Patients underwent conservative follow-up observation, and we investigated the clinical manifestation of SIH and its risk factors.

Patients and Methods

Between January 2006 and December 2015, 931 patients underwent a hernia study prior to inguinal hernia repair. Of these patients, SIH meeting the above-mentioned criteria was present in 175 patients (18.7%). This group included 94 patients who gave their informed consent but refused single-stage surgery and were merely followed up. Eighteen of these 94 patients are currently being followed up as outpatients. Meanwhile, the other 76 patients completed a...
questionnaire survey, and valid responses were obtained from 59 patients. Accordingly, this retrospective study comprises 77 patients.

We studied the incidence and the period until clinical manifestation of SIH in these patients. We also performed a comparative investigation between the incidence and non-incidence groups using the following factors: age, sex, hernial orifice size, body mass index (BMI), history of abdominal surgery, peritoneal dialysis, comorbidities such as prostatic disease, chronic pulmonary disease, diabetes mellitus, appendicitis, abdominal aortic aneurysm (AAA), cardiac disease, and orthopedic disorders, and the size of the hernia on the symptomatic side during the initial surgery.

This study was approved by the institutional review board of our hospital (Approval No. 1065).

[CT findings]

1. Definition of SIH

Patients were diagnosed as having SIH when all of the following criteria were met: (1) The patient is unaware of the hernias on the symptomatic side and the contralateral side. (2) No objective physical findings are observed by a physician. (3) Intraabdominal tissues protrude ≥ 10 mm superior to the inguinal ligament, using the inferior epigastric vessels as a reference, during the hernia study (Fig. 1). We used an Aquilion multislice CT scanner (Toshiba Medical Systems Co., Ltd., Tokyo, Japan), set the slice thickness to 5 mm, and obtained non-contrast CT images of the hypogastrium with the patient in a prone position. CT findings were separately interpreted by two gastrointestinal surgeons, and a positive diagnosis meant that their opinions matched.

2. Size of the symptomatic hernia sac

We used axial hernia study images and created manual traces of the area of the intraabdominal tissue that had prolapsed from the hernial orifice in each slice. We then calculated the total volume using a slice thickness of 5 mm and approximated the hernia sac volume.

[Follow-up questionnaire]

The questionnaire inquired about (1) the appearance of swelling, pain, or discomfort caused by the SIH, (2) the period until clinical manifestation, and (3) treatment, if the clinical manifestation had already occurred (Appendix).

[Statistical analysis]

All Statistical computations were performed using JMP® 13 (SAS Institute Inc., Cary, NC, USA). Descriptive data are reported as mean (standard deviation), median and range, or number of patients and percentage. Categorical variables were compared via Chi-squared test, and continuous variables via Student’s t test and non-parametric Mann–Whitney U test. The significance level was set at 0.05. The optimal cutoff value was determined using the diagnostic accuracy measurements and the receiver-operating characteristic (ROC) curves. ROC curve is a plot of a test’s true positive rate (sensitivity) versus its false-
Appendix

Questionnaire

Name__________

Please answer by circling the appropriate answer.

Question 1. Did you develop a hernia on the opposite side to where you had surgery?
Yes     No

If you answered yes, please answer question 2 onwards.

Question 2. Around when did you notice the hernia on the opposite side?
Please answer as specifically as possible (irrespective of how much you remember).
(Around mm/yyyy)

Question 3. Did you receive any treatment for the hernia on the opposite side?
Yes     No

If yes, approximately when it happen?
(Approximately mm/yyyy)

Thank you for your co-operation.

Results

Seventy-seven patients met the inclusion criteria, and clinical manifestation of the hernia occurred in 21 of them (27.3%) (Fig. 2). The mean period until clinical manifestation was 29.9 months (± 32.6 months), and the median period was 14 months (range, 3 to 105 months). Nineteen out of 21 patients underwent surgery.

Table 1 shows a comparison of the 21 patients in the incidence group and the 56 patients in the non-incidence group. The mean age was 68.5 years in the incidence group and 65.9 years in the non-incidence group (p=0.336). The sex ratios (men:women) were 21:0 and 53:3 in the incidence and non-incidence groups, respectively (p = 0.162). The respective mean SIH hernial orifice sizes were 19.04 mm and 19.48 mm in the two groups (p=0.818), and the mean BMI values were 23.9 kg/m² and 22.9 kg/m² (p=0.139).

We also investigated whether the patients had a history of abdominal surgery and comorbidities that are reported as risk factors for inguinal hernia onset. There were 5 and 9 patients with a history of abdominal surgery in the incidence and non-incidence groups, respectively (p=0.443), 1 and no patients on dialysis (p=0.146), 7 and 10 patients with a history of prostatic disease (p=0.156), 4 and 9 patients with a chronic pulmonary disease (p=0.756), and 1 and 5 patients with diabetes mellitus DM (p=0.526). No significant differences were observed in terms of any of these factors.

The size of the symptomatic hernia sac at the first surgery was significantly greater at 157.6 cm³ (±119.1 cm³) in the incidence group than that of 77.8 cm³ (±103.9 cm³) in the non-incidence group (p=0.029). Furthermore, using a receiver operating characteristics (ROC) curve, we calculated a cut-off value of 44.5 cm³ for the size of the symptomatic hernia (Fig. 3).

We also analyzed the incidence and duration of SIH using a Kaplan-Meier curve. Clinical manifestation occurred in 23.3% (18 patients) of all followed-up patients (Fig. 4). We also investigated the clinical manifestation of SIH by hernia sac size and found that it occurred in 37.5% (15 patients) over 5 years in those with hernia sacs measuring ≥44.5 cm³. Meanwhile, the incidence was 13.5% over 5 years in patients with hernia sacs measuring <44.5 cm³ (p=0.0205).

Discussion

SIH currently does not have a clear definition,
although traditionally, SIH refers to hernias that have not become obvious, do not distend the body surface, and are diagnosed incidentally during surgery or other investigations (e.g., laparoscopy, herniography, CT, or ultrasound). Diagnostic imaging methods for SIH include transcutaneous ultrasound, abdominal CT imaging, and herniography. Although these methods can be used to diagnose SIH, transcutaneous ultrasound has poor objectivity and reproducibility, and herniography is invasive, so neither has entered mainstream use. We perform hernia studies at our hospital primarily to diagnose whether the inguinal hernias are internal or external. These hernia studies are also useful for verifying the presence of an existing SIH. TAPP is a non-imaging method that enables the diagnosis and treatment of contralateral SIH that are detected intraoperatively. TAPP is a useful procedure that is performed through a small wound, so there is little postoperative pain and few hematomas or nerve injuries, resulting in high postoperative quality of life. By contrast, few cases have been managed this way, and the recurrence rate is high.
when surgery is performed by surgeons who have not mastered the technique. The anterior approach is currently the most popular surgical technique for inguinal hernia repair in Japan, and a survey by the Japan Society for Endoscopic Surgery in 2015 showed that approximately 60% of all inguinal hernias are treated via this anterior approach.

Few reports have studied the prevalence and incidence of SIH. The reported rates for a contralateral inguinal hernia occurring after repair on the symptomatic side range from 1.12% to 3.2%, and the inguinal hernia management guidelines of the Japanese Hernia Society cite a 10-year incidence of 3.8%. However, we believe that these figures include cases with SIH onset. Saggar and Sarangi observed SIH in approximately 7.97% of inguinal hernia patients, although clinical manifestation only occurred in 1.12% of these patients. Their report therefore stated that the grade of recommendation for preventive hernia repair was low. Meanwhile, Thumbe and Evans reported that the clinical manifestation of SIH diagnosed during TAPP occurred in 28.6% of cases and recommended preventive repair. The mean observation period for the patients with SIH in this study was 79.4 months. Our results showed that clinical manifestation occurred in 23.3% of our patients over 5 years, and the median value for clinical manifestation was 27.3% over 14 months. These results are consistent with those reported by Thumbe and Evans, and we believe they certainly cannot be overlooked.

Usually, the risk factors for inguinal hernia onset are advanced age, emaciation, previous prostatectomy, and chronic coughing. We believe these factors could also be risk factors for the clinical manifestation of SIH and thus performed a comparative investigation between the incidence and non-incidence groups. No significant differences were observed in terms of most factors, although this may have been due to the small patient population. The only significant difference between the incidence and non-incidence groups in this study was in the size of the symptomatic hernia, and there was a significantly greater number of patients with symptomatic hernias measuring ≥44.5 cm³ in the incidence group. This confirms that reducing large symptomatic hernias may cause prolapse through the weak tissues on the contralateral asymptomatic side.

Repair of large hernias increases the intraabdominal pressure and places the SIH under greater strain. We believe that patients who originally suffer from a large symptomatic hernia are highly likely to
Fig. 4. Kaplan-Meier analysis

(a) Cumulative values for the non-incidence group.
(b) Comparison of symptomatic hernias ≥44.5 cm³ and <44.5 cm³.
have weak tissues on the contralateral, asymptomatic side. When a diagnosis of SIH is made, clinical manifestation is more likely to occur in patients with symptomatic hernias measuring $\geq 44.5$ cm$^3$, which should be explained to the patient. Single-stage or early surgery should also be recommended.

**Conclusion**

This paper documents a study of the incidence of and risk factors for the clinical manifestation of SIH. The 5-year incidence for SIH was 23.3%. A large, symptomatic hernia is a risk factor for clinical manifestation, and as clinical manifestation occurs more readily in SIH patients with a symptomatic hernia $\geq 44.5$ cm$^3$, these patients require careful follow-up. We also believe that single-stage or early surgery should be considered.

**References**

1) Robinson A, Light D, Kasim A, Nice C. A systematic review and meta-analysis of the role of radiology in the diagnosis of occult inguinal hernia. Surg Endosc 2013; 27: 11–8.

2) Griffin KJ, Harris S, Tang TY, Skelton N, Reed JB, Harris AM. Incidence of contralateral occult inguinal hernia found at the time of laparoscopic trans-abdominal pre-peritoneal (TAPP) repair. Hernia 2010; 14: 345–349.

3) Kamei N, Otsubo T. Prone Position Computed Diagnosis under Decompression (Hernia study) for Inguinal Hernia. St. Marianna Medical Journal 2011; 38: 213–219. [in Japanese]

4) Wauschkuhn CA, Schwarz J, Boekeler U, Bittner R. Laparoscopic inguinal hernia repair: gold standard in bilateral hernia repair? Results of more than 2800 patients in comparison to literature. Surg Endosc 2010; 24: 3026–3030.

5) Butsch JL, Kuhn JP. Intramural hematoma of the small bowel: a possible lethal complication of herniography. Surgery 1978; 83: 121–122.

6) Miller J, Cho J, Michael MJ, Saouaf R, Towfigh S. Role of imaging in the diagnosis of occult hernias. JAMA Surg 2014;149: 1077–1080.

7) Japanese Hernia Society. Guidelines for the Treatment of Inguinal Hernia 2015. [in Japanese]

8) Neumayer LA, Gawande AA, Wang J, Giobbie-Hurder A, Itani KM, Fitzgibbons RJ, Jr. Proficiency of surgeons in inguinal hernia repair: effect of experience and age. Ann Surg 2005; 242: 344–348; discussion 348–352.

9) Journal of Japan Society for Endoscopic Surgery 2016; 21.

10) Ruhl CE, Everhart JE. Risk factors for inguinal hernia among adults in the US population. Am J Epidemiol 2007;165: 1154–1161. Epub 2007 Mar 20.

11) Thumbe VK, Evans DS. To repair or not to repair incidental defects found on laparoscopic repair of groin hernia: early results of a randomized control trial. Surg Endosc 2001; 15: 47–49.

12) Nilsson H, Stranne J, Statin P, Nordin P. Incidence of groin hernia repair after radical prostatectomy: a population-based nationwide study. Ann Surg 2014; 259: 1223–1227.

13) Saggar VR, Saraengi R. Occult hernias and bilateral endoscopic total extraperitoneal inguinal hernia repair: is there a need for prophylactic repair?: Results of endoscopic extraperitoneal repair over a period of 10 years. Hernia 2007; 11: 47–49. Epub Sep 28.

14) Rosemar A, Angéras U, Rosengren A. Body mass index and groin hernia: a 34-year follow-up study in Swedish men. Ann Surg 2008; 247: 1064–1068.