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ORIGINAL ARTICLE

Evaluation of relative criteria for single-incision laparoscopic cholecystectomy

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Summary *Background/Objective:* Although single-incision laparoscopic cholecystectomy (SILC) has no advantage over conventional laparoscopic cholecystectomy (LC), except for better cosmesis, few reports have discussed the criteria for SILC. The aim of this study was to evaluate the suitability of our criteria for SILC.

Methods: During the study period, SILC was performed at our institution under the following criteria. The inclusion criteria were elective surgery, age of < 60 years, and body mass index of < 30 kg/m². The exclusion criteria were a thick gallbladder wall, history of choledocholithiasis, previous abdominal surgery, and serious concomitant disease. We reviewed data regarding consecutive patients who underwent LC at our institution from November 2009 to March 2016. The data were assessed with respect to patient characteristics, operative data, and postoperative outcomes.

Results: A total of 1093 patients underwent elective LC, and 232 (21.2%) of these patients underwent SILC using our criteria. Fourteen patients (6.0%) who underwent SILC required extra ports. Among the patients aged < 60 years, 50.2% (232/462) underwent SILC. There were few adverse events, including intra- and postoperative complications, among the patients who underwent SILC.

Conclusion: The above-mentioned criteria are safe, necessary, and sufficient for SILC over conventional LC.

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1. Introduction

Laparoscopic cholecystectomy (LC) has been the standard treatment for gallbladder disease during the past two decades. Surgeons have recently begun performing LC through a single umbilical incision, termed as single-incision LC (SILC). This type of surgery has gained the attention of surgeons, and many reports of various SILC procedures have rapidly accumulated.^{1–6} The potential benefits of this method include a decrease in the postoperative pain and an earlier return to normal functioning. In addition, SILC is a virtually scarless surgery because the surgical incision can be hidden almost completely within the umbilicus.

However, a recent meta-analysis by Garg et al,⁷ including nine randomized clinical trials, concluded that SILC does not confer any benefits in terms of postoperative pain and length of hospital stay. According to these authors, SILC has postoperative complications similar to those of conventional LC but provides better cosmetic results. Furthermore, some randomized trials revealed no advantage of SILC over the conventional LC approach in terms of postoperative outcome.^{8,9} A recent systematic review showed that SILC has a higher procedure failure rate with more blood loss and requires a longer operation time than conventional LC.¹⁰

Although the above systematic reviews suggest that SILC has no advantage over conventional LC, except for better cosmesis, the indications for SILC have not been fully examined, and few reports have discussed the appropriate criteria for SILC. In addition, most studies concerning SILC have seemed to use relatively lenient criteria for the indications for SILC, which may not ensure patient safety. Most of the inclusion criteria indicate that the upper limit for age is > 75 years and that the upper limit for body mass index (BMI) is > 30 kg/m².^{11,12} Although most of the exclusion criteria in these trials included emergency surgery, a history of upper abdominal surgery, and a history of choledocholithiasis, few studies have discussed the use of exclusion criteria concerning the inflammation status, such as the thickness of the gallbladder wall on preoperative imaging.

The indications for SILC should be considered primarily to ensure patient safety if this technique is used with the aim of cosmesis. Therefore, relative criteria for SILC are needed. The aim of this study was to evaluate the suitability of our criteria to ensure patient safety while achieving optimal cosmetic results. We reviewed the outcome of SILC performed in our hospital using our criteria, not the criteria reported previously.

2. Methods

At Kansai Medical University Hirakata Hospital, Osaka, Japan, all patients with gallstones, polyps, or benign tumors of the gallbladder who are fit for surgery are treated with LC. We reviewed the prospective data of these patients collected in the Department of Surgery at our institute from November 1, 2009 to March 31, 2016. SILC was introduced in our department in November 2009. Information was obtained on patient characteristics, operative data, and postoperative outcomes. Outcomes of interest

were the operating time, length of hospital stay, intraoperative and postoperative complications, conversion to open surgery, and additional port insertions.

All patients awaiting cholecystectomy underwent a full assessment that included abdominal ultrasonographic scanning and magnetic resonance imaging of the biliary tree. Patients with suspected choledocholithiasis were referred for endoscopic retrograde cholangiopancreatography prior to surgery. The inclusion criteria for SILC were elective surgery, age of < 60 years, and BMI of < 30 kg/m². The exclusion criteria were a thick gallbladder wall demonstrated on preoperative imaging, a history of choledocholithiasis, previous upper abdominal surgery, and a serious concomitant disease, such as malignant tumor, renal insufficiency requiring hemodialysis, diabetes mellitus requiring insulin injection, regular use of steroids, liver cirrhosis, or heart failure. A thick gallbladder wall was defined as most or the entire gallbladder wall thickened by inflammatory change as demonstrated on preoperative imaging, such as computed tomography, magnetic resonance imaging, and/or echography. All surgical procedures were performed by an experienced surgeon who was assisted by a surgeon-in-training. This experienced surgeon had performed more than 1000 conventional LC procedures at the beginning of the current study.

2.1. SILC techniques

Patients were placed in a supine and reverse Trendelenburg position with slight rotation to the left side. An incision was made at the umbilicus under direct vision, and a multilumen port (SILS Port; Covidien, Mansfield, MA, USA, or Gel-POINT Mini; Applied Medical, Rancho Santa Margarita, CA, USA) was placed. After pneumoperitoneum was established, a flexible-tip laparoscope (LTF TYPE VP; Olympus Medical Systems Corp., Tokyo, Japan) was inserted through the port.¹³ Under laparoscopic observation, a retractor with a loop (Mini Loop Retractor II HA0002, 2-mm external diameter; Covidien) was introduced directly into the peritoneal cavity in the right lateral abdomen. The fundus of the gallbladder was grasped with the Mini Loop Retractor to push the fundus toward the right diaphragm. This type of needle retractor can make SILC safer and easier to perform with a minimally visible wound. The retractor should be used routinely for safe SILC. The Hartman's pouch of the gallbladder was manipulated with an articulating grasping forceps (5-mm Endo Grasp Grasper with Roticulator Technology; Covidien) passed through the umbilical port, whereas dissection at the triangle of Calot was performed using laparoscopic instruments (Maryland dissector WA64350A, Olympus Medical Systems Corp.; Electrocautery Hook A6282, Olympus Medical Systems Corp.; and 5-mm SILS Hook, Tyco Healthcare Group LP, Norwalk, CT, USA). The cystic duct and artery were clipped using a clip applier (Lapro-Clip; Tyco Healthcare UK Ltd., Gosport, UK)¹⁴ and divided with an ultrasonic dissector (SonoSurg X; Olympus Medical Systems Corp.). The gallbladder was dissected from the liver bed using an electrocautery hook. The electrocautery hook can be replaced with an ultrasonic dissector if its use enhances dissection. The gallbladder was subsequently removed through the single port incision. The

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