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Single-incision laparoscopic cholecystectomy in children: a feasible alternative to the standard laparoscopic approach

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Abstract

Purpose: Our aim was to evaluate the outcomes of the single-incision laparoscopic (SIL) cholecystectomy compared with the standard 4-incision laparoscopic (SL) cholecystectomy.

Methods: A retrospective chart review of consecutive patients undergoing cholecystectomy using the SIL approach from January 2008 to September 2010 was performed. These patients were compared with a cohort who underwent an SL cholecystectomy from January 2007 to June 2009. Demographics, operative times, length of stay, blood loss, and intravenous narcotic use was obtained from the charts. A nonpaired Student's *t* test was used to determine statistical significance.

Results: We identified 40 patients in the SIL group and 68 in the SL group. Main diagnosis was cholelithiasis followed by gallstone pancreatitis and cholecystitis. The mean operative time for SIL cholecystectomies was 79.2 minutes vs 63 minutes in the SL group ($P < .006$). The average length of stay was 1.9 days in the SIL group vs 2.3 days in the SL group ($P < .24$). The mean intravenous narcotic use was 1 dose in the SIL group vs 2.9 doses in the SL group ($P < .007$). There were no intraoperative complications. At 1-month postoperative follow-up, all patients had satisfactory recovery.

Conclusion: Single-incision laparoscopic cholecystectomy is a safe and feasible alternative to the standard laparoscopic approach in children, even in the setting of acute disease.

"Standard" laparoscopic cholecystectomy (SL), which is performed using a 4-trocar technique, has become the procedure of choice for the treatment of gallbladder diseases since 1992 in the adult population [1]. In 1991, Sigmund, Newman, Holcomb, and their colleagues were the first to report independently that laparoscopic cholecystectomy in children is safe and effective [2-5]. The largest initial series of more than 26 cases of SL in children was reported by Holcomb et al in 1994 [6]. Since these early reports, the approach has become the criterion standard in surgical management of the gallbladder diseases in children [7].

With the advent of new technologies and innovations, surgeons are searching for procedures that would provide minimal scarring and discomfort. Single-incision laparoscopic surgery (SILS) is one of the newer techniques that has been gaining popularity. The rationale of this technique stems from

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the fact that the umbilicus is natural site as the portal of entry whereby the regular laparoscopic instrument can be used with excellent cosmetic results without the need for specialized equipment/instrumentation or the potential visceral injury caused by other techniques such as natural orifice transluminal endoscopic surgery. Single-site surgery is well reported in the adult literature as a safe and effective technique [8,9]. However, the data on children are less abundant. The aim of this study is to evaluate the outcomes of the single-incision laparoscopic (SIL) cholecystectomy in children compared with the standard 4-trocar laparoscopic (SL) cholecystectomy.

1. Methods

1.1. Surgical technique

The procedure is performed with the patient in lithotomy position while the operating surgeon is standing at the foot of the bed between the patient's legs and the assistant surgeon is standing on the patient's left. A single curvilinear infra-umbilical incision is made after local anesthetic injection. Three 5-mm (Ethicon, Cincinnati, OH) ports (one 100 mm and two 75 mm) are placed adjacent to each other through separate fascial incisions. The trocars are staggered at different heights to minimize collisions. A 0-0 Prolene suture is placed through-and-through the abdominal wall and secured through the wall of the gallbladder's infundibulum to suspend the gallbladder. The ends of the suture are held with a surgical clamp extracorporeally. The triangle of Calot is exposed, and a standard retrograde cholecystectomy is performed using regular laparoscopic instrument. The Endocatch is placed directly through the central trocar site after the port is removed and the fascial incision is enlarged, through which the gallbladder is retrieved. The facial incisions were not connected and closed separately. As in the SL, intraoperative cholangiograms (IOCs) were decided on selective bases for patients with common bile duct stones or dilated common bile duct demonstrated by ultrasounds, unclear anatomy, abnormal liver function test result/hyperbilirubinemia, and pancreatitis. Likewise, IOC was performed using the same technique as in SL where a 14-gauge angiocatheter was placed through the abdominal wall at the right subcostal area, straight above the gallbladder. A 3F or 4F ureteral catheter connected to a 3-way stopcock and extension tubing was then inserted through the angiocatheter and subsequently used to cannulate the cystic duct. The catheter was secured in place with endoclips. The contrast was then injected, and images were obtained using fluoroscopy.

1.2. Methods

After institutional review board approval, we performed a retrospective chart review of consecutive patients who underwent SIL cholecystectomy from January 2008 to September 2010 compared with the cohort of patients who underwent the standard laparoscopic cholecystectomy from January 2007 to June 2009, before the SIL technique was adopted as the preferred approach by the 2 primary surgeons (NN and DA). One of the surgeons did not use the technique until much later. Once the SIL technique was adopted, all incoming patients requiring cholecystectomy, regardless of pathology, were selected for SIL technique. Patients with additional procedures were excluded from the analysis. Pertinent data including demographics, operative (OR) times, intraoperative and postoperative complications, length of stay (LOS), and intravenous (IV) narcotic use were studied. The statistical analysis of the data was performed using nonpaired Student's t test with $P < .05$ considered statistically significant.

2. Results

During the study period, we identified 40 patients (35 female and 5 male) in the SIL group and 68 subjects (56 female and 12 male) in the SL cohort (Table 1). Both groups had similar demographics, with an average age 15 years (8-20 years) and body mass index (BMI) of 31 in the SIL group compared with an average age of 15 years (3-22 years) and BMI of 28 in the SL group, respectively. The majority (92%) of the patients in the 2 groups presented with cholesterol stones (37/40 vs 63/68). Of the 40 subjects in the SIL group, 4 (10%) had acute cholecystitis and 5 (13%) developed pancreatitis compared with 7 (10%) and 12 (17.6%) in the SL group. Five (13%) patients in the SIL group required IOC compared with 19 (28%) patients in the SL group. None of the patients required additional trocar. The mean OR time for SIL cholecystectomies was 79.2 minutes compared with 63 minutes in the SL group ($P < .006$). The OR time for the first 10 cases was significantly longer compared with the subsequent cases: 103.3 vs 69.9 minutes. The OR time of the SIL cholecystectomy nearly approached the OR time of the standard laparoscopy after the initial "learning curve" of the first 10 cases (69.9 vs 63 minutes). There were no intraoperative complications or conversions to open in either group. The blood loss was reported as "minimal" (<20 mL)

Table 1 Comparison of the SIL group outcomes with SL

Operative procedure	SIL cholecystectomy (n = 40)	SL cholecystectomy (n = 68)
Sex	F = 35, M = 5	F = 56, M = 12
Age	15 (8-20)	15 (3-22)
BMI	28.2 ± 7.8	28.1 ± 7.8
LOS (d)	2.0 ± 1.3 ($P < .24$)	2.3 ± 1.5
OR time (min)	82.4 ± 27.6 ($P < .006$)	63.1 ± 28.7
IV narcotics	1.3 ($P < .007$)	2.9
IOC	5	19
EBL (mL)	17	10

F indicates female; M, male; EBL, estimated blood loss.