



## Operative Technique

## Single-incision laparoscopic excision of pancreatic tumor in children



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## ARTICLE INFO

## Article history:

Received 24 August 2014

Received in revised form 5 January 2015

Accepted 2 February 2015

## Key words:

Single-incision laparoscopic surgery

Pancreatectomy

Tumor

Children

## ABSTRACT

**Purpose:** Single-incision laparoscopic surgery (SILS) as a surgical approach in treatment of pancreatic disease has recently been reported in adults. However, its application in pancreatic surgery in children is limited. In this article, we report our preliminary experience of SILS in children with pancreatic disease.

**Methods:** Three children with pancreatic tumor underwent single-incision laparoscopic partial pancreatectomy between July 2011 and August 2013. Two of three children were girls, and one was a boy. The ages ranged from 2 to 10 months, with an average age of 6.7 months.

**Results:** All operations were successfully performed. There was no conversion to the conventional multi-incision surgery. The mean operation time of the 3 cases was 153.3 minutes (range 120–200 minutes). The postoperative hospital stay was 7 days. The drainage tubes were kept for 3 to 4 days after surgery. There was no pancreatic juice leak in this case series. All patients were followed up and there was no recurrence.

**Conclusions:** Single-incision laparoscopic partial pancreatectomy for children with pancreatic tumor is feasible.

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Laparoscopic surgery have significant advantages over open surgery, including clear visual field, reduced injury, decreased postoperative pain, better cosmetic results, and accelerated patient recovery. Despite the excellent results of laparoscopic surgery, further optimization of scars has been advocated. Recently, many experienced laparoscopic surgeons have tried to develop a new minimally invasive technique, namely 'single incision laparoscopic surgery' (SILS). It transpires that SILS allows for a better cosmetic outcome. However, it may also provide less pain and earlier recovery. Owing to the retroperitoneal location of the pancreas and numerous potential postoperative complications, the adoption of laparoscopic techniques for pancreatic diseases is limited. Most of the reports on SILS for the treatment of pancreatic diseases are in adults [1–8]. To date, single-incision laparoscopic pancreatic surgery has been rarely reported in children. In this article, we describe our preliminary experience with SILS in children with pancreatic disease.

## 1. Materials and methods

Between July 2011 and August 2013, three patients (1 boy and 2 girls, age: 2–10 months) with pancreatic tumor were managed with single-incision laparoscopic partial pancreatectomy in the Department

of Pediatric Surgery, Capital Institute of Pediatrics. Due to the retroperitoneal location of the pancreas, SILS is difficult. To reduce the difficulty, the criteria for patient selection in our department are as follows: there is no adhesion in the abdominal cavity, and the patient has no history of abdominal operations or contraindications for laparoscopic surgery. One of three patients suffered from pancreatic cyst located in the head of pancreas, as demonstrated by the pre-operative ultrasound. Two patients suffered from persistent hyperinsulinemic hypoglycemia of infancy (PHHI). The location and size of the lesion were established with the ultrasound, computed tomography, or magnetic resonance imaging before surgery (Fig. 1). All patients have no history of abdominal operations or contraindications for laparoscopic surgery. The same surgeon carried out all the surgeries on these children.

## 1.1. Operative technique

The patients were placed in a supine and slight (35°) anti-Trendelenburg position with legs apart. The surgeon stood between the patient's legs and the assistant stood on the patient's left side (Fig. 2). A transumbilical 1.5–2 cm superficial longitudinal incision was made. One 5 mm trocar was inserted into the lower margin of the incision for the camera port. Two 3 mm trocars were inserted via subcutaneous tunnel 1 to 2 cm on each side of the 5 mm trocar (Fig. 3). The umbilical incision often was stretched further during operation, creating a defect greater than 1.5 cm at the skin level. The umbilical fascial defects are smaller. A 3-mm straight dissector with electrocautery and a

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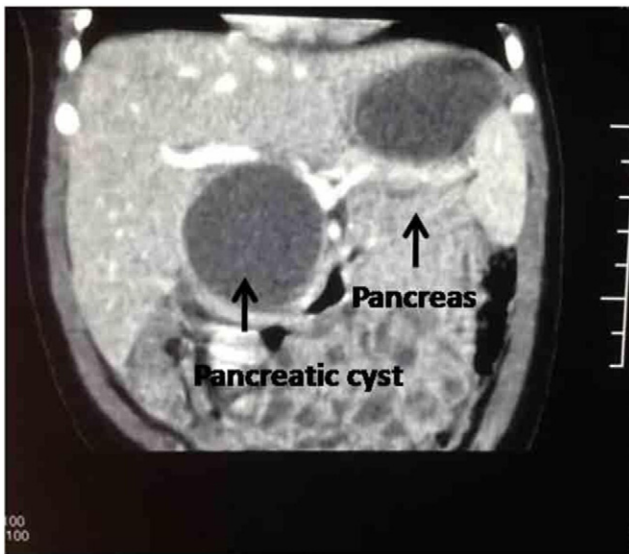


Fig. 1. Pre-operative CT scan showed the location of pancreatic cyst.

3-mm straight grasper were placed through the lateral ports. Carbon dioxide pneumoperitoneum was established at a pressure of 6–12 mmHg.

The remaining procedures were similar to those in the multi-trocar laparoscopic pancreatectomy. Firstly, a gastric traction suture was placed to retract the posterior wall of stomach to the right, thereby exposing the lesser sac (Fig. 4). By dividing the gastrocolic ligament, the pancreas was exposed (Fig. 5). Following a diagnostic laparoscopy, the location and range of the mass or cyst were identified. The first child with pancreatic cyst underwent pancreatic cystectomy. Under laparoscopic surveillance, a cystic mass was found in the pancreatic head. The clear fluid in the cyst was first aspirated. And then, the cystic mass was removed completely from pancreas using electrocautery. A diffuse pancreatic lesion was found in the second child with PHHI, the distal pancreatectomy was performed following the techniques described in the literatures [8,9] (Fig. 6). A focal lesion was present in the pancreatic body in the third child with PHHI. It was removed from the pancreatic tissue (Fig. 6). The specimen was placed in an endobag and was retrieved through the umbilical incision. A drain was placed into the lesser omental bursa through the transumbilical incision at the end of the procedure.

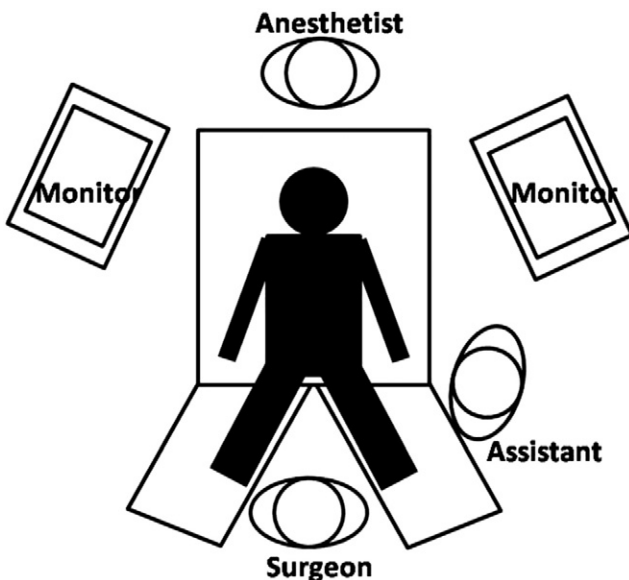


Fig. 2. The patient's position and locations of operative staffs and instruments.

All patients were followed up postoperatively. Physical examination, abdominal ultrasonographic studies, and laboratory tests were conducted at each visit. The operative time and blood loss, postoperative hospital stay, postoperative complications, and preoperative and postoperative ultrasonographic findings and laboratory results were evaluated.

## 2. Results

Single-incision laparoscopic partial pancreatectomy was successfully performed in all patients. No patient required conversion to a conventional multi-incision or open procedure. The pathologic diagnosis of pancreatoblastoma was made in the patient with pancreatic cyst undergoing a pancreatic cystectomy. The diagnosis of nesidioblastosis was established histopathologically in the patient with PHHI undergoing a distal pancreatectomy and focal resection (Table 1). Previous studies suggested that a diffuse nesidioblastosis requires a 95% pancreatectomy, and a focal nesidioblastosis requires a partial pancreatectomy [10–13]. Therefore, a distal pancreatectomy was performed in the child with diffuse nesidioblastosis, and the child with focal nesidioblastosis underwent a focal resection. There was no recurrence of pancreatic tumor postoperatively. The time required for surgery ranged from 120 to 200 minutes (mean: 153.3 minutes). Blood loss was minimal without necessity for blood transfusion. The hospital stay period after the operation was 6 to 7 days. The duration of postoperative abdominal drainage was 3 to 4 days. The follow-up period ranged from 4 to 29 months. No patient developed pancreatic juice leak, pancreatitis, or infection. Blood glucose levels normalized after operation. Despite being forced to extend the incision beyond the umbilical borders during operation, the umbilical scar appears close to “normal” after surgery (Fig. 7).

## 3. Discussion

The “scarless” procedure represents a new trend in laparoscopic surgery. SILS uses the umbilical scar as the port for the camera and the instruments. This allows a better cosmetic outcome and has been recognized as an improvement over conventional laparoscopic surgery. The first attempts at single-incision laparoscopic cholecystectomy were performed by Navarra G et al. [14]. After that, SILS has been applied in many other surgical procedures, such as appendectomy, sleeve gastrectomy, gastrojejunostomy, splenectomy, nephrectomy, liver resection, etc. The application of SILS for the treatment of pancreatic diseases has been reported [1–8]. However, all of reports were in adults, and the report on single-incision laparoscopic pancreatic surgery is rare in children.

We have performed SILS for children with choledochal cysts [15]. After gaining sufficient experience in SILS, we decided to perform SILS in children with pancreatic tumor. In our study, Single-incision laparoscopic partial pancreatectomy was successfully performed in all patients. No patient required conversion to the conventional multi-incision or open procedure. There was no recurrence of pancreatic tumor postoperatively. All these results indicated that Single-incision laparoscopic partial pancreatectomy is safe and effective in children with pancreatic tumor. Previous studies suggested that visible scarring in children may lead to low self-esteem, impaired socialization skills, and decreased self-ratings of problem-solving ability [16]. In our study, the three trocars were inserted through a single umbilical incision, reducing the number of incisions. We speculate that the umbilical scar appears close to “normal” post-operatively (Fig. 7), giving an impression of “scarless” operation.

Although SILS allows for a better cosmetic outcome, it poses unique challenges for the laparoscopic surgeon. First, triangulation and retraction are significantly limited. The introduction of a camera and several instruments parallel to each other results in decreased range of motion and “clashing” of instruments. This decreased freedom of motion increases the technical complexity of the operation and results in a significant learning curve for performing SILS. SILS has a unique learning curve, principally in navigating the instruments within a limited range

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