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Laparoscopic Treatment of Pancreatic Pseudocysts in Children

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Abstract

Background: Pancreatic pseudocysts are problematic sequelae of pancreatitis or pancreatic trauma causing persistent abdominal pain, nausea, and gastric outlet obstruction. Due to the low volume of disease in children, there is scant information in the literature on the operative management of pseudocysts with minimally invasive techniques. We conducted a multi-institutional review to illustrate several technical variations utilized in achieving laparoscopic cystgastrostomy in the pediatric population.

Methods: A retrospective review was conducted of all patients who underwent laparoscopic cystgastrostomy in five institutions. Patient data, operative techniques, and postoperative course were analyzed.

Results: There were 13 patients with a mean age of 10.4 years and mean weight of 52.1 kg. The etiologies of pancreatitis included: trauma (4), gallstones (3), chemotherapy (2), hereditary (1), and idiopathic (3). Preoperative radiographic measurements of the maximal cyst diameter averaged 11.7 cm. Cystgastrostomy was approached by using transgastric exposure in 5 cases and intragastric ports in 8 cases. An average of four ports were used to complete these operations. Mean operative time was 113 minutes. There were no conversions in this series. Cystgastrostomy was performed by using an endoscopic stapler (average 3.8 loads) in 6 cases, sutures in 6 cases, and 1 was formed solely with the Harmonic Scalpel (Johnson and Johnson). Gastrostomy sites were closed by using a stapler in 4 cases and suture techniques in 9. Mean time to initial and goal feeds was 3 and 4 days, respectively. Postoperative imaging revealed persistent pseudocyst in 1 patient, who was treated with a distal pancreatectomy. Therefore, 92% required no further operative intervention and remained asymptomatic upon recovery from their pancreatitis.

Conclusion: A laparoscopic approach to pancreatic cystgastrostomy for chronic pseudocyst proved to be safe and effective in this five-institution survey. Techniques varied, but 92% had complete resolution with minimal morbidity and rapid recovery. Laparoscopic cystgastrostomy should be considered as an appropriate first-line treatment for chronic pseudocysts in children.

Introduction

PANCREATIC PSEUDOCYSTS are a result of pancreatic insult with ductal disruption and leakage of pancreatic enzymes into surrounding soft tissues. These encapsulated fluid collections develop a fibrous wall without an epithelial lining. After 6 weeks, a pancreatic pseudocyst is considered mature, and if greater than 6 cm in size, resolution with conservative medical management is doubtful. Where biliary- and alcohol-induced pancreatitis account for most adult pan-

creatic pseudocysts, the etiology of pancreatic insult in the pediatric population is most often idiopathic or traumatic.^{1,2}

Pseudocysts may cause pain and compressive symptoms that result in nausea, vomiting, and failure to thrive. Persistent, symptomatic pseudocysts can be treated by percutaneous, endoscopic, or surgical approaches. The adult literature emphasizes the successful introduction of minimally invasive techniques in treating pancreatic pseudocysts.^{3,4} A low volume of pancreatic disease in children provides scant information regarding the treatment of pseudocysts in the

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current pediatric literature. In this paper, we introduce a multi-institutional experience with the laparoscopic treatment of pancreatic pseudocysts in children and discuss the various techniques used to treat this problem.

Methods

Thirteen patients from five institutions were retrospectively evaluated for this study. Preoperative data collected included patient age and weight at surgery, gender, etiology of pancreatic pseudocyst, indications for operation, maximal cyst diameter, and number of cysts present. Operative data collected included the approach used, number and size of ports used, technique of cystgastrostomy creation, technique of gastrotomy closure, operative time, and concomitant operations. Postoperative data included days to start feeds, days to full feeds, length of stay, postoperative imaging, length of postoperative follow-up, and postoperative complications.

Operative techniques

Two operative approaches were used to create a cystgastrostomy. The transgastric approach was used in 5 patients. In this approach, the peritoneal cavity is entered and a camera is inserted through an umbilical port. Additional ports are positioned intraperitoneally to allow for the creation of a gastrotomy on the anterior wall of the stomach. After creation of the anterior gastrotomy, the common wall between the stomach and pseudocyst is identified and confirmed with needle drainage. Once the site is identified, the posterior wall of the stomach is opened into the cyst. The cyst is evacuated by using suction, and necrotic debris is removed by using blunt grasping instruments. The cystgastrostomy is created with either a stapling device or sutures to achieve hemostasis at the ostomy edges. When hemostasis and adequate size of the cystgastrostomy is established, the anterior gastrotomy is closed by using either a stapling device or intracorporeal suturing techniques.

The other operative approach, utilized in 8 patients, involves the use of intragastric ports. A laparoscope is inserted into the peritoneal cavity. The stomach is then insufflated, using either an endoscope or nasogastric tube. Once the stomach is insufflated, additional ports are inserted through

the abdominal wall and into the anterior gastric wall. These ports are secured in the stomach, using either radial expanding trocars, balloon trocars, or sutures through the stomach and the abdominal wall. The site of the common wall of the pseudocyst and the stomach is identified, as previously described. Cystgastrostomy is created as in the transgastric approach. When the cystgastrostomy is completed, the intragastric ports are removed and the port sites in the stomach are closed with interrupted, intracorporeal sutures

Results

Patient characteristics are summarized in Table 1. The average age of patients in this series was 10 years (range, 2–16). There were 7 female and 6 male patients. Average weight at operation was 52 kg (range, 12–100). Etiology of pancreatitis varied in this patient population, with 4 patients having a traumatic etiology of their pseudocyst, 3 with unknown etiologies, 3 with gallstone pancreatitis, 2 with chemotherapy-related pancreatitis, and 1 with hereditary pancreatitis. Each patient had a single cyst cavity identified on preoperative imaging, with an average largest dimension of 12 cm (range, 8–20). One cyst exhibited extension into the thoracic cavity, and two cysts did not have preoperative measurements available. Indications for operation included pain and nausea in 10 patients and gastric outlet obstruction in 3 patients.

Operative data are summarized in Table 2. All cases were achieved without conversion to an open procedure or any intraoperative complications. Two laparoscopic cholecystectomies were performed at the time of the cystgastrostomy. The transgastric approach was utilized in 5 operations, with the 8 additional cases performed by using intragastric ports. Those cases that utilized the intragastric approach secured ports in the stomach using balloon trocars (3), radially expanding trocars (3), and/or stay sutures (3) holding the anterior stomach wall to the abdominal wall.

The common wall of the stomach and pseudocyst was needle localized in each case. Once the site of the cyst had been identified, the cyst wall was opened by using bovie electrocautery (9), the Harmonic Scalpel (Johnson and Johnson) (3), or a combination of both techniques (1). The cystgastrostomy was then created and hemostasis ensured by using a stapler

TABLE 1. PATIENT CHARACTERISTICS

Patient no.	Age	Gender	Weight (kg)	Etiology of pancreatitis	Maximum cyst diameter (cm)	Indication for operation
1	13	F	100	Gallstone	15	Pain/nausea
2	13	M	47	Chemo for ALL	10	Pain
3	16	F	81	Gallstone	20	Pain/nausea
4	11	M	40	Unknown	9.6	Gastric outlet obstruction
5	6	M	23	Trauma	8.5	Pain/nausea
6	4	M	19	Trauma	16	Gastric outlet obstruction
7	2	F	12	Chemo for neuroblastoma	12.6	Pain/nausea
8	7	F	—	Unknown	8	Pain
9	12	F	—	Trauma	—	Gastric outlet obstruction
10	15	F	50	Unknown	—	Pain
11	15	M	70	Trauma	17	Pain/nausea
12	10	F	63	Hereditary	9.3	Pain/nausea
13	11	M	68	Gallstone	7.9	Nausea

TABLE 2. OPERATIVE DATA

Patient no.	Approach	Method of entering cyst cavity	Method of cystgastrostomy	Method of closing gastrostomies	Total ports	Total OR time (min)
1	Intragastric	Bovie	Stapler	Stapler	6	150
2	Intragastric	Harmonic	Harmonic	Suture figure of eights	3	90
3	Intragastric	Bovie	Stapler	Stapler	5	180
4	Transgastric	Bovie	Stapler	Suture two layer	3	—
5	Intragastric	Bovie	Stapler	Stapler	3	180
6	Intragastric	Bovie	Stapler	Stapler	3	120
7	Intragastric	Bovie	Suture	Suture	4	152
8	Intragastric	Bovie	Suture	Suture	4	—
9	Intragastric	Bovie	Suture	Suture	3	—
10	Transgastric	Bovie	Suture	Suture	4	90
11	Transgastric	Harmonic	Stapler	Running suture	4	45
12	Transgastric	Bovie and Harmonic	Stapler	Running suture	4	75
13	Transgastric	Harmonic	Stapler	Running suture	5	50

(8), sutures (4), or the Harmonic Scalpel alone (1). When staplers were used, an average of 3.8 vascular loads were fired to create the cystgastrostomy. Gastrostomies were closed with staplers in 4 cases and sutures in 9 cases. The total number of ports used ranged from 3 to 6, with an average of four ports necessary to complete each operation. In most cases, 5-mm ports were utilized, with an additional 10- or 12-mm port used in cases that employed a stapler. One institution used 3.5-mm ports for their 3 cases.

Operative time ranged from 45 to 180 minutes, with an average of 113 minutes. The average operative time in the intragastric group was 145 minutes and in the transgastric group 65 minutes, revealing a significant difference between these two approaches ($P = 0.002$). Time to start feeds postoperatively averaged 3 days (range, 1–5), with time to full feeds at 4 days (range, 2–6). Postoperative length of stay averaged 4.5 days.

Eight patients had follow-up imaging with confirmation of pseudocyst resolution in 7 cases. Ultrasound was performed in 4 patients, and computed tomography (CT) was performed in 4 patients. Studies were performed as early as 1 week postoperatively, but most allowed a 3-month time interval between surgery and the first postoperative imaging.

The one recurrent pseudocyst in this series was identified on a CT scan performed 1 month postoperatively. The original cystgastrostomy in this case was performed transgastrically, and the cystgastrostomy was created with a stapler. A distal pancreatectomy was performed, and the patient recovered well after this second intervention. One patient who had an intragastric cystgastrostomy created with sutures developed hematemesis 1 week postoperatively. This patient required a diagnostic upper gastrointestinal endoscopy that identified clot at the cystgastrostomy with no active bleeding and no further therapy necessary. Length of follow-up ranged from 1 month to 6 years. A 92% success rate for the laparoscopic cystgastrostomy was demonstrated in this patient population.

Discussion

Pancreatic pseudocysts are a rare, but potentially troublesome, problem in the pediatric population. Various meta-

bolic, anatomic, and traumatic insults may result in pancreatitis.¹ Persistent pain or obstructive symptoms, resulting in nausea and vomiting, can complicate chronic pseudocysts. When attempts at conservative medical management, including nasogastric decompression, bowel rest, total parenteral nutrition, and analgesia, fail, drainage of the pseudocyst is warranted.

Most of the surgical literature explores treatment options in the adult population. Endoscopic procedures have been utilized to achieve both transpapillary drainage and some cystenteric drainage procedures. These techniques generally employ stents or drains inserted to optimize evacuation of the cyst. Failure has been as high as 25% in the larger adult series.⁵ The pediatric literature on these techniques is limited by small case numbers and mixed results.^{6–8}

Surgical drainage procedures have long been the gold standard for treating persistent, symptomatic pseudocysts. Most recently, laparoscopic techniques have been applied to this problem. Transgastric,^{9,10} intragastric,¹¹ and infracolic^{3,9} techniques have been described in the adult literature. Cases of laparoscopic cyst jejunostomy have also been reported.¹² The pediatric literature offers few case reports detailing similar techniques applied to pediatric patients.^{13,14}

Conclusion

We evaluated the experience of five institutions with this rare problem and determined that the laparoscopic cystgastrostomy is a safe, effective treatment. There were no intraoperative complications or conversions within our population of 13 patients. Effective drainage was achieved in 12 patients (92%). Patients started on a diet quickly and their postoperative hospital stays were short.

Cystgastrostomies were successfully created by using ports placed either within the stomach or outside, using both staplers and sutures. Each technique has its limitations: The use of a stapler requires a 12-mm port, and the use of suturing techniques requires more advanced laparoscopic skills. Also, there was 1 patient in the latter group that had postoperative bleeding from a suture line. The intragastric technique requires the closure of multiple anterior gastrostomies, as opposed to the one with the transgastric approach. The number of ports utilized and postoperative outcome

variables did not vary based on technique. There was a significant difference in the operative time, when comparing the two approaches to cystgastrostomy, suggesting that gaining access and working within the stomach may be more difficult without any obvious benefit. Due to our small sample size, however, we were unable to determine the best technique to perform the laparoscopic cystgastrostomy. We recommend that surgeons work within their technical comfort zone when performing this rare procedure. Our experience highlights the utility of minimally invasive techniques in safely and effectively treating pediatric pancreatic pseudocysts.

Disclosure Statement

No competing financial interests exist.

References

1. The SW, Pham TH, Lee A, Stavlo PL, Hanna AM, Moir C. Pancreatic pseudocyst in children: The impact of management strategies on outcome. *J Pediatr Surg* 2006;41:1889–1893.
2. Kandula L, Lowe ME. Etiology and outcome of acute pancreatitis in infants and toddlers. *J Pediatr* 2008;152:106–110.
3. Cuschieri A, Jakimowicz JJ. Laparoscopic infracolic approach for complications of acute pancreatitis. *Sem Laparosc Surg* 1998;5:189–194.
4. Palanivelu C, Senthilkumar K, Madathupalayam VM, Rajan PS, Shetty ARS, Jani K, Rangarajan M, Maheshkumaar GS. Management of pancreatic pseudocyst in the era of laparoscopic surgery—experience from a tertiary centre. *Surg Endosc* 2007;21:2262–2267.
5. DePalma GD, Galloro G, Puzziello A, Masone S, Persico G. Endoscopic drainage of pancreatic pseudocysts: A long-term follow-up study of 49 patients. *Hepatogastroenterology* 2002;49:1113–1115.
6. Mas E, Barange K, Breton A, de Maupeou F, Juricic M, Broue P, Olives JP. Endoscopic cystostomy for post-traumatic pseudocyst in children. *J Pediatr Gastroenterol Nut* 2007;45:121–124.
7. Al-Shanafey S, Shun A, Williams S. Endoscopic drainage of pancreatic pseudocysts in children. *J Pediatr Surg* 2004;39:1062–1065.
8. Patty I, Kalaoui M, Al-Shamali M, Al-Hassan F, Al-Naqeeb B. Endoscopic drainage for pancreatic pseudocyst in children. *J pediatr Surg* 2001;36:503–505.
9. Barragan B, Love L, Wachtel M, Griswold JA, Frezza EE. A comparison of anterior and posterior approaches for the surgical treatment of pancreatic pseudocyst using laparoscopic cystgastrostomy. *J Laparoendosc Adv Surg Tech* 2005;15:596–600.
10. Smadja C, Badawy A, Vons C, Giraud V, Franco D. Laparoscopic cystgastrostomy for pancreatic pseudocyst is safe and effective. *J Laparoendosc Adv Surg Tech* 1999;9:401–403.
11. Chowbey PK, Soni V, Sharma A, Khullar R, Baijal M, Vashistha A. Laparoscopic intragastric stapled cystgastrostomy for pancreatic pseudocyst. *J Laparoendosc Adv Surg Tech* 2001;11:201–205.
12. Davila-Cervantes A, Gomez F, Chan C, Bezaury P, Robles-Diaz G, Uscanga LF, Herrera MF. Laparoscopic drainage of pancreatic pseudocysts. *Surg Endosc* 2004;18:1420–1426.
13. Seitz G, Warmann SW, Kirshner HJ, Haber HP, Schaefer JW, Fuchs J. Laparoscopic cystojejunostomy as a treatment option for pancreatic pseudocysts in children—a case report. *J Pediatr Surg* 2006;41:E33–E35.
14. Saad DF, Gow KW, Cabbabe S, Heiss KF, Wulkan ML. Laparoscopic cystgastrostomy for the treatment of pancreatic pseudocysts in children. *J of Pediatr Surg* 2005;40:E13–E17.

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