Laparoscopic anterior cystogastrostomy

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Aim
This study aims to evaluate feasibility, advantages, disadvantages, and outcome of anterior approach of laparoscopic cystogastrostomy in treatment of pancreatic pseudocyst (PP) in Minia University Hospital.
Patients and methods
This prospective study included consecutive patients with PP who were admitted to the Department of General Surgery, Minia University Hospital, between January 2017 and January 2018. All of them were operated upon using laparoscopic anterior approach cystogastrostomy.
Results
This prospective study was conducted in El-Minia University Hospital after being approved by the faculty ethical committee. This study included 15 patients with nine (60%) male patients and six (40%) female patients, and their age ranged from 14 to 61 years, with mean±SD of 39±13.27). The operative time ranged from 58 to 88 min, with mean of 74 min. The intraoperative blood loss ranged from 100 to 700 ml with mean of 285 ml. Overall, two cases were converted to open surgery. The mean hospital stay after surgery for all patients was 9 days. One patient developed postoperative pain and vomiting (6.6%) and another patient developed postoperative pancreatitis (6.6%).
Conclusion
Laparoscopic anterior approach cystogastrostomy is an effective safe approach for management of PP with little complications.

Keywords:
laparoscopy, pancreatic, pseudocyst

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Introduction

Pancreatic pseudocysts (PPs) constitute ~70–80% of all masses in the pancreas [1]. They are the most common complication of chronic pancreatitis (20–38%) and up to 5–15% of patients with acute pancreatitis. Asymptomatic pseudocysts can be managed expectantly and resolve without complications, whereas symptomatic, enlarging, or large ones more than 6 cm in diameter frequently require treatment [2].

Treatment varies between internal, external drainage or endoscopic, laparoscopic, or open intervention. This therapeutic dilemma whether to treat this patient as well as when and with what technique is a difficult one [3].

There is an agreement that large, persistent, and symptomatic cysts should be drained as they are usually associated with complications. Internal drainage is the method of choice and can be achieved by surgical, endoscopic, or laparoscopic interventions [4].

Internal drainage through cystogastrostomy and cystojejunostomy has been well established, and the permanent resolution of pseudocysts has been reported in 91–97% of patients [5].

Laparoscopic and endoscopic approaches for PP drainage and debridement have been developed, and the decision between endoscopic and laparoscopic approach is still controversial [6].

Endoscopic therapy requires experienced endoscopists and might be associated with stent-related complications, inadequate drainage, repeated interventions, and risk of perforation [7].

Laparoscopic cystogastrostomy techniques are reported to result in adequate internal drainage and debridement of PP with minimal morbidity and mortality. Numerous techniques have been reported for laparoscopic PP surgery thus far, including anterior and posterior cystogastrostomies, endoscopy-assisted

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surgery, and cystojejunostomy. However, there is no consensus on the appropriate technique of laparoscopic surgery, and the conclusions were usually built up on individual preferences [8].

The anterior approach is felt to be the technically easier procedure but requires two anastomoses: posterior staple line between stomach and cyst and anterior gastric wall gastrostomy closures [4].

On the contrary, the posterior approach is reported to have better visualization and allow for a large anastomosis but is felt to be more difficult to learn [9].

Patients and methods

Fifteen patients with PPs were included in this study. They were admitted in the Surgery Department of Minia University Hospital in the period from January 2017 and January 2018. Written consent was taken from all patients with full detailed history. The presentation of each patient was recorded, which included abdominal pain, anorexia, vomiting, nausea, abdominal swelling in epigastric region or left hypochondrial region, abdominal mass after a case of pancreatitis, or complications such as infection and hemorrhage.

The sensitivity of physical examination findings is limited. Patients frequently have a tender abdomen. They can occasionally have a palpable abdominal mass. Full laboratory investigations and CA19-9 were done in all patients. Abdominal ultrasound and computed tomography (CT) of the abdomen with contrast were done for all patients.

We excluded from our study patients with cyst diameter less than 6 cm, patients with severe cardiac problem who cannot withstand pneumoperitonium, and pregnant patients.

Patients with acute attacks were treated in the usual measures before they were subjected to surgery (no epigastric pain or tenderness, no nausea, and vomiting).

Prophylactic antibiotics (third-generation cephalosporin), proton pump inhibitor, and LMWH were all given preoperatively. All patients were anesthetized generally using isoflurane or sevoflurane with preoperative analgesic load and sedation with endotracheal intubation.

Patients were positioned in modified semilithotomy position, with the operating surgeon standing between the legs of the patient, the camera surgeon on the right side of the patient, and the assistant surgeon standing on the left side of the patient. The monitor was placed at the head end of the patient. The assistant surgeon, if required, stood on the left-hand side of the camera surgeon. We used the closed technique entry by visiport, and carbon dioxide insufflation was used to create pneumoperitonium, which was maintained and controlled at 12–15 mmHg. This usually requires 3–4 l. The camera port (10 mm) was placed in the midline, 3 cm above the umbilicus. The right-hand working port (5 mm) was placed in the left hypochondrium of the patient. The left-hand working port (5 mm) was placed in the right paramedian position, both these ports being cranial in relation to the camera port.

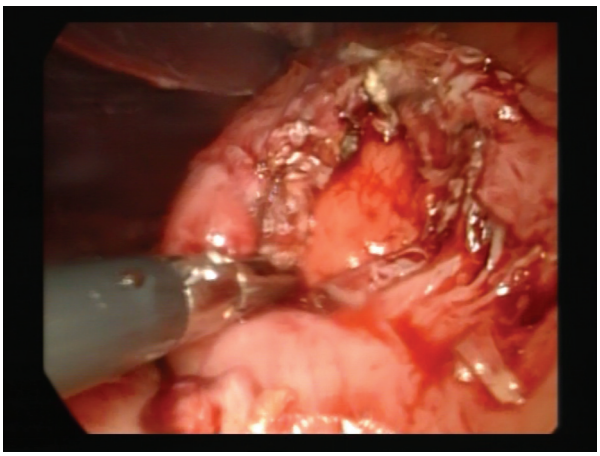
Anterior gastrostomy at the summit of the cyst was the first step using the harmonic scalpel for incision in the anterior gastric wall (Fig. 1).

After anterior gastrotomy, multiple interrupted everting stitches with silk were made from the edges of the gastrotomy to the anterior gastric wall about 2 cm away from the gastrotomy wound. This maneuver aided in keeping the gastrotomy wound open, especially after decompression of the cyst (Fig. 2).

We aspirated the fluid partially from the pseudocyst under laparoscopic visualization, by using percutaneous transgastric puncture with a Veress needle, and diagnostic aspiration was done. A stay stitch was placed at the summit of the bulge incorporating the posterior gastric wall with the anterior cyst wall (Figs 3 and 4).

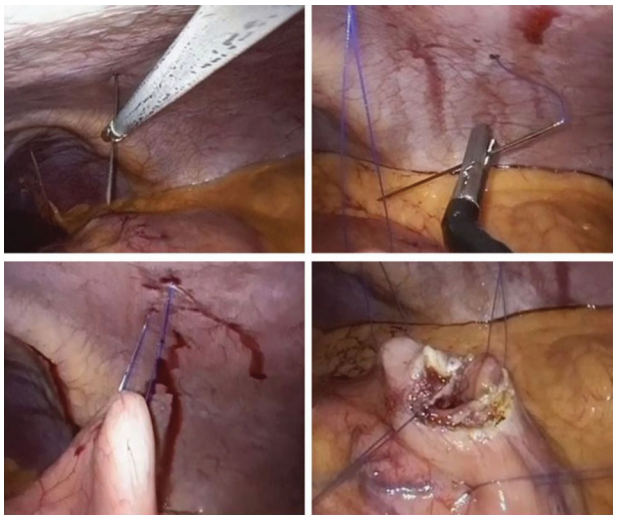
A 4-cm stoma was created using the Endo GIA white cartilage between the cyst and the stomach, which was made easier by lifting of the stay suture on the pseudocyst (Fig. 5).

Figure 1



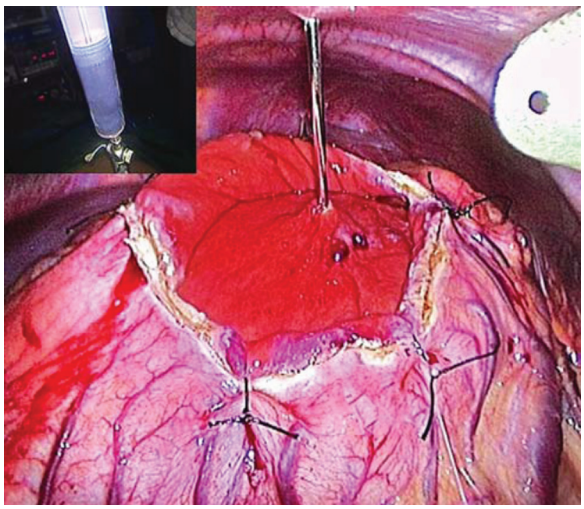
Showing opening of anterior gastric wall.

Figure 2



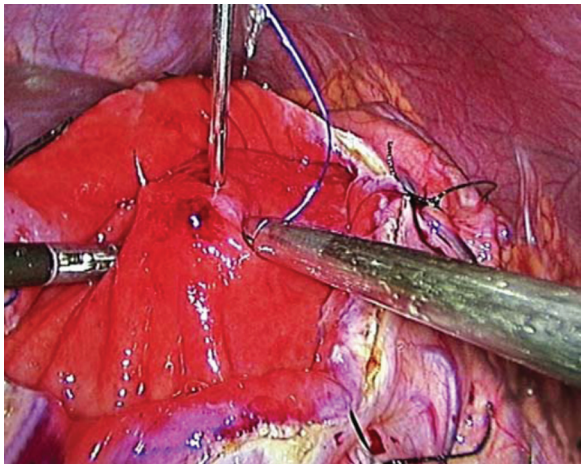
Showing multiple interrupted stay sutures.

Figure 3



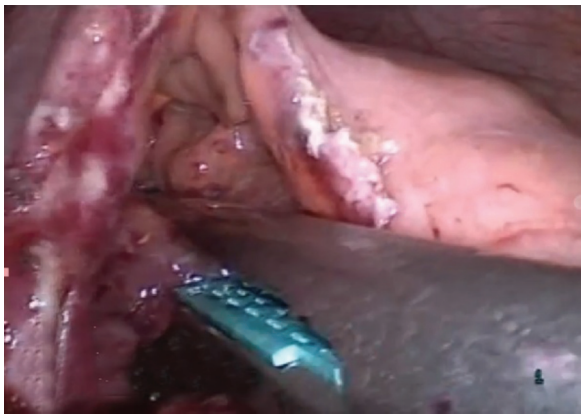
Showing diagnostic aspiration of pseudocyst.

Figure 4



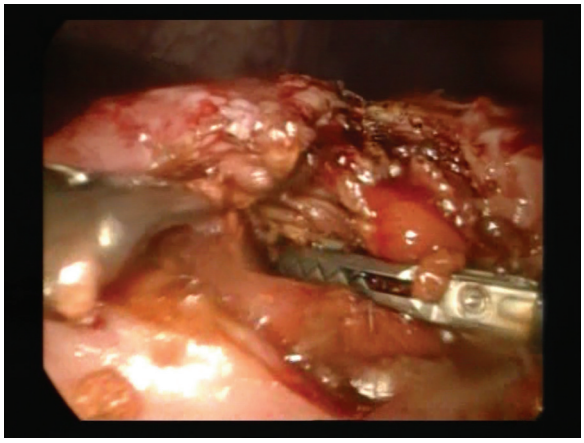
Showing stay stitch at the summit of the bulge.

Figure 5



Showing creation of cystogastrostomy by Endo GIA stapler.

Figure 6



Showing debridement of necrotic materials.

Hemostatic sutures were placed with either continuous or interrupted absorbable sutures (polyglactin 2/0) between the posterior gastric wall and the anterior wall of the cyst.

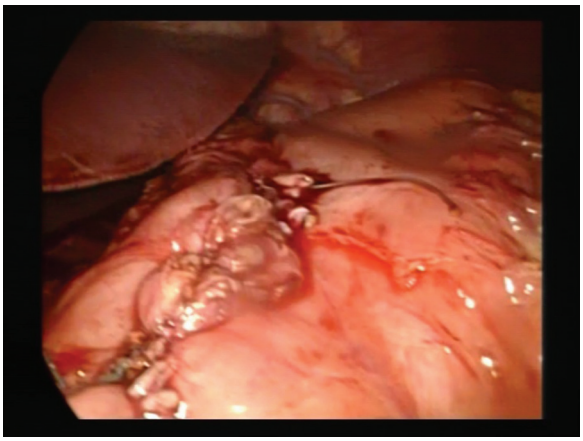
The cyst cavity was examined using the 30° telescopes, and all the necrotic material was debrided using a large fenestrated bowel grasper (Fig. 6).

The cyst cavity was irrigated thoroughly, and the nasogastric tube was placed within the cyst. Intracorporeal sutures with 2/0 polyglactin were used to close the anterior gastrotomy (Fig. 7).

The peritoneal cavity was lavaged and a drainage tube placed (Fig. 8).

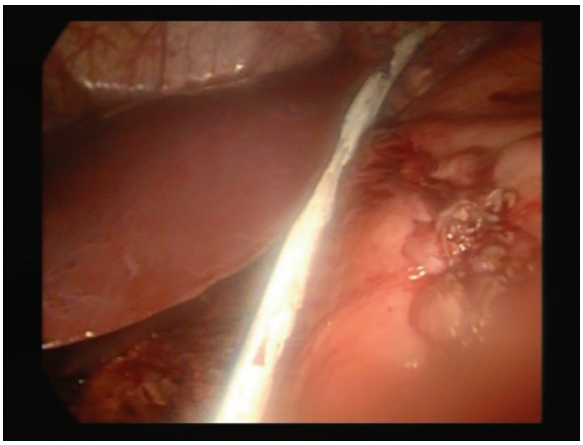
The main cause of conversion to open technique was uncontrolled bleeding. Intraoperative bleeding was recorded by estimation of blood loss in the suction container. Moreover, operative times were recorded.

Figure 7



Showing closure of anterior gastric wall.

Figure 8



Showing insertion of intra-abdominal tubal drain.

As soon as the patients recovered in the recovery room, the Foley's catheter was removed. Ryle was removed on the third day, and intravenous fluids were continued until oral fluids were tolerated usually on the third day postoperatively. Observation was made of the vital sings and the amount of blood in the drain collected. The drain was usually removed on the fifth day postoperatively. Abdominal ultrasonic examinations were done to any patient with any suspected postoperative collection.

Postoperative analgesics were given according to patient's needs, broad-spectrum antibiotics, proton pump inhibitor, and somatostatin subcutaneously were all given throughout the hospital stay. Usually the patients were discharged from the hospital on the sixth day postoperatively if no postoperative complications occurred. All patients were followed up in surgical outpatient clinic after 1, 6 months, and 1 year [epigastric pain, nausea, and vomiting documented clinically and follow-up abdominal ultrasound (U/S) radiologically].

Table 1 Range and mean age of the studied patients

	N	Minimum	Maximum	Mean±SD
Age	15	14	61	39±13.27

Table 2 Sex distribution of the studied patients

Sex	Frequency (%)
Males	9 (60)
Females	6 (40)
Total	15 (100)

Table 3 Past history

History of trauma [*n* (%)]	5 (33.3)
Previous attack of pancreatitis owing to gall stones [*n* (%)]	10 (66.6)

Table 4 Distribution of clinical presentation

Clinical presentation	*N* (%)
Pain	
Present	11 (73.33)
Absent	4 (26.66)
Nausea and vomiting	
Present	8 (53.3)
Absent	7 (46.7)
Mass	
Present	10 (66.7)
Absent	5 (33.3)

Results

This prospective study was conducted in El-Minia University Hospital after being approved by the ethical committee. This study included 15 patients with age of patients ranged from 14 to 61 years old, with mean±SD of 39±13.27, as shown in Table 1.

The study included nine (60%) male patients and six (40%) female patients, as shown in Table 2.

Overall, 66.6% of patients had a previous attack of pancreatitis, whereas only 33.3% had a past history of trauma with development of traumatic pancreatitis, as shown in Table 3.

The main clinical presentation of the patients was abdominal pain (73.3%) followed by abdominal mass (66.70%) and nausea and vomiting (53.3%), as shown in Table 4.

All cysts were initially detected with ultrasound and were further investigated with CT scan. In abdominal U/S, the PP size in length ranged from 6 to 21 cm,

Table 5 Radiological investigation

Abdominal U/S length	
Range	6–21
Mean±SD	10.2±3.57
Abdominal U/S diameter	
Range	6–15
Mean±SD	8.6±2.5
Abdominal CT length	
Range	6–21
Mean±SD	10.6±3.6
Abdominal CT diameter	
Range	6–15
Mean±SD	8.8±2.5

CT, computed tomography; U/S, ultrasound.

Table 6 Laboratory investigation

	N	Minimum	Maximum	Mean±SD
Serum amylase	15	36	236	106.67±54.72
Serum lipase	15	24	121	60.2±28.28

Table 7 Range and mean of operative time and intraoperative blood loss

	N	Minimum	Maximum	Mean±SD
Operative time (min)	15	58	88	74±8.3
Blood loss (ml)	15	100	700	285±175.5

with mean±SD of 10.2±3.57, and its diameter ranged from 6 to 15 cm, with mean±SD of 8.6±2.5. In abdominal CT, the PP size in length ranged from 6 to 21 cm, with mean±SD of 10.6±3.6,and its diameter range from 6 to 15 cm, with mean±SD) of 8.8±2.5, as shown in Table 5.

In all studied patients, serum amylase level ranged between 36 and 236 U/l, with mean level of 106.67 ±54.72 U/l, whereas the serum lipase level ranged between 24 and 121 U/l, with mean level of 60.2 ±28.28 U/l, as shown in Table 6. CA19-9 was normal in all patients.

The operative time ranged from 58 to 88 min, with mean of 74 min.

The intraoperative blood loss ranged from 100 to 700 ml, with a mean of 285 ml, and two patients received an intraoperative blood transfusion, as shown in Table 7.

Overall, two cases were converted to open owing to massive intraoperative bleeding, as shown in Table 8.

The mean hospital stay after surgery for all patients was 9 days, with a range from 6 to 17 days, as shown in Table 9.

Table 8 Conversion to open

Conversion to open [*n* (%)]	
Present	2 (13.3)
Absent	13 (86.7)

Table 9 Range and mean of hospital stay after surgery

	N	Minimum	Maximum	Mean±SD
Duration of hospital stay (days)	15	6	17	9±3.3

Table 10 Complications

Complications	Frequency (%)
No	11 (73.3)
Visceral	0 (0)
Vascular	2 (13.3)
Recurrence	0 (0)
Postoperative pain and vomiting	1 (6.6)
Postoperative pancreatitis	1 (6.6)
Total	15 (100)

Intraoperative vascular injury occurred in two (13.3%) patients, with conversion to open in both cases; one (6.6%) patient developed postoperative pain and vomiting, and these symptoms disappeared after the patient received strong analgesic and antiemetic within three days; and another patient (6.6%) developed postoperative pancreatitis in the follow-up period, and the patient received strong analgesic and intravenous fluids, with nothing per oral was advised, with complete relief after 1 week. The complete resolution and nonrecurrence of the pseudocyst at the end of 1, 6 months, and then 1 year follow-up in the form of epigastric pain, nausea, and vomiting clinically and follow-up abdominal U/S radiologically, along with clinical recovery of the patient, is noted, as shown in Table 10.

Discussion

Laparoscopic surgery is gradually being performed more frequently in the treatment of PP [10].

There are several good reasons to use anterior approach of laparoscopic cystogastrostomy. First, the complete removal of necrosis is possible as well as a wide cystogastrostomy opening. Second, access to the lesser sac, paracolic gutters, perinephric space, and retroduodenal space for drainage is possible as well. Finally, for most patients, one procedure will relieve symptoms, and a shorter length of stay is noted compared with open cystogastrostomy [11].

Although patients who underwent surgery tended to have significantly larger PPs, laparoscopic drainage for

these selected patients seemed to carry very low morbidity and recurrence rates and quite a high success rate [1].

In this study, the results regarding the main etiology of PP was owing to gall stones in 66.6% of patients and owing to trauma in 33.4%, whereas in the study by Simo *et al.* [7], owing to gall stones in 50% of patients, and in the study by Aljarabah and Ammori [1], owing to alcohol abuse in 51% of patients.

In the results of Palanivelu *et al.* [12], the predisposing factors were gall stones in 58 (54%) cases, alcohol in 20 (18.5%) cases, trauma in eight (7.5%) cases and previous distal pancreatectomy for serous cystadenoma of the tail of the pancreas in one case. In 21 (19%) cases, there were no detectable predisposing factors.

In the study by Mori *et al.* [13], the underlying causes were gallstone pancreatitis (57.1%) followed by alcoholic pancreatitis (28.6%), and chronic pancreatitis of unknown origin (14.3%).

The absence of alcoholic pancreatitis in the current study as an etiology of PP may be owing to the culture of the community in which the study was conducted.

In this study, the main complaint of our patients was abdominal pain (73.3%) followed by abdominal mass (66.70%) then nausea and vomiting (53.3%), whereas in the study of Simo *et al.* [7], the presenting symptoms included abdominal pain in 77% of patients and associated nausea/emesis in 50%. Early satiety, diarrhea, and anorexia were reported less frequently. However, in the study of Palanivelu *et al.* [12], 48.2% of patients had mass in the abdomen on clinical examination (41 in the epigastric region and 11 in the left hypochondrium).

In this study, the results regarding mean size of PP in CT finding showed 10.6 cm, which was similar to the mean size in the study of Khaled *et al.* [14], as it was 10 cm, whereas in the study of Aljarabah and Ammori [1], it was 13 cm, and in the study of Simo *et al.* [7], it was 13.72 cm.

The size of the pseudocyst is known to be an important predictor of the success of operative drainage. In the experience of Yeo *et al* [15], 67% of pseudocysts more than 6 cm in diameter required surgical treatment in contrast to 40% of those less than 6 cm. Similarly, O'Malley *et al.* [16] noted that pseudocysts less than 4 cm in size resolved spontaneously at a mean of 2–6 months after diagnosis, although in one case resolution did not occur until 28 months.

In this study, the operative time ranged from 58 to 88 min, with mean of 74 min. The results of Khaled *et al.* [14] showed a mean operative time of 62 min ranging between 25 and 250 min in the laparoscopy group, whereas the results of Aljarabah and Ammori [1] showed operative time ranged from 60 to 305 min, with mean of 152 min.

In the study by Palanivelu *et al.* [12], the mean operative time for laparoscopic transgastric cystogastrostomy group was 86 min; in the study by Simo *et al.* [7], the mean operative time was 220 ±65 min; in the study by Oida *et al.* [17], the operative time ranged from 55 to 120 min, with a mean of 86 min; and in the study by Šileikis *et al.* [18], the mean operative time was 145±37.6 min.

In this study, the intraoperative blood loss ranged from 100 to 700 ml with mean of 285 ml, and two patients received an intraoperative blood transfusion, whereas in the study by Simo *et al.* [7], the intraoperative blood loss ranged from 20 to 1000 ml. The mean estimated blood loss was 223±259 ml and eight patients received an intraoperative blood transfusion.

In the study by Aljarabah and Ammori [1], the intraoperative blood loss ranged from 30 to 350 ml, and the mean estimated blood loss was 89 ml, whereas in the study by Crisanto-Campos *et al.* [19], the mean intraoperative blood loss was 151 ml (20–300 ml).

Two (13.3%) patients in this study bled considerably during the operation and were converted to open, whereas in the study by Aljarabah and Ammori [1], seven (6%) patients were converted to open. This is similar to Khaled *et al.* [14] who had two (6.7%) conversions to open surgery owing to uncontrolled intraoperative bleeding from the PP, whereas in the studies by Palanivelu *et al.* [12] and also Fernandez-Cruz *et al.* [20], no patients were converted to open.

In this study, the postoperative hospital stay ranged from 6 to 17 days, with a mean of 9±3.1, whereas in the study by Aljarabah and Ammori [1], the postoperative hospital stay ranged from 2 to 32 days, with a mean of 5 days. In the study by Simo *et al.* [7], postoperative hospital stay ranged from 4 to 50 days, with a mean of 14 days; in the study by Oida *et al.* [17], postoperative hospital stay ranged from 7 to 10 days, with mean of 8.3 days; and in the study by Palanivelu *et al.* [12],

postoperative hospital stay ranged from 3 to 22 days, with a mean of 5.6 days.

In this study, complications occurred in four (26.7%) patients: two of them had intraoperative bleeding, one developed postoperative nausea and vomiting, and one developed postoperative pancreatitis. However, in the study by Aljarabah and Ammori [1], two patients developed complications in the form of intra-abdominal hematoma and abscess formation, whereas in the study by Crisanto-Campos *et al.* [19], only one (5.9%) patient had a complication associated with the procedure. Owing to the presence of blood output through the drain, he underwent a diagnostic laparoscopy that revealed bleeding from the subxiphoid trocar insertion site, which was controlled laparoscopically. In the study by Šileikis *et al.* [18], 21.4% of patients had early minor complications (postoperative hemorrhage, which required endoscopic hemostasis and hemotransfusion), but no major complications.

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Conflicts of interest

There are no conflicts of interest.

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