

RESEARCH ARTICLE

Comparative outcomes of Open and Laparoscopic drainage in Walled off Pancreatic Necrosis

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ABSTRACT

Introduction: Walled-Off Pancreatic Necrosis (WOPN) develops in approximately 1-9% of patients following acute pancreatitis, typically manifesting 4-6 weeks after the initial episode. Around 15% of patients with severe necrotising pancreatitis go on to develop WOPN. This condition is associated with significant morbidity and occasional mortality. Most necrotic collections ultimately require intervention-either percutaneous, endoscopic, or surgical.

Materials and Methods: A prospective study was conducted involving 51 patients diagnosed with WOPN. Of these, 23 patients underwent open transgastric drainage, while 28 underwent laparoscopic drainage. Demographic data, intraoperative and postoperative outcomes were analysed and compared between the two groups.

Results: Overall, in our study comparing the open versus laparoscopic approach for transgastric drainage of WOPN, the significant finding was a shorter operative time with the open approach. This can be attributed to the use of intracorporeal suturing rather than staplers. Blood loss was lower in the laparoscopic group. Postoperative infections were more common in the open approach. Mortality and morbidity were similar in both groups; hospital stay was significantly shorter in the laparoscopic group.

Conclusion: No single approach is currently considered the gold standard. Therefore, management must be individualised based on the patient's clinical presentation and available resources. The laparoscopic approach reduces overall complications, particularly infectious complications. The use of staplers may also significantly reduce operative time. A robotic approach may be best, but due to limited availability in remote areas, the laparoscopic approach may be considered.

Keywords: Walled Off Pancreatic Necrosis (WOPN); Laparoscopic; Transgastric drainage

INTRODUCTION

Acute pancreatitis is a spectrum of disease entities characterised by complex pathophysiology and variable natural history. Pancreatic inflammation triggers the release of cytokines, which can initiate a cascade of events. However, the aetiopathogenesis for the presence or severity of necrosis is largely unknown. Necrosis is a major determinant of outcome in acute pancreatitis [1]. The necrotic collection needs to be addressed in the majority of patients. The management of necrosis depends on the duration of collection and the presence of infection. The Atlanta classification divides necrotic collections into acute necrotic collections (<4 weeks' duration) and walled-off pancreatic necrosis (>4 weeks' duration) [2]. Management of these collections involves a multidisciplinary approach, including medical, interventional radiology, endoscopic

and surgical approaches. Surgical intervention involves minimally invasive or open necrosectomy. Laparoscopic transgastric necrosectomy is a minimally invasive one-time intervention to manage a lesser sac necrotic collection. In this study, we evaluated the feasibility and outcomes of laparoscopic transgastric necrosectomy for the management of Walled-Off Pancreatic Necrosis (WOPN).

MATERIALS AND METHODS

It was a prospective comparative study conducted at a tertiary care referral hospital over 4 years. Fifty-one patients who underwent laparoscopic and open transgastric drainage were included in the study. The data were collected on patient demographics, intraoperative events and 30-day postoperative events. Patients were followed up for a minimum of 1 year and recurrence, exocrine and endocrine insufficiency were recorded. Inclusion criteria were symptomatic WOPN or infected WOPN situated in the lesser sac and having an indentation on the stomach. Patients who had prior interventions, such as percutaneous drainage and endoscopic treatment, were excluded from the study. Patients with features of portal hypertension and pseudoaneurysms were also excluded. Contrast-Enhanced Computed Tomography (CECT) was done in all the patients at the onset of symptoms and before surgical intervention. The CECT recorded the

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size, situation, number and proximity to the stomach. Associated complications, including pulmonary, vascular, biliary and enteric, were noted. Endoscopic Ultrasound (EUS) was performed just prior to surgery to confirm the presence of a collection and any blood vessels between the gastric wall and the collection.

Operative procedure leg split position was used in all the patients, with the surgeon standing between the legs. We used four ports in all patients. One 10mm camera port at the periumbilical region, another 10mm left lower quadrant port and a 5mm right lower quadrant port for dissection, debridement and suturing. Another 5 mm epigastric port for retraction. Diagnostic laparoscopy was done and the impression of the stomach was noted.

Laparoscopic ultrasound may be used if needed. The anticipated gastrostomy site is marked with cautery for about 4-5cm. Stay sutures are taken on the lateral edges of the marked site. Anterior gastrostomy made with a Harmonic device. The collection was reconfirmed with needle aspiration. The fused posterior wall of the

stomach and cyst wall is incised for 4-5cm stay sutures of different colours. The cyst wall was excised and sent for histopathological examination. Necrosectomy is done with forceps and the necrosed tissue is placed in a bag. The necrosum was sent for microbiological culture. Thorough saline irrigation of the cyst cavity is done. The cyst wall was thoroughly inspected after the camera was introduced into the cyst. The cyst wall and posterior wall of the stomach are sutured with continuous absorbable sutures to facilitate continuous internal drainage into the stomach. Anterior gastrostomy closed with sutures.

RESULTS

Fifty-one patients were included in the study. Twenty-eight in the laparoscopic group and twenty-three in the open group. 46 were male patients and 5 were female patients. Alcohol-induced acute pancreatitis was the most common cause. The mean duration of illness was 47.3 days are shown in the Table 1.

TABLE 1. Patient demographics: Summary table for association between group and parameters.

PARAMETERS	GROUP		p value
	Laparoscopy (n = 28)	Open (n = 23)	
Age (Years)	40.04 ± 7.36	40.65 ± 10.17	0.8091
Age			0.8762
21-30 Years	5 (17.9%)	3 (13.0%)	
31-40 Years	11 (39.3%)	10 (43.5%)	
41-50 Years	9 (32.1%)	6 (26.1%)	
51-60 Years	3 (10.7%)	4 (17.4%)	
Gender			0.0562
Male	23 (82.1%)	23 (100.0%)	
Female	5 (17.9%)	0 (0.0%)	
Aetiology			0.0552
Alcohol	16 (57.1%)	20 (87.0%)	
Biliary	9 (32.1%)	2 (8.7%)	
Tropical	3 (10.7%)	1 (4.3%)	
Duration	41.89 ± 6.50	42.74 ± 7.01	0.6601
CP (Present)	5 (17.9%)	6 (26.1%)	0.5142
Endocrine insufficiency (Present)	5 (17.9%)	8 (34.8%)	0.1683
Comorbidities (Present)	5 (17.9%)	5 (21.7%)	0.7392
Indications			0.3322
Pain	20 (71.4%)	12 (52.2%)	
Persistent unwellness	5 (17.9%)	5 (21.7%)	
Biliary obstruction	3 (10.7%)	4 (17.4%)	
Duodenal obstruction	0 (0.0%)	2 (8.7%)	

The mean age of the study group was 40 years and males were frequently affected. The most common aetiology was alcohol consumption, followed by gallstone disease and tropical pancreatitis. All the patients were operated on after 4 weeks of symptom onset and the mean duration was 42 days. All the collections in proximity to

the stomach situated in the lesser sac were included. The WOPN ranged in size from 7 to 21 cm (Figure 1, 2 and 3). The intervening wall was at least 5mm in thickness. Common bile duct obstruction was noted in 7 patients and duodenal obstruction in 2. Pleural effusion was the most common associated complication, observed in 18% of patients.



Figure 1. Clinical picture of WOPN.



Figure 2. USG image of WOPN.

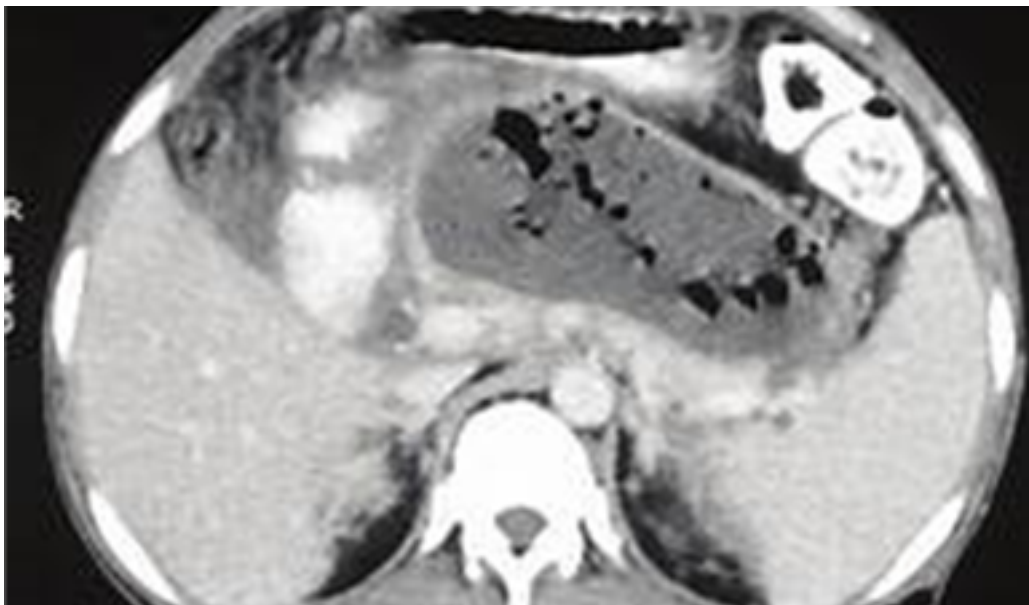


Figure 3. CT image of WOPN.

Diabetes mellitus was present at admission in nineteen patients. Other comorbidities like systemic hypertension,

cardiac, renal and endocrine ailments were present in 17 patients are shown in Table 2.

TABLE 2. Operative details.

Operative time (Minutes)***	117.68 ± 29.52	80.83 ± 17.38	<0.001 ⁴
Blood loss (mL)***	95.54 ± 43.83	141.30 ± 68.51	0.011 ⁴
Additional procedures			0.159 ²
No	15 (53.6%)	17 (73.9%)	
Cholecystectomy	9 (32.1%)	2 (8.7%)	
Additional drainage	4 (14.3%)	4 (17.4%)	
Conversion (Yes)	3 (10.7%)	0 (NaN%)	1.000 ³

The most common indication for surgery was pain, persistent unwellness and biliary and duodenal obstruction. Eighteen of the above patients had either fever, tachycardia, or leukocytosis at the time of surgery. The mean duration of surgery was 80 minutes for open surgery and 117 minutes for laparoscopic surgery. Blood loss was greater in the open group (mean-140ml) than in the laparoscopic group

(mean-95ml). Eleven patients with biliary pancreatitis underwent cholecystectomy. Four patients in each group underwent simultaneous drainage for retroperitoneal or paracolic collections. Three patients needed conversion to open due to dense adhesions and bleeding are shown in Table 3.

TABLE 3. Post-operative results.

Overall complications (Present)	10 (35.7%)	11 (47.8%)	0.3823
Infection***			0.0042
Absent	26 (92.9%)	15 (65.2%)	
Wound infection	0 (0.0%)	6 (26.1%)	
Intra-abdominal abscess	1 (3.6%)	2 (8.7%)	
Port site infection	1 (3.6%)	0 (0.0%)	
Pancreatic fistula (Present)	3 (10.7%)	4 (17.4%)	0.6872
Bleeding (Present)	2 (7.1%)	3 (13.0%)	0.6472
GI fistula			0.7222
Absent	27 (96.4%)	21 (91.3%)	
Colonic	1 (3.6%)	1 (4.3%)	
Gastric	0 (0.0%)	1 (4.3%)	
Pulmonary complications (Present)	5 (17.9%)	8 (34.8%)	0.1683
DVT (Present)	3 (10.7%)	3 (13.0%)	1.0002
Cardiac (Present)	3 (10.7%)	6 (26.1%)	0.2682
Hospital stay***	6.14 ± 2.07	8.65 ± 3.47	0.0024
Readmissions (Yes)	3 (10.7%)	7 (30.4%)	0.1542
New onset DM (Present)	4 (14.3%)	4 (17.4%)	1.0002
Steatorrhoea (Present)	2 (7.1%)	2 (8.7%)	1.0002
Mortality (Present)	1 (3.6%)	2 (8.7%)	0.5832

The overall complication rate was higher in the open group (47%) than in the laparoscopic group (35%). Postoperative infections were significantly higher in the open group. Pulmonary complications were most common, affecting 25% of patients. One patient in the open group needed percutaneous drainage for an infected perisplenic collection. Six patients had external pancreatic fistulae (Grade A and B); these patients were managed conservatively. Two patients developed colonic

fistula, which required diversion ileostomy. One patient in the open group developed a gastric fistula, which was managed with Nasojejunum Tube (NJ) tube insertion and octreotide. This patient developed Deep Vein Thrombosis (DVT) in the post-operative period and on Postoperative Day (POD) 11 had a massive bleed from the fistula site and midline wound and succumbed. Four of the five patients with post-operative haemorrhage had a sentinel bleed and emergent referral to Intervention Radiology (IR) was

done. All three patients had splenic artery aneurysms and underwent coil embolisation. The fifth patient, before referral, had a massive bleed and succumbed.

DISCUSSION

The necrotic collections of the pancreas need a multidisciplinary approach to management. It includes image-guided percutaneous drainage, endoscopic treatment with stent placement or direct endoscopic necrosectomy. The surgical approach involves open necrosectomy, VARD or minimally invasive, either laparoscopic or now robotic approach [3]. Gagner described three types of laparoscopic approaches to WOPN. First, the retrogastric, retrocolic route, which can also be used in early intervention if warranted. Second is the retroperitoneal approach and third is the transgastric route [4]. Apart from reduced pain and an earlier return to work, the advantage of laparoscopic intervention is that a single procedure usually suffices. Assessing all abdominal compartments facilitates drainage of remote collections inaccessible by percutaneous or endoscopic approaches. Simultaneous cholecystectomy can be done. Wide drainage can be achieved by cystogastrostomy [5].

Open procedures have high rates of pancreatic fistula, endocrine and exocrine insufficiency, enteric fistula (up to 20%) and incisional hernia (up to 25%) [6,7]. However, in our study, we did not notice such a pattern. We did not study the incidence of incisional hernia. Percutaneous drainage is the least invasive technique, but its success rate is low in the presence of a thick necrotic mass. The presence of an external catheter may predispose to recurrent infections and the need for multiple catheters makes this approach less appealing [8]. The endoscopic intervention has the disadvantages of requiring multiple interventions and multiple imaging modalities. Endoscopic intervention cannot access all the collections and patients with biliary pancreatitis need additional laparoscopic cholecystectomy [9]. Patients who had combined endoscopic and percutaneous intervention needed the external catheter for 83-189 days. Hospital stay was 26-55 days and the need for reimaging was 14.3 times [10]. Indications for laparoscopic transgastric drainage include symptomatic WOPN, persistent unwellness, new onset organ failure and biliary or enteric obstruction. The most common cause for intervention in this study was persistent pain and persistent unwellness. The prerequisites for the procedure include proximity to the stomach and the absence of blood vessels in the intervening wall [1]. The vascular involvement in acute necrotic pancreatitis is 22% of the portosplenic mesenteric venous axis [11].

In our study, WOPN was common in males in the fourth and fifth decades of life. The most common aetiology is alcohol consumption and gallstones [13]. Eleven patients had associated Chronic pancreatitis and nineteen patients had Diabetes mellitus. However,

the association of these conditions with morbidity or mortality is unknown. The mean surgical duration was longer in open surgery than in laparoscopic surgery. The mean duration of laparoscopic transgastric drainage in the study by Worhunsky DJ, et al. was 170 minutes and in the study by Kevin, et al. was 219 minutes [14, 15]. The operative complications were more common in the open group (47%) than in the laparoscopic group. In a study by Munene, et al. the overall complication rate was 33% [16]. The major complication rate with the laparoscopic approach was 24 %, similar to our study and the study done by Worhunsky DJ, et al. [14].

In a meta-analysis by Luo D, et al. overall clinical resolution, postoperative bleeding, endocrine and exocrine dysfunction and mortality are similar between endoscopic and laparoscopic techniques [16]. In a study conducted in three high-volume centres with 178 patients undergoing both open and laparoscopic transgastric necrosectomy, the intra-abdominal infection rate was 11%, the pancreatic fistula rate was 4% and the readmission rate was 20%, similar to our study [13].

In a study of large or extended WOPN, Open surgery (47.4%) had significantly more complications than laparoscopic procedures (9.1%). In the same study, mortality was also significantly higher in the open group [17]. In critically ill patients, the most common complication was pulmonary infections [18]. The conversion rate in our study was 6%, similar to those reported in other studies [19,20]. However, robotic transgastric necrosectomy showed a lower conversion rate (3.5%) in 57 patients [21]. The operative time and conversion rates were low when using staplers to create a cystogastrostomy [22, 23]. Overall, in our study comparing the open versus laparoscopic approach for transgastric drainage of WOPN, the significant finding was a shorter operative time with the open procedure. This can be attributed to the use of intracorporeal suturing rather than staplers. Blood loss was lower in the laparoscopic group. Postoperative infections were more common in the open approach. Mortality and morbidity were similar in both groups; hospital stay was significantly shorter in the laparoscopic group.

CONCLUSION

No single approach is currently considered the gold standard. Therefore, management must be individualised based on the patient's clinical presentation and available resources. The laparoscopic approach reduces overall complications, particularly infectious complications. The use of staplers may also significantly reduce operative time. A robotic approach may be best, but due to limited availability in remote areas, the laparoscopic approach may be considered.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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