

A case of necrotising pancreatitis, treated with surgery, a large two-way drain and plunger irrigation with povidone-iodine and saline

Judith A. Roger,
MD, FRCSC,
Ali Modir-Rousta,
Ph.D

Centre for Rural Studies,
Memorial University of
Newfoundland, St. John's,
Newfoundland, Canada

Correspondence à:
Judith A. Roger,
juditharoger@gmail.com

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INTRODUCTION

Pancreatic necrosis with sepsis is a serious complication of pancreatitis and needs surgical intervention,¹ which can be challenging,² especially when the presentation is unusual and the key equipment (contrast-enhanced computed tomography) is not functioning. The following case happened 28 years ago, with well-trained staff, 3 years before the first Canadian hepatobiliary surgeon emerged. Sudden critical situations, back then, and now, still happen. The air transport from the place of the acute occurrence to the tertiary care centre has not changed significantly. The writer had just finished her Canadian surgical residency but had worked as a surgeon in a rural solo practice in Canada before the Canadian residency.

The percutaneous long lavage system is known to decrease the frequency and mortality of pancreatic sepsis in severe acute pancreatitis.³ This peritoneal lavage was initially added as a post-operative help⁴ but is also reported as the primary and, at times, only surgical intervention.

Antibiotics are reserved for severe septic episodes of pancreatitis.¹ New antibiotics are not coming readily on the market as they did in the past. We need to think of new ways to combat septic events.

Iodine is prevalent in seawater at approximately 50 µg/L. Chemically stable iodine is commercially available in a water-soluble polymer called polyvinylpyrrolidone, now commonly called povidone. A systematic review of 27 randomised clinical trials reported various wounds and compared antiseptic wound agents. Iodine proved significantly better than other antiseptic agents. Even with an elevated serum level, it does not show harmful effects on the thyroid or the wound healing process.⁵ Therefore, it retains its place in modern antiseptic agents and is the recommended antiseptic in the following cases: gynaecology and obstetrics, urology and surgery for the perineum. The 1% solution has an increased bactericidal effect.⁶ Further use includes fistulas, open abdomen⁷ and even eye surgery. In rats, iodine was instilled in the peritoneal cavity after exposure to

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seawater and reduced endotoxins and tumour necrosis factor, thereby reducing the development of septicæmia.⁸

CASE REPORT

A 39-year-old previously healthy man presented to our regional community hospital, 800 km from the tertiary centre, with difficult-to-diagnose pancreatitis. His only initial symptom was left lower quadrant pain. His vital signs and the physical examination were normal. The abdomen was soft and non-tender, and bowel sounds were heard. The routine blood tests as for a patient with abdominal pain were: white blood count elevated to 28000, serum sodium at 139mmol/L, potassium 5.2mmol/L, blood urea nitrogen 4.8mmol/L, creatinine 122mmol/L, liver function, calcium and amylase were normal. His arterial blood gases showed a metabolic acidosis. The serum glucose was 18mmol/L and the urine revealed ketones, although he had eaten earlier that day.

Thinking he had possibly diabetic ketoacidosis he was admitted by Medicine and received copious amounts of IV fluids.

The only computed tomography (CT) scanner, then 3 years old, was not functioning. An abdominal series showed a normal bowel pattern without any indication of intra-peritoneal fluid. An ultrasound scan did not detect any abnormality either. The initial laboratory tests are shown in Table 1.

The patient developed more pain involving his upper abdomen. He vomited blood over the next 6–8 h and underwent an upper gastrointestinal endoscopy. The gastroenterologist saw a possible mass within the stomach. After the endoscopy, the patient had peritoneal signs. Transport to the tertiary centre 800 km away was out of the question (the average time from an air transport request to the arrival of the patient was 14 h). The patient was taken to the operating room (OR), and was found to have acute pancreatitis, creating a hole in the posterior wall of the stomach. The stomach mucosa around the perforation was quite swollen and had created mass-like oedema on endoscopy. The transverse colon was necrotic, but the left lower quadrant looked normal.

After resection of the transverse colon, creating a mucous fistula and colostomy, the pinhole in the stomach was excised to a healthy stomach wall and then closed in layers. Omentum was buttressed over the stomach repair. A peritoneal lavage system was created to soothe pancreatic inflammation. A drip with 0.45% saline was directed over the surface of the reddened pancreas while two suction drains were collecting in the more dependent areas [Figure 1].

Postoperatively, the patient improved after 1 day of ventilation and developed interest in what had happened to him. The pathology confirmed necrosis of the transverse colon.

Table 1: Ranson's criteria for pancreatic necrosis

Parameter	Criteria	#Points	Patients data	#of points
Age	>55	1	39	0
WBC	>16000	1	28000	1
LDH	>350 IU	1	294	0
AST	>250 IU	1	47	0
Glucose	>11.1 mmol/L	1	18	1
After 48 hours				
HCT drop	10% drop or >	1	36%	1
BUN rise	>1.8 mmol/L	1	0.72	0
Calcium	<2 mmol/L	1	1.71	1
O ₂	<60 mm Hg	1	50 mm Hg	1
Base deficit	>4mEq/L	1	11	1
Fluid sequestration	>6000ml	1	12000 ml	1
Total		11		7
Mortality				
	0-2 points. 0-3%			
	3-5 points. 11-15%			
	6-11 points. >40%			

LDH: Lactate dehydrogenase, AST: Aspartate Aminotransferase, HCT: Hematocrit, BUN: Blood urea nitrogen, WBC: White blood count

The entire family and the author discussed transfer to our tertiary centre repeatedly over the next 2 weeks. It was a time of deep soul searching. The author of this article (JR) was in the 1st year of independent practice as a Canadian fellowship surgeon. Before the Canadian surgery training, the author had trained in Europe and had also been in practice as a solo general practitioner (GP) surgeon in an isolated area but had the opportunity to discuss difficult cases with the previous preceptors. A year as chief resident only the year before had given the author much opportunity to treat the sickest of the sick. Patients with necrotising pancreatitis treated with peritoneal lavage were a familiar situation. They had all recovered slowly but had needed time and diligence. Even the rural hospital at the time had supportive internists and anaesthetists familiar with intensive care unit patients. Teachers were only a phone call away.

The entire family preferred him to stay. The patient's children attended school and visited every other day. The CT scanner, once repaired, revealed a poorly defined pancreas and a homogenous fluid collection behind the tail of the pancreas. The patient seemed to improve for 2 weeks and then suddenly became unstable with peritoneal signs. The CT scan reported: a left sub-diaphragmatic abscess collection and a gastric perforation around the greater curvature. The pancreas was poorly defined, diffusely enlarged and poorly margined with increased density throughout the retroperitoneum and mesenteric fat.

Back to the OR: the stomach had opened along the greater curvature. Three-quarters of the necrotic pancreas and the spleen, infested with an anaerobic infection, were removed. The

stomach was re-sutured with thick non-resorbable material (2/0 Nylon). A large soft Saratoga drain was inserted into the basin of the previous pancreatic body, which was already covered with granulation tissue surrounded by a 4 mm rim of a borderline viable pancreas. Irrigation of warm 0.45% saline coming through the two-way drain was recreated. The wide Saratoga drain allowed little chunks of tissue to come out. A gastrostomy tube and a small bowel (SB) feeding tube were set in place. An SB suction of the second part of the duodenum, leading through another gastrostomy aspirated bile and pancreatic juice, was then added into a SB feeding tube further downstream [Figure 2]. The pathology reports confirmed the necrotic pancreas and spleen full of air bubbles due to the anaerobic infection.

For several weeks, the patient improved again until the drainage fluid became thicker. Signs of infection led to the usual workup (blood cultures, CT scan not contributing and line change). The patient was started on antibiotics. A subtle smell from the Saratoga drain was noticed.

Then, the central lumen of the Saratoga drain was irrigated with a 60 mL syringe filled with body-warm normal = 0.9% Saline. The plunger was moved back and forth to loosen necrotic tissue. After aspiration of the turbid returning fluid the content was discarded. This procedure was repeated twice, first using 0.9% Saline mixed with Povidone iodine 1% in a 9:1 mix (45mL Saline with 5mL povidone iodine) and then using warm Saline. The patient's sepsis subsided within 15 min after a small piece of tissue was retrieved with the to-and-fro motions. It worked on three different occasions and saved the patient a trip to

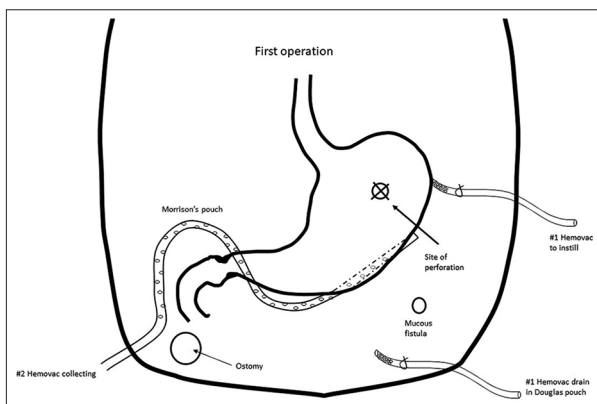


Figure 1: First operation.

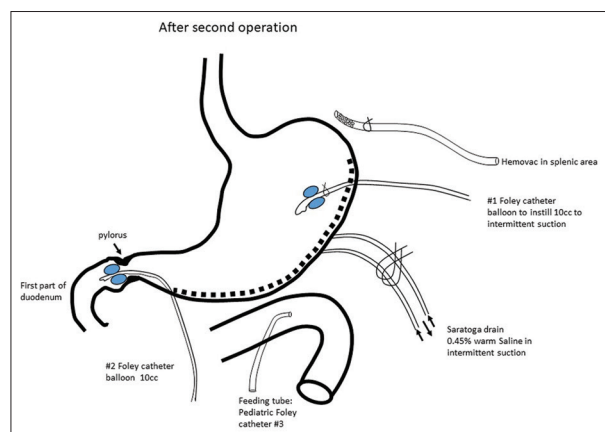


Figure 2: Second operation.

the OR. Instead of ordering a CT on the second and third occasions, the drains were sniffed for a suspicious smell. Then, the saline/iodine method was performed, which worked.

The patient was never in cardiac or renal failure despite extensive necrosis. After several months of hospital stay, he remembered a distant fall from a scaffold 3 weeks before he came to the hospital. This might have been the cause for pancreatitis as he had no gallstones and was not consuming alcohol to explain the cause for his illness. As the drainage cleared, the irrigation could be tapered down and stopped. He was discharged after a total of 8 months in the hospital. The family preferred him to stay in our local community facility.

Six months later, his ascending was reattached to the descending colon. He now tolerates food without enzymes but developed insulin-dependent diabetes, controlled with the pump. Every 5 years, he gets his immunisations for pneumococcus, meningococcus and *Haemophilus influenzae*. As his father had colon cancer, he returned for a colonoscopy.

DISCUSSION

General surgery in remote rural areas remains challenging, especially with non-functioning equipment. In addition, air transport from rural areas to tertiary care centres has been an ongoing issue and has not improved over the years. Often, patients suppress their aches and then present at advanced stages with complicated pathology. Certain cases of necrotic pancreatitis do not need countless trips to the OR. The OR time is now extremely limited in rural areas.

Once there is an infected necrotic area, surgical drainage is advised. In necrotising pancreatitis, using peritoneal irrigation is an accepted way to assure gradual drainage of pancreatic secretions and debris. While using the peritoneal two-way lavage system for pancreatitis, febrile episodes can occur. Checking for a suspicious odour from one of the drainage tubes might be helped by intermittent irrigation with diluted warm povidone-iodine⁸ followed by warm saline. If this action is effective, it saves medical imaging, trips to the OR and aggravation of the patient, besides the associated costs. Once the Saratoga drain allows fluid to exit the inflamed area, it is essential to keep irrigating with a high flow rate⁹ to avoid

thick drainage becoming occlusive. Povidone-iodine has been found to be toxic in experimental animals if given in a dose of 4 ml/kg. The patient involved got 0.07ml/kg (5 mL).^{10,11} The liquid was barely tea colour. Even the paediatric literature saw a decreased rate of intra-peritoneal abscess after irrigation with povidone-iodine for perforated appendicitis.¹²

In the author's (JR) original training in Europe, the residents were scrubbing with iodine and were tested for the serum content of iodine. Even if it was elevated, no changes in thyroid function were found. The author (JR) spent 18 months in a surgical service in Canada before entering a GP and solo surgical practice but from there got an opportunity for a 'real Canadian surgical residency'.

Since this case occurred, the surgical approach to debridement of pancreatic necrosis has been refined using minimally invasive surgery, which seems to be physiologically less disturbing. Amongst those methods,¹³ delayed debridement¹⁴ had the highest probability of being the safest approach. Good clinical observation¹⁵ and examination are of utmost importance while plunger irrigating to-and-fro loosens necrotic tissue.

CONCLUSION

This case report is for the clinically experienced rather than surgical beginners. The treatment described was most fitting for this patient. Judgement and discretion are advised.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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