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CASE REPORT

A novel approach to severe acute pancreatitis in sequential liver–kidney transplantation: the first report on the application of VAC therapy

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Summary

This work is the first report of vacuum-assisted closure (VAC) therapy applied as a life-saving surgical treatment for severe acute pancreatitis occurring in a sequential liver- and kidney-transplanted patient who had percutaneous biliary drainage for obstructive ''late-onset'' jaundice. Surgical exploration with necrosectomy and sequential laparotomies was performed because of increasing intra-abdominal pressure with hemodynamic instability and intra-abdominal multidrug-resistant sepsis, with increasingly difficult abdominal closure. Repeated laparotomies with VAC therapy (applying a continuous negative abdominal pressure) enabled a progressive, successful abdominal decompression, with the clearance of infection and definitive abdominal wound closure. The application of a negative pressure is a novel approach to severe abdominal sepsis and laparostomy management with a view to preventing compartment syndrome and fatal sepsis, and it can lead to complete abdominal wound closure.

Introduction

The recently introduced VAC therapy (V.A.C. Therapy™; KCI, San Antonio, TX, USA) is a system that provides a new opportunity to treat severe abdominal peritonitis by applying a negative pressure to prevent abdominal compartment syndrome and favor collection clearance [1,2].

Anastomotic biliary strictures have been considered the technical ''Achilles' heel'' in orthotopic liver transplantation (OLT) from deceased donors; they occur in 5–10% of patients, with a higher incidence in the first year after OLT [3].

Endoscopic retrograde cholangio-pancreatography (ERCP) and percutaneous transhepatic biliary drainage (PTBD) seem to be the treatments of choice for biliary strictures in OLT, achieving good success rates of 88% and 90%, respectively [3,4], with relatively low complication rates.

Acute pancreatitis (AP) is an often fatal complication after liver [5,6] and kidney [7] transplantation, and its frequency is relatively high (33%) after biliary tract manipulation [8].

Acute pancreatitis after PTBD in untransplanted patients with biliary strictures occurs in about 6.6% of

patients with a high mortality risk [9]; it complicates 9% of ERCP in OLT patients [4], whereas no specific data are available on PTBD procedures in the OLT population.

The severe inflammatory and necrotic picture associated with AP may require surgery, which is not infrequently followed by life-threatening septic abdominal complications.

We report on the case of an intra-abdominal catastrophe after severe acute necrotizing iatrogenic pancreatitis after PTBD in a patient who had a liver and 10 years later, a sequential single-kidney transplant as a result of a worsening renal insufficiency requiring hemodialysis [10], which was treated successfully with repeated laparotomies applying the VAC Therapy.

Case report

A 53-year-old man who had undergone sequential transplantation of the liver (in 1995, for HCV-related cirrhosis) and of a single kidney (in 2005, because of chronic renal failure) was admitted to our Gastroenterology Unit in September 2008 with progressive severe obstructive jaundice (total bilirubin 110 μmol/l) as a result of a ''late-onset'' tight anastomotic biliary stricture identified on magnetic resonance cholangio-pancreatography. Hepatic Doppler US revealed no vascular inflow or outflow obstructions. A PTBD was performed, positioning an internal-external biliary catheter, because the patient refused ERCP.

After the procedure, the patient developed sudden severe epigastric pain irradiating posteriorly with vomiting and an increase in amylase levels (2668 IU/l). Abdominal CT scan (Fig. 1) revealed pancreatic head swelling and a diffuse peri-pancreatic fluid collection. Rising fever, severe hypotension, and acute renal failure (anuria, serum creatinine 510 μmol/l) prompted the patient's transfer to the ICU for immediate hemodialysis.

A first laparotomy was performed 48 h after the onset of symptoms with pancreatic necrosectomy for a necrotizing pancreatitis: after a generous abdominal washout, antifungal instillation, and the positioning of multiple drainage tubes, a primary abdominal wound closure was performed. Persistent fever and hemodynamic instability prompted a second abdominal CT scan, which revealed necrotic abdominal fluid collection requiring a second washout laparotomy (on post-operative day 19). A surgical revision for sudden intraperitoneal diffuse pancreatic bleeding was performed 10 days later.

By this time, wound closure proved very difficult because of fascial tissue fragility, large muscle retraction, and an excessively high intra-abdominal pressure. Intraoperative liver biopsies revealed no rejection, high-grade steatosis, necrosis, and septic cholestasis.

Figure 1 Pre-operative CT scan revealing pancreatic head enlargement and diffuse peri-pancreatic fluid collections.

Figure 2 vacuum-assisted closure therapy computerized vacuum pump.

Given a multidrug-resistant *Acinetobacter baumannii* abdominal and biliary infection, we decided to provide intravenous broad-spectrum antibiotic and antifungal therapy and suspend cyclosporine and mycophenolate, maintaining a minimal immunosuppressive therapy (prednisone 4 mg/day) to provide immunologic protection for the transplanted kidney.

Vacuum-assisted closure therapy (Figs 2 and 3) was used to perform repeated abdominal washouts with local antibiotics and antifungal agents to drain all fluid collections carrying a risk of infection and prevent superinfections, and to facilitate the closure of the wide

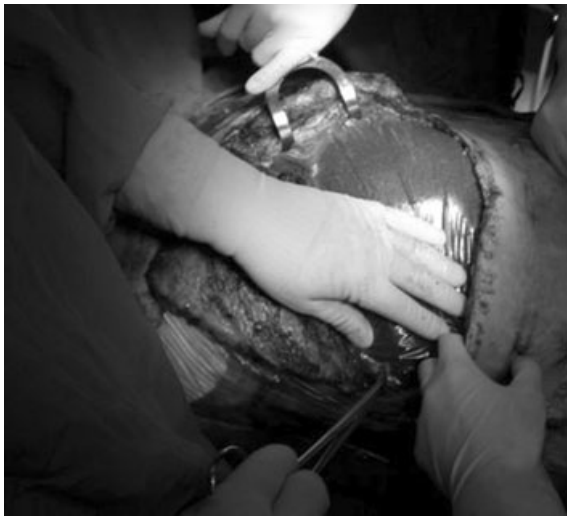

Figure 3 vacuum-assisted closure therapy – positioning of the dressing.

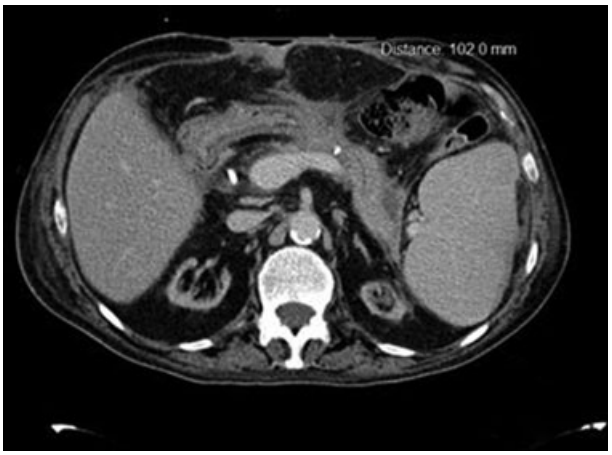

Figure 4 Postoperative CT scan showing no free fluid or intra-abdominal collections and complete regression of the severe pancreatitis.

laparotomic wound while avoiding any open laparostomy and environmental contamination.

The patient underwent 14 successive relaparotomies (two a week) with necrosectomy, abdominal washout, and VAC therapy; postoperative abdominal CT (Fig. 4) showed no free fluid or intra-abdominal collection, and a complete regression of the severe pancreatitis. Then twice-weekly bedside VAC dressing changes until granulation was complete and the large abdominal wound closed (Fig. 5), with a reduced abdominal fluid output and the definitive removal of the dressing in March 2009 (after 6 months).

Figure 5 Complete closure of the abdominal wound 6 months after first applying the dressing.

No negative pressure-related complication (e.g. small bowel or colon perforations, or bleeding) or pathologic increase in intra-abdominal pressure occurred during this period.

Massive intravenous antibiotic and antifungal medication was needed to deal sequentially with *Pseudomonas aeruginosa*, *Enterococcus faecium*, and *Candida albicans* abdominal super-infections and biliary contaminations, until the patient's temperature and leukocytosis returned to normal.

The patient was discharged in April 2009 with minimal antibiotic therapy, normal liver, and kidney function and a full recovery of his physical autonomy, with no evidence of any onset of diabetes. A year later, however, he developed a symptomatic, pancreatic pseudocyst 8 cm in size causing dyspepsia and major weight loss, which was successfully treated with endoscopic US-guided cystogastrotomy and subsequent ERCP with endoscopic papillotomy, revealing no evidence of biliary stones.

Discussion

Acute pancreatitis has been reported to have an incidence of 5.7% and a mortality rate of up to 64%, particularly in

the early peri-operative period, and more rarely in the longer term in stable patients. It has been documented that biliary complications contribute to AP in stable OLT recipients [5,6,8].

Lochan *et al.* successfully managed a case of severe acute post-OLT AP with percutaneous CT-guided drainage and repeated percutaneous necrosectomy under fluoroscopic guidance [11].

Given the high related mortality and morbidity rate, acute necrotizing-hemorrhagic pancreatitis with documented clinical, biohumoral, and CT findings often warrant surgery and successive washout laparotomies, leading to laparostomy formation and making it difficult to manage the open abdomen.

The use of laparostomy after damage-control surgery is well established, but the open abdomen is also associated with high mortality and morbidity rates, which exceed 25% [12].

Vacuum-assisted closure therapy involves the use of a computerized vacuum pump that applies an evenly distributed negative pressure (adjustable from −50 to −125 mmHg) to the abdominal cavity by applying a special dressing consisting of a nonstick semi-occlusive film and an open-cell polyurethane foam.

Applying the negative pressure to the tissues exploits the latter's mechanical properties and it has been suggested that the stretching induced on the surface of the tissues coming under the negative pressure creates tiny deformations called ''tissue blebs'' (or ''tissue mushrooms''), which take effect on the cytoskeleton, stimulating cell division, and proliferation while also reducing edema and neo-angiogenesis [13,14].

The VAC therapy device can contain the abdominal viscera, remove fluids and exudates, quantify third space losses, and promote granulation tissue and definitive abdominal closure [2], as well as preventing abdominal compartment syndrome, and it seems to be a useful adjunct in the management of the open abdomen, especially in cases of severe peritonitis [15,16]. In a recent systematic review of studies on the continuous application of a negative abdominal pressure, the VAC system was associated with the highest closure and lowest mortality rates when compared with other laparostomy management strategies and methods [17].

Vacuum-assisted closure therapy amply met the criteria for use in the critically ill patient (who was hemodynamically unstable, with multiple organ transplants, and immunosuppressed and therefore at high risk of infection) requiring an aggressive surgical therapy. We opted for its early application because the patient had an incipient abdominal compartment syndrome after primary wound closure and a multidrug-resistant abdominal infection. We performed twice-weekly surgical dressing changes with no rise in intra-abdominal pressure and hemodynamic instability, obtaining a prompt recovery of renal function and a progressive reduction in fluid output; the intra-abdominal infection was overcome and a definitive, complete abdominal wound closure was achieved. We recorded no iatrogenic lesion related to the technique (e.g. intraperitoneal bleeding or gastric, small bowel or colon perforations).

Based on our experience, VAC therapy is suitable for use in multi-organ transplanted patients, paying particular attention to:

1 Applying an initially low negative pressure (50 mmHg) to reduce the risk of any early bleeding and perforations, gradually increasing the pressure slowly afterward;
2 Meticulous abdominal inspection when changing the dressings so as to ensure a complete hemostasis of sources of even minimal bleeding and to assess and, if necessary, repair any edematous, inflamed or damaged hollow viscera at high risk of perforation;
3 An omental dressing placement, which avoids an excessive negative pressure being applied to hollow viscera and the risk of intestinal anastomotic leaks
4 Intra-abdominal pressure monitoring;
5 A close multidisciplinary cooperation because of the need to plan frequent or urgent dressing changes;
6 Minimization of immunosuppressive therapy to protect the function of the transplanted slid organs while containing as far as possible any interference with the immune system's antimicrobial responsiveness [18].

In conclusion, we found the VAC therapy a life-saving method for the management of post-pancreatitis open laparostomy in a transplanted patient on minimal immunosuppressive therapy and suffering from severe multidrug-resistant abdominal sepsis: VAC prevented the onset of abdominal compartment syndrome and enabled a definitive recovery of the abdominal wall, with complete resolution of the systemic sepsis.

Authorship

GZ, RB and CU: collected and analyzed the data and wrote the article; FD'A, EG, AV, AC, DB, MS, PB, PB, PA and PF: collected the data.

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