



Damage Control Surgery for Acute Mesenteric Ischemia, Bowel Perforation, and Faecal Peritonitis

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Abstract

Introduction: Acute mesenteric ischemia brings about a risk of mortality as high as 75%. Because mesenteric ischemia can progress after surgery, the length of bowel resected is a surgical challenge. “Damage-control surgery” is based on temporary-abdominal-closure, resuscitation and adjustment of acid-base balance. “Second-look” laparotomy assesses the intestinal viability. We propose the “damage-control surgery” and “second-look” laparotomy as an available option to treat acute mesenteric ischemia with bowel perforation and faecal peritonitis.

Material and Methods: Real case of 63-year-old patient, alcoholic cirrhosis Child b, admitted at emergency department with peritoneal irritation. Blood test: creatinine 4.09 mg/dl, C-reactive protein 176.7 mg/l, procalcitonin 14.83 ng/ml, lactate 3.50 mmol/l, and leucocytosis $26 \times 10^3/\mu\text{l}$. CT-scan: pneumoperitoneum and diffuse intestinal ischemia. Faecal peritonitis and intestinal necrosis during emergency surgery was found.

Results: Thirty cm of terminal jejunum and proximal ileum and 10 cm of terminal ileum were resected. Because of hemodynamic instability and uncertain intestinal viability small bowel stumps were left closed in the abdomen. Temporary-abdominal-closure was performed. After 72 h in the intensive care unit a “second-look” laparotomy was done. Two anastomoses and definitive laparotomy closure was performed. He was discharged on postoperative day 16th from the second operation.

Discussion: “Damage-control surgery” and “second-look” laparotomy are good option to acute mesenteric ischemia surgical management. Re-laparotomy should be performed 48 h to 72 h after index surgery and the decision to perform an anastomosis, a stoma, or another small bowel resection should be based on the evolution in ICU, the hemodynamic status, and the intraoperative findings.

Keywords: Acute mesenteric ischemia; Damage control surgery; SLL; TAC

Introduction

The term “damage control surgery” that was proposed by Rotondo et al., [1] in 1993, is based on three steps: a rapid and effective first procedure with a Temporary Abdominal Closure (TAC); resuscitation and adjustment of acid-base balance; and definitive surgical treatment. Acute Mesenteric Ischemia (AMI) brings about a risk of mortality as high as 75% [2,3]. Intestinal necrosis requires resection. Signs of viability include pink color, peristalsis, and mesenteric pulse, and can guide the decision making, as well as diagnostic tests such as US or fluoresce in [2]. However, no single method or test has proven reliability, because mesenteric thrombosis and ischemia can progress after surgery [4]. In 1965, Shaw introduced the “Second-Look” Laparotomy (SLL) in order to address this issue, which consists of a planned reintervention 48 h after surgery, aimed at assessing intestinal viability [5]. We propose the “damage control surgery” approach and “second-look” laparotomy as a available option to treat acute mesenteric ischemia with bowel perforation and faecal peritonitis.

Materials and Methods

We herein describe the case of 63-year-old patient, diagnosed with alcoholic cirrhosis Child b, which was admitted at the emergency department for fever (38°C) and diffuse abdominal pain. He

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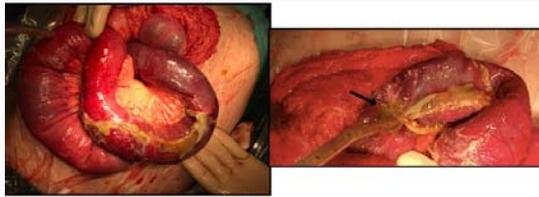


Figure 1: Signs of necrosis and diffuse intestinal ischemia, black arrow: intestinal perforation.

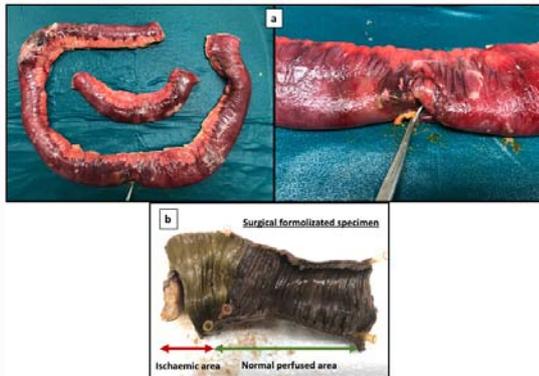


Figure 2: a) Intestinal resection (30 cm of distal jejunum and proximal ileum; 10 cm of distal ileum). b) Surgical formolized specimen which shows the ischaemic area limit.

presented with signs of peritoneal irritation. Blood test showed acute renal insufficiency (creatinine 4.09 mg/dl), high levels of C-reactive protein (176.7 mg/l), procalcitonin (14.83 ng/ml), lactate (3.50 mmol/l), and leucocytosis ($26 \times 10^3/\mu\text{l}$). CT scan with i.v. contrast showed pneumoperitoneum and signs of diffuse intestinal ischemia, with no signs of obstruction of the major visceral trunks.

Results

Emergency surgery was performed, and a faecal peritonitis was found, with intestinal necrosis and perforation of the proximal and terminal ileum, associated with signs of intestinal ischemia in the remainder portions of ileum and jejunum (Figure 1). Two small bowel resections were performed, involving 30 cm of terminal jejunum and proximal ileum and 10 cm of terminal ileum (Figure 2a). Section of the bowel was performed with three-line staplers. Surgical specimen pathological report showed intestinal ischemia and necrosis (Figure 2b). Because of hemodynamic instability and of the uncertain viability of the bowel, the decision was made to use damage-control surgery. Small bowel stumps were hence left closed in the abdomen. The TAC was performed with a negative pressure system, realized with plastic covering the small bowel loops, covered with sterile gauzes and sterile plastic on the skin, and two vacuum drains (Figure 3). After 72 h in the Intensive Care Unit (ICU), because of favourable clinical evolution and reduced need of vasoactive medications, a SLL was performed. A significant improvement of small bowel loops was found, so that no additional resections were required (Figure 4a). Two manual, latero-lateral anastomoses (a jejuna-ileal anastomosis and an ileo-colic anastomosis) were performed, and two peri-anastomotic drains were placed (Figure 4b). Laparotomy closure was performed in a single layer with monofilament sutures, and a graphes were used for the skin (Figure 4c). The patient remained in ICU for ten days because of a pneumonia and respiratory distress. He was discharged on postoperative day 16th—from the second operation. At one year



Figure 3: Damage-control surgery applied to acute intestinal ischemia. Temporary abdominal closure with aponeurosis traction by means of a negative pressure system, realized with plastic covering the small bowel loops, covered with sterile gauzes and sterile plastic on the skin, and two vacuum drains.

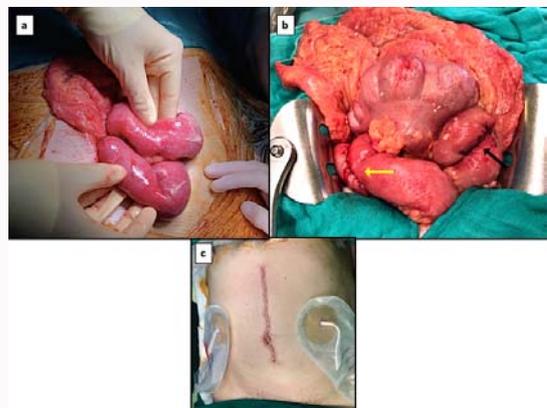


Figure 4: “Second-look” surgery. a) Small bowel loops of normal appearance. b) Jejunum-ileal (black arrow) and ileo-colic anastomoses (yellow arrow). c) Single-layer abdominal closure with peri-anastomotic drains.

follow-up the patient did not report any alterations in bowel function and has no abdominal hernias.

Discussion

AMI is defined as abrupt stop of the vascular feeding to a segment of small bowel, resulting in ischemia, cellular damage, and intestinal necrosis [2]. It can occur because of vein thrombosis, occlusive arterial ischemia caused by atherosclerosis or embolism, and non-occlusive ischemia, due to a vasoconstriction from insufficient splanchnic flow [3]. Intestinal necrosis requires resection, but deciding the extension of the resection represents a challenge, due to the difficulty in identifying ischemic bowel that will develop intestinal necrosis [4]. In the present case we used the “damage control surgery” approach and SLL with optimal results. Since Rotondo et al., [1] proposed the “damage control surgery” subsequent studies confirmed the efficacy of such an approach, which has been associated with reduced rates of postoperative mortality and complications. The TAC should cover the intra-abdominal content completely, in order to maintain the physiological function as much close to a close abdomen as possible, to reduce the risk of herniation or adhesions between the small bowel and the abdominal wall, and to protect against injuries to the intestine. The material used for TAC should therefore have micro-pores in order to facilitate the drainage of fluids, bacteria, and detritus. Negative pressure would ease achieving these aims and facilitate

subsequent closure of the abdominal wall [6]. Several techniques have been described to perform closure of the abdominal wall [7,8], and all agree toward the principle of constant aponeurosis traction in order to ease the definitive closure in subsequent procedures. SLL is now part of the current armamentarium of available options to treat AMI, with 1B recommendation grade [4]. But, Sachs et al., [9] showed that only 20% of patients with AMI benefit from SLL, in so that they suggest that it is not a mandatory approach due to the possible complications associated with a second anesthesia and re-operation. Some authors advocate excluding SLL if the site of transition between viable and frankly ischemic bowel is clearly observed at surgery, if the anastomosis was safely and effectively performed or the stoma is viable, if a small quantity of free intestinal fluid was observed, if the patient is hemodynamically stable, and if lactate levels decrease intraoperatively [10]. Damage-control surgery and SLL are a good option in patients with AMI because of technical and physiological reasons. Re-laparotomy should be performed 48 h to 72 h after index surgery and the decision to perform an anastomosis, a stoma, or another small bowel resection should be based on the evolution in ICU, the hemodynamic status, and the intraoperative findings during SLL.

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