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Lessons from a case-paradigm of damage control laparotomy in peritonitis

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Abstract
Generalized peritonitis from complicated acute gangrenous colon volvulus, with added clinical picture of impending perforation, dysoxic respiratory failure from toxemia and acute anuria from abdominal compartment syndrome, represents a paradigm case for damage control surgery.

Keywords: Damage-control laparotomy, abdominal compartment syndrome, severe peritonitis, colon volvulus, toxic-inflammatory shock

Introduction
Despite damage control surgery (DCS) is not a new concept and has been implemented for years, it may hide risks for the unaware operator, due to the fact that damage control laparotomy (DCL) in generalized peritonitis is still not an universally applied practice and is left often to individual judgement.
The case is a compendium and in the same time a paradigma of the indications for DCL in peritonitis and the inherent risks encompassing the strategy.

Case Report
A 58 years old man was admitted from another hospital with 2 days history of generalized peritonitis and severe abdominal distention.
Clinical parameters: (HR 132 bpm, RR 20 pm, BP 108/54, skin temp. 35 °C, and only anuria (200 ml of urine collected via catheter in twelve hours after the last spontaneous micturition).
A hypoxaemic normocapnic dysoxic respiratory failure was evident (SaO_2 89% and metabolic acidosis under Ventimask 40%, PaO_2 74.1 mmHg, $PaCO_2$ 35.9 mmHG, Bicarb 22 mmol/L, PH 7.35, BE –5.3 mmol/L).
Laboratory results in mmol/L: (Na+ 138 mmol/L, K+ 3.9 mmol/L, Cl- 115 mmol/l, Urea 28 mg/dL, Creatinine 0.84 mg/dL, Amylase 16 IU, Alb 14 g/L [35-50], Total Proteins 27 g/L [60-80]).
Haematology laboratory results per mm/3 were WCC 10.000/mm3, Hb 15.7 g/dL, Plts 284.000/mm3; Hct 0.454; Coagulation profile was within normal range (INR 1.3, PTT and PT within 1.5 times the respective controls, with only the D-Dimers slightly elevated > 0.5 < 1.0 mg/L).
The chest X-ray was normal. The supine plain abd XR, showed a closed loop obstruction by colon volvulus, with dilated and twisted transverse and sigmoid colon showing lack of haustral markings and presence of mucosal islands, suggestive of impending perforation. Air reflux was seen in a small bowel loop; no air was seen in the rectum [FIG 1].
At laparotomy, most of large bowel except the proximal ascending segment, and most of the ileum except the terminal 30 cm, were found gangrenous, necrotic or congested.
Some foul-gangrene smelly exudate was also present as result of trasudation through damaged sigmoid colon with flimsy patches of serosa and impending perforation, trasudating faecal material [FIG 2].

Fig 1: Supine Plain Abdomen X-ray showing closed loop obstruction by dilated and twisted transverse colon with lack of haustral markings, presence of mucosal islands, and no air in the rectum

Fig 2: One piece of rotten colon is missing as too rotten to be displayed; specimen of ileo-sigmoid knotting variety of volvulus with pivot point at the splenic flexure plus volvulus of the transverse colon; visible areas of impending perforation with flimsy patches of serosa and exudation of faecal material.

Without untwisting the gangrenous loops and by using i) knife on clamps, ii) and Vicryl 1 stitch overrunning suture, iii) TA 55 and iv) GIA stapling, all the dead bowel was rapidly removed leaving only the jejunum, 30 cm of terminal ileum plus the proximal ascending colon, and the rectum. During the brief operation, the patient experienced one episode of hypotension and a series of multiple bygeminal ventricular ectopics.

The abdominal cavity was packed with large abdominal gauze swabs in the colon bed and pelvis, and the abdomen rapidly closed with skin staples only.

Due to internal department' policies at the time, in particular the one that the team looking after a patient in post op had to be different from the one who operated in emergency in order to amalgamate staff from different world regions and medical attitudes, the patient was re-operated only four days after the index op by another team than the one who did the index op on the basis of mild deviation from coagulation parameters values and relying on the naso-gastric tube draining (NGT) for that length of time.

At reoperation, after the removal off soaked packs and thorough intraperitoneal lavages. a jejuno-terminal ileum anastomosis and a high formal ascendent-ostomy in the upper abdominal quadrant was done by the surgeon.

The patient was discharged after three weeks, after a postoperative period characterized by pneumonia and superficial laparotomy wound infection, with an appointment for follow up.

Comments

Impact op

Retrospectively, the finding was identified as ileosigmoid knotting, a variety of colon volvulus with pivot point at the splenic flexure.

Advanced complicated ileosigmoid knotting is a rare but highly lethal variety of colon volvulus with mortality rates going up to 48% due to sepsis, toxemia and the hemodynamic and respiratory effects of the volvulus [1-2].

A closed loop obstruction with compromised gut vascular supply and a severe intra-abdominal hypertension is a life-threatening condition for the high risk of an abdominal compartment syndrome (ACS) and the risk of impending perforation with the combined morbidity of systemic toxaemia followed by faecal peritonitis.

It is an upmost critical emergency of acute abdomen and abdominal surgery after vascular catastrophes.

Some of these patients do not arrive to GA or die on the table for the combined MOD/F intrinsic to advanced presentation (pers. obs).

Acute onset mortality/morbidity in volvulus of the colon is due to ACS, specifically the respiratory and renal failures and its effects on venous return and cardiac output. Early acute abdominal compartment syndrome (ACS), although not quantitized by direct measurement in this case, was clinically present with anuria in presence of normal biochemistry, resolved postoperatively with the surgical decompression and explained by the compression of the over-distended gut on the ureters. The acute hypoxaemic respiratory failure with normocapnia in presence of a normal chest Xr and the ECG intraoperative abnormalities were caused by the endotoxaemia and citokynes-driven dysoxia. ACS causing ARF is in fact by definition an hypercapnic/hypoxic respiratory failure as for the splinting effect on the diaphragm**.** A clear mix acid-basic disorder was evident on presentation with a severe metabolic acidosis, and a compensatory respiratory alkalosis plus the presence of a dysoxic respiratory injury from toxins also contributing to the compensatory hyperventilation and a growing component of respiratory acidosis from the massive abdominal distention. The disorder was intrinsically compensated, keeping the patient alive before surgery [3-5].

The normo-leucocitosis in presence of a massive gangrene

and IR injury indicates a WBC consumption dynamic going on, an ominous prognostic sign in a picture of generalized toxaemia.

The presence toxaemia, sepsis, and hypotension, whether preoperative or intraoperative, is an ominous sign predicting high risk of anastomotic failure and the frequent use of inotropic support in ICU in postoperative management affects anastomotic healing.

Relook

Clearly the relook at 96 hours instead of 48 hours from the impact op was an error. Leaving soaked abdominal packs *in situ* for four days accounted for the stormy postoperative period characterized by wound and chest infections. The mild coagulation derangement in no way could justify the late risky relook [6].

The ascend-ostomy was preferred by the relooking surgeon to an easier formal caecostomy with the idea of avoiding a further resection-closure. The choice may have also accounted for the postoperative laparotomy wound and chest infection, due to its splinting position on full breathing.

Interesting to note, no problems were seen with a relook at 96 hours from the impact operation, with reference in particular to the stapled segment from terminal ileum to ascending colon and the NGT output.

Conclusion

Persisting intra-abdominal infection with sepsis, toxaemia, and failure of anastomosis or abdominal wall healing are known complications in emergency intestinal surgery.

In generalized faecal peritonitis, the deeply embedded faecal material and bacteria in the peritoneal serosa resist in fact to debridement and peritoneal lavage [7], and the ischemic process causing gangrene or IR toxaemia can progress subclinically at microscopic level beyond the first impact operation clearance, maintaining a state of cryptic shock before abutting in a full blown MOD/F from septic and/or toxic shock [8].

No scores, including the reasonably valid Mannheim Peritonitis Index, can substitute clinical judgement on what at a preoperative and intra-operative appraisal constitutes a risk for anastomosis and abdominal wall healing failure, due to different systemic and local factors [9].

Damage control surgery (DCS) in toxic gangrenous peritonitis, whether from a complicated colon volvulus or not, is a life-saving, morbidity lessening, obligatory strategy [1, 2].

The case represents a perfect paradigm for the indications for emergency DCL and the complications that may have to be faced [10].

Conflict of Interest

Not available.

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