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Original Research

Minimally invasive surgery in the era of step-up approach for treatment of severe acute pancreatitis

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ABSTRACT

Objectives: To assess the minimally invasive surgery into the step-up approach procedures as a standard treatment for severe acute pancreatitis and comparing its results with those obtained by classical management.
Methods: Retrospective cohort study comparative with two groups treated over two consecutive, equal periods of time were defined: group A, classic management with open necrosectomy from January 2006 to June 2010; and group B, management with the step-up approach with minimally invasive surgery from July 2010 to December 2014.
Results: In group A, 83 patients with severe acute pancreatitis were treated, of whom 19 underwent at least one laparotomy, and in 5 any minimally invasive surgery. In group B, 81 patients were treated: minimally invasive surgery was necessary in 17 cases and laparotomy in 3. Among operated patients, the time from admission to first interventional procedures was significantly longer in group B (9 days vs. 18.5 days; $p = 0.042$). There were no significant differences in Intensive Care Unit stay or overall stay: 9.5 and 27 days (group A) vs. 8.5 and 21 days (group B). Mortality in operated patients and mortality overall were 50% and 18.1% in group A vs 0% and 6.2% in group B ($p < 0.001$ and $p = 0.030$).
Conclusions: The combination of the step-up approach and minimally invasive surgery algorithm is feasible and could be considered as the standard of treatment for severe acute pancreatitis. The mortality rate deliberately descends when it is used.

1. Introduction

Acute pancreatitis (AP) remains a serious public health problem in Western countries [1], with an incidence that has increased to 13–14 cases per 100,000 people per year [2–4]. Although most cases are mild and self-limiting [5], mortality in severe acute pancreatitis (SAP) remains high, exceeding 3000 deaths annually in the US [1]. Classically, infection of pancreatic necrosis was considered an absolute indication for urgent surgical debridement, even so mortality rates could reach up to 25–40% [6,7], a percentage that was reduced with medical treatment [8].

When organ failure (OF) and infected pancreatic necrosis are both present it indicates extremely severe disease or critical acute pancreatitis. The main risk factor for death is the infection of pancreatic necrosis and the relative risk of mortality doubles when it includes OF [9,10]. Therefore, currently the main indication for surgical treatment in SAP remains the infection of pancreatic or peripancreatic necrosis, especially if associated with OF [11].

However, the diagnosis of infected necrosis alone is not an absolute indication for surgical treatment [12,13]. Conventional open necrosectomy (ON) is associated with a high rate of postoperative complications, reoperations and mortality, as well as a high rate of postoperative diabetes [14–17]. The earlier the surgery is performed during the evolution of the disease, the poorer the results [16,18] and, in fact, surgical treatment has proved insufficient for adequate control of the systemic inflammatory response in early stages of SAP [16,19,20]. Nevertheless, if surgical debridement is performed at a late stage, the reoperation rate is lower and the results are highly improved [9,18,21].

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The step-up approach has shown that what matters is not the removal of the necrosis, but it is the control of the septic focus [22]. In cases of sterile SAP associated to persistent organ failure the results of surgery remain poor, so it is only considered in selected cases [11], basically when serious clinical deterioration is presented. The earlier and the more severe the onset of the OF, the worse the prognosis [14].

The various treatments in acute necrotising pancreatitis include the ON and minimally invasive surgery (MIS) have shown good results in both treatment strategies [23]. The use of the step-up approach with MIS in SAP is gaining popularity, and the procedure is currently an alternative to ON. Specialist groups routinely use it in over 90% of their patients, with good results [24,25], whereas when ON is manage by some selected expert groups it presents a mortality rate of only 12% [26,27].

The aim of our study is to evaluate the MIS into the step-up approach procedures as a standard method of managing SAP, comparing it with the classic conventional therapy and analysing the evolution of our results in the treatment of SAP.

2. Methods

In July 2010, we adopted the step-up approach/MIS treatment algorithm proposed by the Dutch Pancreatitis Study Group [22,28]. Since then we have attempted to apply this approach in all patients with SAP. Prior to July 2010 some selected patients had undergone MIS, but not as part of a formal treatment strategy.

We designed a retrospective comparative cohort study with two groups of consecutive patients treated with two different SAP management protocols:

- Group A (conventional therapy), from 1/1/2006 to 30/6/2010 (54 months): patients were treated in accordance with current recommendations for classic management of SAP [29,30].
- Group B (step-up approach-MIS), from 01/07/10 to 31/12/14 (54 months): patients were treated using MIS into the step-up approach strategy [22].

The work has been reported in line with the STROCSS criteria [31] and informed consent of treatment was obtained for every patient.

In both periods, the same recommendations were followed with regard to the use of prophylactic antibiotics, enteral nutrition, need for early ERCP and diagnosis by fine-needle aspiration puncture or blood cultures of the pancreatic/peripancreatic infection [13,32–34]. Although patients were managed by a specialist multidisciplinary team in both periods, in group A surgery was carried out as an emergency procedure by the surgeon on call, while in group B, as far as possible, surgery was performed on a semi-scheduled basis by a surgical team specialising in pancreatic surgery.

Only patients with definitive, unequivocal diagnosis of acute pancreatitis were enrolled in the study [32,33]. In addition, the disease had to be the primary or initial cause of admission to our centre, regardless of the etiology. Patients with clinical criteria (OF > 48 h. duration) and/or radiological criteria of severity according to the revised recommendations of Atlanta 2012 [35] were considered as SAP. Pancreatic pseudocyst was considered a late complication of the AP, so no cases were included in the study. We do not show the different scoring systems, although we use them routinely because the same initial clinical and radiological scores can develop a variety of clinical course of disease.

Variables analysed were: age, sex, etiology, days before surgery, Intensive Care Unit (ICU) stay, total stay, need for surgical intervention and type, number of reoperations, presence or absence of infected necrosis, and mortality.

3. Invasive procedures performed

In ON, the incision of choice was a bilateral subcostal laparotomy, and the technique of choice was necrosectomy and postoperative local lavage [29]. In some cases, in view of the intraoperative findings and at the discretion of the surgeon, the abdomen was left open with an ad vacuum therapy system. This system was especially used in re-operations, when the abdominal wall cannot be closed and to decompress and avoid compartment syndrome [36].

The MIS interventions were adapted to each patient. Five different types [37] were considered:

3.1. Percutaneous drainage (PD)

One or more percutaneous drains of at least 8 French are inserted under radiological guidance. The puncture site and route are previously agreed upon with the radiologist, taking into account the intended treatment strategy and bearing in mind the possibility of the need for surgery in the future.

3.2. Transperitoneal laparoscopic approach (TPLA)

A conventional laparoscopic approach is used to access the pancreatic sac via the gastric greater curvature. Debridement of the infected pancreatic/peripancreatic necrosis is performed if required and large caliber drains are then put in place.

3.3. Video-assisted retroperitoneal necrosectomy (VARD)

This procedure is performed as initially described by Horvath [38] and later popularized by van Santvoort [39]. At the end of the intervention, a large caliber drain is left in the debrided area.

3.4. Laparoscopic transgastric drainage (TGLD)

Using a conventional laparoscopic approach, an anterior gastrostomy is performed, through which the area of retrogastric necrosis is located using laparoscopic ultrasounds. A posterior gastrostomy is performed for the evacuation of the infected necrosis into the stomach, and then the anterior gastrostomy is sutured.

3.5. Transgastric endoscopy drainage (TGED)

Through the stomach, two or more transgastric drains are inserted in the area of infected necrosis, which is located using endoscopic ultrasounds.

4. Statistical analysis

For the statistical analysis, SPSS 14.0 software was used. The results are presented as mean and standard deviations, as numbers and percentages or as median and percentiles when confidence intervals were too high. The qualitative variables were analysed with the chi-squared test and the continuous variables with the Student “t” test. For sample sizes below 30, Fisher's exact test and U the Mann-Whitney test were used. Differences with $p < 0.05$ were accepted as statistically significant.

5. Results

Of the 1322 patients admitted to our hospital for AP, 164 with SAP (12.4%) were enrolled in the study.

Table 1 shows patient characteristics and outcomes. No significant differences were found between the two groups regarding to patient features. Patients in group A who underwent surgery did so earlier than those in group B. Although the average intervention in group A was 9