

## Laparoscopic approach in abdominal emergencies: a 5-year experience at a single center

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**SUMMARY:** Laparoscopic approach in abdominal emergencies: a 5-year experience at a single center.

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**Background.** Laparoscopy is ever more common in both elective and emergency surgery. In fact, in abdominal emergencies it enables the resolution of preoperative diagnostic doubts as well as treatment of the underlying disease. We present a retrospective study of the results of a 5-year experience at a single center.

**Patients and methods.** Between September 2006 and August 2011, 961 patients were treated via laparoscopy, including 486 emer-

gency cases (15 gastroduodenal perforation; 165 acute cholecystitis; 255 acute appendicitis; 15 pelvic inflammatory disease and non-specific abdominal pain [NSAP]; 36 small bowel obstruction). All procedures were conducted by a team trained in laparoscopic surgery.

**Results.** The conversion rate was 22/486 patients (4.53%). A definitive laparoscopic diagnosis was possible in over 96% of cases, and definitive treatment via laparoscopy was possible in most of these.

**Conclusions** Our own experience confirms the literature evidence that laparoscopy is a valid option in the surgical treatment of abdominal emergencies. In any case, it must be performed by a dedicated and highly experienced team. Correct patient selection is also important, to enable the most suitable approach for each given situation.

**KEY WORDS:** Laparoscopy - Abdominal emergencies.

### Introduction

Laparoscopy is now the preferred surgical approach in numerous diseases, due to its many advantages. In abdominal emergencies, this technique has both a diagnostic and a therapeutic role, enabling identification of the condition responsible for the clinical picture and, in many cases, its adequate treatment (diagnostic and therapeutic laparoscopy) (1-3).

We undertook a retrospective analysis of the use of laparoscopy in emergency abdominal surgery in our unit over the last 5 years.

### Patients and methods

Between September 2006 and August 2011, 486 patients underwent emergency laparoscopy. Decisions not to use this approach

was based on general and local criteria. General criteria comprised the inability to establish and maintain adequate pneumoperitoneum (hemodynamic instability, severe cardiorespiratory diseases, coagulation disorders). The local exclusion criteria were as follows: history of malignant abdominal tumors; more than two prior major abdominal surgical procedures; massive abdominal distension.

A clinical picture of diffuse peritonitis was not in itself considered an absolute contraindication to laparoscopy, even though a number of authors consider severe peritonitis to be a contraindication, due to the theoretical risk that the pneumoperitoneum could increase blood levels of bacteria and endotoxins. In reality, various experimental and clinical studies support the idea that the inflammatory response provoked by laparoscopy is less than that of open surgery, thanks to the reduced trauma and tissue damage. Biochemical markers of the acute phase reaction (fibrinogen, ceruloplasmin, alpha 1-antitrypsin) seem to be lower after laparoscopic surgery. The same seems to be true for neuroendocrine mediators and polymorphonuclear granulocyte levels (4). Laparoscopy is also associated with a faster recovery of peristalsis and return to eating. All this enables homeostasis to be maintained more easily, with an improved immune response (reduction in immunosuppression due to fasting and surgical stress) (5).

Before surgery, all patients underwent routine blood tests (CBC, coagulation, kidney, liver and pancreatic panels, cholestasis markers, necrosis markers, serum electrolytes), ECG, chest X-ray and abdominal US or CT, depending on the clinical suspicion. We compared patients undergoing open surgery against those undergoing laparoscopy, considering the duration of the procedure, the ASA class and the clinical outcome (intra and post-operative complications and duration of hospitalization).

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### Technique

The patient's position on the operating bed was chosen on the basis of the suspected preoperative diagnosis. For supramesocolic space disorders, we used the French position. For appendix, pelvis and large intestine disorders, we used the classic lithotomy position. In one case of a shotgun wound, the patient was positioned in the right lateral decubitus position (to enable access to the left adrenal space).

As these were emergency procedures, a urinary catheter and nasogastric tube were used in all cases, and removed where possible after the operation. In almost all cases, the first trocar was positioned through the navel using Hasson's open access technique, enabling a safe approach even in patients who had undergone previous surgery. Where the small intestine was obstructed by adhesive bands, the first trocar was positioned as far as possible from the surgical scar (6). We used 5, 10 and 12 mm trocars. After positioning of the optical trocar, the abdominal cavity was carefully explored to enable diagnosis and the most suitable placement of the other ports (7). In the event of diffuse peritonitis, the first step was to remove the purulent effusion with repeated irrigation/aspiration with saline solution at 37° C and povidone-iodine-based antiseptic. Once the diagnosis had been established, the procedure continued using laparoscopy or, where necessary, was converted to open surgery. An abdominal drain was used in all cases of peritonitis.

## Results

### *Perforated gastroduodenal ulcer*

In the study period, 18 patients were treated for a perforated gastroduodenal ulcer, of whom 15 by laparoscopy. Two of these were later converted to open surgery as the perforation was not identified on laparoscopic exploration and the posterior wall was subsequently found to be involved. In the remaining three cases, it was decided from the outset to perform open surgery, due to the patients' general clinical condition (ASA IVE, Boey score 2-3), for which laparoscopy was completely contraindicated (8). The mean operating time for all patients was 81.1 minutes, breaking down to 103.3 minutes for the laparoscopy group (range 90-120 minutes) and 70 minutes for the open surgery group (range 35-95 minutes). The greater duration of the laparoscopic procedure was essentially due to the repeated irrigation/aspiration. One man in the open surgery group, whose general condition was very poor, later died in intensive care, due to worsening respiratory signs and sepsis from a nosocomial infection. A woman treated by laparoscopy for duodenal bulb perforation was re-operated 6 days later for peritonitis. Exploration revealed an exudate of intestinal material from the suture line. Reinforcement of the suture resolved the clinical picture. The mean duration of hospitalization was 6.2 days (range 5-11 days).

### *Acute appendicitis*

638 patients were treated for acute appendicitis with circumscribed or generalized peritonitis (it should be stressed that peritonitis is not an indication for conversion) (9). Of these, 383 were treated with open surgery (the

laparotomy technique depended on the severity of the clinical picture, from the classic McBurney incision to right pararectal incision and in some cases midline incision), and 255 with laparoscopy. The choice depended on the presence of an available expert in laparoscopic surgery and the patient's general clinical condition. We always use a 10-12 mm transumbilical optical trocar, with subsequent positioning of two 5 mm trocars above the pubis and in the left side (10). We use 5 mm 30° laparoscopic optical. Mesoappendix section was carried out with bipolar current, followed by appendectomy once the stump had been secured by endoloop (11). The mean duration was 58.1 minutes and 58.53 minutes respectively for the open surgery and laparoscopy groups (range 25-110 min), with no significant difference ( $p = 0.47$ ; NS) (12). Conversion to open surgery was necessary in just two cases: in the first, appendicitis was associated with a perforation of the cecum that could not be repaired via laparoscopy, while in the second there were multiple ileal perforations caused by the ingestion of radio-transparent foreign bodies. In one case, with clinical signs and symptoms strongly suggestive of acute appendicitis, a 16.5 cm appendiceal growth was discovered, which histological examination revealed to be a carcinoid tumor. In another three cases appendicular mucocoeles were found, the largest of which had self-amputated. In these conditions, appendectomy was carried out using a 45 mm EndoGIA (vascular reload - medium). The mean duration of hospitalization was 3.8 days (range 3-7). There was no mortality or morbidity.

### *Acute cholecystitis*

1024 cholecystectomies were performed (640 by laparoscopy and 383 with open surgery), of which 267 (26%) were carried out as emergency procedures in patients with emphysematous or gangrenous cholecystitis. Of the latter, 165 were carried out by laparoscopy and 102 with open surgery. Open surgery was reserved for patients with particular types of previous laparotomy (major abdominal surgery and multiple operations) or those whose general clinical condition did not enable the maintenance of adequate pneumoperitoneum (serious cardiorespiratory diseases) (13). Regardless of the technique used, 96.1% of the procedures were carried out within the first 72 hours (around 91% within the first 36 hours), considered by international guidelines as the golden hours for treatment (early laparoscopic cholecystectomy) (14, 15). There was a statistically significant difference in mean duration between the laparoscopy group (63.3 minutes, with a highly variable range of 20-160 minutes) and the laparotomy group (82.6 minutes, range 30-120) ( $p < 0.001$ ). Conversion was necessary in 15 cases (2.3%), of which 9 were in the first two years of the study period. The most common reasons for conversion were as follows: failure to recognize the elements of Calot's triangle due

to long-established adhesions (9 cases); bleeding from the liver bed that could not be controlled laparoscopically (2 cases); cholecyst-duodenal fistula (one case); common bile duct lesion requiring creation of a common duct anastomosis (1 case); patient's intolerance of pneumoperitoneum (1 case); unrecognized neoplastic process (1 case). Second-look laparoscopy was necessary in three cases due to anemia caused by bleeding from the liver bed (all three cases occurring in the first two years of the study period) (16, 17). The mean duration of hospitalization was 2.8 days. All patients with gallbladder and bile duct calculi underwent sequential treatment with endoscopic retrograde cholangiopancreatography followed by video-laparocholecystectomy within 48 hours (and in any case during the same period of hospitalization) (18, 19). No ETG-guided or video-assisted percutaneous cholecystostomies were performed.

#### *Pelvic disease and NSAP*

In women with a clinical picture of acute abdomen of uncertain origin or with problems regarding differential diagnosis with gynecological diseases, the laparoscopic approach was essential, even though our hospital is equipped with advanced diagnostic instruments (CT and MRI). 15 female patients were treated, of whom 11 had a gynecological condition (hemorrhagic corpus luteum, peritoneal endometriosis) (20); two had NSAP (21, 22, 23, 24) and intestinal sub-occlusion due to pelvic adhesions secondary to previous caesarean sections; one had a pelvic abscess secondary to micro-perforation of an intestinal loop; and another a uterine growth, which required conversion to open surgery in order to perform hysterectomy plus bilateral salpingo-oophorectomy. In many of these cases, the hospital's gynecologists provided an essential contribution. There was no morbidity or mortality.

#### *Bowel obstruction*

36 patients were treated for bowel obstruction by small intestine adhesions (25) in 9 cases, by internal hernia in 1 case and by colon tumor or colon inflammatory disease

in 26 cases. In the "small intestine" group, conversion was necessary in just one case due to excessive distension of the intestinal loops, which severely restricted the operating field. In the "colon" group too, conversion was necessary in just one case. A mini-laparotomy was carried out in six cases (generally using a Pfannenstiel incision) for extracorporeal anastomosis and removal of the surgical specimen. Two cases of diverticular sigmoiditis were treated with a hand-assisted technique. There was no intra- or perioperative mortality.

## Conclusions

Improvements in medical technology mean that an ever smaller number of patients arrive in the operating room without a clear diagnosis. However even in such cases, the ever greater use of laparoscopy has led to a considerable drop in the number of exploratory and/or non-therapeutic laparotomies. Laparoscopy not only enables accurate diagnosis but, in many cases, also treatment of the condition responsible for the clinical picture. Its contraindications for emergency surgery are the same as those for elective procedures. However, as noted above, peritonitis should not be considered an absolute contraindication for laparoscopy. In fact, these conditions enable peritoneal irrigation to be carried out more effectively, albeit prolonging the duration of the operation.

Our experience demonstrates the feasibility of laparoscopy in abdominal emergencies, with mortality and morbidity rates similar to those for open surgery but with reduced post-operative pain, shorter hospitalization times and, finally, increased patient satisfaction. Finally, video surgery has a crucial role in the training of young surgeons. Our hospital is in fact a teaching hospital, which enables trainees to take an active part in surgical procedures alongside an expert tutor. The same procedures can be used for training purposes in the study of anatomy and surgical technique and in the discussion and resolution of some clinical questions that arise only during emergency surgery.

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