



The laparoscopic approach in emergency surgery: A review of the literature

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ABSTRACT

The role of laparoscopy in the acute care surgery had significantly increased during the latest years, both as a diagnostic and treatment method of all the upper or lower gastrointestinal pathologies. The objective of the present research is to review the current indications for laparoscopy in abdominal emergencies and to detail the benefits and complications associated with this approach. We have reviewed the relevant literature about this topic published between January 2005 and December 2017, using the PubMed/Medline and Web of Science Core Collection databases. According to the current evidence, we may conclude that the laparoscopic approach is an integral part of the emergency surgery for all the abdominal pathologies. Although laparoscopy requires specialized training and curricula, it brings all the benefits of minimal access in acute care arena.

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1. Introduction

The role of laparoscopy in the acute care surgery had significantly increased during the latest years, both as a diagnostic and treatment method of all the upper or lower gastrointestinal pathologies[1]. Nowadays, extensive surgical procedures are performed through a minimally invasive approach, and the current medical evidence confirms for laparoscopy that “you can resist an invading army, but not an idea whose time has come” said by Victor Hugo.

The objective of the present research is to review the current indications for laparoscopy in abdominal emergencies and to detail

2. Materials and methods

We have reviewed the relevant literature on the topic, using the PubMed/Medline and Web of Science Core Collection databases. We searched keywords in the title and abstract as the following combinations: laparoscopy OR minimally invasive surgery

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females, with disagreement in recommendations between European Association for Endoscopic Surgery and World Society of Emergency Surgery Guidelines[11,12].

Although early evidence showed a higher rate of intra-abdominal abscesses for laparoscopic group[13], a meta-analysis published in 2016 revealed that after the year 2001 the effect size in favor of open procedures began to disappear[14]. Analyzing all the available studies up to 2016, the intra-abdominal abscesses rate was similar between laparoscopic and open groups, with an overall cumulative odds ratio of 1.32 ($P>0.05$)[14].

During the latest years, the nonoperative treatment, with antibiotics, was proposed for uncomplicated acute appendicitis[15]. Kirby *et al.* reported that for uncomplicated cases, appendectomy is associated with fewer complications compared to conservative treatment. Major post-intervention complications were 0.8% in appendectomy group and 10.1% in the antibiotic group[16].

3.3. Acute diverticulitis

Although seductive, according to increasing evidence, the laparoscopic peritoneal lavage and drainage should not be considered the treatment of choice in patients with perforated diverticulitis and generalized peritonitis. However, the emergency laparoscopic sigmoidectomy is feasible in selected patients with perforated acute diverticulitis, provided they are handled by experienced surgeons[17]. Similar to other gastrointestinal resections, the laparoscopic sigmoidectomy is superior to open sigmoidectomy in terms of early postoperative outcomes[18].

The SCANDIV Randomized Clinical Trial showed a mortality at 90 days of 13.9% in the lavage group and of 11.5% in the resection group[19]. The reoperation rate was 20.3% and 5.7% in the lavage and resection group, respectively. There were no differences between the groups for the hospital stay and quality of life[19]. The LADIES trial, published in 2015, concluded that laparoscopic lavage is not superior to sigmoidectomy for the treatment of purulent perforated diverticulitis[20]. Cirocchi *et al.* showed in their meta-analysis that the laparoscopic lavage is associated with a statistically significant higher rate of postoperative intraabdominal abscesses. There were no differences regarding 30-day postoperative mortality and 30-day surgical reintervention rate. The laparoscopic group had a lower postoperative wound infection rate and a shorter length of hospital stay. The authors concluded that the laparoscopic lavage is not fundamentally inferior to surgical resection, and this technique may achieve reasonable outcomes with minimal invasiveness[21].

3.4. Perforated peptic ulcer

In patients with generalized peritonitis due to perforated peptic

ulcer, the laparoscopy results are not clinically different from those of open surgery, although a decrease of septic abdominal complications were observed in minimally invasive group[22]. The main contraindication for a laparoscopic approach is the septic shock. As a surgical procedure to address the perforation, the primary repair should be performed in lesions smaller than two-centimeter diameter. The resection is indicated in patients with suspicion for malignancy, and in perforations larger than two-centimeter[23]. A multicenter retrospective study, which included 297 patients, showed that the laparoscopic approach for perforated peptic ulcer is feasible; the procedure is safe, with no increased risk of duodenal fistulae or residual intraperitoneal abscesses[24].

3.5. Small bowel obstruction

In the case of small bowel obstruction, Byrne *et al.* compared the outcomes of 83 patients operated by a laparoscopic approach with 163 patients in the open group[25]. In the multivariate analysis, the patients' age was the most reliable predictor for adverse outcomes ($P = 0.003$). The adjusted odds ratio for overall complications was 0.46, favoring the laparoscopic patients. The mean postoperative length of stay was also in favor of laparoscopic approach (3.8 vs 8.4 days)[25].

The predictive factors for a successful laparoscopic approach in patients with small bowel obstruction are: less than two previous laparotomies, pre-existent non-median laparotomy, appendectomy as suspected cause, a single band adhesion as the mechanism of obstruction, early management within 24 h, the absence of peritonitis on the physical examination and an experienced surgeon. Factors associated with failure of laparoscopic approach are the dilatation of the bowel loops more than four centimeters on abdominal computed tomography, severe associated morbidities, and hemodynamic instability[26].

3.6. Large bowel obstruction

Although the laparoscopic colorectal resections are predominant in elective patients, the minimally invasive approach is rarely used in the case of large bowel obstruction. To improve perioperative outcomes and to avoid an emergency laparotomy, colonic self-expanding metal stents followed by minimally elective resection is increasingly used in cases of large bowel obstruction.

Gash *et al.* analyzed their outcomes with laparoscopic management of large bowel obstruction, including 45 patients in 8 years[27]. There were twenty-one operations for colonic cancer, ten lower anterior resections, six Hartmann's, seven right hemicolectomies and one total colectomy. The postoperative complications included two cases of atrial fibrillation, two wound infections, two cases of ileus, one case of CO₂ retention, one stoma necrosis, one circulatory

collapse and bowel ischemia, and one anastomotic leak. The authors concluded that laparoscopic resection of acute large bowel obstruction is feasible and safe, which has a low complication rate and allows patients an early hospital discharge[27].

3.7. Acute mesenteric ischemia

The acute mesenteric ischemia is an elusive disease, with initial nonspecific symptoms until late peritonitis occurs. Nowadays, the modern imagistic tools increase the chance for early diagnosis and successful treatment. However, we should always remember the characterization of the disease by Cokkinis, in 1926: "Occlusion of the mesenteric vessels is apt to be regarded as one of those conditions of which the diagnosis is impossible, the prognosis is hopeless, and the treatment almost useless"[28].

In 2016, the European Society of Emergency Surgery published their guideline for acute mesenteric ischemia and concluded that there is insufficient evidence to support the routine use of laparoscopy in acute mesenteric ischemia for diagnosis or second-look[29].

3.8. Abdominal trauma

In hemodynamically stable trauma patients with suspected abdominal injuries, laparoscopy can be performed safely and effectively[30–34]. The advantages are the reduction of the nontherapeutic/unnecessary laparotomy rate, shortening of hospitalization and cost-effectiveness. Blood loss higher than 750 mL, heart rate over 100 beats per minute, hemodynamic instability, and severe traumatic brain injury are a contraindication for laparoscopy. The main indication of laparoscopy in trauma patients is for diagnosis of occult diaphragmatic injuries in left thoracoabdominal penetrating wounds.

A systematic review of 51 studies revealed a sensitivity for laparoscopy in penetrating abdominal trauma of 66.7%-100%, a specificity of 33.3%-100%, with an accuracy of 50%-100%. Missed intraabdominal injuries were found in 3.3% of cases[32].

The medical literature is confusing about the current indications of minimally invasive approach in blunt trauma patients. In blunt injuries, the laparoscopy was proposed for suspected diaphragmatic injuries (found in 0.065%-0.148% of patients), suspected cavitory organ injury (found in 0.9%-2.5% of patients), the presence of free peritoneal fluid without solid organ lesions, discrepancy between imagistic and clinical examination, and as adjunctive of selective nonoperative management of grade IV – V liver injuries. An analysis of the National Trauma Data Bank between 2007-2010 found 4 755 patients who underwent diagnostic laparoscopy. Among them, 19.3% had a therapeutic laparoscopy, including diaphragm repair, bowel repair or resection and splenectomy[35].

4. Conclusion

According to the current evidence, the laparoscopic approach is an integral part of the emergency surgery for all the abdominal pathologies. Although laparoscopy requires special training and curricula, it brings all the benefits of minimal access in acute care arena.

Conflict of interest statement

The authors report no conflict of interest.

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