

Emergency Laparoscopic Surgery in High-risk Patients

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Abstract Most of the abdominal surgical emergencies can be effectively treated by laparoscopic techniques. Nowadays, the number of high-risk patients is growing, mainly due to the increased life expectancy of the population. This condition is often a contraindication to minimally invasive surgery. This review article provides a clarification of the concept of high-risk patient and his eligibility to laparoscopic surgery, even in abdominal emergencies. Literature review of these topics was performed in PubMed/ MEDLINE up to September 2014. Our hypothesis is that laparoscopic surgery in urgency is not contraindicated for the high-risk patient, which may indeed benefit from it.

Keywords: laparoscopic surgery, emergency, high-risk patient

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1. Introduction

It is estimated that about 234 million major surgical procedures per year are performed worldwide. Of these, more or less 20% are surgical emergencies. Laparoscopic surgery minimizes surgical stress and thus improves an early post-operative recovery. This is also demonstrated in a large part of abdominal surgical emergencies, where the minimally invasive surgery has expressed a broad effectiveness of treatment. Patients that we nowadays operate show increasingly high variables of risk, which may affect postoperative outcomes. It would seem logical to treat these patients with a more "gentle" surgery, such as minimally invasive, but it is almost never the case. So the question is: can we safely operate in emergency by laparoscopic surgery the high-risk patients too? The purpose of this review is to try to answer this question by analyzing and interpreting the current evidence regarding the applicability of laparoscopic surgery for the treatment of abdominal urgency even in high-risk patient.

2. Materials and Methods

We analyzed the topics about laparoscopic surgery and its use for treating abdominal urgencies, the concepts of surgical high-risk and frail patient. We performed a comprehensive review of the literature on the topics above in PubMed/ MEDLINE up to September 2014. We also searched relevant websites and conference proceedings and reference lists of cited articles. We did not apply any date or language restrictions.

3. Reducing Surgical Invasiveness

The period between 1987 and 1993 represented the dawn of laparoscopic surgery, the time in which different authors have codified the techniques for minimally invasive treatment of the most common surgical diseases, making them diffusible and reproducible. Right from the beginning, it was well known that the emergency laparoscopic surgery was more challenging than the elective one, while recognizing that, in selected cases, laparoscopy constituted a valid therapeutic alternative [1]. Several papers have pointed out the applicability of laparoscopic surgery in the treatment of acute abdomen and abdominal emergencies, noting the dual role of laparoscopy, which is both the last diagnostic and the first therapeutic step [2,3,4]. About this, the experiences were initially very cautious in indications, due to the low learning curve, then more and more convinced until producing consensus conferences and meetings of experts on the topic [5]. Nowadays, laparoscopic technique is supported with strong consensus for the treatment of both acute cholecystitis and appendicitis. Acute cholecystitis should be treated by laparoscopic cholecystectomy (Grade of Recommendation - GoR A) with an "early" approach, which means as soon as possible and in any case within 72 hours of onset of symptoms, even in the elderly and also in cases of severe cholecystitis. Laparoscopic appendectomy represents the procedure of choice for acute appendicitis in particular groups of patients, however, numerically consistent (GoR A). Non specific abdominal pain (NSAP), which identifies an acute abdominal pain occurred less than 7 days before and for whom the diagnosis remains uncertain after basic diagnostic tests, can be appropriately managed by laparoscopic exploration (GoR A), significantly improving the rate of diagnosis and contextual therapy. Laparoscopic technique can be used in expert hands for the treatment of gastro-duodenal perforation, complicated acute diverticulitis and bowel obstruction, although with a still non maximal grade of recommendation. Laparoscopic

surgery produces a reduced postoperative immune response compared to conventional techniques, improving the performance of the organism after a surgical stress. This has been attributed primarily to a lower handling and atmospheric exposure of the viscera in course of minimally invasive surgery [6]. The monocyte expression of DR receptor for the human leukocyte antigen (HLA-DR) remains higher after minimally invasive surgery compared to open, summarizing a better response to surgical trauma [7]. In addition, serial serum assays of C-reactive protein (CRP) and interleukin 6 (IL-6) are lower within 48 hours after laparoscopy. These results emerge in both elective [8] and urgent surgery. Sista *et coll*, publishing a randomized clinical trial on the treatment of acute cholecystitis in emergency, found in patients treated by laparoscopic approach reduced CRP serum levels, an higher expression of HLA-DR and lower levels of plasmatic elastase understood as a marker of leukocyte activation [9]. There were similar findings for the laparoscopic treatment of both acute appendicitis and gastro duodenal perforation [10,11]. Moreover, in animal models, there was no evidence that the pneumoperitoneum could amplify abdominal sepsis nor endotoxemia, contrary to what claimed by some authors in the past [12,13].

4. The High-risk Surgical Patient

The patients of surgical interest are gradually changed over the years as a result of the increased life expectancy. The percentage of population over 65 years old in the 28 member countries of the European Union (EU-28) increased from 16.0% in 2002 to 17.9% in 2012, with the projection to reach 28.7% of the EU-28's population by 2080 [14]. In Italy, one of the countries with the highest mean age, life expectancy at birth in 2013 was 79.4 years for men and 84.5 years for women [15]. This demographic change has potentially brought with it an increase in individual comorbidities, a more complex surgical past history and diffuse chronic therapies. In addition, the lifestyle often affects surgical risk factors, as in case of obesity and regardless of age. According to the surgical literature, the high-risk patient is that has one or more of the following characteristics: age over 80 years, body mass index (BMI) greater than 30 kg/m², previous major abdominal and pelvic surgery, American Society of Anesthesiologists (ASA) score greater than 2. However, further characterization must be taken into account, namely that of frail patient. The concept of frailty is emerging in recent years as an indicator of poor psychological and physical performance, decreased resistance to stress, depletion of physiological reserves. It generally increases with age and is inversely proportional to surgical outcome and post-operative morbidity and mortality rates [16]. Although different definitions of frailty have been given, the most appropriate is specifically based on pathophysiological data: unintentional weight loss, self-reported fatigue, diminished physical activity, measured impairment of grip strength and gait speed. Three positive markers indicated the presence of frailty [17]. The concepts of high surgical risk and frailty are substantially interrelated, but they do not coincide. All frail patients are to be considered of high-risk, but not all, although many, high-risk patients are also frail. Therefore

seems to be evident that the criticality of a patient is given by the sum of his inherent characteristics of risk with the severity of the disease, which may be maximum in case of abdominal surgical emergency.

5. Emergency Laparoscopic Surgery in High-risk Patients

As noted, peritonitis determines both a hypovolaemic shock from the sequestration of peritoneal fluids and a septic shock from toxemia, defining a complex shock which together with the ileum and the bacterial translocation may result in a multiple organ failure. So, in front of such a complex situation, due to both the urgency of surgery and the frailty of the patient, it would seem logical to use a more "gentle" kind of surgery, such as minimally invasive. But the everyday experience suggests that it is not always this choice. Certainly, in terms of syllogistic, or rather Aristotelian, logic, in this case one could speak of contradiction. In fact, already in 2005, a consensus conference from the European Association for Endoscopic Surgery (EAES) suggested that all patients with acute abdomen could benefit from a laparoscopic approach, while recognizing some contraindicative situations such a severe septic shock or a major bowel distension [18]. But the only absolute contraindications, however, were the lack of laparoscopic expertise and, in high-risk patients, a poor response to intraoperative pneumoperitoneum. This reflects our philosophy of work, where minimally invasive surgery, both in election and emergencies, is suitable for every kind of patient regardless of age or risk [19,20]. However, it is crucial to remember that emergency laparoscopic surgery in high-risk patients could bring with it some problems. Several authors have pointed out that advanced age, obesity and comorbidities constitute independent predictors of prolonged surgical time and increased conversion rate in laparoscopic cholecystectomy for acute cholecystitis [21,22]. And it is well known as both a too long operative time and the rate of conversion affect the post-operative morbi-mortality. In addition, as noted, some of the characteristic features of high surgical risk, such as age over 80, obesity or malnutrition, cardiovascular history and chronic use of steroids, independently increase the risk of anastomotic dehiscence [23,24]. On the contrary, the indication to laparoscopic appendectomy in obese patients has been recognized with level 1 evidence [25,26]. Emergency laparoscopic surgery in critically ill patients is a challenge that must be addressed with appropriateness, which results in a completed learning curve and adequate surgical volumes. These factors are reflected in the concept of proficiency, that should not belong only to the surgical team but also to the institution of care. In this way, it will be possible to reach, even in high-risk patients, the advantages that characterize laparoscopic surgery, which are less post-operative pain, shorter hospital stay and early return to active life. Even in a laparoscopic surgical approach, some factors may change the surgical strategy. What remains unclear is whether a particular kind of patient, such as at high-risk, could change the attitude of the surgeon, influencing some technical choices. For example it could increase the rate of use of abdominal drains in patients with high bleeding risk or who have a

growth in risk variables for anastomotic leakage. Or again, if the same clinical situation can be handled in a different manner in the high-risk patient compared to the patient at normal risk, as in case of having to choose between a direct anastomosis with or without a defunctioning stoma and a Hartmann's procedure. It is very difficult to express indications in this sense, as the variability of individual cases makes impossible a proper risk stratification applied to any single disease. However, in view of the above, it seems appropriate to consider that the same indications applied for emergency laparoscopy in patients without severe risk factors, they are also for the high-risk patients.

6. Conclusions

Laparoscopic surgery represents a standard of care, both diagnostic and therapeutic, for most abdominal emergencies. To date, if there is a structural and professional proficiency, it is our opinion that there are no contraindications to laparoscopic surgery in emergency for high-risk patients.

Statement of Competing Interests

FR, FC and IS declare that they have no conflict of interest.

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