



Emergency splenectomy: is there a role for laparoscopy?

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Abstract: Emergency splenectomy is often to treat a life-threatening situation. Since the first laparoscopic splenectomy in 1995, the minimally invasive approach for splenectomy has increased worldwide. Today, laparoscopy has its place in the management of abdominal emergencies. Laparoscopic abdominal exploration can be safely used in emergency department. We review the indications of laparoscopic splenectomy in an emergency situation, from traumatic to iatrogenic indications. A trauma event can determine a splenic injury. A laparoscopic approach can be adopted when the patient is hemodynamically stable. For a non-traumatic cause, laparoscopy can be safely used. Iatrogenic indications are mostly treated with a traditional surgery due to a hemodynamically unstable condition of the patient. Laparoscopy in the trauma patient is not standardized yet. Nevertheless, all reported series had good results in selected cases.

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Introduction

Sutherland and Burghard made the first description of splenectomy in 1910. Minimally invasive surgery for elective splenectomy has become a routine procedure in all laparoscopic centers. Since then, this technique has been increasingly used and quickly referred to as the gold standard of treatment in elective cases. Today, laparoscopy has its place in the management of abdominal emergencies. Nevertheless, emergency surgery is often to treat life-threatening situations, and the conversion rate in the emergency setting is higher than in the elective one.

Laparoscopic splenectomy (LS) in an emergency condition was first described 25 years ago (1). Only 11 years later, the first case series of six patients treated by LS for trauma was described (2). In the present review, we report the different indications and state of the art of LS in the emergency setting.

Trauma indication

Splenic injury due to a traumatic event such as a car accident, high falling injury, and blunt injury is a real life-threatening situation. The necessity of urgent explorative laparotomy as a standard procedure in the treatment of abdominal trauma is no longer the unique approach. A laparoscopic approach can be adopted when the patient is hemodynamically stable. Laparoscopy was proposed in 1998 in an algorithm as a diagnostic procedure in patients with abdominal stabs (3). The first larger series was reported by Huscher *et al.* in 2006 (2). In this series, the authors presented two different approaches, the anterior and the semi-lateral one, respectively. The spleen was extracted after being inserted into a plastic bag and withdrawn, extending the trocar incision by 20-mm, then morcellated inside the extraction bag. The median post-operative stay was seven days. Ransom and Kavic reported a small series of 4 LS

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for continued hemorrhage postembolization bleeding (4). Carobbi *et al.* reported a series of 10 consecutive cases of LS in post-traumatic patients (5). They reported a median time of 17 min to reach hemostasis, with a median of 2 blood transfusion and a length of hospital stay of 4 days. The specimen was removed fragmented in a plastic bag through the 12-mm port site.

In 2015, a comparative study between 19 open versus 23 LS for spleen trauma demonstrated good results in terms of paralytic ileus and bed rest time for the laparoscopic group. However, higher operative time was observed (6). Huang and colleagues compared eleven cases of LS in hemodynamically stable patients with 41 open splenectomies (7). They observed the same results of previous studies, no difference in terms of complications or mortality and longer operative time for the laparoscopic group. Moreover, several single cases of LS in traumatic patients are reported: the utility of minimally invasive surgery in a Jehovah's Witness patient (8); the technical possibility to use a single port for LS (9); in a pregnant patient (10). All studies conclude the safety and feasibility of a minimally invasive approach in traumatic patients provided hemodynamic stability.

Non-traumatic

A non-traumatic condition is a rare indication for emergency splenectomy. We found only case reports in the literature. One of the most common causes is a wandering spleen. Wandering organ is an extremely rare condition defined as a freely mobile organ in the peritoneal cavity secondary to a lack of peritoneal attachments (11). Clinical presentations vary from asymptomatic incidental discovery to a life-threatening acute abdomen (12). The torsion of the splenic pedicle can impair blood the flow through the spleen and, in the worst cases, an ischemic spleen. Provided the hemodynamically stability of the patient, laparoscopy is the most desirable approach if splenectomy is required (13,14). In all cases, no major complication or mortality was reported.

A very rare indication is primary abdominal pregnancy. The liver and the spleen are favorable for implantation because of their flat shape, and abundant blood flow, which make them easily reached by the fertilized ovum. However, in those cases, organ rupture is frequent. Contrariwise to the wandering spleen, splenic pregnancy is associated with hemoperitoneum (15,16). A singular case of hereditary spherocytosis has been described to turn into an emergency during pregnancy and treated with a laparoscopic approach. The difficulty of this

case was the pregnancy and morbid obesity of the patient. No complication has been reported (17).

A spleen rupture can be caused by tumoral mass. A case of LS has been described for metastatic choriocarcinoma (18).

Iatrogenic

Iatrogenic splenic injury during general surgery is a recognized complication increasing operation time and hospitalization that results in an increased risk of morbidity and mortality. However, in the present review, we will not report cases during abdominal surgery. Many cases of iatrogenic spleen injury during endoscopic procedures have been described. Not only, but in different medical procedures such as cases related to upper gastrointestinal procedures, during endoscopic retrograde cholangiopancreatography, percutaneous nephrolithotomy, vascular operations involving abdominal aorta, gynecological operation, left lung biopsy, chest drain, very rarely spinal surgery and even cardiopulmonary resuscitation have been described (19). However, in most reported cases, patients were treated with an open approach due to a hemodynamically unstable condition and, in some cases, after resuscitation maneuvers. Few LS cases are reported after screening colonoscopy.

Authors have underlined the timing of the diagnosis for a possible minimally invasive approach (20,21).

Partial laparoscopic splenectomy

In the last years parenchyma sparing splenic resections have been reported to decrease the post-splenectomy patient's morbidity (22).

In 1995, Poulin *et al.* (1) reported the first case of partial LS for a ruptured spleen. With 21 cases of partial LS for a ruptured spleen, Li and colleagues reported the larger experience to date (23). The authors used four trocars in all cases and had two conversions to full LS. They had no difference in morbidity between partial LS and full LS. The main technical difficulty for partial LS is the risk of intraoperative and/or postoperative bleeding. In emergency cases, the hemoperitoneum may increase the difficulties to control bleeding caused by the spleen rupture. The challenge is mainly related to specific vascular anatomy.

Conclusions

Minimally invasive splenectomy is increasingly used in

emergency cases. The main contraindication is the unstable hemodynamic condition of the patient. Emergency splenectomy is a life-threatening condition. Laparoscopy in the trauma patient is not standardized yet. Nevertheless, all reported series had good results in selected cases.

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