

Technique of laparoscopic splenectomy: how I do it

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Abstract: Laparoscopic splenectomy (LS) is the gold standard procedure to remove the spleen in elective patients. The laparoscopic procedure can be performed safely in patients with a massive splenomegaly, too. Despite many authors prefer the lateral approach, we put the patients in a supine position. This position offers good exposition of the splenic vessels and allows for a rapid control of hilar blood flow. Moreover, the supine approach does not require the retraction of the spleen away from hilum, this allows the procedure to be carried out in most cases without the need to insert a fourth trocar. We control the hilum vessels, after closing the main trunk of the splenic artery with a hem-o-lok, with one firing of an endoscopic stapler loaded with a vascular cartridge, providing that the tail of the pancreas is protected and all hilar structures can be included between the jaws of the stapler. We call this method the stapling technique. LS provides the advantages of shorter length of stay, decreased postoperative pain, and morbidity, but it should be performed using standardized technique by skilled and experienced surgeons.

Keywords: Laparoscopic splenectomy (LS); laparoscopy; anterior approach; splenomegaly; stapling technique

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Introduction

Splenectomy plays an important role in the management of a wide range of acquired, congenital, and neoplastic hematologic disorders. Splenectomy rarely leads to cure underlying hematologic disease but may resolve the symptoms of splenomegaly and can reduce the incidence of morbidity associated with these disorders. It also can help to make a diagnosis in setting of idiopathic splenomegaly.

Laparoscopic splenectomy (LS) has become the standard approach for performing splenectomy in elective patients (1). The most important controversy surrounding LS regards the size of the spleen; the laparoscopic procedure can be performed safely in patients with a massive splenomegaly, even in cases which the spleen is more than 20 cm in length. Open splenectomy is still indicated in cases where spleen size does not permit safe laparoscopic resection (2).

LS provides the advantages of shorter length of stay, decreased postoperative pain and decreased morbidity but it

is the surgical procedure with complication and conversion rate higher than other advanced laparoscopic procedures. For these reasons it should be performed using standardized technique by skilled and experienced surgeons.

Patient selection and workup

Patient selection was made following the principles of the European Association for Endoscopic Surgery (EAES) guidelines (3). Supermassive splenomegaly is defined as a spleen greater than 25 cm in maximum diameter: it isn't an absolute contraindication, but when the spleen is ≥ 30 cm in greatest dimension the laparoscopic procedure must be avoided. Perioperative imaging is important for operative planning, therefore according to our experience we exclude from laparoscopy ASA IV patients, spleen with diameter ≥ 30 cm, and patients with portal hypertension. Computed tomography (CT) or ultrasonography (US) are available alternatives to assess splenic size and to detect the presence of accessory spleens. CT offers the advantages of providing

information about anatomic relationships, vascular anatomy, presence of perisplenic lymphadenopathy and inflammation.

Preoperative preparation

Antibiotic prophylaxis is performed within 60 minutes before making skin incision and should cover skin flora. Low molecular weight heparin is administered before the induction of anesthesia and should be continued for up to one month as prophylaxis for splanchnic thrombosis.

The positioning of orogastric or nasogastric tube can help to reduce gastric distension and can improve visualization and dissection of the short gastric vessels along the greater curvature of the stomach. A Foley catheter is always inserted. Nevertheless LS can be performed safely in patient who have platelet counts as low as 20,000/ μ L, steroids and IV immunoglobulin can be used to increase platelet counts preoperatively in case of autoimmune disease. Blood products should be available intraoperatively, especially in patients with severe thrombocytopenia; in particular platelets have to be transfused only after splenic artery ligation. If patient is in chronic therapy with corticosteroids, stress dose of steroids should be administered with a rapid taper postoperatively.

In elective cases it is recommended to vaccinate patients against encapsulated organism (*Hemophilus influenzae* B, *Pneumococcus* and *Meningococcus*) about 2–4 weeks before splenectomy.

Equipment preference card

Despite many authors prefer the lateral approach, we put the patient in a supine position with the lower limbs and the left arm abducted. This position offers good exposition of the splenic vessels and allows for a rapid control of hilar blood flow. Moreover, the supine approach doesn't require the retraction of the spleen away from hilum, this allows the procedure to be carried out in most cases without the need to insert a fourth trocar (*Video 1*).

The Veress needle is inserted in the left paraumbilical region, water drop test is performed and the abdomen is insufflated to 14 mmHg of carbon dioxide (CO₂). The Veress needle is removed and a 10 mm trocar is positioned in the same site. The 30-degree laparoscope is inserted into the abdominal cavity and the others trocars are placed under direct visualization. Port placement generally includes two trocars in left upper quadrant of the abdomen: a 5 mm one on paramedian line and a 10 mm trocar on the

anterior axillary line. The latter position depends on the longitudinal size of the spleen. An additional 5 mm trocar, if necessary, it is placed in the right upper quadrant.

Role of team members

The patient is placed on the operating room table with right rotation of 30° and reverse Trendelenburg position. The left arm and lower limbs are abducted, this allows the surgeon to stand between the patient's legs. In front of him, at the level of the patient's left shoulder, the monitor is positioned. The camera driver takes his place on patient's right. An assistant is on the left side of camera driver and he will lift the stomach when needed. The scrub nurse and the Mayo's table are on surgeon's right side.

Procedure

The abdomen is explored and accessory spleens, if present, are identified. The omentum is first turned away, and the splenocolic and phrenocolic ligaments are exposed and detached with an energy device, we prefer radiofrequency energy device and we use the laparoscopic LigaSure® vessel sealing system. This step allows for further mobilization and inferior retraction of the splenic flexure of the colon. The splenorenal ligament then is dissected and this manoeuvre allows access to the splenic hilum. Using radiofrequency device, the gastrosplenic ligament and the short gastric vessels are closed and divided along greater gastric curvature. This dissection should be carried up to the level of the left crus, and the stomach can be retracted to the right. The right mobilization of the stomach exposes the pancreas body-tail, on whose upper edge runs the splenic artery. A delicate but decisive dissection allows isolate the splenic artery in its free section, as soon as it leaves the pancreatic tail, about 2–3 cm before its forking at hilum. A hem-o-lok closes it, this manoeuvre makes the subsequent dissection safer and reduces the volume of the spleen (4). From this moment, if a small infraction of the parenchima is determined, the bleeding is only a venous one. After the complete detachment of the spleno-diaphragmatic ligament, the splenic vessels are naked and straight. At this point, the hilum is taken with one firing of an endoscopic stapler loaded with a 60-mm vascular cartridge provided the tail of the pancreas is protected and all hilar structures can be included between the jaws of the stapler we called "stapling technique" (5).

The spleen is placed into a 15-mm retrieval bag. In case

of benign disease, the spleen can be morcellated and extracts in fragments from the site of the periumbilical trocar, this avoid to make an additional incision of the abdomen. If the splenectomy is made for malignant disease, the spleen is extracted intact through a Pfannenstiel incision or enlarging the 10 mm left trocar site.

After extraction, the splenic bed, the hilum and the greater curvature of the stomach should be inspected thoroughly to ensure haemostasis. The decrease of the pneumoperitoneum to 9–10 mmHg can help to obtain this purpose. At this point of the procedure, a drain is placed through the 10 mm trocar site and left in splenic bed for 2 days.

Postoperative management

The Foley's catheter and the orogastric or nasogastric tube are removed at the end of the procedure. Pain control is obtained with parenteral paracetamol 1 g twice a day for the first 48 postoperative hours, and subsequently it's transitioned to oral medication if necessary. All patients are encouraged to ambulate and are allowed to unrestricted diet on first postoperative day. The drain is removed on second postoperative day and most of patients are discharged on second postoperative day. Patients are monitored for hemorrhage, atelectasis and infection in the early postoperative period. Antiplatelet therapy is indicated with thrombotic complications or prophylactically when platelet levels reach 1 million. Portal vein or mesenteric vein thrombosis can be a serious complication of splenectomy; for this reason, patients can be maintained on prophylactic doses of low-molecular-weight heparin for 4 weeks postoperatively. Infectious complications are rare in our series. The risk of overwhelming post-splenectomy infection (OPSI) is highest in children under the age of 5 and in patients who have history of immunosuppressant therapy. The antibiotic prophylaxis is made according the Guidelines for Overwhelming Post-Splenectomy Infection Prophylaxis, and the agent of choice is penicillin; in case of penicillin allergies, trimethoprim-sulfamethoxazole or erythromycin should be used.

Tips, tricks and pitfalls

(I) The supine approach doesn't require the retraction of the spleen away from hilum, this allows the procedure to be carried out in most cases without the need to insert a fourth trocar;

- (II) The patient is placed on the operating room table with right rotation of 30° and reverse Trendelenburg position
- (III) The incision of the splenocolic and phrenocolic ligaments allows for further mobilization and inferior retraction of the splenic flexure of the colon;
- (IV) The splenic artery is identified and dissected free from the upper border of the pancreatic tail, its dissection and closure at this point make allows reduce the spleen volume;
- (V) After the complete detachment of the spleno-diaphragmatic ligament, the splenic vessels are naked and straight. It makes easier take the hilum with one firing of an endoscopic stapler.

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Footnote

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