

Laparoscopic Spleen Surgery: Baia Mare County Emergency Hospital Experience, Romania

Mihaela Leșe

General Surgery Department, County Emergency Hospital, Baia Mare, Romania

Rezumat

Chirurgia laparoscopică a splinei: experiență acumulată în Spitalul de Urgență Județean Baia-Mare, România

Introducere: Chirurgia splinei este o chirurgie fără anastomoză și fără modificarea circuitelor fiziologice ale organismului; de aceea, diferența de mărime a inciziei în abordul laparoscopic, comparativ cu abordul clasic, determină principalele avantaje ale chirurgiei laparoscopice: necesar redus de analgezice, rata redusă a complicațiilor postoperatorii, durata scăzută de spitalizare și necesarul redus al transfuziilor de sânge intra- și postoperator.

Material și metodă: Au fost analizate retrospectiv datele din foile de observație a 4 pacienți operați laparoscopic pentru purpură trombocitopenică idiopatică, chist și abces splenic.

Rezultate: Vârsta medie a pacienților a fost de 56 de ani, durata spitalizării postoperatorii a fost de 4 zile în toate cazurile, durata intervenției chirurgicale a fost în medie de 150 de minute și s-a administrat o singură unitate de sânge postoperator.

Concluzii: Chirurgia laparoscopică a splinei este realizabilă și sigură în experiența inițială a Spitalului Județean de Urgență Baia Mare, permite recuperarea rapidă postoperatorie a pacienților și conservarea splinei în afecțiunile care afectează parțial parenchimul splenic.

Cuvinte cheie: splenectomie laparoscopică, chist splenic, abces splenic

Abstract

Background: Spleen surgery is a surgery without anastomosis and without the modification of the body's physiological circuits; therefore, the difference in the size of the incision between the laparoscopic and the open approach determines the main advantages of the laparoscopic surgery: small amounts of painkillers, reduced postoperative complication rate, low duration of hospitalization and reduced intra- and postoperative blood transfusion requirements.

Methods: Data from the medical records of 4 patients who underwent laparoscopic surgery were retrospectively analyzed. They underwent surgery for idiopathic thrombocytopenic purpura, splenic cyst and abscess.

Results: Mean age of patients was 56 years old, postoperative hospital stay was 4 days in all cases, the surgery lasted 150 minutes on average and a single unit of blood was given after surgery.

Conclusions: Laparoscopic spleen surgery is achievable and safe in the initial experience of the Baia Mare County Emergency Hospital, Romania; it enables a rapid postoperative recovery of the patients and the preservation of the spleen in diseases only partially affecting the splenic parenchyma.

Key words: laparoscopic splenectomy, splenic cyst, splenic abscess

Corresponding author:

Mihaela Leșe
11/43, Decebal Boulevard
Baia Mare, Maramures County, Romania
E-mail: mihaelales@yahoo.co.uk

Introduction

Seen as a “delicate” surgical procedure until the first half of the 20th century due to postoperative complications, which in most cases were fatal, spleen surgery has fully benefited from the development of surgical techniques and the achievements of the pharmaceutical industry (antibiotherapy, immunology etc.). Therefore, after the first partial splenectomy in modern era for a splenic trauma, in 1959 (1), the era of splenic “invulnerability” ended, although the concept of preserving spleen is not new: first successful partial splenectomies were performed by Viard for spleens prolapsed through abdominal wounds in 1581 (2) and Mayo published for the first time several cases in 1909 (3). The steps that followed were focused on trying to preserve the spleen (4, 5, 6), as septic complications are redoubtable in splenectomized patients. However, the most spectacular innovation in spleen surgery was the introduction of the laparoscopic approach. Since it is a surgery without anastomosis and without the modification of the body's physiological circuits, the outcomes in spleen surgery depend mostly on the size of the abdominal wall incisions. Generally speaking, laparoscopic surgery is followed by incisional hernias at trocar sites in less than 1% of the cases (7, 8), while in open surgery postoperative incisional hernias represent 11% of the cases (9, 10), according to some studies. Laparoscopic spleen surgery includes all the advantages of the minimally invasive procedures: small amounts of postoperative painkillers, rapid recovery of intestinal transit and mobility of patient, low duration of hospitalization, low incidence of pulmonary atelectasis, thromboembolic complications and abdominal wall infections.

In Romania, the first laparoscopic splenectomy was reported by Diaconescu in 1990, for a splenic hydatid cyst (11), and in 2006 Vasilescu and colleagues published the first series of laparoscopic subtotal splenectomy (12). Also, in 2010, he made the first partial robotic splenectomy (13), emphasizing the importance of preserving spleen and its feasibility in laparoscopic and robotic surgery.

Material and Methods

In the last 5 years the average number of spleen surgeries performed per year in the Baia Mare County Emergency Hospital, Romania, was 14 (maximum 17, minimum 8), the most frequent surgical indications being splenic injury (Table 1),

followed by hematologic diseases (idiopathic thrombocytopenic purpura, secondary hypersplenism and lymphoma). Out of 72 surgeries performed during this time, 70 patients (97%) underwent splenectomy. Spleen function preservation was made by heterotopic implantations of autologous splenic tissue in 4 patients with splenectomy for splenic trauma and it was 2 surgeries with complete splenic preservation, one for splenic cyst and the other for splenic abscess – all in all 2 surgeries (2,8% of the cases).

As of 2014, surgeons in the Baia Mare County Emergency Hospital have been using laparoscopic surgery in spleen pathology after the acquisition of the necessary laparoscopic surgical instruments – the unit and the LigaSure forceps coming with the complete laparoscopic equipment, as well as the Endo GIA staplers for the transection of the splenic pedicle and parenchyma. There were 4 patients who underwent surgery, 3 female and 1 male - for idiopathic thrombocytopenic purpura (2 cases), splenic cyst and splenic abscess.

Case 1. Patient B. A., 42 years old, diagnosed with chronic idiopathic thrombocytopenic purpura, not responding to conservative treatment, transferred from the Hematology Department after standard preoperative care and increasing platelet count from 11,000/mm³ to 209,000/mm³. The decision was made to perform laparoscopic splenectomy only after the patient has received anti-pneumococcal, anti-haemophilus influenzae B and anti-meningococcal vaccines.

Being the first laparoscopic spleen surgery, the patient was put in a supine position with a pad in the left thoracolumbar region in order to reveal the left hypochondriac and the left lumbar region. Tilting the operating table 15° to the right as well as adopting the reverse - Trendelenburg position at an angle of 30°, we obtained a tilting of the patient's body at an angle of 45° (Fig. 1). This was easily convertible to the supine position, in case a hemorrhage would have appeared or in case an emergency laparotomy was required.

Inspection of the peritoneal cavity revealed a normal-sized spleen, but with multiple adhesions to the diaphragm and its inferior pole partially obscured by the left colic flexure. Using the 5 mm LigaSure forceps, we started with the sectioning of the adhesions to the inferior pole of the spleen and we lowered the colon by sectioning the phrenocolic and splenocolic ligaments, thus opening the lesser sac. We continued by dissecting the inferior adhesions of the spleen to the diaphragm. For the dissection of the tight adhesions we used the electrocautery hook, in order not to pull the splenic capsule, thus avoiding

Table 1. Spleen pathology indications for surgery in the Baia Mare County Emergency Hospital

Year	Haemolytic anemia	Purpura	Secondary hypersplenism	Lymphoma, Myeloma	Other						Total
					Trauma	Abscess	Infarction	Cyst	Tactics	Tumour	
2011				1	11	1			3	1	17
2012					11	1			1	1	14
2013			1	1	6						8
2014		2	1		10	1	1				16
2015			1		13	2		1	1		17

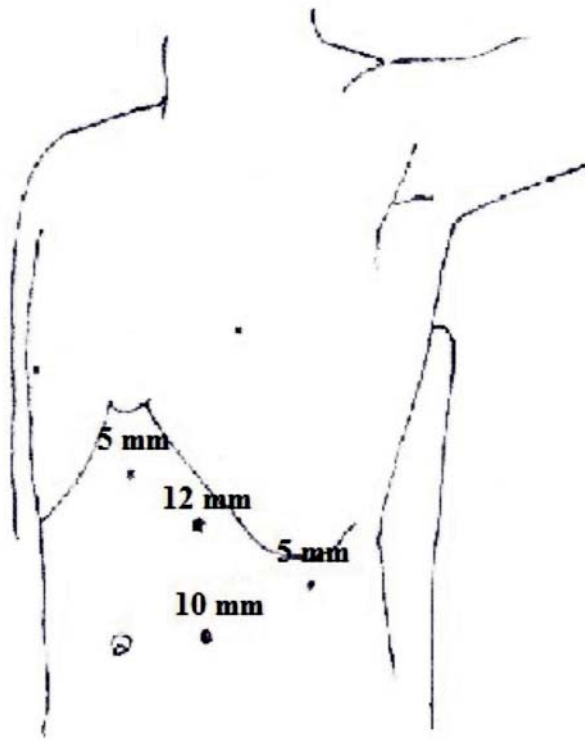


Figure 1. Trocar placement for laparoscopic splenectomy

decapsulation. The next phase was the sectioning of the gastro-splenic ligament, by lifting the anterior wall of the stomach, in its vertical part; we used the 10 mm LigaSure forceps, then the 5 mm one, with which we subsequently sectioned the adhesions of the upper pole to the diaphragm. We were then left with the splenic pedicle. We introduced the Endo GIA articulating stapler selecting the white (vascular) cartridge, but we could not load the splenic pedicle between its jaws. We decided to seal the vessels in the hilum of the spleen, using the 10 mm LigaSure forceps, which we activated twice, prior to each cutting. Using the same forceps we continued to section the remaining adhesions of the spleen to the diaphragm. There was no bleeding after splenectomy. For the removal of the spleen we used a plastic freezer bag, much thicker than an ordinary one, introduced through the 12 mm trocar. To extract the spleen we cut the tissue into morsels with a calculus removal forceps used in laparoscopic cholecystectomy. Then we wetted the content of the bag with a saline solution, thus the fragments of the spleen could easily be removed, without any additional sectioning of the abdominal wall. At the end we left a drainage tube in the splenic lodge. The surgery lasted 205 minutes; the patient had bowel movements the next day, when we also suppressed the drainage tube. The patient was released on the fourth postoperative day.

Case 2. Patient E.M., 68 years old, with chronic idiopathic thrombocytopenic purpura, non-responsive to corticotherapy, is transferred from the Hematology Department after correcting platelet count from $2,000/\text{mm}^3$ to $96,000/\text{mm}^3$ and receiving standard immunization in order to undergo laparoscopic splenectomy. Having prior experience in laparoscopic splenec-

tomy, we decided to use the same surgical team position and the same type of instruments. Unlike the first case, this patient had less adhesions between the spleen and the diaphragm. We sectioned the splenic pedicle with the same 10 mm LigaSure forceps, but in this case we encountered venous bleeding anterior to the pedicle. The assistant used the 5 mm forceps and succeeded at stopping the bleeding at its source. We mounted vascular clips to this forceps using an applicator and no more bleeding occurred after lifting the forceps. Later we discovered that the 10 mm LigaSure forceps that we used in order to seal the vessels in the hilum had already been used three times before, so that explained why the bleeding occurred after we sectioned the vessels. The surgery lasted 180 minutes while postoperative hospital stay was 4 days.

Case 3. Patient C.M., 65 years old, undergoing a routine ultrasound checkup is diagnosed with a large splenic cyst measuring 75mm at the upper pole of the spleen.

Shortly after the diagnosis was established, the patient complained of pain at the base of the left hemithorax and was seen in the surgical clinic, subsequently being admitted to the hospital for partial laparoscopic cystectomy. The tomographic image confirmed the diagnosis of a large splenic cyst (Fig. 2). We used the same surgical devices as in the case with splenectomy. The cyst was easily localized just by visually inspecting the spleen. It had a whitish capsule, but we had to dissect the adhesions of the greater omentum on its surface. We used the 5 mm LigaSure forceps for the dissection and the sectioning as well. We proceeded with the transperitoneal abdominal puncture of the cyst and extracted a chocolate – coloured fluid which excluded once again the possibility of a parasitic nature of the cyst. We sectioned the wall of the cyst with the electrocautery hook, then we excised the capsule up to the splenic parenchyma; the excised fragment was sent to histopathological examination. We inspected the remaining cavity which had many fringed recesses. In this cavity we placed a fragment of the greater omentum which we fastened to the edge of the cyst using metal clips and attached a drainage tube next to it. The



Figure 2. Large splenic cyst, tomographic image

surgery lasted 90 minutes and the patient was released from hospital 4 days after the surgery. Microscopic exam revealed the absence of malignant cells and parasites, and lack of epithelial layer. Three months after the intervention the ultrasound image revealed a normal spleen.

Case 4. Patient K.I. 49 years old, visited the surgical practice accusing pain in the base of the left hemithorax, as well as excessive perspiration. Six months earlier the patient underwent surgery for morbid obesity; laparoscopic gastric plication was performed on the greater gastric curvature, after which the patient lost 40 kg. During the patient's checkup, his weight was 116 kg. Ultrasonography revealed splenic abscess (subcapsular splenic fluid collection with mobile echoes and declining sedimentation) while computed tomography confirmed the diagnosis (Fig. 3) and discovered a minimal left basal pleurisy. The tomographic image showed a tube-shaped stomach after the laparoscopic gastric plication.

We performed the surgery with the patient in the aforementioned position, but we used only two working trocars: the 5 mm one for the subxiphoid region and the 10mm one for the midclavicular line, on the edge of the rib cage. On inspection we found a tube-shaped plicated stomach after the previous surgery, having a single, lax and thin adhesion of the greater omentum around the gastric angle. The spleen was adherent to the diaphragm and the thoracic wall, together with fringes of the greater omentum. This time the adhesions of the spleen to the thoracic wall were tight and for the dissection we used the 5mm LigaSure forceps as well as the tip of the surgical aspirator. During the dissection we opened the cavity of the abscess, wherefrom we evacuated the white sticky pus. The cavity wall was ragged and part of the spleen capsule remained adherent to the diaphragm. We removed a fragment of the abscess wall while for the diffuse bleeding we used the electrocautery hook. We mounted two drainage tubes: one in the abscess cavity and the other one in a left parietal colic position. We removed them on the third, respectively the second postoperative day and the patient was released from the hospital on the fourth postoperative day. The patient was reviewed at 10 and 21 days postoperatively, asymptomatic and without detectable ultrasound fluid collections.

Discussion

Splenectomy in relation to hematologic diseases does not cure the affection but it helps in the remission of the symptoms or the scheduling of the treatment, objectives that can be attained more easily and more quickly through minimally invasive procedures. Theoretically, laparoscopic splenectomy is more difficult to perform through minimally invasive procedures due to the rich vascularity of the spleen and the numerous peritoneal connections; yet, in practice the zoom image and the excellent visibility for the whole team (not only the surgeon), the access into small spaces and the reduction of bleeding through increasing the intra-abdominal pressure given by the pneumoperitoneum are a few of the technical advantages which made laparoscopic splenectomy widely used (14).

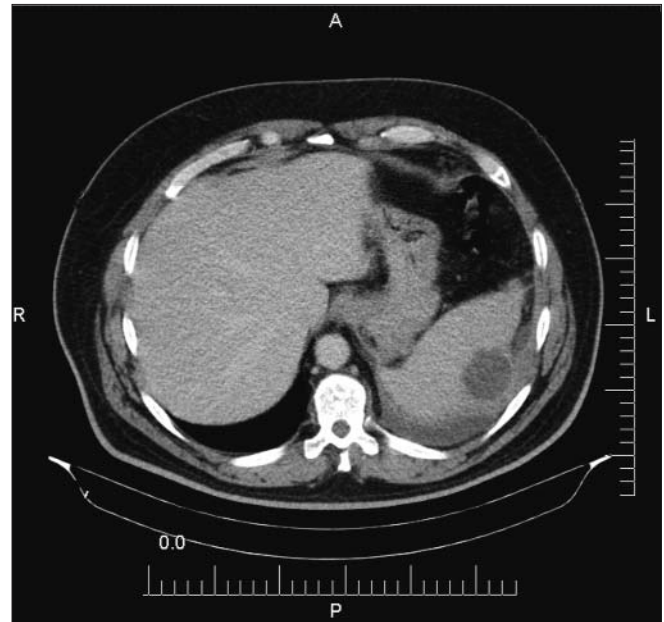


Figure 3. Splenic abscess and left pleurisy, tomographic image

We preferred the anterior (supine) position approach due to the easily manageable repositioning of the patient in case an emergency conversion to the classical surgical procedure was imposed. We had the advantage to operate on normal dimension spleens, for which, however we needed the fourth trocar for the “lifting up” of the spleen.

This approach is not totally “anterior”, because by supporting the hemithorax on a roll or a sponge and tilting the operating table we have a semi-lateral position, which brings the advantages of the lateral approach: the blood does not accumulate in the hilum of the spleen, thus it does not reduce visibility, while the stomach and the left lobe of the liver recede from the spleen. Moreover, we easily introduced the spleen into the plastic bag, to be extracted from the abdomen.

The main instrument used for dissection was the 5 mm LigaSure forceps (Covidien Boulder CO), with which we sectioned the vessels with a diameter smaller than 3-4 mm and practically all the ligaments of the spleen; we called it “the skeletizing forceps of the hilum” because we used the electrocautery hook only in a few cases (for the tight adhesions next to the spleen capsule) until we had to deal with the vessels in the hilum and the blunt tip of the electrocautery (to highlight the anatomical elements). To section the vessels of the hilum we prepared the Endo GIA articulating stapler with the white cartridge, but the 12 mm trocar position (although with articulating arms) did not allow us to introduce one of its arms in a posterior position to the pedicle. Being familiar with bipolar vessel sealing (15, 16), we applied twice the 10 mm LigaSure forceps on the hilar vessels, after which we sealed the elements. Within the second laparoscopic splenectomy we used the described method from the very beginning, but the occurrence of the bleeding was most probably due to the fourth utilization of the forceps.

The occurrence of bleeding should not generate panic: one should use the easiest and most rapid method for hemostasis.

In our case, the assistant squeezed the bleeding vessel using a 5 mm atraumatic double-action fenestrated forceps and we mounted metal clips under it. The compression of the hemorrhage source would have stretched the neighbouring vessels.

To extract the spleen we used a polyethylene bag generally utilized for freezing food (the thicker type, sterilized with ethyleneoxide), in which we introduced the spleen, without decapsulating it, thus preventing splenic tissue to be seeded throughout the peritoneal cavity eventually leading to peritoneal splenosis. The fragility of the splenic parenchyma was an advantage when extracting the spleen since we did not have to section the abdominal wall on the 12 mm trocar site, we only had to widen it with the retractor. Using the cholecystectomy forceps we extracted fragments of the spleen without rupturing the plastic bag (as it might have happened with the morcellator) aided by a saline solution in order to allow the splenic tissue to slip over the plastic.

The splenic cyst was accidentally diagnosed, but the patient remembered having suffered a trauma to her left hemithorax 6 months prior to the surgery. The histopathological examination of the cyst wall fragment revealed only necrotic tissue with no epithelial lining, which led us to the conclusion that there had probably been a post-trauma pseudocyst before, a false cyst, or a type 2 cyst, according to Martin's classification (17), depending on the mode of occurrence (Table 2).

This explains the adhesions of the greater omentum to the capsule of the spleen, which we had untied using the 5 mm LigaSure forceps and the tip of the surgical aspirator. The puncture of the cyst allowed the delimitation of the area tangent to the surface of the spleen and the incision of the wall at that level, using the electrocautery, preventing parenchymal bleeding. We then continued by removing a fragment with the 5 mm LigaSure forceps. The excision was difficult due to the thickness of the splenic capsule caused by the inflammatory reaction.

This procedure allowed us to anchor a fragment of the greater omentum to the sectioned edge with some metal clips. Splenic cysts are a rarely occurring affection – the literature of the field has so far reported only approximately 800 cases (18) – that is why we consider us being very lucky to have had the opportunity to experience laparoscopic splenectomy when operating on the previously mentioned patient.

Splenic abscess is also a rare affection, only 600 cases having been published in the literature of the field (19). The fact that it was diagnosed only 6 months after a laparoscopic gastric plication suggests the presence of splenic venous thrombosis (20) or spleen devascularization after the sectioning of the short gastric vessels (21).

It was the first time for our team to explore intraoperatively a patient with previous laparoscopic gastric plication, this being one of the 19 interventions made for morbid obesity in our hospital. We inspected the continuous suture line of the stomach which retained its tubular shape as well as the adherent spleen to the thoracic wall, without any contact to the stomach, covered by fragments of the greater omentum. We used no more than 2 working trocars (a 5 and a 10 mm one), introduced at the edge of the ribs using a 5 mm atraumatic

double-action fenestrated forceps and the 5 mm LigaSure forceps. The adhesions were tight and hard, sometimes we had to untie them using the tip of the surgical aspirator, which caused bleeding, however not abundant. While dissecting the adhesions of the spleen to the thoracic wall, we opened the abscess and after we got rid of the pus we found a small sized cavity full of debris which we cleaned using a saline solution. We were able to section only a small fragment of the abscess wall, using the electrocautery. We left two drainage tubes: one in the remaining cavity, the other one under the inferior pole of the spleen, in order to drain the fluid from the left paracolic gutter, due to the reverse - Trendelenburg position of the patient on the operating table. The results of the inoculation on cultures showed nonspecific microbial flora.

All the patients were released from the hospital on the 4th postoperative day, irrespective of the type of surgery carried out. This means that postoperative recovery is not dependent on the type of intervention on the spleen – preservation or removal of the organ, since the physiological circuits or the integrity of the abdominal wall are not affected. None of the patients had splenomegaly or associated diseases which could have determined the difficulty or contraindication of laparoscopic surgery.

Conclusions

Laparoscopic spleen surgery proved to be safe and feasible in the initial experience of the Baia Mare County Emergency Hospital, the first of this level in Romania in which the spleen is approached laparoscopically, in our knowledge. Patients' postoperative recovery was much quicker compared to open spleen surgery, where the shortest hospital stay was 6 days. Spleen-preserving surgery is easier through the laparoscopic approach due to better visibility and easy access to the splenic lodge.

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