Advances in Robotics & Automation
ISSN: 2168-9695

Patriti and Casciola, Adv Robot Autom 2012, S:1
DOI: 10.4172/2168-9695.S1-002

Research Article
Open Access

Robot-Assisted Splenectomy: Technique and Indications

Alberto Patriti* and Luciano Casciola

ASL3 Umbria, Department of Surgery, Division of General, Vascular, Minimally Invasive and Robotic Surgery, Hospital San Matteo degli Infermi, Spoleto, Italy

Abstract

Robot-assistance has been recently used to perform splenectomy for hematological disorders. Studies describing the technique and indications to robot-assisted splenectomy have been reviewed.Its use as an alternative to the standard laparoscopic splenectomy is particularly beneficial in more challenging cases due to anatomical or iatrogenic conditions. A careful preoperative work-up and intraoperative evaluation are mandatory to discriminate whether robot-assistance could be useful. Moreover, robot-assisted splenectomy remains an essential teaching model before approaching more difficult procedures.

Keywords: Robot-assistance; Splenectomy; Laparoscopic splenectomy; Robot-assisted splenectomy; Idiopathic thrombocytopenic purpura not responsive to conventional treatments; Autoimmune hemolytic anemia; Sferocitosis; Beta-Thalassemia; Hairy-Cell Leukemia; Chronic idiopathic mielofibrosis; Splenic Lymphoma

Introduction

Laparoscopic Splenectomy (LS) was first described in 1991 by Delaitre and in the last two decades it has progressively became the procedure of choice for non-traumatic splenic lesions [1,2]. LS can be performed with times comparable to those required for open splenectomy, as well as minimal morbidity and less postoperative pain. The postoperative length of stay is also significantly reduced following LS, which in turn can lead to decreased hospital costs [3].

Laparoscopy does, however, have some disadvantages, including two-dimensional vision and rigid tools, which can make splenectomy for splenomegaly challenging. Theoretically, robotic surgery (Four arms da Vinci®; Intuitive Surgical, Sunnyvale, CA) can overcome these limitations providing "wristlike" instruments and three-dimensional view, resulting in high-resolution binocular view of the surgical field and more precise dissection of the splenic vessels even in difficult situations [4].

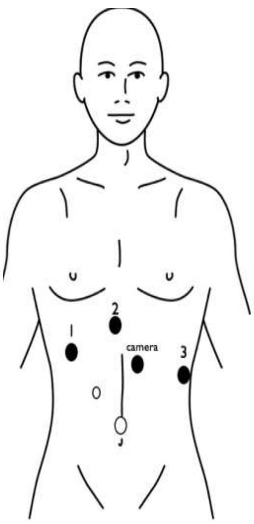

Figure 1: Trocar position. Black dots: robotic trocars. White dots: assistant's trocars.

Technical Aspects

Patient positioning and robot docking

The patient is placed in the supine position. The right arm is padded and tucked at the side. The on-table surgeon stands on the right side. The scrub nurse and instrument is positioned lateral to the right leg. A Mayo stand positioned over the right leg holds the most commonly utilized instruments. The robot is docked over the patient left shoulder. The patient is in reverse Trendelenburg position and the table tilted on the right side to improve exposure.

Port placement

Five trocars are placed after induction of 12-mm Hg pneumoperitoneum by the Verres needle (Figure 1). One 10-12-mm trocar is placed supra-umbilical for the assistant. Three 8-mm Intuitive robotic trocars are placed in the right upper quadrant, in the epigastria and in the left flank. One 10-12 mm port is inserted in the middle point between the left costal margin and the umbilicus to be used for the robotic camera. One 5-mm accessory trocar can be inserted in the epigastria, between the umbilical port and that inserted in the right upper quadrant.

Technique

A thorough inspection of the peritoneal cavity for gross pathology and accessory spleens is performed. If identified, the accessory spleen should be removed before splenectomy. RS is performed from an anterior approach (i.e. vessel division without posterior mobilization of the spleen). The stomach is retracted to the right with the Cadiere forceps inserted through trocar number 1. The Precise bipolar forceps is introduced through port number 2. Port number 3 is used to introduce alternatively the monopolar and the Harmonic scissors. Splenic flexure is mobilized only if necessary in order to expose and divide the spleno-colic ligament and the left gastro-epiploic vessels. Splenic

***Corresponding author:** Alberto Patriti, ASL3 Umbria, Department of Surgery, Division of General, Vascular, Minimally Invasive and Robotic Surgery, Hospital San Matteo degli Infermi, Spoleto, Italy, E-mail: albertopatriti@gmail.com

Received August 11, 2012; **Accepted** November 21, 2012; **Published** November 23, 2012

Citation: Patriti A, Casciola L (2012) Robot-Assisted Splenectomy: Technique and Indications. Adv Robot Autom S1:002. doi:10.4172/2168-9695.S1-002

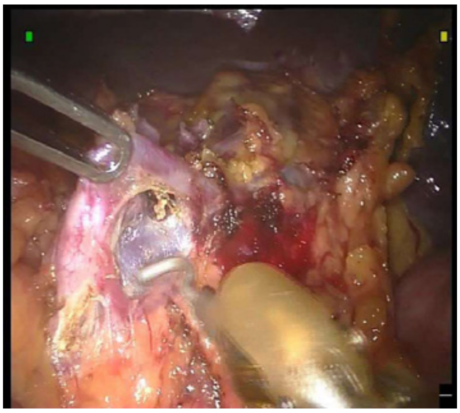

Figure 2: Dissection of the splenic artery away from the splenic vein.

flexure mobilization can be useful as well to dissect the pancreatic tail and identify the splenic vessels in obese patients. The short gastric vessels are divided using the Harmonic scissors till full exposition of the pancreatic tail and splenic vessels. Alternatively, the short gastric vessels can be clipped and divided with the monopolar scissors.

The pancreatic tail is exposed using the fourth robotic arm in trocar 1 to completely retract the stomach on the right side and a traumatic bowel grasper to retract caudally the transverse colon. The splenic artery is circumferentially dissected at the level of the distal portion of the pancreas. If the artery gives off long branches, they can be dissected separately (Figure 2). This phase of the operation is carried out with the precise bipolar forceps in trocar number 2 and the monopolar scissors or Permanent Cautery Hook in trocar number 3. After visualization of the vein, the splenic artery or its branches are divided between plastic locking clips inserted by the assistant from the umbilical port. The vein is finally dissected. In order to fully encircle even the larger splenic veins, the vein can be gently grasped by the precise forceps allowing a complete circumferential dissection using the monopolar scissor or Permanent Cautery Hook. The vein is finally transected between two large plastic locking clips. Main advantage of the robot over traditional laparoscopy is the possibility also to ligate and suture splenic vessels in this phase of the operation.

The assistant stretches the Gerota fascia caudally using the suction-irrigator and maintains the field clean. The robotic arm in trocar number 2 is used to lift up the spleen by gentle pressure and by the monopolar scissor in trocar number 3 the splenic ligament are dissected in a caudal-to-cephalad direction. A 10-mm endoscopic bag is inserted through the umbilical trocar and the robot undocked. Once the specimen is accommodated into the bag, the abdomen is deflated. The umbilical incision can be extended along the left circumference of the umbilicus. With dilation and a slight traction on the bag, the removal is carried out aseptically without the risk of neoplastic seeding. The bag is opened and the spleen removed for morcellation. The closure is performed by layers with an interrupted suture [5]. A drain is routinely inserted through port number 3 and left in place.

Indications to laparoscopic and robot-assisted splenectomy

The most accepted indications to LS are hematological disorders: Idiopathic Thrombocytopenic Purpura not responsive to conventional treatments, Autoimmune Hemolytic Anemia, Sferocitosis, Beta-Thalassemia, Hairy-Cell Leukemia, Chronic Idiopathic Mielofibrosis, and Splenic Lymphoma. LS can be also considered for the differential diagnosis and staging of lymphoproliferative diseases, for re-staging after chemotherapy or radiotherapy in abdominal lymphoma, as well as when diseases recurrence is suspected and for the treatment of cystic or solid splenic lesions. To date, studies conducted to investigate the role of robot-assisted splenectomy (RS) did not show any significant advantage over LS [4,6]. Bodner compared their first seven robotic splenectomies with their first seven laparoscopic splenectomies. They reported a longer operative time for the robotic group (154 min vs. 127 min for the laparoscopic group, $P<0.05$), as well as higher costs ($6927 vs. $4084, $P>0.05$) when compared with the laparoscopic group. Thus, they concluded that the use of the robot for splenectomy was not justified at that time [6].

More recently, Gelmini et al. [4], conducted a bi-institutional comparative study entailing with two groups of patients (n=45 in each group) undergone LS and RS. No statistically significant differences were found regarding intraoperative blood loss, conversion rate to laparotomy, food intake, drain removal, postoperative complications, and median time to discharge. On the contrary, statistically increased differences were observed in median operative time and costs ($2590 vs. $6930, $P>0.05$). Nevertheless, some authors advocate that endo-wristed movements and three-dimensional view may result advantageous when LS results demanding in order to reduce the complication and conversion rate [7].

According to Giulianotti et al. [7], whether LS is technically challenging or not can be ascribed to four factors. Anatomy of the pancreatic tail can make complex splenic vessels dissection when a bulky or "intra-splenic" pancreatic tail is present. Anatomy of the splenic vessels is another factor. Splenic artery and vein branching off in multiple, short vessels can hamper their identification and ligation. Spleen volume and consistency is the most common factor determining conversion of LS and the only one can be detected in the preoperative setting by CT and ultrasound exploration. The last factor impairing the good outcome of LS is related to iatrogenic conditions, such as previous radiotherapy (Figure 3) [7]. With the exception of splenomegaly, it is not easy to predict preoperatively the difficulties encountered during LS. Therefore, indications to RS should be accurately evaluated during the preoperative work-up and eventual laparoscopic exploration, restricting the robot use to cases not suitable for LS. On the other hand, RS remains a good teaching model due to the absence of a reconstructive phase and could be used to train naïve robotic surgeons in order to deal with more difficult situations [7].

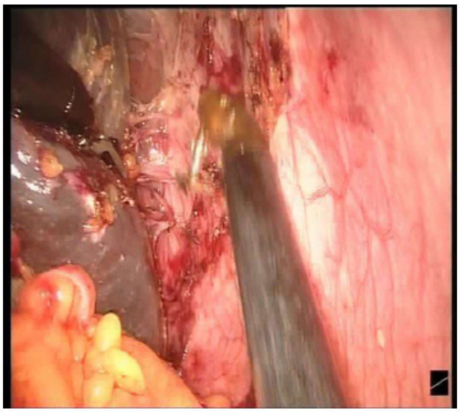

Figure 3: Adhesions due to preoperative radiotherapy.

Conclusions

At the present state of the art, it is unlikely to prove that RS it advantageous for the patient. However, RS still remains an important step toward adequate training in robotic general surgery in order to obtain the experience necessary to perform more complex procedures, such as Whipple procedure. The clinical use of RS should be indicated in cases where an objective challenging situation is encountered during laparoscopic exploration.

References

1. Delaitre B, Maignien B (1991) Splenectomy by the laparoscopic approach. Report of a case. Presse Med 20: 2263.
2. Casaccia M, Torelli P, Squarcia S, Sormani MP, Savelli A, et al. (2006) The Italian Registry of Laparoscopic Surgery of the Spleen (IRLSS) A retrospective review of 379 patients undergoing laparoscopic splenectomy. Chir Ital 58: 697-707.
3. Winslow ER, Brunt LM (2003) Perioperative outcomes of laparoscopic versus open splenectomy: a meta-analysis with an emphasis on complications. Surgery 134: 647-653.
4. Gelmini R, Franzoni C, Spaziani A, Patriti A, Casciola L et al. (2011) Laparoscopic splenectomy: conventional versus robotic approach-a comparative study. J Laparoendosc Adv Surg Tech A 21: 393-398.
5. Casciola L, Codacci Pisanelli M, Ceccarelli G, Bartoli A, Di Zitti L et al.(2008) A modified umbilical incision for specimen extraction after laparoscopic abdominal surgery. Surg Endosc 22: 784-786.
6. Bodner J, Lucciarini P, Fish J, Kafka RR, Schmid T (2005) Laparoscopic splenectomy with the da Vinci robot. J Laparoendosc Adv Surg Tech A 15: 1-5.
7. Giulianotti PC, Buchs NC, Addeo P, Ayloo S, Bianco FM (2011) Robot-assisted partial and total splenectomy. Int J Med Robot 7: 482-488.