Robotic single-access splenectomy using the Da Vinci Single-Site® platform: a case report

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Abstract

Background Single-access laparoscopic splenectomy can offer patients some advantages. It has many difficulties, such as instrument clashing, lack of triangulation, odd angles and lack of space. The Da Vinci Single-Site® robotic surgery platform could decrease these difficulties. We present a case of single-access robotic splenectomy using this device.

Methods A 37 year-old female with idiopathic thrombocytopenic purpura was operated on with a single-site approach, using the Da Vinci Single-Site robotic surgery device.

Results The procedure was successfully completed in 140 min. No intraoperative and postoperative complications occurred. The patient was discharged from hospital on day 3.

Conclusions Single-access robotic splenectomy seems to be feasible and safe using the new robotic single-access platform, which seems to overcome certain limits of previous robotic or conventional single-access laparoscopy. We think that additional studies should also be performed to explore the real cost-effectiveness of the platform. Copyright © 2013 John Wiley & Sons, Ltd.

Keywords robotic surgery; single-incision surgery; minimally invasive splenic surgery; new single-site Da Vinci platform

Introduction

In the last two decades, laparoscopic surgery has gained an important role in the treatment of many surgical diseases (1,2). Regarding laparoscopic splenectomy (LS), an observational cohort study, using data from the ACS NSQIP database, has recently shown that LS is associated with more favourable postoperative outcomes than open surgery, irrespective of the indications for splenectomy or the patient’s clinical status (3).

Likewise, some surgeons have reported their initial experience in single-access LS, suggesting that it could offer the patient better cosmetic results, since only an umbilical incision was used to access the abdominal cavity. However, single-access laparoscopy (SAL) has many difficulties, such as instrument clashing, lack of triangulation, odd angles and lack of space. For this reason, some surgeons have tried to decrease these difficulties through the application of robotic surgery during SAL (4,5).
Materials and methods

A 37 year-old female (body mass index = 25.5 kg/m²; ASA score = 2) was referred to our unit for an idiopathic thrombocytopenic purpura. Her medical records included hypertension and previous open appendectomy. Preoperative ultrasonography (US) was performed to assess the volume of the spleen and to identify accessory spleens (ASs). Spleen volume was 380 ml.

The patient was prepared by receiving meningococcal, pneumococcal and *Haemophilus influenzae* type B vaccinations 1 month before surgery. Antibiotic prophylaxis was administered 12 h before the surgical procedure and perioperative antithrombotic therapy.

The patient was placed in a right lateral approach. The table was tilted in a slight reverse Trendelenburg position and flexed 30° to open the space between the iliac crest and the costal margin. The first assistant stood on the patient’s ventral side, while the scrub nurse was positioned on the dorsal side.

A 2.5 cm umbilical skin incision was performed and followed by abdominal fascia dissection. The silicon port was grasped with a clamp and inserted through the incision (Figure 1). The pneumoperitoneum was inflated at a pressure of 12 mmHg. The Da Vinci Single-Site® surgical system (Intuitive Surgical, Sunnyvale, CA, USA) was introduced, facing the patient’s right side (Figure 2).

Prior to initiating any dissection, a careful search for ASs was performed. A Veress needle, inserted into the cavity and protected with a swab, was useful for lifting the spleen in order to obtain a better exposure of the splenic hilum (Figure 3). The next operative step was the mobilization of the splenic flexure of the colon. Then the gastroplenic ligament was opened to allow entry into the lesser sac (Figure 4). The splenic artery was identified, dissected free from the upper border of the pancreatic tail and clipped approximately 2 cm from the splenic hilum, in order to decrease blood supply to the spleen and reduce its volume. The division of the gastroplenic ligament was completed and all the short gastric vessels were divided using a harmonic scalpel. Only during the gastric vessels section the harmonic scalpel was introduced through the fourth access of the single-port device and manoeuvred by the assistant surgeon. The next step was the progressive mobilization of the spleen by division of the posterior (spleno-renal ligament) and superolateral (spleno-diaphragmatic ligament) peritoneal attachments. The splenic vein was then isolated at the hilum; thanks to previous ligation by clips of the splenic artery and to the lateral decubitus of the patient, the vein was not under any strain and could be ligated easily. At this stage, the splenic artery and vein were divided, completing

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**Figure 1. Single-access device**

**Figure 2. Robot position**

**Figure 3. Instruments**
spleen mobilization. The last operative step was spleen removal by manual trans-umbilical morcellation. The fascia was closed with absorbable interrupted sutures, and subcutaneous closure was performed with absorbable sutures.

Results

The procedure was successfully completed in 140 min, with a console time of 90 min. Intraoperative blood loss was null. No intraoperative complications occurred and no conversions to laparoscopy or laparotomy or additional ports were required. Passing of flatus took place on postoperative day 2. A liquid diet was then allowed and well tolerated. No postoperative complications occurred and the patient was discharged from hospital on day 3. At a follow-up of 30 days, no further complications were observed. Histology confirmed the preoperative diagnosis.

Discussion

To the best of our knowledge, we are the first to report a case of splenectomy using the Da Vinci Single-Site® robotic surgery platform.

LS has now become the technique of choice for the surgical removal of benign splenic diseases (6). Recently it has been shown that LS is associated with more favourable postoperative outcomes than OS, irrespective of the indications for splenectomy or the patient’s clinical status (3). In the last few years, in an attempt to introduce the reduced port surgery quickly in routine practice, the SAL has been adopted. So far, several procedures have been successfully performed through a SAL approach (7–12).

Likewise, some reports on single-access laparoscopic splenectomy (SALS) have been published in the literature (13–17). These studies, although limited by sample size, indicate to date that the spleen can be safely removed using SAL and all the authors have endorsed the feasibility of this approach. In a recent review (18), Targarona et al. have debated the difficulties presented by SALS (clashing, lack of triangulation, odd angles and lack of space). Our initial impression is that these difficulties can be reduced with the use of the Da Vinci Single-Site robotic surgery platform, which surpasses the previous common robotic surgical platform for two reasons. First, the surgeon inserts the instruments through the cannula, so that the hook (introduced on the left) intersects with the grasping forceps (introduced on the right). After tool recognition on the part of the robotic console, the surgeon can control the hook with his right hand and the forceps with his left. Moreover, the new robotic tools are semi-flexible and reach the surgical field in a more natural way and closer than that of SAL. These characteristics, as also reported by Morelli et al. (5), restore the normal triangulation, making surgical procedures easier than standard SAL (see supporting information, Video S1).

These advantages might seem very useful during a splenectomy performed through an umbilical incision. The difficulties encountered during a SALS performed through the navel have already been reported by Targarona et al. (18). They suggest that even though less trauma and a better cosmetic result are achieved during a conventional SAL if the incision is made in the navel, some dissection manoeuvres can be especially difficult or even impossible, due to the oblique dissection line between the umbilicus and the upper part of the spleen.

However, regarding these advantages for performing a SAL via the navel, it is important to observe certain recent results about the incidence of incisional hernia (IH) after a single-access procedure. Podolsky et al. (19) report that the decrease in incisions may decrease the development of infection or hernia sites and the formation of intra-abdominal adhesions. On the other hand, a larger incision may increase the rate of seroma and umbilical hernia. Concern will clearly regarding increased risk of infection and ultimately potential for increased hernia formation at the access site. Maggiori et al. (10) remark that one of the major disadvantages of more complex single-access procedures is the need for an incision 3–5 cm in length, which might lead to a greater tendency for wound herniation. In contrast, Marks et al. (20) report that it is also unclear whether the higher incidence of IH observed in their case series of SAL cholecystectomy can be translated to other single-site procedures, specifically to those with larger organ extraction, where a longer incision is required for both the standard and single-incision procedures. Finally, we are confident that in the future this approach could be improved by the use of new flexible tools that are not yet available.

In conclusion, robotic single-site splenectomy with the new dedicated platform seems to be feasible and safe, surpassing certain limits of previous robotic or conventional SAL. However we think that additional studies with more cases should be carried out also to explore the possible cost-effectiveness of robotic single-site splenectomy.
Conflict of Interest

The authors have declared that there is no conflict of interest.

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References


Supporting information

Additional supporting information may be found in the online version of this article at the publisher’s website.

Video S1. Instrument control through the new robotic platform