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A standardised and simplified technique for laparoscopic resection of the splenic flexure

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Abstract

The splenic flexure is an uncommon location of colorectal cancer, being involved in 2%–3% of cases. The low chance of being engaged in resecting cancer of the splenic flexure can make it difficult for surgeons to build their learning curve and to achieve a reliable experience. As the majority of colectomies are still performed by low-volume surgeons, there is growing agreement that providing local services with adequate surgical education and training could be an effective strategy to improve outcomes and global health. Arming surgeons with simplified and easy-to-learn surgical techniques could be an important step of this strategy. A novel simplified technique for laparoscopic resection of the splenic flexure is presented, which combines laparoscopic mobilisation of the right colon with extracorporeal vascular ligation and bowel anastomosis.

Keywords: Colon cancer, colon resection, colorectal cancer, laparoscopic colectomy, splenic flexure

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INTRODUCTION

The splenic flexure (SF) is an uncommon location of colorectal cancer, being involved in 2%–3% of cases.^[1]

The low frequency of this diagnosis and the double pathway of blood supply and lymphatic drainage explain why tumours of the SF are rarely included in studies comparing open and laparoscopic surgery, and there is lack of a standardised mini-invasive technique.

Few articles exist on techniques of laparoscopic resection of the SF (LRSF) and contemplating methods for intracorporeal vascular ligation and bowel anastomosis that are the prerogative of high-volume surgeons.^[2-7]

Nevertheless, a remarkable increase in the number of laparoscopic colectomies performed in low-volume hospitals is observed in the recent years because the adoption of mini-invasive procedures gives advantage to hospitals in terms of patient recruitment.^[8] Therefore, the availability of standardised and simplified techniques for laparoscopic colectomy becomes a necessary tool to preserve the quality of surgery.

In 2016, we described a simplified technique for laparoscopic right colectomy, with laparoscopic mobilisation of the right colon followed by extracorporeal vascular ligation and bowel anastomosis: the key point of this technique is that the right colon, once mobilised,

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may be exteriorised through a small incision that directly overlies the root of its supplying vessels.^[9] We used the same concept to develop our simplified technique of LRSF that is described below.

PRE-OPERATIVE PREPARATION

Abdominal contrast-enhanced computed tomography (CT) scan with three-dimensional CT-angiography is advisable to clarify vascular anatomy.

POSITIONING OF PATIENT AND PORTS

Positioning of the patient

The patient is placed supine, with right arm at the side.

The surgeon is on the patient's right side; the assistant stays on the surgeon's left side; the nurse and the monitor stay on the patient's left side [Figure 1].

Port-site placement

A 10-mm trocar (U-T) is placed in the midline just above the umbilicus. A 10-mm trocar (RF-T) is placed in the right flank, just medial to the anterior axillary line at the same level of the U-T. A 5-mm trocar (RI-T) is placed in the right iliac fossa, 2 cm below the McBurney's point. A 5-mm trocar is placed in the epigastric midline (EPI-T), 4 cm above the U-T. Then, a 5-mm trocar is placed in the left iliac fossa, mirroring the McBurney's point (LI-T) [Figure 2a].

OPERATIVE STEPS

Anatomy key points

The only artery that will require an intracorporeal ligation is the left colic artery (LCA).

Together with the superior aspect of the inferior mesenteric artery (IMA), from which it originates, the LCA forms the right side of a rectangle, of which the aorta is the base, the duodenojejunal junction (DJJ) is the left side and the inferior mesenteric vein (IMV) is the upper side [Figure 3]. If the peritoneum is incised below the DJJ and above the aortic profile, a window can be opened by lowering the Gerota's fascia from the posterior aspect of the left mesocolon. When deepening this window towards the aortic bifurcation, the superior aspect of the IMA and the LCA is met and can be prepared for a safe division of the LCA at its origin. The 5% chance of an absent LCA should be kept in mind.^[10]

Step 1: Vascular ligation and division of the left colic artery and inferior mesenteric vein

The patient is placed in the Trendelenburg position, the left side inclined upwards. The laparoscope goes through

the RF-T, the U-T and the RI-T are used by the surgeon during the dissection [Figure 2b] and the EPI-T and the LI-T can be used by the assistant.

The greater omentum is placed in the supramesocolic space; the small bowel is placed in the right hypochondriac and lumbar regions, exposing the DJJ. The peritoneum is incised between the IMV and the upper profile of the aorta, from the DJJ to the aortic bifurcation. Starting below the DJJ, a window is opened as described above, detaching by blunt dissection the Gerota's fascia from the left mesocolon, until the left paracolic gutter and the root of the transverse mesocolon at the lower edge of the pancreas are reached [Figure 4a and b]; the left gonadal vessels should be visualised. Dissection proceeds toward the aortic bifurcation until the superior profile of the IMA

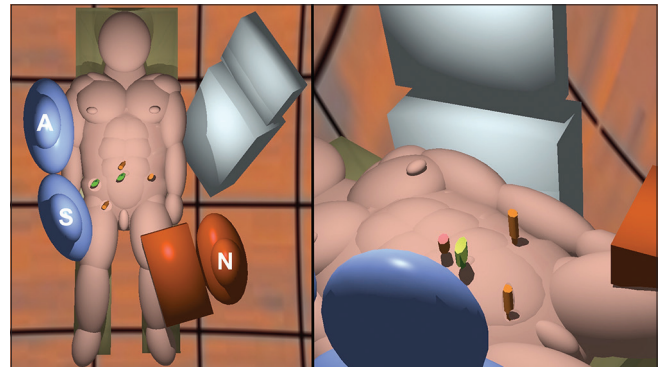


Figure 1: Positioning of the patient

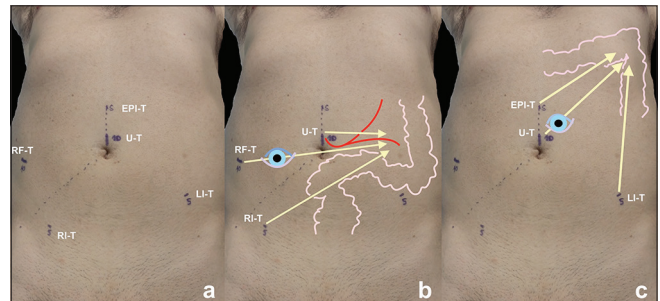


Figure 2: (a) Port-site placement, (b and c) trocar triangulation

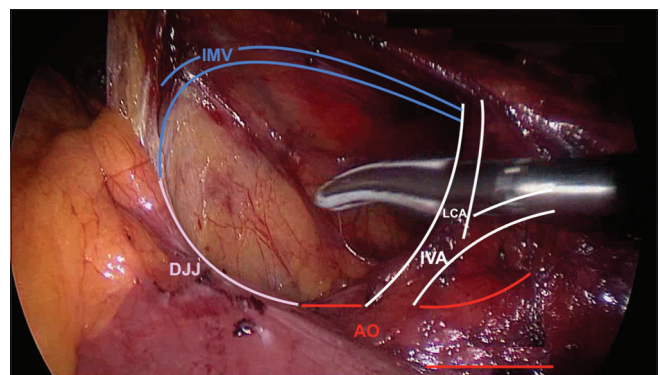


Figure 3: Anatomy key points

is reached [Figure 4c]. The IMA is cleared from lymph nodes and the origin of the LCA is reached and prepared for ligation [Figure 4d]. Before dividing the LCA, the left ureter is visualised in the space between the gonadal vessels and the IMA. If the LCA is absent, the first sigmoid artery can be prepared and divided as well. Finally, the IMV is divided close to the pancreas.

Step 2: Mobilisation of the sigmoid and descending colon

The peritoneum is incised above the external iliac vessels at the left side of the sigmoid colon [Figure 5a]. The left paracolic gutter is incised, and the sigmoid and descending colon are detached until joining the window described above in Step 1 [Figure 5b]. The sigmoid colon is medialised enough when it is completely detached from the left ureter at the pelvic inlet [Figure 5c]. Medialisation of the descending colon proceeds upwards and stops just before the SF [Figure 5d]. We strongly advise not to go further this way into the dissection of the SF.

Step 3: Division of the gastrocolic, splenic and phrenicocolic ligaments

The patient is placed in the reverse Trendelenburg position, the left side inclined upwards. The laparoscope goes through the U-T, and the EPI-T and the LI-T are used by the surgeon during the dissection [Figure 2c]. The RF-T is used by the assistant, to lift the stomach or lower the transverse colon, or by the surgeon, as an alternative to the EPI-T when working at the middle third of the gastrocolic ligament (GL).

Starting from its middle third and proceeding clockwise toward the lower pole of the spleen, the GL is divided below the gastroepiploic arcade and the omental bursa is opened. Lifting the stomach helps during the dissection [Figure 6a]. Downward traction of the greater omentum must be avoided to prevent tearing of the spleen [Figure 6b]; when approaching the spleno-omental adhesions and the splenicocolic ligament, gentle lifting of the spleen is preferred [Figure 6c]. The phrenicocolic ligament is divided clockwise, joining the former dissection at the left paracolic gutter [Figure 6d]. Now, the transverse and descending colon can be pulled downwards and the division of the Gerota's fascia can be completed, detaching the SF from the renal capsule.

Step 4: Dissection of the root of the transverse mesocolon

This final step is achieved lowering the transverse colon and proceeding anticlockwise from the SF alongside

the lower edge of the pancreas [Figure 7a]. The latter is clearly visualised this way and respected [Figure 7b]. The root of the transverse mesocolon is detached from the lower edge of the pancreas and above the DJJ, until the head of the pancreas is encountered [Figure 7c and d]. At this point, the left colon falls medially, and the profile

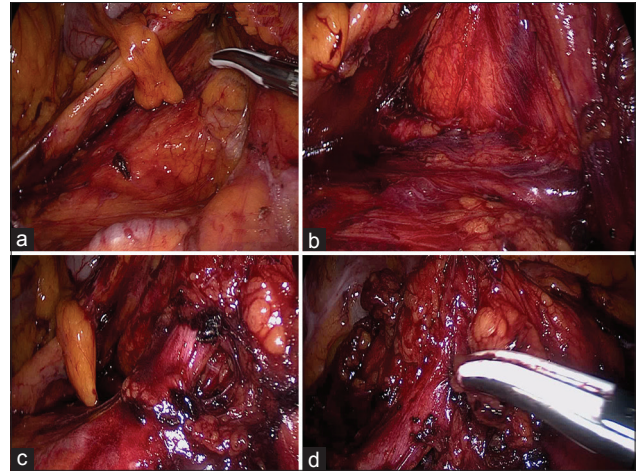


Figure 4: (a and b) Creation of the peritoneal window, (c) preparation of the IMA, (d) preparation of the LCA

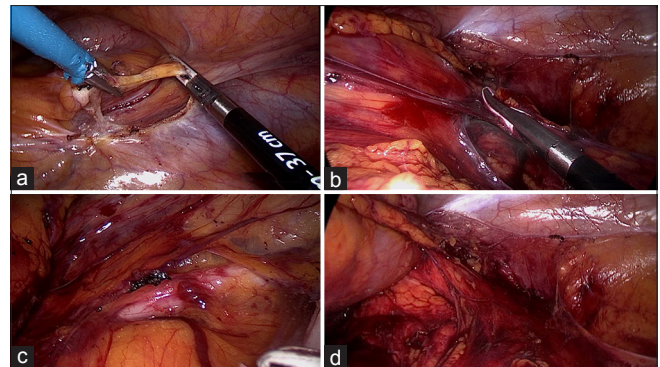


Figure 5: (a) Incision of the left paracolic gutter, (b) conjunction with the peritoneal window, (c) detachment of the sigmoid colon at the pelvic inlet, (d) end of mobilisation of the descending colon

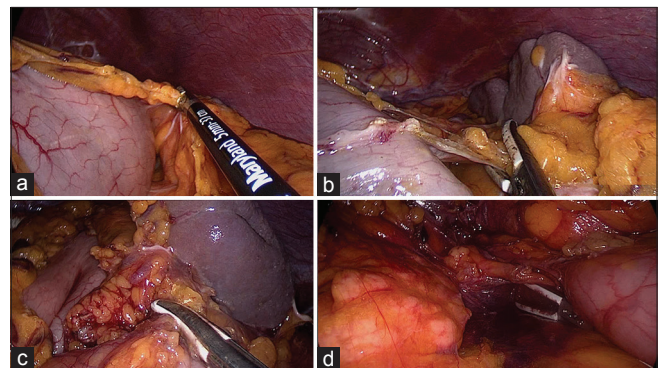


Figure 6: (a and b) Division of the gastrocolic, (c) splenicocolic and (d) phrenicocolic ligaments

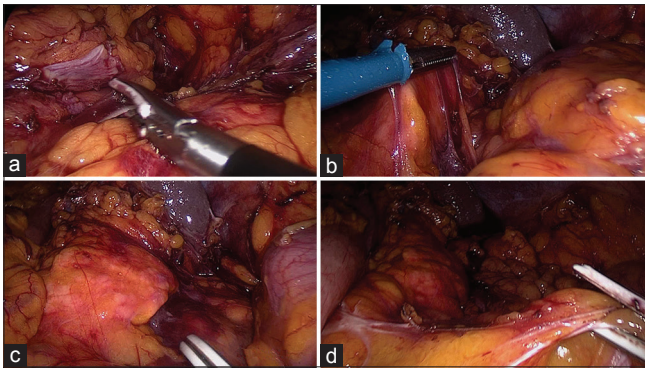


Figure 7: (a and b) Dissection of the root of the transverse mesocolon at the lower edge of the pancreas, (c and d) exposure of the head of the pancreas

of the aorta, the left renal capsule and the left common and external iliac vessels are at sight.

Step 5: Extracorporeal vascular ligation and colic anastomosis

The U-T incision is extended cephalad to join the EPI-T, and the SF is exteriorised [Figure 8a and b]. The colon is divided at least 12 cm above and below the tumour. The colic portion to be resected is pulled upwards, and the transverse mesocolon is divided from its external edge towards the left branch of the middle colic artery (MCA), which is identified by translucency and divided at its origin [Figure 8c and d]. A side-to-side colic anastomosis is performed. A Jackson-Pratt drain, inserted in place of the LI-T, is left near the lower edge of the pancreas, and the incisions are closed.

POST-OPERATIVE CARE

The drain is removed in the 2nd post-operative day if the amylase content is <3 times the upper normal serum value.

CONCLUSION

The uniqueness of the SF is given by its double source of blood supply and lymphatic drainage, at the conjunction between the superior mesenteric and the inferior mesenteric territories. This unique anatomic feature, and the low chance of being engaged in resecting the SF, can make it difficult for surgeons to build their learning curve and to achieve a reliable experience.

Injury to the spleen during mobilisation of the SF and injury to the pancreas or the main trunk of the MCA during division of its left branch are amongst the most feared incidents that can discourage surgeons to attempt an LRSF, instead of an open procedure. Therefore, combining laparoscopic mobilisation of the SF to extracorporeal vascular ligation and bowel anastomosis (the same as in open surgery) could be a more friendly technique to deal with. Moreover, the IMA,

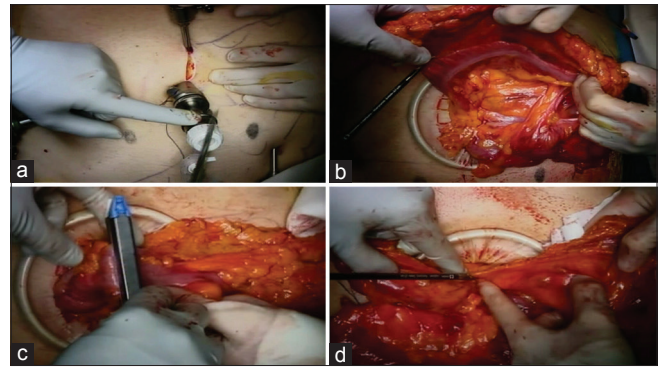


Figure 8: (a) Abdominal incision between the U-T and the EPI-T, (b) exteriorisation and (c) division of the colon, (d) division of the left branch of the MCA

LCA and IMV are pursued as in laparoscopic left colectomy, which is a much more familiar operation.

As the majority of colectomies are still performed by low-volume surgeons, there is a growing agreement that providing local services with adequate surgical education and training could be an effective strategy to improve outcomes and global health. Arming surgeons with simplified and easy-to-learn surgical techniques could be an important step of this strategy.

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Conflicts of interest

There are no conflicts of interest.

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