Transverse colectomy using indocyanine green with flexure-mobilization first approach

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Abstract: Laparoscopic transverse colectomy is technically demanding because of the non-standardized surgical procedure and complicated vascular anatomy. To perform transverse colectomy, both flexures should be mobilized, and lymph node dissection around the middle colic artery should be performed. Several surgical videos have introduced middle colic artery dissection as the first approach with both flexures being subsequently mobilized. Sometimes, however, flexure mobilization can be difficult after lymph node dissection around the middle colic vessels due to an unfamiliar surgical plane, while the direct approach to the middle colic artery is also technically challenging because of anatomical difficulty. Indocyanine green (ICG) is widely used in the surgical field not only for detecting lymph nodes and perfusion but also for clarifying anatomical structures like the vascular and biliary systems. Thus, the authors here detail a laparoscopic transverse colectomy using ICG and both flexure-mobilization first approach.

Keywords: Laparoscopic transverse colectomy; indocyanine green (ICG); transverse colon cancer

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Introduction

Laparoscopic transverse colectomy is technically challenging, not just because of the low incidence of mid-transverse colon cancer, but also because the surgical procedure has yet to be standardized.

Although the mid-transverse colon is only supplied by the middle colic artery, the mesentery of the transverse colon is close to the superior mesenteric artery (SMA) and vein (SMV), the greater omentum, the pancreas, and the lesser sac. Due to these anatomical characteristics, the extent of lymph node dissection for transverse colon cancers should not only include the middle colic artery but also the inferior border of the pancreas, the middle colic vessels, the SMA and vein, and the greater omentum. Technically, dissection around the middle colic artery is demanding because of the complicated vascular anatomy and anatomical variations.

Nowadays, indocyanine green (ICG) is widely used in many surgical fields. The main purpose of using ICG is to determine the flow of lymphatics and the status of perfusion (1,2). ICG is also very helpful in clarifying complicated anatomical structures including the biliary system and vascular system (3,4). Therefore, it follows that using ICG in complicated vascular anatomy around the middle colic artery and SMA would be very helpful to make the anatomy clear.

Both hepatic and splenic flexure mobilizations are essential to achieving tension-free anastomosis in transverse colectomy. Many surgeons prefer to mobilize both flexures after completing lymph node dissection, but sometimes identifying the surgical plane is challenging because the surgical plane for both flexure mobilizations from the site of middle colic vessels can be unfamiliar and complicated.

The aim of this video (*Figure 1*) is to introduce a standardized flexure-mobilization first approach for laparoscopic transverse colectomy with the use of ICG for

Figure 1 Transverse colectomy using ICG with flexure-mobilization first approach (5). ICG, indocyanine green. Available online: http://www.asvide.com/watch/32911

clarifying the vascular anatomy.

Operative technique

The patient was a 63-year-old male with pathologically proven mid-transverse colon cancer. CT showed clinical T3N0M0, and that the right and left branches of the middle colic artery were separately arising from the SMA.

Port placement

Under general anesthesia, 10 mm ports were inserted into the umbilicus, and 5 mm ports were placed at the right upper quadrant (RUQ), right lower quadrant (RLQ), left upper quadrant (LUQ), and left lower quadrant (LLQ).

Right mesocolon dissection

The patient was placed in Trendelenburg with left tilting position. The surgeon and scope operator stood on the left side of the patient. First, dissection was started at the ileocecal peritoneum, and the right mesocolon was dissected from the retroperitoneum until reaching the hepatic flexure. During right mesocolic dissection, care should be taken not to injure the duodenum and ureter.

Splenic flexure take-down

The patient was placed in the Trendelenburg with right tilting position. The surgeons and scope operator moved from the left side of the patient to the right side. Dissection was performed around the IMV, Toldt's fascia was identified, and the left mesocolon was dissected from the retroperitoneum. Next, the transverse mesocolon was completely divided from the inferior border of the pancreas using an inferior approach, and the lesser sac was entered. Finally, the lateral peritoneal attachment and gastrocolic ligament were divided, concluding the splenic flexure mobilization.

Lymph node dissection

The patient was once again placed in Trendelenburg with left tilting position. The surgeon and scope operator moved from the right side of the patient to the left side. After making traction of the transverse mesocolon, the dissection area was marked by monopolar electrosurgery. Just after the start of mesocolon dissection, ICG was injected into the vein to clarify the vascular anatomy of the middle colic artery. After identification of the middle colic artery, lymph node dissection was then performed, and the middle colic vessels were ligated at the site of origin.

Specimen extraction and extra-corporeal anastomosis

The umbilical port site was extended, and extra-corporeal anastomosis was performed. Before completing anastomosis, the perfusion status was checked by ICG.

Description of the operation video*

First, we identified the tumor location, where we performed colonoscopic tattooing before the surgery. Dissection was started at the ileocecal peritoneal fold. We identified the white line of Toldt's fascia, and the right mesocolon was dissected from the retroperitoneum. At this time, the operator and scopist were located on the left side of the patient. We continued dissection until reaching the hepatic flexure. In this wax, way the right mesocolon was fully mobilized.

After this, we identified the IMV and dissected below it. We identified Toldt's fascia and the left mesocolon was dissected from the retroperitoneum. Meanwhile, the

* This description is intended to help clarify the surgical procedure of the video, and is recommended as accompaniment to viewing the video file.

operator and scopist moved on the right side of the patient. We the focused on the pancreas and divided the transverse mesocolon from the inferior border of the pancreas through the inferior approach. We continued dissection until reaching the lesser sac and could then enter the lesser sac.

We then dissected the descending colon lateral attachment, and the left gastro-colic ligament was divided. This was the last step of the splenic flexure.

After this, we started lymph node dissection. After making traction of the transverse mesocolon, the dissection area was marked by monopolar electro-surgery. At this time, the operator moved again to the left side of the patient. Next, we dissected around the middle colic artery. We found the SMV with the SMA on its left side.

After some dissection, ICG was injected by intravenous route. After ICG injection, the vascular structure became more apparent. As confirmed by pre-operative CT, the right and left branches of the middle colic artery were arising separately from the SMA. The right and left branches of the middle colic artery were dissected and ligated at their origin site. Next, accessory right colic vein was ligated. Next, gastrocolic trunk of Henle was identified and ligated. In the final phase, the middle colic vein was dissected and ligated, and we continued dissection of the transverse mesocolon. The omentum was divided along the lower margin of the gastroepiploic vessel, and the remainder of the gastro-colic ligament was separated. The remaining transverse mesocolon was dissected from the superior border of the pancreas.

At this stage, the pancreas was completely separated from the transverse mesocolon. This is the surgical view of D3 lymph node dissection; these are the duodenum, pancreas head, SMV, and SMA.

We trimmed the transverse mesocolon toward the T-colon resection site, distally and proximally, and extracorporeal anastomosis was performed. Before completing the anastomosis, the perfusion status was checked by ICG. At last, after anastomosis, the perfusion status was also confirmed by ICG.

Surgical outcome

The operation time was 190 minutes with an estimated blood loss of 50 cc. There were no intra-operative complications. Post-operative management was performed by enhanced recovery after surgery (ERAS) protocol, and the patient was discharged without any complications on the second postoperative day. The final pathology was pT2N1b(3/19)M0.

Comments

We consider the standardized mobilization-first approach of transverse colectomy to be safe and feasible, and the use of ICG to be helpful in clarifying the vascular anatomy.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/ales.2019.07.07). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013).Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

References

1. Currie AC, Brigic A, Thomas-Gibson S, et al. A pilot study to assess near infrared laparoscopy with indocyanine green (ICG) for intraoperative sentinel lymph node mapping in early colon cancer. Eur J Surg Oncol 2017;43:2044-51.
2. Kawada K, Hasegawa S, Wada T, et al. Evaluation of intestinal perfusion by ICG fluorescence imaging in laparoscopic colorectal surgery with DST anastomosis.

Surg Endosc 2017;31:1061-9.
3. Majlesara A, Golriz M, Hafezi M, et al. Indocyanine green fluorescence imaging in hepatobiliary surgery. Photodiagnosis Photodyn Ther 2017;17:208-15.
4. Sadowski SM, Vidal Fortuny J, Triponez F. A reappraisal of vascular anatomy of the parathyroid gland based on fluorescence techniques. Gland Surg 2017;6:S30-7.
5. Bae JH, Kim JG, Lee YS. Transverse colectomy using ICG with flexure-mobilization first approach. Asvide 2019;6:226. Available online: http://www.asvide.com/watch/32911

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