Introduction

Surgical strategies of complete mesocolic excision (CME) includes two concepts based on embryonic anatomy and surgical oncology: sharp separation of the mesocolic visceral and parietal plane; radical lymph nodes dissection and ligation colon-feeding vessels at their roots for a larger range of longitudinal enterotomy (1). The feasibility and survival benefit of CME for the patients with colon cancer has been demonstrated recent years (2-5). Lateral and medial accesses are two modes of CME procedure. Conventional laparoscopic CME utilizes lateral access. Previous study has indicated that laparoscopic CME via medial access and traditional colectomy are technically comparative (4).

Completely medial approach (CMA) and hybrid medial approach (HMA) are two different approaches for medial access proposed by our medical center. CMA involves several bottom-to-top approaches including the entrance of intermesenteric space (IMS) via transverse retrocolic space (TRCS), the dissection of the middle colic vessels (MCV), the gastrocolic trunk of Henle (Henle trunk, HT) and the inferior margin of pancreas. Previous research has demonstrated that CMA is technically feasible, and is the better choice for right hemicolectomy (6). The main goal of this article is to illustrate the surgical procedures and anatomic strategies of CMA in details based on this case.

Method

Patients with clinical stage II, III right-hemi colon cancer and whose important vessels in the surgical area are free from the invasion of tumor can be the candidate for CMA. Patients should have a well tolerability for laparoscopic
surgery, and without severe cardiopulmonary insufficiency. In the present video (Figure 1), the patient is a 45 years old woman who was diagnosed adenocarcinoma of ascending colon proximal to hepatic flexure by coloscope and histological test (Figure 2). The tumor stage was assessed to be cT4N1M0 by CT scan preoperation (Figure 3).

Surgical position

The patient was placed in supine position after the administration of general anesthesia, with both legs split and arms folded, and at a head-down left side tilt position. The surgeon stood on the left side of the patient, while the first assistant was on the right. The camera operator was positioned between two legs of the patient.

Surgical procedures

Pneumoperitoneum maintained not higher than 12 mmHg, and was built via the Veress needle. Five trocars were required in this surgery. One 10-mm trocar was placed on the upper left abdomen; the other was placed at the infraurmibal area with an inserted 30-degree laparoscope. One 5-mm trocar was on the lower left abdomen, and another two 5-mm trocars were on the upper and lower right abdomen respectively (Figure 4).

The surgical procedure of CMA starts at the ileocolic vessel and proceeds along superior mesenteric vein (SMV) to enter the TRCS from bottom to top. A bottom-to-top fashion is used to extend from pancreatic inferior edge. Middle colon vessels and the HT were dissected afterwards. TRCS is extended laterally to commute RRCS and superiorly to enter the IMS. Extending the inborn surgical plains to avoid mesocolon from defection. The surgery was conducted as follow (Figures 4-13).

Results

It took 128 min to finish this surgery, intraoperative bleeding was about 10 mL. Nineteen central lymph nodes were retrieved. The pathology outcome after the surgery shows it the adenocarcinoma staging T4N1M0. Besides, the time to first passing flatus and discharge were 2 and 12 days respectively.

Discussion

Anatomic strategies of CMA

Laparoscopic CME via medial access completes the dissection of surgical trunk and the ligation of central vessel to mobilize colon, involving an approach of inferior
Figure 4  Trocars position.

Figure 5  Initiation: the anatomic projection of ileocolic vessels (ICA and ICV) served as the initiation.

Figure 6  Identification and extension of RRCS: sharp separation of the mesocolic plane. The visceral plane of mesocolon and prerenal fascia (PRF) remains intact.

Figure 7  Identification of superior mesenteric vessels (SMV/SMA) and ileocolic vessels (ICV/ICA), lymph nodes dissection at the root of these vessels.

Figure 8  Identification and extension of the TRCS: TRCS is extended to commute with the RRCS. Proceed along the SMV/SMA or surgical trunk to conduct the ligation of right colic vessels (RCA/RCV) and right branch of middle colic artery (RMCA).

Figure 9  Ligation of Henle trunk (HT): HT’s branches are of high variability. In this case, HT consists of RCV, ASPDV, RGEV and MCV.
medial to superior lateral. Three avascular spaces (TRCS, RRCS, and IMS), and one surgical plane consists of gut, prerenal fascia (PRF) and nearby structure is essential to the mobilization of right-hemi colon (6).

IMS is located superior to the transverse mesocolon and posterior to the greater omentum. It communicates with the TRCS via the root of the transverse mesocolon. Thus, the entrance of the IMS is necessary for the mobilization of right-hemi colon. CMA requires a bottom-to-top approach during the mobilization, which has the advantage of fewer vessel-related complications and reducing operation time.

**Difficulties and obstacles in CMA to the CME**

**Recognize the TRCS**

The TRCS is an inborn surgical space located posterior to the transverse mesocolon and anterior to the pancreatic inferior margin. We propose two ways to identify the TRCS. First, SMV can serve as a landmark for TRCS. In CMA, the range to dissect mesocolon can be clearly defined by the surface of SMV sheath, and the entrance of TRCS can be achieved after dissection. Second, TRCS can be successfully entered by superior extension of RRCS by dissecting the ventral part of the pancreas and the horizontal portion of duodenum.

**“Climbing” the pancreatic inferior edge**

Hemorrhage of pancreatic injuries is a potential complication of CMA. Therefore, it’s vital to recognize the pancreatic inferior edge and the timing for “climbing”. We regard emergence of the HT as the symbol of close to the pancreatic inferior edge. Meanwhile, the extension of the avascular space should be converted into a climbing procedure from bottom to top. Besides, it’s also feasible to dissect along the left margin of right gastroepiploic vein (RGEV) get entrance to IMS.

**Conclusions**

Laparoscopic CME for CMA is safe, technically feasible
and highly recommended for the tumor locates in the right-hemi colon. Whereas, it's also a difficult surgery that should be conducted in an experienced medical center.

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Footnote

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References