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Vascular variations during laparoscopic right hemicolectomy : a case report

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Abstract

Vascular variations in the right colon are frequently observed in surgery. Surgeons face certain challenges as a result, particularly those who are young. Incorrect blood artery ligation and resection, as well as a failure to recognize vascular fluctuations in time during surgery, may result in unnecessary bleeding and associated consequences. This article reviews a case of laparoscopic right hemicolectomy (LRHC), describes its vascular variations, and combines relevant literature to warn of the problems that may be encountered in this type of surgery.

Keywords

Vascular Variation, Surgery, Superior mesenteric artery, Superior mesenteric vein.

1. Introduction

Colorectal cancer (CRC) is one of the major new cancers in the world, and its incidence is ranked third, and the mortality rate can reach the second[1]. 40-45% of CRCs occur on the right side[2]. The cornerstone of treatment for colon cancer that is initially non-metastatic is still surgery. Complete mesocolic excision (CME), first proposed by Hohenberger in 2009, has gradually been accepted by gastrointestinal surgery experts[3]. Central vascular ligation (CVL) and CME are typically required for colon resections carried out in accordance with the CME concept. The main blood vessels that need to be cut in a classic right hemicolectomy include ileocolic artery (ICA), right colic artery (RCA), right branch of middle colic artery (MCA), ileocolic vein (ICV), right colic vein (RCV) and right branch of middle colic vein (MCV). According to the findings of earlier studies, the above blood vessels' anatomical structure may differ. The majority of these investigations have concentrated on the differences in the right colic vessels, particularly the morphological differences of the gastrocolic trunk of Henle (GTH)[7, 8] and the superior mesenteric artery (SMA) and its branches[4-6]. However, few studies have focused on the relationship between SMA and SMV.

Vascular variation is crucial during surgery and could prevent the procedure from going as smoothly as it could. Cutting off a blood vessel by mistake may even lead to irreversible consequences[9]. Therefore, this study is to warn of the challenges that vascular variation may pose in surgery and to demonstrate the significance of carefully dissecting and identifying blood arteries during surgery through a case of vascular variation.

2. Case report

A 54-year-old male patient was admitted to the hospital with abdominal pain and black stools for more than 2 weeks. Two weeks before admission, the patient had lower abdominal pain without obvious cause. The pain was paroxysmal and aggravated, but the degree was still tolerable. It was accompanied by watery black stools. The patient was in good health and had

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no history of chronic diseases such as hypertension, diabetes, and coronary heart disease. The patient first visited a local hospital. During colonoscopy, multiple colon polyps and annular masses in the ascending colon were unexpectedly found. The endoscopist took pathological specimens from the rectum and ascending colon for pathological examination. The results of pathological examination showed that the specimen in the rectum was a tubular adenoma, but unfortunately the specimen in the ascending colon was a moderately differentiated adenocarcinoma. As the lower-level hospital did not have the surgical capability, the patient, accompanied by his family, came to our hospital for further treatment. A physical examination was performed on the patient upon admission, and the patient was found to be anemic, with a heart rate of 77 bpm and a blood pressure of 134/79 mmHg. The patient felt slight pain when the right side of their abdomen was palpated, but there was no discernible tumor there. Laboratory investigations revealed that the patient was anemic, with a hemoglobin level of 87.2 g/L, and no significant increase in tumor markers. After completing the preoperative evaluation, we considered the patient's overall condition to be acceptable and planned to perform a LRHC. After getting the patient's informed consent, the procedure was planned as soon as feasible. When manipulating blood vessels during surgery, the RCV was first found and cut. Then it was found that the SMA went around the back of the SMV and crossed with the SMV, forming an X shape (Fig. 1). For this reason, the dissection of the RCA was not smoothly. Fortunately, after careful dissection, the RCA was finally found and severed (Fig. 2). We discovered during the ensuing surgery that the MCV drained into the GTH rather than the SMV (Fig. 3). Except for the two vascular variations mentioned above, which brought some obstacles to the operation, the other steps of the operation were carried out seamless. The postoperative pathological examination results were consistent with the preoperative colonoscopy pathological results. After the operation, the patient was given perioperative treatment under the guidance of the concept of accelerated recovery, and the patient recovered smoothly without obvious complications. After discharge, the patient returned to the hospital regularly for follow-up and postoperative adjuvant chemotherapy.

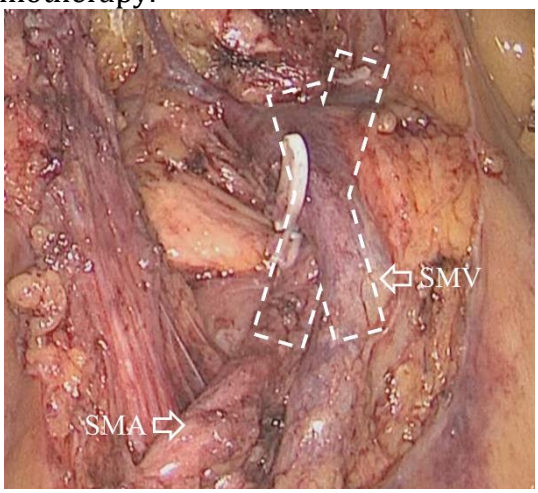

Fig. 1 Intraoperative view demonstrates an X-shaped relationship between the superior mesenteric artery (SMA) and the superior mesenteric vein (SMV).

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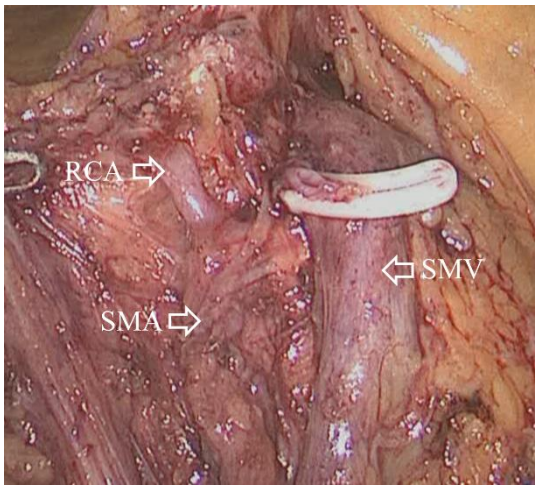

Fig. 2 Intraoperative view demonstrates that the right colic artery (RCA) branched off from the superior mesenteric artery (SMA).

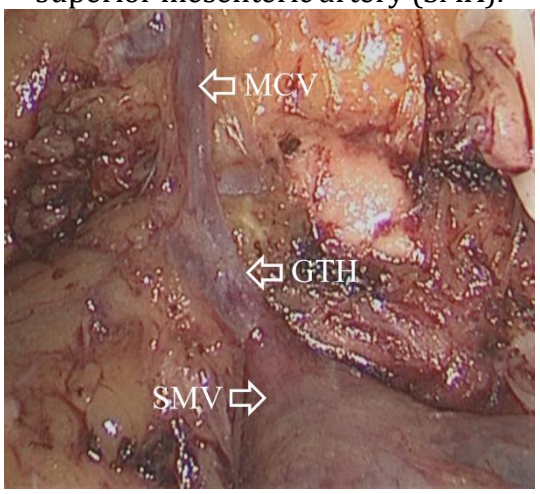

Fig. 3 Intraoperative view demonstrates that the middle colic vein (MCV) drained into the gastrocolic trunk of Henle (GTH).

3. Discussion

Laparoscopic surgery is widely used in gastrointestinal surgery because of its unique advantages and good short-term efficacy, which is not inferior to traditional laparotomy[10]. There are three commonly used surgical approaches, including medial to lateral (MtL) approach, lateral to medial (LtM) approach and cranial to caudal (CtC) approach. All three surgical approaches can effectively and safely complete LRHC[11]. The CtC approach was chosen for surgery in this case report.

Because of its intricate anatomical features, LRHC presents significant hurdles for gastrointestinal surgeons, particularly initial surgeons with limited experience[12]. Unquestionably, a key factor in determining whether surgery is successful or not is how to locate and ligate the central blood arteries. Many previous studies have summarized and described the vascular variations during right hemicolectomy. The kind of GTH is one of the most important factors. The GTH is defined as the confluence of the right gastro-epiploic vein (RGEV) and the antero-superior pancreato-duodenal vein (ASPDV). Other veins sometimes drain into the GTH, including the RCV, superior right colic vein (sRCV), MCV, accessory middle colic vein (aMCV), and very rarely, the ICV[13-15]. According to the number of colic veins entering the GTH, it can be divided into four types: 0, Ⅰ, Ⅱ, and Ⅲ[16]. The patient's MCV was discovered to drain into the GTH in this instance, which is a type Ⅰ. During LRHC, the GTH

might be a crucial anatomical landmark for detecting MCV. Additionally, it has to be better identified and dissected because it is prone to bleeding during surgery.

On the other hand, It is often accepted that the SMV and SMA run together and that the SMA is typically on the left side of the SMV[17]. In contrast to the norm, Wu et al. discovered that in a small number of cases, the SMA rarely appears to the right of the SMV[18]. In addition, Landolsi et al. found that the SMA and SMV were found to be accompanied by an "X"-shaped variant[19]. Similarly, Du et al. found that the ICA sometimes has two branches and there is a crossing of the SMA and SMV[20]. Contrary to the previous research, we discovered that in this case, although the SMA intersects the SMV, it is situated behind it rather than in front of it. Anatomical variations of the SMA and SMV can be the most serious and life-threatening complications during right hemicolectomy[21]. As a result, it is very crucial to dissect blood vessels in a predictable way during surgery.

An understanding of anatomy is essential for performing surgery at the root of the mesentery. Initially, cadaveric dissection was typically the only method that allowed for a systematic understanding of the morphology of the mesenteric arteries. Researchers have recently employed novel techniques including preoperative enhanced CT[22, 23] and preoperative angiography[24] to display the morphology of mesenteric arteries in a variety of dimensions and approaches. Abdominal CT scans are frequently performed on CRC patients before surgery, although regular angiography is rarely performed. Therefore, the vascular structure may be known beforehand and vascular damage can be minimized during surgery to prevent harm to the intestinal blood supply by interpreting imaging pictures prior to surgery, utilizing laparoscopic technology, and combining this with three-dimensional reconstruction technology. To a certain degree, it can also reduce the operation time. Additionally, if required, vascular angiography can be carried out prior to surgery. This will lessen the likelihood of issues from vascular variances and more intuitively display the abdomen vascular anatomy.

4. Conclusion

Correct vascular ligation is a critical step in right hemicolectomy. Understanding the patient's vascular status by reviewing previous cases and preoperative examinations can reduce adverse consequences caused by vascular variations. This case can provide surgeons with a deeper understanding of vascular variations.

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