



Case report

Causes and management of bleeding during laparoscopic colorectal cancer surgery

Ming Xu, Weiqiang Wu, Zengqiang Yang, Feng Gao*

*Correspondence: clarency@163.com.

Department of Colorectal and Anal Surgery, Lanzhou General Hospital, Lanzhou, Gansu Province, China

Abstract: In this paper, the causes of bleeding during laparoscopic colorectal surgery and the measures to solve it are discussed. 386 cases of laparoscopic colorectal cancer surgery in our hospital from January to December 2015 were selected. There were 17 cases of bleeding during surgery, which accounted for 4.4% of the total amount. 2 cases were converted to laparotomy, and 15 cases were surgery via laparoscopy. In the surgical process, improper surgery, lack of good laparoscopic anatomical structure of the cognitive level, and congenital anatomic variation may have caused the accidental bleeding during surgery. Corresponding measures should be taken to stop accidental bleeding.

Keywords: Laparoscope; Colorectal cancer surgery; Causes of bleeding; Processing strategy

Citation: Xu M, Wu WQ, Yang ZQ, Gao F. Causes and management of bleeding during laparoscopic colorectal cancer surgery. *Rep. Clin. Stud. Med.* **2019; 1(1):** - . <http://dx.doi.org/10.18282/rasm.v1.i1.26>.

Received: 20th Jan. 2019

Accepted: 21th Mar. 2019

Online: 31th Mar. 2019

Introduction

The clinical application of laparoscopic surgery cases is increasing and laparoscopic colorectal surgery has also been widely recognized. Accidental bleeding is one of the most common complications in a colorectal cancer surgery. It is also the most major cause of conversion to open surgery. Consequences will be very serious if treatment is not timely. Therefore, it is a basic requirement for every clinician to effectively master the method of hemostasis in laparoscopic colorectal cancer surgery.

Data

In this study, we selected 17 cases of accidental bleeding during laparoscopic colorectal cancer surgery, including 11 males and 6 females (aged 52-81, 63 on average). The main symptoms were defecate change (7 cases), weight loss (4 cases), hematochezia (3 cases), abdominal distension (1 case), and no obvious symptoms (2 cases). There were 5 cases showing positive signs such as abdominal mass, and 12 cases showing no positive signs. The tumor was located in the cecum (1 case), ascending colon (3 cases), descending colon (3 cases), sigmoid colon (3 cases), or rectum (7 cases). There was 1 case of clinical stage I, 9 cases of stage II, and 7 cases of stage III. Colonoscopy was performed on 1 case of adenocarcinoma.

Methods

All patients underwent standard laparoscopic radical resection of colorectal cancer. Any accidental bleeding of more than 100 mL was recorded, causes analyzed and countermeasures summarized.

Statistical methods

The results were analyzed using SPSS v16.0, measurement data using mean \pm standard deviation ($\bar{x} \pm s$); count data were expressed as a percentage and were compared using χ^2 test. Intraoperative unexpected bleeding was the dependent variable and patients with clinical data and possible hemorrhage factors were independent variables. Using multivariate logistic regression analysis, $P < 0.05$ was considered statistically significant.

Results

2 cases of laparoscopic surgery were converted to open surgery. The first was a case of rectal cancer in the internal perineal vein injury bleeding (about 350 mL). The bleeding became more turbulent and was converted to open surgery to stop the bleeding. The second was a case of ascending colon cancer, right colonic artery hemorrhage laparotomy hemostasis. The rest 15 cases of intraoperative bleeding were under laparoscopic hemostasis. All patients recovered well after surgery, and exhibited no other serious complications. Surgery time was 2.5-4.5 h (3.2 h on average). The total amount of bleeding during operation was 150-400 mL (260 mL on average). Postoperative recovery time was 2-7 days (3.6 days on average). Postoperative hospital stay was 6-12 days (8.2 days on average). There was 1 case of postoperative pathological Duck A stage, 9 cases of Duck B stage, and 7 cases of Duck C stage. *Table 1* listed the cause of bleeding and the method of hemostasis.

Table 1. Causes of bleeding and the methods of hemostasis

Cause and location of bleeding	The number of cases	Hemostasis method
Treatment failure of large vessels	---	---
Right colic artery	1	Open hemostasis
Right branch of middle colic artery	2	Gauze packing with gauze + titanium clip Gauze packing and energy cutter head
Inferior mesenteric artery	2	Gauze packing with gauze + titanium clip
Left colon blood vessel	3	Titanium clip Gauze packing with gauze + titanium clip
Other branches of the sigmoid or inferior mesenteric artery	4	Gauze packing with gauze + titanium clip Gauze packing and energy cutter head Energy cutter head Titanium clip
Surgical injury	---	---
Right colic artery	1	Gauze packing + energy knife head + titanium clip
Left internal jugular vein	3	Open hemostasis Gauze packing under microscope Gauze packing with gauze + titanium clip
Anterior sacral vein	1	Gauze packing under microscope

Discussion

Due to the characteristics of laparoscopic surgery, it is prone to bleeding. According to published reports, the average frequency of accidental bleeding from laparoscopic colorectal cancer surgery is 6.6 times. As the laparoscopic vision is very small, if the hemorrhage amount is large, vision will be quickly occupied. If it is under the pneumoperitoneum,

negative pressure suction can quickly reduce the pneumoperitoneum space or lead to the space disappearing completely. Any operation under these conditions will be difficult. In addition, general laparoscopic monitors are two-dimensional, lacking depth. In the process of hemostasis, because it is not manually directed, the surgery would eventually lead to the conversion to laparotomy.

Causes of laparoscopic colorectal cancer surgery

Bleeding caused by improper operation

In the process of operation, due to bleeding caused by improper operation, accidents could occur from time to time. In the present study, in a case of ascending colon cancer laparoscopic resection, the left intestinal forceps used to pull the mesenteric unexpectedly pulled the right colic artery nylon clip off, leading to a massive hemorrhage and was later converted to an open surgery. In 3 cases of laparoscopic rectal cancer radical surgery, the left pudendal bleeding was due to the middle rectal tumor. An ultrasound knife isolated rectal ligaments, due to the lever, it caused the tumor body lift, resulting in venous injury. These cases of bleeding eventually led to laparotomy. In a case of the inferior mesenteric artery hemorrhage, the vascular sheath mistakenly separated as the trunk clamping and the true trunk was cut off, leading to massive hemorrhaging.

Thermal damage

In the laparoscopic surgery, doctors use a knife that is an ultrasonic scalpel and another high frequency electric knife; the two knives' lateral thermal damage range is 1 mm and 4 mm with a longitudinal thermal damage depth reaching up to 4 mm. Therefore, in order to prevent bleeding during surgical procedures, protection around the cutter head should be strengthened. The working knife heading outward during the cutting procedure and surgery around the blood vessels should be avoided. However, it is worth noting that in laparoscopic surgery for colorectal cancer, intraoperative bleeding often occurs due to thermal damage; especially those carried by beginners. In addition, when cutting small blood vessels, the residual vascular wall would be injured and bleeding if not fully clamped. Therefore, in the process of a surgery, the entire vessel must be completely closed, and the breakwater technology should be used.

Anatomical variations caused by congenital or tumor factors

In this study, accidental bleeding occurred during a case of laparoscopic surgery for rectal cancer. The left colic artery was located relatively high and the inferior mesenteric arterial sheath was damaged during the separation process, which eventually led to accidental bleeding. After the accurate processing, successful hemostasis was achieved. In a case of ascending colon cancer laparoscopic right hemicolectomy resection, due to the roots of mesenteric vessels metastasis lymph nodes, the superior mesenteric forward vein moved to the top and was almost removed. During the final separation and resection of the metastatic lymph nodes, the blood vessels should be clearly visible to avoid the occurrence of accidental bleeding.

Strategies of bleeding during laparoscopic colorectal cancer surgery

A qualified colorectal surgeon must be familiar with the various measures to deal with bleeding in laparoscopic surgery when confronted with an unexpected bleeding, and effectively take measures.

Visibility

During surgery, visible bleeding position is the key to successful hemostasis under laparoscopy. Whenever bleeding occurs, the whole surgery team must cooperate to maintain calm and not blindly rush to stop the bleeding, but to ensure an effective pull to reveal the bleeding site. The left hand holding the suction device is used to find the bleeding wound and the bleeding point.

Suture

If the blood vessel wall is bleeding or difficult to stop bleeding due to the location, laparoscopic suture hemostasis is to be used. If the vascular wall bleeding can be blocked via clips or removed with an aspirator when bleeding points are exposed, sutures are not necessary. However, the requirements for laparoscopic suture operations are particularly high, not only requiring superb suturing and knotting techniques, but also requiring patients having good psychological quality and good team cooperation, failing which would lead to expanding blood spots.

Energy surgical technique

These include electric knives, electric coagulation sticks, ultrasonic knives, LigaSure, argon knives, and other equipment. Electric knives, electric coagulation rods, and argon knives are mainly used in small blood vessels hemorrhage, liver, spleen, substantive bleeding organs and large wounds. In the process of hemostasis, the wound is drained either by using gauze or a suction device. Ultrasonic knives and LigaSure can be used when blood vessels with a diameter of 5-7 mm are involved because their heat radiation ranges are small. In fact, these two energy equipment are used when dealing with accidental bleeding of larger blood vessels. In our experience, it is safe to administer LigaSure treatment on 3 mm diameter arteries and a diameter of less than 2 mm would require the application of breakwater technology. The proximal end of the inferior mesenteric artery, the left main artery, and the proximal end of the main artery need to be treated with exact vascular clamps; large blood vessel hemorrhage within the scope of resection can be treated with energy surgery. Good results can be obtained by applying electric coagulation in the active bleeding or small blood vessel bleeding.

Bleeding from large blood vessels

During surgery, if arteries and other large vessels bleed, the bleeding is more ferocious. Using hemostatic gauze will narrow the laparoscopic vision, sustain the negative suction pressure, reduce the intraperitoneal space, and prevent surgery to continue. Surgery technique would then convert to laparotomy, under direct vision to stop the bleeding. If bleeding could not be controlled with gauze and other techniques failed to achieve a complete hemostasis, the surgery would have to be converted to laparotomy.

In summary, in laparoscopic colorectal surgery, it is most important to prevent the occurrence of bleeding. Detailed vascular anatomy, accurate processing of vascular anatomical variation and gentle manipulation can effectively avoid it. Skillful laparoscopic operation and stable psychological quality are the key to resorving accidents.

Conflict of interest

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

Reference

1. Yang P, Peng X, Deng JZ, Zhou YH, Li ZC, *et al.* Analysis of early reoperation after laparoscopic colorectal cancer surgery. *J Pract Med* 2013; 29(14): 2350-2352.
2. Zeng Z. Comparative analysis of the clinical effect of laparoscopic rectal cancer surgery and traditional open surgery for rectal cancer. *Chin Mod Med* 2013; 20(22): 25-26.
3. Hu DH, Fu ZX, Li SK. Meta-analysis of short-term efficacy and safety after laparoscopic resection for colorectal cancer. *Chongqing Med* 2009; 38(14): 1774-1776.
4. Chen J, Wu P, Jia DM. New progress of laparoscopic surgery for colorectal cancer. *Chin J Surg Oncol* 2013; 5(6): 383-386.