Retrospective Analysis of the Influence of Closure of Mesenteric Defects on Complications During Laparoscopic Radical Resection of Right Colon Cancer

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Research article

Keywords: mesenteric defects, complications, right-side colectomy, laparoscopic colectomy

Posted Date: November 4th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-99973/v1>

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Abstract

Background: The influence of closure of mesenteric defects during laparoscopic radical resection of right colon cancer is still controversial.

Methods: A total of 66 patients who were received laparoscopic radical resection of right colon cancer in our hospital were enrolled. The statistics of complications, included Postoperative Length of Stay, Exhaust time after surgery, Defecation time after surgery, Intraoperative blood loss, Length of incision, Length of operation, Lung infection, Abdominal infection, Anastomotic bleeding and Anastomotic leakage were examined.

Results: The mesenteric defects were closed in 35 patients in Clousure group and not closed in 31 patients in Nonclosure group. The difference between two group included Total complication, Postoperative length of stay, Exhaust time after surgery, Defecation time after surgery, Length of operation, Lung infection, Abdominal infection, Anastomotic bleeding and Anastomotic leakage are not significant ($p>0.05$).

Conclusion: Whether to close the mesenteric defects during laparoscopic radical resection of right colon cancer does not affect the rate of comlications.

Background

Colorectal cancer is one of the common malignant tumors, with the third highest incidence rate and the fourth highest mortality rate worldwide(1). According to data from the National Cancer Center of China, the incidence and mortality of colorectal cancer in our country are gradually increasing(2). Although in recent years, breakthroughs have been made in the treatment of colorectal cancer, radical surgery is still the first choice for improving survival and quality of life of patients with resectable and resectable colorectal cancer after neoadjuvant therapy.

Compared with traditional surgery, laparoscopic colon surgery has the advantages of less pain, small incision, rapid recovery, and short fasting time, and the effect of tumor treatment is equivalent to traditional surgery(3–5). However, there is controversy about whether to close the mesenteric defects after laparoscopic radical resection of colon cancer(6–8). The unclosed mesenteric defects after radical resection of right colon cancer may lead to complications such as hernia, volvulus, and intestinal obstruction(6). However, closing the mesenteric defects increases the surgical operation, which is more difficult, may damage the mesenteric blood vessels, affect the blood supply of the anastomosis, and increase the incidence of anastomotic leakage(9). Because mesenteric defects may not form a hernia and the incidence of intestinal volvulus is low, there is a lack of relevant large-sample clinical research data. This article collects the data of patients who underwent laparoscopic radical right colon resection in our hospital to evaluate whether to close the mesenteric defects and the relevance to the risk of complications.

Methods

Patients

This retrospective study included 66 patients who underwent laparoscopic radical resection of right colon cancer at the Department of Gastrointestinal Surgery, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, from May 2017 to May 2018. Among them, 35 patients closed the mesenteric defects, 31 patients did not close the mesenteric defects, including 37 males and 29 females, with a median age of 59.5 years (27–86 years).

Surgical Techniques of Right Colectomy

General anesthesia with tracheal intubation. Take the "big" font position, head down and feet high 30°. Umbilical puncture establishes pneumoperitoneum, and the intra-abdominal pressure is 12–14 mmHg. The trocar of the umbilicus is used as a laparoscopic observation hole, and the mirror is explored to determine the location of the disease, whether there are lymph nodes, abdominal cavity, and liver metastasis. Using the intermediate approach, open the mesentery along the superior mesenteric vein, dissect out the ileocolonic blood vessels, the right colon blood vessels and the blood vessels in the colon, the roots are cut off, and the lymph nodes at the roots of the blood vessels are removed. Separate and cut the gastrocolic ligament outside the gastro-epiploic vascular arch. Tumors of the liver flexure of the colon must cut off the right gastro-epitopic vascular branch, and clean the lymph nodes below the pylorus. Along the outside of the colon from the iliac fossa to the liver curve of the colon, the posterior peritoneum is incised to free the ascending colon from the posterior abdominal wall. Do not damage the duodenum, ureter, kidney, spermatic cord (or ovarian) blood vessels. Make an auxiliary incision on the umbilical hole, protect the incision with the incision protector, and lift the specimen to be removed out of the body, and remove the right colon, including tumor, mesocolon, 15-20cm terminal ileum, cecum, ascending colon, and right segment of the transverse colon, and perform ileo-colon Coincide. The mesenteric defects in closure group was closed. The mesenteric defects in nonclosure group was not closed. Re-establish the pneumoperitoneum, flush the abdominal cavity with normal saline, place drainage, and confirm that there is no bleeding and no torsion of the anastomosis.

Statistical Analysis

Divided into closure group and nonclosure group. The data were analyzed by Chi-square test and t test to analyze the correlation between whether to close the mesenteric defects and perioperative complications. All statistics are calculated by statistical software SPSS23.0. P value less than 0.05 is considered statistically significant.

Results

We included 66 patients, including 37 males and 29 females, with a median age of 59.5 years (27–86 years), 48 with adenocarcinoma, and 18 with other tumors. According to the surgical operation, they were divided into closure group and nonclosure group. Among them, 35 patients closed the mesenteric defects and 31 patients did not close the mesenteric defects. Comparing the above general data of patients, the age of the closure group was 59.23 ± 12.81 years old, and the age of the unclosure group was 57.42 ± 11.83 years old, the difference between two groups was not statistically significant ($P = 0.957$). There were 23 men (65.7%) and 14 women (34.3%) in the closure group, 14 men (45.2%) and 17 women (54.8%) in the unclosure group. The difference between two groups was not statistically significant ($P = 0.093$). There were 25 patients (71.4%) with adenocarcinoma in the closure group, the 10 (28.6%) with other carcinoma, 23 patients (74.2%) in the unclosure group with adenocarcinoma, and 8 patients (26.8%) with other carcinoma. The difference between two groups was not statistically significant. ($P = 0.801$). There was no statistically significant difference in the above-mentioned clinical data between the two groups. As shown in Table 1.

Table 1
Comparison of characteristics between the closure group and the nonclosure group (n = 66)

Characteristics	Closure group (n = 35)	Nonclosure group (n = 31)	P
Age	59.23 ± 12.81	57.42 ± 11.83	0.957
Gender:			
Male	23(65.7%)	14(34.3%)	0.093
Female	12(45.2%)	17(54.8%)	
Pathologic types:			
Adenocarcinoma	25(71.4%)	23(74.2%)	0.801
Others	10(28.6%)	8(26.8%)	

The included patients underwent laparoscopic radical resection of right colon cancer. There were 35 patients in the closure group and 31 patients in the nonclosure group. There was no significant difference in clinical data between two group. In order to compare whether closing the mesenteric defects would affect the incidence of complications, we compared and analyzed the hospitalization data of the two groups of patients by chi-square test and t test, including total complication, postoperative length of stay, exhaust time after surgery, defecation time after surgery, intraoperative blood loss, Operation time, Length of incision, lung infection, abdominal infection, anastomotic leakage, anastomotic bleeding. In the closure group, 11 patients (31.4%) had complications while 24 patients didn't (68.6%). In the nonclosure group, 8 patients (25.8%) had complications while 23 patients (74.2%) didn't. To compare the total complication rate, there was no statistically significant difference between two groups ($\chi^2 = 0.253$, $p = 0.615$). Through t test, we found that the postoperative length of stay (Closure group: 7.43 ± 3.86 days vs

Nonclosure group: 7.84 ± 4.38 days, $t = -0.404$, $p = 0.687$), exhaust time after surgery (Closure group: 5.51 ± 2.16 days vs Nonclosure group: 6.35 ± 2.27 days, $t = -1.539$, $p = 0.129$), defecation time after surgery (Closure group: 6.09 ± 2.13 days vs Nonclosure group: 7.03 ± 2.01 days, $t = -1.849$, $p = 0.069$), operation time (Closure group: 3.53 ± 1.10 hours vs Nonclosure group: 7.03 ± 2.01 hours, $t = -0.80$, $p = 0.937$) had no significant difference between two groups. In closure group, 3 patients (8.6%) had lung infection, 3 patients (8.6%) had abdominal infection, 2 patients (5.7%) had anastomotic leakage and 2 patients (5.7%) had intestinal obstruction. In nonclosure group, 1 patients (3.0%) had lung infection, 1 patients (3.0%) had abdominal infection, 0 patients (0%) had anastomotic leakage and 2 patients (6.5%) had intestinal obstruction. No patients had anastomotic bleeding in both group. Through Chi-square test, the rate of lung infection ($\chi^2 = 0.825$, $p = 0.364$), abdominal infection ($\chi^2 = 0.825$, $p = 0.364$), anastomotic leakage ($\chi^2 = 0.183$, $p = 0.177$), anastomotic bleeding, intestinal obstruction ($\chi^2 = 0.016$, $p = 0.900$) had no statistically significant difference two groups. As shown in Table 2.

Table 2
Outcomes and Complications of Surgery(n = 66)

Characteristics	Clousure group (n = 35)	Nonclosure group (n = 31)	P
Total complication			0.615
Positive	11(31.4%)	8(25.8%)	
Negative	24(68.6%)	23(74.2%)	
Postoperative Length of Stay(days)	7.43 ± 3.86	7.84 ± 4.38	0.687
Exhaust time after surgery(days)	5.51 ± 2.16	6.35 ± 2.27	0.129
Defecation time after surgery(days)	6.09 ± 2.13	7.03 ± 2.01	0.069
Operation time(h)	3.53 ± 1.10	3.55 ± 0.89	0.937
Lung infection			0.364
Positive	3(8.6%)	1(3.0%)	
Negative	32 (91.4%)	30 (97.0%)	
Abdominal infection			0.364
Positive	3(8.6%)	1(3.0%)	
Negative	32 (91.4%)	30 (97.0%)	
Anastomotic bleeding			/
Positive	0 (0%)	0 (0%)	
Negative	35 (100%)	31 (100%)	
Anastomotic leakage			0.177
Positive	2 (5.7%)	0 (0%)	
Negative	33 (94.3%)	31 (100%)	
Intestinal obstruction			
Positive	2(5.7%)	2(6.5%)	0.900
Negative	33 (94.3%)	29(93.5%)	

Discussion

Colorectal cancer is one of the most common gastrointestinal malignancies. Global cancer statistics show that the current incidence of colorectal cancer ranks third among malignant tumors, and the mortality rate ranks fourth among malignant tumors(1). At present, the main therapy methods for colorectal cancer is still surgical treatment. In recent years, with the continuous advancement of medical technology and the development of minimally invasive surgery, laparoscopy has gradually been accepted by the public and developed rapidly because of its small incision and rapid recovery.

In 1985, German doctors performed laparoscopic cholecystectomy for the first time(10), and laparoscopic techniques have been widely used in various fields. In 1991, Jacobs et al.(11) reported the first case of laparoscopic right colon surgery due to a benign colon tumor, and laparoscopic surgery began to be carried out in the field of colorectal surgery. Meta-analysis shows that the time of laparoscopic-assisted colorectal cancer surgery is equivalent to that of open surgery(12). Compared with laparoscopic-assisted left colon and rectal surgery, laparoscopic-assisted right hemicolectomy has a slower development due to complex anatomical structures, large surgical resection areas, and many adjacent organs.

It is necessary to pay attention to mesenteric hiatus hernia during gastrointestinal surgery. Mesenteric hiatus hernia is caused by intestinal loops passing through the mesenteric defect, which is rare in clinical practice. Intestinal obstruction is the main manifestation. It is divided into congenital and acquired. Congenital is generally caused by mesenteric development defects, and acquired due to defects caused by surgical operations. Acquired mesenteric is related to the treatment of mesenteric defect and the type of surgery. In recent years, due to the rise of bariatric surgery, Roux-en-Y gastric bypass surgery is extensive development. A study based on 2395 bariatric surgery showed that 3.9% of patients had postoperative intestinal obstruction, of which 27.6% was caused by intra-abdominal hernia(13). Studies have shown that it is safe to close the mesenteric defect in laparoscopic gastric bypass surgery, which can reduce the risk of postoperative complications and should be used as a part of routine surgery (14, 15).

In laparoscopic colon surgery, whether to close the mesenteric defect is rarely reported, and there is still controversy. A retrospective study of 195 patients showed that no patients had intestinal obstruction due to patent mesenteric defect after right hemicolectomy. Routine suture of mesenteric defect after operation may not benefit patients(8). A study of 530 patients showed that mesenteric defects caused complications in 4 cases (0.8%), of which 2 cases had intra-abdominal hernias causing small bowel obstruction, and 2 cases caused anastomotic torsion due to defects, but the overall study data cannot support that is beneficial for patients to close mesenteric defect(16). Another retrospective study involving 133 patients showed that closing the mesenteric defect during colon surgery was associated with higher complications and was not beneficial to patients(6). These studies above indicate that there is no evidence to prove that closing the mesenteric defect can benefit patients, and that surgical procedures may increase the risk of complications.

The incidence of intra-abdominal hernias caused by mesenteric defect is low, but there are still some case reports showing that mesangial hiatus hernias caused by mesenteric defects can cause serious

complications and often require surgical treatment to relieve the obstructive symptoms(17–19). A retrospective study showed that of 58 patients undergoing right hemicolectomy, 30 closed the mesenteric defects and 28 unclosed. In the unclosed group, 2 patients had intestinal obstruction, and 1 patient had surgical site infection and needed to be repeated surgery, the reoperation rate is higher than that of the closed group (11% vs 0%, $P = 0.033$). Closing the mesenteric defects does not prolong the operation time and increase surgical bleeding, which may benefit patients(20). Therefore, based on the above-mentioned literature, some experts believe that although the incidence is not high, the mesenteric defects needs to be closed during surgery, which has prevented serious postoperative complications from occurring, thus requiring reoperation.

In our study, a total of 66 patients who underwent radical resection of right colon cancer were enrolled. Among them, 35 cases closed mesenteric defects and 31 cases did not close mesenteric defects. Statistical software was used to analyze the incidence of postoperative complications. The rate of postoperative complications in the closure group was higher than that in the nonclosure group (31.4% VS 25.8%), and the difference was not statistically significant. Among them, the incidence of lung infection, abdominal infection and anastomotic leakage in the closure group was higher than that in the nonclosure group, and the difference was not statistically significant. It may be due to the increased operation of closing the mesenteric defects, which led to a slight increase in the incidence. Intestinal obstruction occurred in 2 patients in the closure group and the nonclosure group. There was no significant difference in the incidence between the two groups. The examination found that the intestinal obstruction was not related to the intra-abdominal hernia, which may be caused by intestinal adhesions of surgical operations. After conservative treatment in 4 patients, the symptoms of intestinal obstruction disappeared.

In 35 patients who closed the mesenteric defects, it took an average of 13.43 minutes to close the mesenteric defects. Compared with the nonclosure, there was no significant difference in the total operation time between the two group. There were no significant differences in the length of hospitalization, exhaust time, and defecation time between the two groups. According to the data included in our study, it is believed that closing the mesenteric defects did not increase the risk of surgery and affect the postoperative recovery of patients.

At present, whether or not to close the mesenteric defects under laparoscopic radical resection of the right colon is still controversial. There is no large sample study to confirm whether closing the mesenteric defects is related to intestinal obstruction and postoperative complications. This retrospective study included a small sample size. According to the results, closing the mesenteric defects did not increase the risk of surgery. There is no evidence that closing the mesenteric defects reduces the risk of postoperative intestinal obstruction. In general, the incidence of postoperative intra-abdominal hernia is low, and whether or not to close the mesenteric defects during laparoscopic radical right colon resection still requires a large sample study to provide evidence.

Conclusion

From our study, it can be seen that closing the mesenteric defects during laparoscopic radical resection of right colon cancer does not increase the risk of surgery. Meanwhile, there is no evidence that closing the mesenteric defects is associated with the incidence of hernia-related intestinal obstruction. We believe that it is not necessary to close the mesenteric defects during laparoscopic radical resection of right colon cancer. Combined with former research results and case reports, whether to close the mesenteric defects is still controversial. More large-sample prospective randomized controlled trials should be carried out to provide clinical evidence support.

Declarations

Ethics approval and consent to participate

The experimental protocol was established, according to the ethical guidelines of the Helsinki Declaration and was approved by the Human Ethics Committee of Union Hospital, Tongji Medical College, Huazhong University of Science and Technology. Informed consent was obtained from all patients. Informed consent was obtained from all patients by written document.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

Funding

This work was supported by National Natural Science Foundation of China (grant nos.81600401 to Chuanqing Wu and 81874184 to Kaixiong Tao). Dr. Chuanqing Wu and Dr. Kaixiong Tao participated in the design of the study. The fundings supported in the collection and analysis of the data.

Authors' contributions

Design of the work: CW, KT ; Literature research: ZD, YL; Data acquisition: ZD, DW, PH; Data analysis: ZD; Manuscript editing:ZD.

All authors read and approved the final manuscript.

Acknowledgements

We appreciate to professor Kaixiong Tao and Chuanqing Wu for their advices and fundings. And we also appreciate to the surgeons for their works and assistances.

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