Proceedings of Anticancer Research, 2024, Volume 8, Issue 4
http://ojs.bbwpublisher.com/index.php/PAR
ISSN Online: 2208-3553
ISSN Print: 2208-3545

Clinical Application Analysis of Laparoscopic-Assisted Total Gastrectomy in the Surgical Treatment of Gastric Cancer

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Abstract: *Objective:* To investigate the clinical application effect of laparoscopic-assisted total gastrectomy in the surgical treatment of gastric cancer. *Methods:* The clinical data of 86 COPD patients included in the study were collected and divided into 43 cases each in Groups A and B using the randomization method, with open total gastrectomy in Group A and laparoscopic-assisted total gastrectomy in Group B. The clinical indexes, pain levels, and complications of patients in the two groups were observed in combination with the indexes. *Results:* The baseline data of the two groups of patients were not statistically significant (all $P > 0.05$); the operation time, incision length, first flatulence time, and hospitalization time of patients in Group B were shorter than those in Group A (all $P = 0.000$); the NRS scores of patients in Group B on the 1st postoperative day and the 2nd postoperative day were significantly lower than those in Group A ($t = 23.443$, $t = 28.784$, all $P = 0.000$); the total complication rate of patients in Group B (1; 2.33%) was significantly lower than that of Group A (9; 20.94%) ($\chi^2 = 7.242$, $P = 0.007$). *Conclusion:* In the surgical treatment of gastric cancer, laparoscopic-assisted total gastrectomy can promote patients' recovery, reduce patients' pain, and lower the probability of complications.

Keywords: Laparoscopy; Total gastrectomy; Gastric cancer; Open surgery

Online publication: August 12, 2024

1. Introduction

As one of the most common malignant tumors of the digestive system, gastric cancer has a high morbidity and mortality rate worldwide [1]. For a long time, traditional open total gastrectomy has been the main method of surgical treatment for gastric cancer. However, although this method can effectively resect the tumor and clear the lymph nodes, its significant surgical trauma, slow postoperative recovery, and high complication rate make the patients' quality of life seriously affected [2]. With the continuous progress of medical technology, laparoscopic technology has gradually been widely used in the field of surgery, especially in the surgical treatment of gastric cancer, laparoscopic-assisted total gastrectomy has become an emerging and minimally invasive treatment option. With the help of a high-definition camera and precise surgical instruments, this technique enables the surgeon to perform precise resection and lymph node dissection of the stomach under direct vision [3,4], without

the need to perform extensive open abdominal operations on the patient as in traditional surgery. For this reason, more and more studies have begun to focus on the effectiveness of its application in clinical practice. In this paper, the clinical application of laparoscopic-assisted total gastrectomy in the surgical treatment of gastric cancer is analyzed in depth, aiming to provide a more scientific and reasonable basis for the choice of surgical treatment for gastric cancer patients.

2. Materials and methods

2.1. General information

The clinical data of 86 cases of gastric cancer patients requiring total gastrectomy included in the study were collected and divided into 43 cases each in Groups A and B using the randomization method.

Inclusion criteria: (1) preoperative pathological diagnosis of gastric cancer and the need for total gastrectomy; (2) clinical stage I-III; (3) indications for surgery without contraindications such as coagulation dysfunction and severe cardiopulmonary insufficiency; (4) voluntary participation in this study and signing of informed consent.

Exclusion criteria: (1) those with combined heart, liver, kidney, and other important organ injury; (2) those with incomplete clinical data.

2.2. Methods

Group A underwent an open total gastrectomy. Patients need to be evaluated for systemic conditions before surgery, and patients with dehydration and electrolyte disorders need to be appropriately infused with fluids and electrolyte supplementation to correct water and electrolyte disorders before surgery. For patients with pyloric obstruction, preoperative fasting, gastrointestinal decompression, fluid infusion, and daily gastric lavage are required to reduce the inflammation and edema of the gastric mucosa. During surgery, the patient is placed in a lying position under general anesthesia. After the anesthesia took effect, the middle position of the upper abdomen was used as the incision for total gastrectomy, which included separating the greater omentum, cutting off the right gastric omental vein and the right gastric omental artery, and removing the subpyloric lymph nodes. After confirming where the right gastric vessel was located, the loose tissue around it was dissected and removed, and the duodenal stump was closed. The tissues of various groups of lymph nodes that are closely related to the metastasis of gastric cancer were removed. The gastrosplenic ligament was sequentially cut and ligated, and the posterior peritoneum of the tail of the pancreas and the lymph nodes anterior and superior to it were removed. Then anastomosis of the esophagus and jejunum or other ways of reconstruction of the digestive tract were performed according to the specific conditions of the patients.

Group B underwent laparoscopic-assisted total gastrectomy. Consistent with open total gastrectomy, patients were required to undergo a generalized assessment of their condition prior to surgery. Then, the patient was placed in the lying position for general anesthesia, and after the anesthesia took effect, 3–4 small holes were made in the patient's abdomen, and the abdominal cavity was accessed through the instruments of the laparoscope to establish the operating platform. A laparoscopic exploration of the abdominal cavity was performed to determine whether the tumor condition was suitable for laparoscopic-assisted total gastrectomy. After confirming the laparoscopic-assisted total gastrectomy, the perigastric tissues, greater omentum, ligaments, etc. were dissected, and the left and right gastric blood vessels and the left and right gastric omentum blood vessels were ligated; lymph nodes were cleared, and the scope of clearance needed to be cleared up to the second station of the gastric lymph nodes; most of the stomach was resected or the whole stomach was

resected according to the location of the tumor; and a small incision was made on the abdomen to anastomose the stomach and the duodenum or the jejunum after the gastric tumor has been dissected under the laparoscopic procedure. Anastomosis was performed.

2.3. Observation indexes

In this study, the general data of patients were counted, and the level of clinical indexes of patients was assessed by operation time, incision length, time of the first flatulence, and hospitalization time; the pain level of patients was assessed by numerical rating scale (NRS); and the occurrence of complications including incisional infection, duodenal stump fistula, lung infection, and incomplete adhesion intestinal obstruction was assessed.

2.4. Statistical analysis

Statistical processing was performed with SPSS 20.0, and the data were expressed as either mean ± standard deviation (SD) or [*n* (%)], and the two-sample *t*-tests and χ^2 tests were used for comparison between groups, with $P < 0.05$ as the difference being statistically significant.

3. Results

3.1. Comparison of general information of patients in the two groups

As shown in **Table 1**, the baseline information of the two groups of patients was not statistically significant ($P > 0.05$).

Table 1. Comparison of general information of patients in the two groups

Groups	Gender (male/female)	Average age (years)	Tumor diameter (unit)
Group A ($n = 43$)	23/20	65.38 ± 4.22	2.53 ± 1.36
Group B ($n = 43$)	25/18	66.47 ± 4.25	2.62 ± 1.32
χ^2 / t	0.189	1.193	0.311
P	0.664	0.236	0.756

3.2. Comparison of the level of clinical indicators between the two groups of patients

As shown in **Table 2**, the operation time, incision length, first flatulence time, and hospitalization time of patients in Group B were significantly shorter than those in Group A (all $P = 0.000$).

Table 2. Comparison of the level of clinical indicators between the two groups of patients (mean ± SD)

Groups	Operative time (min)	Incision length (cm)	Time to first anal evacuation (d)	Length of hospitalization (d)
Group A ($n = 43$)	175.32 ± 12.87	6.20 ± 0.82	3.31 ± 0.97	21.21 ± 6.67
Group B ($n = 43$)	35.36 ± 9.97	3.05 ± 0.32	1.45 ± 0.88	12.10 ± 4.21
t	56.375	23.467	9.313	7.574
P	0.000	0.000	0.000	0.000

3.3. Comparison of pain levels between the two groups

As shown in **Table 3**, the NRS scores of patients in Group B were significantly lower than those of Group A on postoperative day 1 and postoperative day 2 ($t = 23.443$, $t = 28.784$, both $P = 0.000$).

Table 3. Comparison of pain levels between the two groups

Groups	NRS score	
	Postoperative day 1	Postoperative day 2
Group A (n = 43)	5.21 ± 0.28	3.88 ± 0.22
Group B (n = 43)	4.02 ± 0.18	2.78 ± 0.12
t	23.443	28.784
P	0.000	0.000

3.4. Comparison of complication rates between the two groups of patients

As shown in **Table 4**, the total complication rate of patients in Group B (1; 2.33%) was significantly lower than that of Group A (9; 20.94%) (χ^2 = 7.242, P = 0.007).

Table 4. Comparison of complication rates between the two groups of patients

Groups	Incision infection	Duodenal stump fistula	Lung infection	Incomplete adhesive bowel obstruction	Overall incidence
Group A (n = 43)	4 (9.30%)	1 (2.33%)	1 (2.33%)	3 (6.98%)	9 (20.94%)
Group B (n = 43)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (2.33%)	1 (2.33%)
χ^2	-	-	-	-	7.242
P	-	-	-	-	0.007

4. Discussion

Gastric cancer is a malignant tumor originating from the epithelium of the gastric mucosa, and its incidence and mortality rates are high worldwide. The occurrence of gastric cancer is related to a variety of factors, including genetics, environment, diet, and *Helicobacter pylori* infection [5]. The clinical manifestations of gastric cancer are varied and commonly include stomach pain, decreased appetite, weight loss, nausea, and vomiting [6]. Since the early symptoms of gastric cancer are not obvious, many patients have entered the middle and late stages when diagnosed, and they need to be treated comprehensively by various therapeutic means, such as surgery, chemotherapy, radiotherapy, and so on. Surgery plays an important role in the treatment of gastric cancer, among which, total gastrectomy is a commonly used surgical method for treating gastric cancer, which is suitable for patients with a wide invasion of gastric cancer and inability to preserve gastric function. During the surgery, the surgeon removes the whole stomach tissue of the patient and may remove part of the esophagus, duodenum, and adjacent lymph nodes at the same time. After the surgery, the patient will need to undergo reconstruction of the digestive tract to restore eating function.

Among total gastrectomy surgeries, they are usually categorized into traditional open total gastrectomy and laparoscopic total gastrectomy. Among them, the former requires a larger abdominal incision, which makes the surgery traumatic and postoperative recovery slow. Due to the traumatic surgery, patients may face the risk of complications such as infection, bleeding, and intestinal obstruction after surgery. For this reason, the advantages of laparoscopic total gastrectomy are highlighted.

In this study, the operation time, incision length, first flatulence time, and hospitalization time of patients in Group B were shorter than those in Group A (all P = 0.000), indicating that laparoscopic total gastrectomy can promote the recovery of patients in the surgical treatment of gastric cancer. The main reasons are as follows: first, laparoscopic-assisted total gastrectomy can shorten the operation time. Its use of high-definition cameras

and specialized instruments provides surgeons with a clearer surgical field of view and more delicate operating ability. Compared with traditional open surgery, laparoscopic surgery is able to locate tumors and lymph nodes more quickly and accurately, reducing the intraoperative time for finding and confirming the target [7]. It can also effectively reduce unnecessary operating steps and errors, further improving surgical efficiency. Second, laparoscopic-assisted total gastrectomy can reduce the length of incision. It uses a small hole to enter the abdominal cavity, eliminating the need to incise large areas of skin and tissue as in conventional surgery. The significant reduction in the length of the incision reduces the trauma of the surgery to the body [8,9] and also facilitates the patient's postoperative recovery. Third, laparoscopic total gastrectomy reduces the time to first anal defecation. Because this approach has relatively little interference with the intra-abdominal cavity, it can reduce the risk of adhesion and obstruction of the intestinal tract. Compared with conventional surgery, patients' bowel motility function recovers faster after laparoscopic surgery, which helps to achieve anal emission earlier. Early anal emission not only indicates that the intestinal function has returned to normal but also helps the patient to start eating and nutritional supplementation earlier, which promotes the recovery of the body. Fourth, laparoscopic total gastrectomy can shorten hospitalization time. As laparoscopic surgery is less traumatic and quicker recovery, patients have relatively low postoperative pain and can get out of bed earlier for activities and self-care.

This study also pointed out that the NRS scores of patients in Group B were significantly lower than those of Group A on postoperative day 1 and postoperative day 2 (t = 23.443, t = 28.784, both P = 0.000), indicating that laparoscopic-assisted total gastrectomy is able to effectively reduce the level of patient's pain in the surgical treatment of gastric cancer, which is mainly due to its minimally invasive and precise nature. Laparoscopic total gastrectomy enters the abdominal cavity through a small hole, eliminating the need to incise large areas of skin and tissue as in traditional surgery, thus significantly reducing the trauma to the organism caused by the surgery. This minimally invasive nature results in less pulling and damage to the surrounding tissues during the procedure, which in turn reduces the level of post-operative pain. Plus, laparoscopic surgery uses a high-definition camera that provides the surgeon with a clear, magnified view of the surgery, which helps the surgeon locate tumors and lymph nodes more precisely and reduces unnecessary tissue damage. This precision further reduces the level of pain during surgery.

This study also proposed that the total complication rate of patients in Group B (1; 2.33%) was significantly lower than that of Group A (9; 20.94%) (χ^2 = 7.242, P = 0.007), indicating that laparoscopic-assisted total gastrectomy can effectively reduce the occurrence of patients' complications in the surgical treatment of gastric cancer. There are several main reasons for this: firstly, minimally invasive operation avoids the extensive exposure and damage to the abdominal cavity of traditional open surgery, significantly reduces the surgical interference with the intra-abdominal organs, and reduces the tissue damage and inflammatory reaction [10]. Secondly, the clear surgical field can help the surgeon separate tissues and clear lymph nodes more finely, reducing the risk of accidental injury and bleeding. Meanwhile, laparoscopic-assisted total gastrectomy has fast postoperative recovery, which can reduce complications caused by prolonged bed rest and fasting, such as lung infection and deep vein thrombosis. This is consistent with the findings of Zhang Xiong *et al.* [11], who found that by comparing the occurrence of complications between laparoscopic and open total gastrectomy for the treatment of stage I gastric cancer, the complication rate of laparoscopic total gastrectomy for the treatment of patients with stage I gastric cancer was lower compared with that of open total gastrectomy.

In conclusion, laparoscopic-assisted total gastrectomy can promote the recovery of patients, reduce the pain of patients, and lower the probability of complications in the surgical treatment of gastric cancer.

Disclosure statement

The authors declare no conflict of interest.

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