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Clinical Importance of Surgical Treatment of Low Rectal Carcinoma in Anus-Preserving Procedure—an Analysis of 86 Cases

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We investigated the methods and experiences of an anus-preserving procedure in curative resection of low rectal carcinoma. Eighty-six patients with low rectal carcinoma underwent Dixon's procedure with device assistance. Patients were then observed for the effects of operation. The operation was successful in all patients. Pathologic examination of specimens revealed negative margins. Complications such as anastomotic leakage were found in 7 cases. All patients recovered well. Device assistance may contribute to the successful performance of anus-preserving procedure in low rectal carcinoma. Whether the anus can be preserved or not depends on the accurate measurement of the distal length of the rectum. A meticulous hemostasis and avoidance of tension on the stoma are key measures for avoiding anastomotic leakage.

Key words: Low rectal carcinoma – Anus-preserving procedure – Total mesorectal excision (TME) – Double stapling technique (DST)

Currently, treatment of low rectal carcinoma is still achieved predominantly through surgical excision; however, an expectation of satisfactory treatment has shifted the focus from a concentration on curative resection alone to an equal emphasis on curative resection as well as life quality. In recent years, scholars have made intensive investigations of the anatomic and physiologic structures of the rectum, and we now have a thorough understanding about pathologic and biologic features of infiltration and lymphatic metastasis of rectal carcinoma. With the development of operative procedures and equipment, patients with rectal carcinoma have benefited greatly. They might be serviced with radical cure of the carcinoma as well as with anal preservation. Investigations about anus preserving procedures have been a recent feature of surgical treatment of rectal carcinoma. Here, we report our experiences of the performance of an anus-preserving operation on low rectal carcinoma, including curative effects, indications, and complications, and we discuss its clinical value.

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Patients and Methods

Patients

Between January 2005 and January 2010, 86 patients (65 men, 21 women) with low rectal carcinoma underwent total mesorectal excision (TME) together with double stapling techniques (DST) in anus-preserving procedures. Their ages ranged from 21 to 76 years, with a median age of 58 years. The distance from the bottom rim of the tumor to anal verge ranged from 5 cm to approximately 7 cm (more than 6 cm in 71 cases, and less than 6 cm in 15 cases). The following gross specimens were present: 61 cases of ulcerous carcinoma, 14 cases of projected carcinoma, and 11 cases of infiltrative carcinoma. The histological types were as follows: 9 cases of well-differentiated adenocarcinoma, 51 cases of middle-differentiated adenocarcinoma, 16 cases of poorly differentiated adenocarcinoma, 6 cases of mucinous adenocarcinoma, and 4 cases of canceration of adenoma. The following Dukes stages were present: 8 cases at stage A (9.3%), 66 cases at stage B (76.7%), and 12 cases at stage C (14.0%). The Heald method was applied in TME, and roticulator auto suture or end-to-end anastomotic device serial products were applied in DST.

Surgical procedures

Separation of cancer focus and thorough clearance of lymph node followed the rules of TME. Rectal mesentery of the specimens remained intact: distal excision site of the mesentery was no less than 5 cm away from the tumor edge, and that of the rectum was no less than 3 cm. At the expected cutting site, the sigmoid colon was cut up; anastomat was purse-string sutured at the proximal end of the intestinal canal. Rotary closed apparatus was placed at the distal end of the tumor 3.0 cm away from the focus to close the rectum; the tumor was then dissected along the proximal end of the closed apparatus. The anus and stump rectum were sterilized with 0.05% iodoform; the anus was dilated to be relaxed. The rotary closed apparatus was inserted slowly into the anus until reaching the closed end of the rectum; it was then pushed up to the dorsal part to pierce a hole in the central part of the closed end of the rectum and joined tightly with the anastomat. No immediate firing was performed. With the rotary closed apparatus as pilot, a pole was punctured at 5 cm away from anal verge, and a double-channel drainage tube was placed at the sacroanterior position and fixed; then the anastomat was fired. The intactness of the cutting edge at distal and proximal ends was checked carefully after withdrawal of the anastomat. The pelvic floor peritoneum was reestablished, and the abdominal wall was closed sequentially.

Results

No death was reported in this group. Anus preservation was successfully achieved in all cases. Pathological examination showed that the distal excising verge was negative for tumor cells in all 86 cases. Anastomotic leakage was observed in 4 cases, who were cured following excessive rinsing and drainage. Anastomotic bleeding was reported in 3 cases, who recovered following conservative treatment. Within 1–2.5 years, 7 cases developed local recurrence, including 4 cases of anastomotic recurrence and 3 cases of pelvic recurrence. Among these 7 cases, 5 were at Dukes stage C, including 3 cases receiving ultralow anastomosis, and 2 were at Dukes stage B, who had poorly differentiated adenocarcinoma and died of distant metastasis in the liver 1.5–2.5 years postoperatively.

Discussion

A satisfactory outcome of defecation function following low or ultralow colorectal or coloanal anastomosis could be described as follows:

1. Anal cushion could be retained if the rectum 2 to 3 cm above the dentate line was preserved. There were ''Y'' type anal cushions in the right front, right back, and left sides at the site 2 to 3 cm above the dentate line. Closure of the cushions prevented overspilling of the feces.
2. There were Krause end bodies and Gloom-Maszzoni and Pacinian corpuscles in sensory nerve endings in the epithelium of the anal cushion 2 cm above the dentate line. The Krause bodies maintained a sense of heat, and the Gloom-Maszzoni and Pacinian corpuscles sensed changes in tension and depression. Therefore the sensory nerve endings can differentiate feces from other rectal contents.
3. The internal sphincter was preserved, which prevented incontinence.
4. The puborectal muscle was saved, so the anorectal angle was maintained and satisfactory continence function was obtained. The rectum above the dentate line should be preserved at least 2 to 3 cm; the rectum should also be fully relaxed to avoid overstretch of the anastomotic stoma.

Failure of rectal carcinoma surgical treatment was mainly due to the subsequent local recurrence and distant metastasis. So thorough resection of the tumor focus and radical clearance of rectal mesentery deserved equal emphasis. The rectum below the peritoneal reflection site was not covered with peritoneum, but its back wall closely attached the pelvic visceral fascia, which encysted the blood vessels, nerves, lymph, and lipid connective tissues. Kishimoto *et al*[1] first reported in 1982 that TME for rectal carcinoma radical operation reduced the postoperative local recurrence rate significantly; in 1992, they reported a local recurrence rate as low as 3.6% in 152 cases, which was the lowest reported up to that time. In this group, total rectal mesentery, or a length >5 cm from the tumor site, was excised.

Vuong *et al*[2] studied rectal anatomic structure and lymph drainage carefully and concluded that lymph metastasis of rectal carcinoma usually went upward, sideward, and downward. They proposed abdominal perineoanoplasty as the gold-standard operation for rectal carcinoma. However, it has been recently reported that lymph metastasis of rectal carcinoma goes mainly upward; tumors above the peritoneal reflection, in particular, seldom metastasized sideward or downward. Only highly malignant or advanced tumors, due to obstruction of the lymphatic vessel by cancer embolus, were able to metastasize downward reversely, and the distance was usually within 2.5 cm. Paty *et al*[3] performed tumor excision 2 to 3 cm from the bottom edge of the rectal tumor; pathological examination revealed the cancer cells were denied infiltration and confirmed oncologic safety. However, in a radical operation, oncologic principles should not be violated in order to preserve the anus, nor should radical resection be performed at the expense of anal function. In the treatment of these 86 cases, we strictly followed the operation indications but held some flexibility: the edge of the specimen had to be negative for cancer cells. Excision of the cancer focus and clearance of lymph nodes should be in agreement with TME principles. Gu *et al*[4] performed the anus-saving operation following TME principles in 289 cases and reported a local recurrence of only 6.71%.

With regard to the size, location, differentiation, and infiltration of the tumor and the general condition of the patient, sphincter saving in low rectal carcinoma excision can improve the patient's postoperative quality of life.[5] In some clinical cases, it seemed impossible to preserve the anus at the beginning, but after complete division of the rectum, anus saving was possible, which is explained by the shape of the rectum. The rectum forms an arc instead of a straight line in the pelvic cavity. After complete division of the rectum and cutting up of the bilateral ligaments, the rectum can be extended by at least 3 cm, which is advantageous for anus preserving.[6] In China, rectal carcinoma usually attacks the lower segment of the rectum, accounting for approximately 74.1% of cases. In recent years, with the development of surgical equipment and techniques, especially the application of DST, anus preserving in low rectal carcinoma excision has been allowed theoretically and practically, and its frequency has increased from 40% to 70%. It was reported[7] that the postoperative local recurrence rate and 5-year survival rate following DST for low or ultralow anterior resection (LAR) and abdominoperineal resection were not significantly different.

In the 86 cases undergoing DST for LAR, anastomotic leakage was reported in 4 cases (4.6%). This is a characteristic complaint following DST for LAR. It was reported[8] that the occurrence rate of symptomatic anastomotic leakage following DST for LAR was 2.7% to 19%. Anastomotic leakage following DST may have many causes, especially local factors and intraoperative manipulation. In our experiences, prevention of anastomotic leakage caused by DST might be aided by the following:

1. Avoidance of tension on the anastomotic stoma. For LAR, complete division of the descending colon and splenic flexure, and enough length of the proximal end of the colon, are of great value in ensuring a lack of tension on the anastomotic stoma, which can lessen anastomotic leakage. Olagne *et al*[9] reported that when the distal colon length was kept unchanged, anastomotic leakage occurred more frequently with the increase of proximal colon resection length.
2. Rich blood supply. In TME, the distal colonic segment with no blood supply is too large. Operative manipulation can injure the ascending artery of the left colon by mistake. The colon and mesentery might be twisted into a deformity when sutured. All these might lead to anastomotic leakage. It was reported[10] that it was sufficient to excise the mesentery by 4 cm.
3. Selection of suitable anastomat and obturator. If the diameter of the anastomat is too big, the intestinal wall muscular layer and mucous layer would be lacerated, resulting in overthinness of the intestinal wall. It is liable to induce anastomotic leakage. If the abundant tissues at the distal end were not cleared sufficiently, the obturator

would not be closed completely. This can also cause anastomotic leakage.

4. Usage of anterior double-canal drainage tube. LAR usually causes a large wound, which is prone to causing presacral hematocele and hydrops, ultimately interfering with healing of the wound. An anterior double-canal drainage tube was placed in parallel with the anus and kept unobstructed. This is beneficial for preventing presacral hematocele, hydrops, or infection, thus decreasing the anastomotic leakage rate.
5. Meticulous preoperative intestinal preparation. The anus and rectum should be rinsed and sterilized thoroughly using 0.05% iodoform to dramatically reduce local infection, facilitating healing of the wound.
6. Condition of ''empty upper part, unobstructed lower part, and loose middle part.'' Artificial anal canal was placed alternatively if necessary.

Anastomotic stricture is another common complication following DST for LAR. Wang and Wei[11] reported that the anastomotic stricture rate ranged from 2.5% to 10%. Measures to prevent postoperative anastomotic stricture in DST might include the following: (1) Appropriate diameter size of the anastomat. A too-small diameter is prone to leading to anastomat stricture. In this group, an anastomat with a diameter of 34 mm was applied. (2) Rich blood supply of anastomat. A poor blood supply of the anastomat could lead to tissue hypoxia, inducing hyperplasia of fibrous tissue and forming a scar, causing stricture of anastomat. (3) Thorough clearance of abundant tissues at the two resection ends. Adipose tissue and blood vessels on the intestinal wall should be cleared carefully to avoid the existence of abundant tissue in the narrow space of the anastomat, lessening stricture of the anastomat. (4) Prevention of anastomotic leakage and local infection. Careful and strict suture and smooth anterior drainage are strongly recommended.

Postoperative anastomotic bleeding following DST might appear at low rates. In our research, postoperative anastomotic bleeding was found in 3 cases, so the rate of bleeding was only 3.4% in this group, with fresh bleeding from the anus or presacral drainage as the main manifestation. We modulated the needle indicator to point to between 60% and 70% when performing sutures. After that, the pelvic floor was washed with hot salt. Then we observed whether oozing of blood and hemorrhage occurred or not. If it occurred, electric coagulation or titanium pin hemostasis would be performed. Based on the above-mentioned treatment, no anastomotic bleeding was observed again in this group.

In 86 cases, local recurrence was observed in 7 cases (8.1%), which was in agreement with previous reports (5%–20%).[4] In this group, a few patients ignored principles of radical treatment and stressed postoperative life quality at the risk of recurrence, which was the main factor causing local recurrence. How to avoid postoperative recurrence efficiently? In our opinion, principles of TME should be followed strictly. During division of the rectum, blood vessels under the rectal mesentery were ligated; the sigmoid mesocolon was then connected bilaterally. The sigmoid colon was lifted and divided sharply to as far as the coccyx apex under direct vision from loose connective tissue between presacral fascia and rectal proper fascia. In this way, rectal proper fascia could remain intact. This is currently considered the most valuable measure for reducing local recurrence. Even if the lymphoid node is not attacked, there might exist an adenocarcinoma cell nest in the rectal mesentery. If the sigmoid colon were divided bluntly rather than sharply, and the rectal mesentery could not be resected completely, then the carcinoma might remain, and carcinoma cells might proliferate and subsequently implant.[12]

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