

## **Individualized choice regarding the method for ensuring negative margins in an anus-preserving operation for ultralow rectal carcinoma.**

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### **Abstract**

**Background:** To explore the safety and efficacy of individualized choice regarding the method for ensuring negative margins in an anus-preserving operation for ultralow rectal carcinoma.

**Methods:** Thirty-seven patients with ultralow rectal carcinomas were enrolled from February 2011 to February 2013. On the premise of ensuring negative margins, 15 patients underwent a transabdominal coloanal anastomosis using a double-stapling technique; 12 patients underwent a transabdominal coloanal anastomosis using a triple-stapling technique; 7 patients underwent a transanal pull-through coloanal anastomosis using a double-stapling technique; and 3 patients underwent a transanal pull-through coloanal anastomosis using a triple-stapling technique. Of the patients who underwent a transabdominal coloanal anastomosis, 8 patients had a preventive colostomy, and all patients who had a pull-through coloanal anastomosis had a preventive colostomy.

**Results:** Among the patients who did not have a preventive colostomy, 4 patients had an anastomotic fistula, and 1 patient had an anastomotic fistula with a hemorrhage and urination disorder. Additionally, 9 patients had short-term postoperative fecal incontinence; all had diarrhea, with symptom resolution 6 months later. The patients who had a preventive colostomy underwent diaphyses 3 months later, with no deaths occurring.

**Keywords:** Negative margins, Total mesorectal excision technique, Ultralow rectal carcinoma, Transabdominal coloanal anastomosis, Transanal coloanal anastomosis.

*Accepted on July 26, 2016*

### **Introduction**

Surgical treatment of an ultralow rectal carcinoma should ensure the following: first, it can affect a radical cure, and second, it can improve the patient's quality of life. In order to improve a patient's quality of life, it is necessary to preserve the anus, and preservation of the anus should ensure negative margins first and consider what type of surgical method for reconstruction second [1]. As the pelvis space is narrow and as the visual field is greatly limited, it is possible that the proximal rectum is disconnected after a total mesorectal excision. However, upon opening the proximal rectum after an anastomosis, if the excision margin distance is found to be insufficient, if the intraoperative pathological examination reports positive margins, if the distal end has retracted towards the anal side, or if the anastomosis has been completed, then the anus-preserving operation is difficult to complete, so it is sometimes necessary to abort the anus-preserving operation and carry out a Miles operation [2,3]. Recently, we have adopted surgical methods with double- or triple-stapling techniques to ensure negative margins: transabdominal coloanal anastomosis or pull-through coloanal anastomosis, so altering the surgical method by "only chance," while avoiding the embarrassing situation of positive margins, ensuring the safety and efficacy of an anus-preserving operation for

ultralow rectal carcinoma, and increasing the success rate for preserving the anus. Our method is reported below.

### **Materials and Methods**

#### **General data**

Thirty seven patients with ultralow rectal carcinomas were enrolled from February 2011 to February 2013, including 15 males and 22 females, aged 42 to 72 years. All patients were found to have masses preoperatively by digital rectal examinations, of which 15 patients had masses in the lateral posterior rectal walls, 17 patients had masses in the posterior rectal walls, and about 5 female patients had masses in the anterior rectal walls; 2 cases had masses that were closely adjacent to the dentate lines (>2 cm). Under direct vision through an anoscope, a surgeon obtained the tissues with a forceps for a pathological examination and diagnosis (the distance to the anal verge was <5 cm). There were 36 cases of highly and moderately differentiated adenocarcinomas and 1 case of a poorly differentiated adenocarcinoma. Before the operation, the distances from the lower edges of the tumors to the dentate lines and anal verges were detected, and the ratios of the tumor masses to the circumferences of the rectal walls

were preliminarily measured; the female patients underwent bimanual gynecological examinations, and the correlation between the tumor masses and posterior vaginal walls was assessed according to the activities of the tumor masses. This work was approved by ethics committee of our hospital. Written informed consents have been obtained from all patients.

## **Surgical Methods**

### ***Total mesorectal resection***

The patient was placed in a high lithotomy position and the entire mesorectum was separated using total mesorectal excision on the basis of removing the lymph nodes at the root of the inferior mesenteric artery. Furthermore, the left colic artery was retained and the root of the sigmoidal artery was excised and ligated. The tributaries of the inferior mesenteric vein were exposed and ligated on the left. The sigmoid mesocolon within corresponding lymphatic drainage area was removed. The purse pliers were clamped and the intestine was cut off at an expected excision place. After the distal end of the rectum, which had been cut off, was stretched and dissociated from the levator ani muscle, if the distance between the distal end of the tumor and the anorectal ring was less than 3 cm, then it was continuously dissociated along the puborectalis to the level of dentate line. An FHY30 linear stapler was placed under the lower edge of the rectal tumor, and the anastomosis was completed. The stapler was not opened. However, an angled forceps was clamped in the mouth side of the linear stapler, and the excision was carried out during this period.

### ***Intraoperative pathological examination***

An intraoperative, rapidly frozen, pathological examination of the excised rectal tissue was carried out. If the pathological result was negative for rectal tissue, the linear stapler was opened, the anvil of a WHY29 circular stapler was placed into the proximal colon, the purse was tightened and the blind end of the rectum was rinsed. After anal dilatation, the stapler head was smeared with iodine, then rotated back and forth and inserted into the anus. The adjusted nut in the rear of the stapler was rotated anticlockwise, and the guiding shaft was passed through the midline of the closing line of the excised rectum under the operator's guidance. Moreover, the guiding shaft was connected to the anvil, and then, the adjusted knob was rotated clockwise, during which the anvil moved closer to the stapler. When the green line appeared approximately in the middle of the indication window, stapling was performed and the anastomosis was completed. After the adjusting nut was rotated clockwise for a quarter circle, the entire stapler was removed, and the anastomosis was finished.

### ***Selection of surgical procedures***

If the excised rectum was positive, a linear stapler was again placed into the distal end of the unopened linear stapler. Two linear staplers were pulled in opposite directions, so the distance between the 2 staplers was as large as possible, and

the anastomosis with the second linear stapler was completed. A scalpel was used to excise the rectum along the edge of the second linear stapler, and a rapid pathological examination of the excised rectum was performed. If the result was negative, the linear staplers were opened, and the completion method was the same as the above-mentioned double-stapling technique. If the second stapler could not be placed into the distal end of the first stapler (or a negative rectal tissue result could not be guaranteed during the second excision), then a ring clamp was placed through the anus up until the excision edge. A number 7 line was used to suture and fix the remaining rectal edge in the ring clamp. Then, a surgeon inserted a hand into the pelvic cavity and pushed the remaining rectum, while the ring clamp was pulled synergistically. The rectum was pulled through the anus and the distance from the tumor to the dentate line was clearly visible. The anastomosis was completed with an FHY30 linear stapler. The linear stapler was retained and the excised tissue was sent for a pathological examination. If the result was negative, the linear stapler was removed, and the remaining anus was replaced. If the result indicated positive margins, an FHY30 linear stapler was again placed into the anal canal of the retained FHY30 linear stapler. The margins were removed for pathological examination. If the result was negative, the anastomosis was completed according to the method described above. In the 4 methods mentioned above, the surgeon should confirm that both excision circles were intact with no defects. A digital rectal examination showed that the anastomotic stoma was smooth. Meilan liquid was then injected into the anus, and there was no presacral blue-stained gauze. The presacral rubber hose was removed by creating another hole in the left lower abdominal wall, and the abdominal cavity was closed. The latex drainage tube was internally affixed in the proximal end of the anastomotic stoma and sutured and fixed in the perianal region for patients who had a pull-through coloanal anastomosis. All patients who had a pull-through coloanal anastomosis underwent preventive transverse colostomy.

## **Results**

### ***Baseline data***

The median follow-up time was 15 months (6-24 months). The median age was 55 years (42 to 72 years); and the follow-up rate was 100%. No recurrence occurred during follow-up. After postoperative 6 months, the stool frequency was restored 1 to 3 times a day and increased to 3-5 times daily for certain patients.

### ***Anastomosis approach***

A total of 37 patients were recruited. To evaluate the negative margins, 15 patients underwent a transabdominal coloanal anastomosis using a double-stapling technique, 12 patients underwent a transabdominal coloanal anastomosis using a triple-stapling technique. Seven patients underwent a transanal pull-through coloanal anastomosis using a double-stapling technique and 3 patients underwent a transanal pull-through

coloanal anastomosis using a triple-stapling technique. Of the patients who had a transabdominal coloanal anastomosis, 8 patients had a preventive colostomy, and all patients who had a pull-through coloanal anastomosis had a preventive colostomy. Among the patients who had a preventive colostomy, 4 patients had an anastomotic fistula, and 1 patient had an anastomotic fistula with a hemorrhage and urination disorder. Nine patients had short-term postoperative fecal incontinence, during which all had diarrhea.

### ***Postoperative evaluation and chemotherapy***

Their symptoms were recovered significantly after 6 months. The patients who had a preventive colostomy underwent diaplasia after 3 months, and no deaths occurred. Postoperative pathological examination confirmed that both ends of the cutting edge had no residual cancer cells. There was a case of a poorly differentiated adenocarcinoma, and there were 35 cases of papillary or tubular adenocarcinoma. After the operation, all patients received chemotherapy: folinic acid, fluorouracil, and oxaliplatin (mFOLFOX6), as well as oxaliplatin (L-OHP), 135 mg/m<sup>2</sup> per day, intravenous (IV) 2 h on day 1; leucovorin (LV) and calcium folinate, 400 mg/m<sup>2</sup> per day IV 2 h on days 1 and 2; and fluorouracil (5-FU5), 2600 mg, continuous IV for 46 h. Six consecutive cycles were performed, 21 days for each cycle.

### **Discussion**

The following aspects should be considered to ensure the negative margins during an anus-preserving operation for ultralow rectal carcinoma. First, the indications should be strictly controlled during an anus-preserving operation. Second, the degree of tumor differentiation should be considered for patient enrollment. Those with highly- and moderately-differentiated adenocarcinoma should be selected [1]. Third, alternative factors should be considered, such as the distance from the lower edge of the tumor to the dentate line, the depth of tumor invasion into the rectal wall [2], and the ratio of the tumor mass to the circumference of the rectal wall, aiming to ensure an increase in a patient's survival. The distance to the lower edge of the tumor can be shortened to 2 cm or even 1 cm intraoperatively [3]. Within the mesentery of the distal end of a low rectal carcinoma, tumor proliferation is up to 3.5 cm, so surgical excision should exceed this range. It is insisted that a 5 cm distance from the distal end of the mesentery should be removed [4] but that the lower edge of the mesentery of an ultralow rectal carcinoma should be totally removed if the 5 cm condition cannot be satisfied. Thus, intraoperative assessment of negative margins is of significance. To ensure negative resection and circumferential resection margins, it is inevitable to retain a shorter rectum, especially for patients who have a close distance between the tumor and the dentate line. An anus-preserving operation requires an adept total mesorectal excision technique. Only in this manner can pelvic autonomic nerve preservation be achieved in order to avoid urinary retention and ejaculation or erectile dysfunction. During a pull-through coloanal

anastomosis, it is a challenging task to pull the intestinal canal through or the distance is not long enough after pulling the intestinal canal through. It is feasible to push the intestinal canal in and stretch the remaining rectum again, by continuously dissociating the intestinal canal along the levator ani and puborectalis to the dentate line in the anal canal and pulling it through again to anastomose. The key to the surgical approach is for the first linear stapler to remain in place after the anastomosis, at least until it is decided whether to perform an end-to-end coloanal anastomosis according to the pathological results. The distance between the tumor and the dentate line is measured under direct vision through an anoscope for a pull-through coloanal anastomosis. The linear stapler remains in situ after linear stapling, and the surgical method is determined according to pathological results.

The effects of transabdominal or pull-through coloanal anastomoses using double- or triple-stapling techniques were evaluated to guarantee negative margins for patients diagnosed with ultralow rectal carcinomas. During total resection and anastomosis of ultralow rectal carcinoma, insufficient resection and residual tumors may occur at the resection margins. To ensure negative pathological results for the lower edge of the tumor and that clinical efficacy of the anastomosis was guaranteed, the distal rectum was excised and coloanal anastomosis was carried out. Before distal rectal excision, linear stapler anastomosis was adopted for the distal end of the rectal tumor. After the anastomosis, the specimen was removed, and the linear stapler remained in situ. The excision margins on the lateral edge of the linear stapler were sent for pathological examination. It was feasible to directly carry out an anastomosis for negative margins. If the pathological result was positive, the second linear stapler was placed into the distal end of the first linear stapler, and 2 linear staplers were pulled in opposite directions so the distance between the 2 staplers increased as possible. The anastomosis with the second linear stapler was completed. The rectum on the anal side was cut off between the 2 linear staplers. After rapid pathological examination of the excision margins, the anastomosis was carried out repeated. If it was difficult to place the second linear stapler inside, a pull-through coloanal anastomosis was adopted using the same method as of a transabdominal coloanal anastomosis.

Precautions for an anus-preserving operation for a low rectal carcinoma should be emphasized. In an anus-preserving operation for low rectal carcinoma, the mesorectum should be completely excised based on the condition of total mesorectal excision, at least to the dentate line. All layers and the length of the anal canal should be retained, which contributes to favorable postoperative defecation function [5]. This method can effectively ensure that a limited portion of the anal canal is removed. To guarantee tension-free anastomosis, it is necessary to fully dissociate the splenic flexure of the colon. A direct coloanal anastomosis was adopted in this study. However, no severe complications occurred, such as an inability to control bowel movement throughout the surgery. Therefore, we believe that direct coloanal anastomosis can be used during an anastomosis for patients with ultralow rectal

carcinoma. Although total mesorectal excision can significantly reduce the recurrence rate, it is still necessary to carry out conventional chemotherapy and even comprehensive treatment, such as radiotherapy.

Eighteen patients out of 37 underwent preventive colostomy. Among 19 patients who did not have preventive colostomy, 4 patients had an anastomotic fistula and treated with colostomy, and the diaphyses were performed after 6 months. Patients with visual or an estimated distance of <2 cm to the dentate line underwent preventive colostomy. First, the blood supply to the proximal incised end should be guaranteed during the operation. Gu et al. proposed using a low ligation technique of the inferior mesenteric artery (IMA) [6], but during an actual operation, removal of only the superior rectal artery did not satisfy the requirements of a proximal bowel anastomosis. Therefore, it is recommended to remove the root of the sigmoid colon and retain the left colic artery and vascular arch, so as to ensure the length of the colon and a tension-free anastomosis. For a full-thickness intestinal anastomosis of the proximal and distal incisional ends, the consistency of the calibers of the closer and stapler, as well as avoidance of an anastomosis with a large closer and small stapler, are also crucial.

## Conclusion

Taken together, for patients with low anastomotic sites, especially those close to the dentate lines, it is appropriate to carry out a preventive colostomy. An anastomotic fistula may still occur, probably resulting from the blood supply of residual anal canal and an inconsistency between the peristaltic frequency of the proximal colon in the postoperative anastomotic stoma and the peristaltic frequency of the distal residual anal canal.

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