Effects of low negative pressure suction rectal drainage on postoperative intestinal function recovery and postoperative complications of rectal cancer

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Abstract: Objective: The goal of this study was to investigate the effects of low negative pressure suction rectal drainage on intestinal function recovery after rectal cancer surgery. Methods: A total of 150 patients that underwent rectal cancer surgery were enrolled. Patients were randomly divided into experimental group and control group with 75 patients in each group. The experimental group was given low negative pressure suction rectal drainage and the control group was given regular negative pressure suction rectal drainage. The time of bowel sounds recovery and the time of gastric tube removal were compared between the two groups. The volume of abdominal drainage on the 1st, 3rd, and 7th postoperative day were also compared between the groups. The incidence of rectal drainage tube blockage and postoperative complications (incision infection, pneumonia, gastric retention, anastomotic leakage, intestinal obstruction) was also evaluated. Results: There was no significant difference in the general condition between the two groups (P > 0.05). The time of bowel sounds recovery and the time of the gastric tube removal were significantly shorter in the experimental group than the control group (both P < 0.05). There was no difference between the two groups regarding the volume of abdominal drainage on the 1st, 3rd, and 7th postoperative day (P > 0.05). The incidence of rectal drainage tube blockage in the experimental group was significantly lower than the control (P < 0.05). The incidence of anastomotic leakage was lower in the experimental group (P < 0.05), while the other complications were not significantly different between the two groups (P > 0.05). Conclusion: The use of low negative pressure suction rectal drainage after rectal cancer surgery can shorten the time of bowel sounds recovery, and reduce the incidence of drainage tube blockage and the occurrence of anastomotic leakage, which is highly recommended in clinical practice.

Keywords: Low negative pressure suction, rectal drainage, rectal cancer surgery, intestinal function

Introduction

In the past 10 years, the incidence and mortality of rectal cancer in China have increased dramatically. Studies have reported that the mortality rate of rectal cancer in China was as high as 46.6% in 2015 [1, 2]. Among them, patients over 45 years old accounted for 93.28% [3, 4]. More often than not, rectal cancer patients have no specific symptoms in the early stage. However, distant metastases often occur in the middle and late stages; as a result, the cure rate is significantly decreased. Therefore, early diagnosis and early treatment is crucial [5].

Currently, the mainstream treatment of rectal cancer is surgical resection. When the tumor has not invaded the anus, the surgery will spare the anus to improve the patient’s quality of life. If the tumor has invaded the anus, the anus should be removed with the tumor [6, 7]. It is also important to ensure recovery of intestinal function after surgery. Usually, a negative pressure suction device is used to drain the liquid from the rectum after surgery, which is not only beneficial to early recovery, but also beneficial to long-term prognosis.

At present, the commonly used method for gastrointestinal decompression is a disposable negative pressure suction, which can aspirate gastrointestinal contents, blood remains, and inflammatory exudate after surgery [8, 9]. Inappropriate suction pressure is not only detrimental to the aspiration of the residue, but also
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 damages the gastrointestinal mucosa [10]. Low-pressure suction uses a suction pressure that is lower than the disposable suction canister, so that the residue is maximally drained out without damaging the intestinal mucosa, thus facilitating early intestinal recovery [11]. Studies have shown that low-pressure suction drainage can be used in postoperative patients with breast cancer, which enhances drainage of the wound [12]. However, the effects of low-pressure suction rectal drainage on the recovery of intestinal function and postoperative complications after rectal cancer surgery is by far poorly studied.

Materials and methods

Patients

A total of 150 rectal cancer patients, including 79 males and 71 females, admitted in the Department of General Surgery of the First Affiliated Hospital of Gannan Medical University from January 2015 to December 2018 were enrolled in the study. All patients underwent anus-sparing rectal cancer surgery. The study was approved by the Ethics Committee of the First Affiliated Hospital of Gannan Medical University and all patients signed informed consent. Based on the negative pressure suction pressure of the rectal drainage, patients were randomly divided into two groups after surgery, with 75 patients in each group. The experimental group was given low-pressure suction rectal drainage (-7~5 kPa) and the control group was given regular pressure suction rectal drainage (-14~8 kPa). The size and location of the abdominal cavity drainage were the same in both groups.

Inclusion criteria: Patient has confirmed diagnosis of rectal cancer through endoscopy and biopsy; Patient underwent transabdominal resection of rectal cancer (Dixon procedure) [13].

Exclusion criteria: Patient has severe malnutrition or mental disorders. Patient cannot tolerate surgery. Patient cannot cooperate during hospitalization.

Methods

Rectal drainage tube placement: Appropriate silicone drainage tube was selected based on the patient’s stature and surgery site. The diameter of the silicone tube is 1.0-2.0 cm. At the side of the tube, 3-5 holes were cut for better draining effect. Then the drainage tube was placed 3-5 cm proximal to the anastomosis, and the tube was pulled out from the anus and connected with a disposable suction canister to drain the stool and residue in the rectum. The suction canister was placed 10 cm below the patient’s bed. The suction drainage tube was removed at 7th day after surgery.

Suction pressure setting procedures: The pressure of the disposable suction canister was adjusted to -8 kPa. Then the draining tube of the suction canister was placed in the water; fully open the regulating valve before adjusting the valve. The pressure of the control group was adjusted to -14~8 kPa; the pressure of experimental group was adjusted to -7~5 kPa. After the patient was awoken from anesthesia, the patient was transferred to the ward, and the suction canister was placed 10 cm below the bed.

Observational indicators

The time of bowel sounds recovery and the time of gastric tube removal were compared between the two groups. The volume of abdominal drainage on the 1st, 3rd, and 7th postoperative day were also compared between the groups. The incidence of rectal drainage tube blockage and postoperative complications (incision infection, pneumonia, gastric retention, anastomotic leakage, intestinal obstruction) were also evaluated.

<table>
<thead>
<tr>
<th>Table 1. Comparison of general conditions</th>
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<tbody>
<tr>
<td>Group</td>
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<tr>
<td>-------</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Age (year)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
</tr>
<tr>
<td>Comorbidities</td>
</tr>
<tr>
<td>Hypertension</td>
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<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Clinical staging</td>
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<tr>
<td>Stage I</td>
</tr>
<tr>
<td>Stage II</td>
</tr>
</tbody>
</table>

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**Results**

**Comparison of general information**

There was no significant difference in gender, age, BMI, and underlying diseases between the two groups (all $P > 0.05$) as shown in Table 1.

**Comparison of the time of bowel sounds recovery and the time of gastric tube removal**

The time of bowel sounds recovery and the time of gastric tube removal in the experimental group were significantly shorter than those in the control group (all $P > 0.05$) as shown in Table 2 and Figure 1.

**Comparison of the volume of abdominal cavity drainage**

There was no significant difference in the volume of abdominal drainage between the experimental group and the control group on the 1st, 3rd, and 7th day after surgery (all $P > 0.05$) as shown in Table 3 and Figure 2.

**Comparison of the incidence of rectal drainage tube blockage**

The incidence of rectal drainage tube blockage after surgery in the experimental group (4.00%) was significantly lower than that in the control group (18.67%) ($P < 0.01$) as shown in Table 4.

**Comparison of postoperative complications**

The incidence of anastomotic leakage in the experimental group (5.33%) was significantly lower than that in the control group (16.00%) ($P < 0.05$), while the other complications were not significantly different between the two groups (all $P > 0.05$) as shown in Table 5.
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Table 3. Comparison of the volume of abdominal cavity drainage (mean ± sd)

<table>
<thead>
<tr>
<th>Group</th>
<th>Experimental group (n = 75)</th>
<th>Control group (n = 75)</th>
<th>t/χ²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>POD 1 (mL)</td>
<td>523.45 ± 129.32</td>
<td>532.25 ± 127.22</td>
<td>0.420</td>
<td>0.675</td>
</tr>
<tr>
<td>POD 3 (mL)</td>
<td>234.51 ± 121.32</td>
<td>237.82 ± 103.34</td>
<td>0.180</td>
<td>0.857</td>
</tr>
<tr>
<td>POD 7 (mL)</td>
<td>45.63 ± 12.36</td>
<td>44.41 ± 13.28</td>
<td>0.583</td>
<td>0.561</td>
</tr>
</tbody>
</table>

POD: Postoperative day.

Figure 2. Comparison of the volume of abdominal drainage. 1d: postoperative day 1; 3d: postoperative day 3; 7d: postoperative day 7; exp group: experimental group; con group: control group. ***P < 0.001.
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Other postoperative complications such as incision infection, pneumonia, gastric retention, intestinal obstruction, etc. are not affected by intra-abdominal pressure. The major influencing factor of incision infection is pathogen. Because the silicone drainage tube is sterile, we didn’t see any difference in infectious complications between the two groups. Gastric retention and intestinal obstruction are usually the results of intestinal motility disorders. Different negative pressures have no direct effect on intestinal motility and secretion, so there was no difference in the incidence of those complications between the two groups.

This study analyzed the clinical efficacy of low-pressure suction drainage on the recovery of intestinal function after rectal cancer surgery, which is rarely studied so far. However, the relatively small sample size in this study limited the further analysis of the results. Future studies will delve into how low-pressure suction drainage improves patient’s prognosis by protecting intestinal mucosa and function.

In conclusion, the use of low-pressure suction drainage after rectal cancer surgery can shorten the time of bowel sounds recovery, reduce the incidence of tube blockage, and effect anastomotic leakage without affecting the drainage of abdominal cavity, which is highly recommended in clinical practice.

Disclosure of conflict of interest

None.

Table 4. Comparison of the incidence of rectal drainage tube blockage [n (%)]

<table>
<thead>
<tr>
<th>Group</th>
<th>Experimental group (n = 75)</th>
<th>Control group (n = 75)</th>
<th>t/χ²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases of tube blockage</td>
<td>3 (4.00%)</td>
<td>14 (18.67%)</td>
<td>8.027</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Table 5. Comparison of postoperative complications [n (%)]

<table>
<thead>
<tr>
<th>Group</th>
<th>Experimental group (n = 75)</th>
<th>Control group (n = 75)</th>
<th>t/χ²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incision infection</td>
<td>4 (5.33)</td>
<td>5 (6.67)</td>
<td>0.118</td>
<td>0.731</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>3 (4.00)</td>
<td>2 (2.67)</td>
<td>0.207</td>
<td>0.649</td>
</tr>
<tr>
<td>Gastric retention</td>
<td>2 (2.67)</td>
<td>4 (5.33)</td>
<td>0.694</td>
<td>0.405</td>
</tr>
<tr>
<td>Anastomotic leakage</td>
<td>4 (5.33)</td>
<td>12 (16.00)</td>
<td>4.478</td>
<td>0.038</td>
</tr>
<tr>
<td>Intestinal obstruction</td>
<td>4 (5.33)</td>
<td>3 (4.00)</td>
<td>0.150</td>
<td>0.699</td>
</tr>
</tbody>
</table>

References


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[18] Song Y. Patients after abdominal operation to carry out different nursing counter measure on the recovery of gastrointestinal function effect. China Continuing Medical Education 2015.


