Dysfunction in Defecation and Its Treatment after Rectal Excision

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Abstract: Various types of dysfunction in defecation are known to develop after low anterior resection for rectal cancer. In particular, the lower the level of anastomosis, the more serious the disturbance. This disturbance is characterized by a variable frequency of defecation and urgency. To improve this condition, colonic J-pouch anal anastomosis was reported as an option. In this technique, a colonic J-pouch was constructed and anastomosis was formed with the anus to restore stool reservoir function. This technique has been performed since 1988 at our institution. It was observed that approximately 3 years after the operation stool frequency was significantly decreased, the development of urgency was reduced, and the defecation function was improved, compared with straight coloanal anastomosis. This improvement in the function of defecation appeared to be largely influenced by both an increase (approximately twice) in the capacity and the compliance of the colonic pouch. Since these results were not derived from randomized trials, the published results of randomized trials were investigated, and are also discussed below.

Key words: Coloanal anastomosis; Colonic J-pouch anal anastomosis; Colonic coloplasty

Introduction

It is known that sexual dysfunction, dysuria or dysfunction in defecation develop after rectal excision for the treatment of rectal cancer. Among these, sexual dysfunction and dysuria result from resection of the sympathetic or parasympathetic nerve, hypogastric nerve, pelvic nerve or pelvic plexus, accompanying the dissection of lymph nodes anterior to the abdominal aorta or pelvic lymph nodes. On the other hand, dysfunction in defecation is considered to be an indication of the improvement in surgical techniques. Namely, anastomosis has become possible by using autosuturing devices even at a relatively low level, to avoid the need...
for a permanent artificial anus. Moreover, colo-
anal anastomosis has been performed to con-
struct an anastomosis with the lower anal
channel.\(^1\) However, it has been recognized that
the level of anastomosis is proportionally re-
lated to the frequency of dysfunction in defeca-
tion, with a lower level corresponding to a
higher frequency. It has been recognized that
urgency or a high stool frequency increases
after surgery and anomalous conditions such as
unstable defecation function develop.

Nicholls et al. have suggested that the main
cause of dysfunction in defecation is most
likely to be the lack of reservoir function in
the colonic “neorectum”, in some patients.\(^2\)
Lazorthes et al. and Parc et al. published reports
in 1986\(^3,4\) on coloanal anastomosis by construc-
tion of a colonic J-pouch that forms an anasto-
mosis with the anus, in order to overcome this
dysfunction. Post-operative favorable results
were also reported. At our institution, we have
performed this colonic J-pouch anal anastomo-
sis (colonic J-pouch, and so forth) under spe-
cific conditions since 1988. We will report these
postoperative results and intend to introduce
the results of published data from randomized
trials in a comparison with straight coloanal
anastomosis.

The Results of Colonic J-Pouch Anal
Anastomosis in Our Institution

Straight coloanal anastomosis is the name of
the technique in which there is a direct anasto-
mosis with the anus without a reservoir func-
tion. When comparing the mean daily stool
frequency in colonic J-pouch cases, the daily
stool frequency is significantly less than for
straight coloanal anastomosis cases up to one
year after surgery (\(p<0.01\)). A smaller differ-
ence was found around 3 years after surgery
(\(p<0.05\)) and there were no significant differ-
ences 5 years after surgery and onward (Fig. 1).
Moreover, with rectoanal manometry (neo-
rectoanal manometry), the test items that
showed an inverse correlation with daily stool

![Fig. 1 Time course of daily stool frequency](image1)

\[
\text{Fig. 1 Time course of daily stool frequency}
\]

![Fig. 2 The relationship of daily stool frequency and maximum tolerated volume (MTV)](image2)

\[
y = -19.4x + 245.7 \\
r = -0.59, \ p<0.01
\]

![Fig. 2 The relationship of daily stool frequency and maximum tolerated volume (MTV)](image3)

\[
y = -0.39x + 3.74 \\
r = -0.58, \ p<0.01
\]

![Fig. 3 The relationship of daily stool frequency and compliance](image4)
frequency were maximum tolerated volume (Fig. 2) and compliance (Fig. 3) of colonic pouch \((p<0.01)\). This appears to indicate a correlation between increased colonic pouch volume, or the ease of expansion of the colonic pouch under applied pressure, a lower daily stool frequency. On the other hand, in a comparison of colonic J-pouch and straight coloanal anastomosis at one year after surgery when defecation function becomes stable, no differences were found in anal canal length (ACL), maximum resting pressure (MRP, a test to assess the function of the internal anal sphincter) and maximum squeeze pressure (MSP, a test to assess the function of the external anal sphincter) (Table 1). Maximum tolerated volume (MTV), threshold volume (ThV) and compliance (Comp) were significantly higher for the colonic J-pouch patients (Table 2). In colonic J-pouch cases, MTV, maximum tolerated pressure (MTP), ThV, ThP and Comp showed no significant differences between 1 year after surgery and 3 years or more after surgery (Table 3). Moreover, the symptom of urgency that was problematic in straight coloanal cases was rarely observed in colonic J-pouch cases.

According to the results mentioned above, compared with straight coloanal anastomosis cases, it was shown that colonic J-pouch significantly reduced the stool frequency until approximately 3 years after surgery, with decreased development of symptoms like urgency, and an improvement in defecation functions. This improvement in defecation function seemed to be largely the result of an increase in volume (approximately twice) due to the pouch construction and an increase in compliance.

### The Results of Randomized Trials

Since the results of our institution are not based on enough cases and they are not derived from randomized trials, we intend to refer to the results of the discussion on published randomized trial data. The results below are from a time point one year after surgery when the defecation function becomes stable.

Ortiz et al. have compared the colonic J-pouch of 10cm in length with straight anastomosis and found a large number of cases with

<table>
<thead>
<tr>
<th>Table 1 Comparison of Rectoanal Manometry (after 1 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonic J-pouch ((n=15))</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>ACL (cm) (3.5\pm1.0)</td>
</tr>
<tr>
<td>MRP(cmH(_2)O)</td>
</tr>
<tr>
<td>MSP(cmH(_2)O)</td>
</tr>
</tbody>
</table>

ACL: anal canal length, MRP: maximum resting pressure, MSP: maximum squeeze pressure

<table>
<thead>
<tr>
<th>Table 2 Comparison of Rectoanal Manometry (after 1 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonic J-pouch ((n=15))</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>MTV(ml) (221.5\pm55.1)</td>
</tr>
<tr>
<td>MTP (cmH(_2)O)</td>
</tr>
<tr>
<td>ThV(ml)</td>
</tr>
<tr>
<td>ThP(cmH(_2)O)</td>
</tr>
<tr>
<td>Comp (ml/cmH(_2)O)</td>
</tr>
</tbody>
</table>

MTV: maximum tolerated volume, MTP: maximum tolerated pressure, ThV: threshold volume, ThP: threshold pressure, Comp: compliance

<table>
<thead>
<tr>
<th>Table 3 Comparison of Rectoanal Manometry According to the Years after Surgery (Colonic J-pouch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) year after surgery ((n=13))</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>MTV(ml)</td>
</tr>
<tr>
<td>MTP (cmH(_2)O)</td>
</tr>
<tr>
<td>ThV(ml)</td>
</tr>
<tr>
<td>ThP(cmH(_2)O)</td>
</tr>
<tr>
<td>Comp (ml/cmH(_2)O)</td>
</tr>
</tbody>
</table>
ment in defecation function in every case, even at different lengths of the colonic J-pouch. Some results have been obtained from randomized trials. In summary, it appears that (1) the volume of the colonic J-pouch is approximately twice that of straight coloanal anastomosis, (2) construction of the colonic J-pouch improves anal sphincter function, and reduces daily stool frequency and frequency of the development of urgency, (3) this improvement is particularly evident until one year after surgery.

Therefore the length of the colonic J-pouch constructed seems to be an important consideration. Hida et al. reported that there was no difference in the clinical assessment of a 10 cm colonic J-pouch when compared with a 5 cm colonic J-pouch but MTV and Comp were.

Table 4 Comparison from Randomized Trial (after 1 year)

<table>
<thead>
<tr>
<th>Reporter</th>
<th>Colonic J-pouch</th>
<th>Number of patients</th>
<th>Daily stool frequency</th>
<th>Stool frequency 3 times/day and fewer</th>
<th>Normal sphincter function</th>
<th>Urgency</th>
<th>Maximum tolerance volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ortiz, H. et al.</td>
<td>(−) 15</td>
<td>NS</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>9</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>(+) 15</td>
<td>NS</td>
<td>10</td>
<td>18</td>
<td>19</td>
<td>4</td>
<td>335</td>
</tr>
<tr>
<td>Seow-Choen, F. et al.</td>
<td>(−) 19</td>
<td>2</td>
<td>14</td>
<td>18</td>
<td>4</td>
<td>2</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>(+) 20</td>
<td>2</td>
<td>15</td>
<td>19</td>
<td>2</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Hallböök, O. et al.</td>
<td>(−) 47</td>
<td>3.5</td>
<td>NS</td>
<td>NS</td>
<td>15</td>
<td>2</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>(+) 42</td>
<td>2.0</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Lazorthes, F. et al.</td>
<td>(−) 16</td>
<td>5.0</td>
<td>5</td>
<td>5</td>
<td>14</td>
<td>3</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>(+) 15</td>
<td>2.5</td>
<td>13</td>
<td>15</td>
<td>2</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS: not stated, *p<0.05

Table 5 Comparison from Randomized Trial (pouch volume)

<table>
<thead>
<tr>
<th>Reporter</th>
<th>Pouch volume (cm)</th>
<th>Number of patients</th>
<th>Anastomosis (cm)</th>
<th>Clinical evaluation</th>
<th>Maximum tolerance volume (ml)</th>
<th>Compliance (ml/cmH2O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hida, J. et al.</td>
<td>5</td>
<td>20</td>
<td>4.5</td>
<td>NS</td>
<td>99</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>20</td>
<td>4.5</td>
<td>NS</td>
<td>130</td>
<td>6.4</td>
</tr>
<tr>
<td>Lazorthes, F. et al.</td>
<td>6</td>
<td>23</td>
<td>2.5</td>
<td>NS</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>24</td>
<td>2.3</td>
<td>NS</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

NS: not significant, *p<0.005

daily stool frequency of three times or less and a significant difference in MTV. Moreover, Seow-Choen et al., who examined the colonic J-pouch of 8 cm in length, have found a large number of cases with daily stool frequency of three times or less and significant difference in normal sphincter function. Hallböök et al. have found a significant difference of lower daily stool frequency, lower frequency of urgency symptom, and lower frequency of leakage with a colonic J-pouch of 6–8 cm in length. On the other hand, Lazorthes et al., who examined a colonic J-pouch of 5 cm in length, have found a significant difference in lower daily stool frequency and more cases with daily stool frequency of three times or less (Table 4).

Similar to the above-mentioned cases, various authors have reported significant improvement in defecation function in every case, even at different lengths of the colonic J-pouch. Some results have been obtained from randomized trials. In summary, it appears that (1) the volume of the colonic J-pouch is approximately twice that of straight coloanal anastomosis, (2) construction of the colonic J-pouch improves anal sphincter function, and reduces daily stool frequency and frequency of the development of urgency, (3) this improvement is particularly evident until one year after surgery.

Therefore the length of the colonic J-pouch constructed seems to be an important consideration. Hida et al. reported that there was no difference in the clinical assessment of a 10 cm colonic J-pouch when compared with a 5 cm colonic J-pouch but MTV and Comp were.
significantly higher for a 10 cm. On the other hand, Lazorthes et al. compared a colonic J-pouch of 6 cm in length with that of 10 cm in length and reported that clinical assessment showed no differences in the stool frequency, urgency, anal sphincter function and other parameters (Table 5). It has conversely been shown that a longer colonic J-pouch results in dyschezia in some cases. Thus it seems that the optimum length or optimum volume requires further investigation through research.

Future Prospects

This technique of anastomosis with the anus by constructing a colonic J-pouch with rectal ampulla function seems to have been standardized globally because of the postoperative favorable results. In 2000, Fazio et al. reported a new surgical procedure instead of this colonic J-pouch method. After resection of the rectum up to the anal canal, an 8-cm to 10-cm colotomy is made between the tenia in the proximal colon. Then the longitudinal opening is closed in a transverse fashion. This procedure increases the capacity of the colonic lumen. Theoretically it is similar to strictureplasty procedure for the intestinal stricture and this kind of operation is called “colonic coloplasty.” In the same institution, approximately the same results have been obtained from a comparison of the colonic J-pouch anal anastomosis and colonic coloplasty. Moreover, at the ASCRS held in Chicago in June 2002, Fürst et al. reported similar results from a prospective randomized pilot study. Therefore, it appears that this colonic coloplasty procedure may take the place of the colonic J-pouch as a new simple, inexpensive surgery in the future. Further examination at other institutions should be performed.

Conclusions

As mentioned above: As a technique for the treatment of carcinoma of the lower rectum, to avoid construction of a permanent artificial anus, extremely low level anastomosis has been performed. As a result, the post-operative complication of dysfunction in defecation has attracted new attention. Construction of a colonic J-pouch was developed as a surgical procedure to improve the dysfunction in defecation and produced favorable post-operative outcomes. However, improvements are still needed because all of the problems have not been resolved. Therefore, further efforts by surgeons toward the development of better techniques to enhance defecation function are required.

REFERENCES


