Isoperistaltic transverse colon interposition after total gastrectomy for gastric cancer: effect on the quality of life

ORIGINAL ARTICLE Annals of Cancer Research and Therapy

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Among patients who underwent total gastrectomy for gastric cancer, 102 patients who received transverse colon interposition (TCI) by the Nagamachi type II method, (48 manual and 54 mechanical) were compared with 24 patients who underwent the jejunal p-loop Roux en Y method. Esophageal reflux was compared between the above three methods, and the influence on the quality of life (QOL) was examined. When compared to the jejunal p-loop Roux en Y method, the QOL was better for patients who underwent the TCI method (p<0.01). The incidence of reflux esophagitis with the TCI method was lower than after the jejunal p-loop Roux en Y method (p<0.05), and was 0% for the manual method. Reflux prevention was assessed using the standard acid reflux test and the degree of esophageal reflux with the manual method was significantly lower than with the jejunal p-loop Roux en Y method (p<0.0001). Esophageal reflux was also less severe with the manual method than the mechanical method (p<0.05). Manometry of the replacement stomachs revealed that, even though retrograde contraction waves were not detected in the interposed colon, the high pressure zone at the esophago-interposed colonic junction played a role in preventing reflux. These findings indicate that the TCI method particularly by the manual method is a good reconstruction technique after total gastrectomy. Excellent postoperative QOL can be obtained soon after the operation, because reflux esophagitis can be almost completely prevented.


Key words: transverse colon interposition method, quality of life, reflux prevention

The important points to consider when choosing the method for reconstruction of the stomach after total gastrectomy are as follows: good food retention, absorption and excretion, and the prevention of reflux esophagitis and the dumping syndrome that negatively affect the postoperative QOL. Since Schlatter first performed total gastrectomy in 1897, the jejunum has been used to reconstruct the stomach, but the postoperative problems associated with total gastrectomy have not been resolved despite various improvements and modifications.

State et al. and Lee first utilized the colon as a substitute stomach in 1951. State et al. antiperistaltically interposed the transverse colon between the esophagus and duodenum, while Lee utilized the ileo-colon to improve food retention and promote gradual excretion.

At our department, isoperistaltic pedicular transverse colon interposition (TCI) by the Nagamachi type I method, involving end-to-end anastomosis of the esophagus with a transverse colon segment, was performed by Nagamachi et al. on 52 patients between 1965 and 1970. Before this method was introduced, the incidence of reflux esophagitis ranged from 25% to 32%, but this method decreased the incidence to 12.0%. This method was further improved by Nagamachi, and from 1986 we began to perform the Nagamachi type II method, in which end-to-side anastomosis is used to connect the stump of the esophagus to the transverse colon. Between 1986 and 1990, anastomosis was performed manually (manual method), and after 1991 an automatic anastomosis device (Auto Suture® New premium CEEA or PREMIUM CEEA 25) was used to simplify the surgical procedure (mechanical method) (Fig. 1).

In the present study, esophageal reflux prevention and the postoperative QOL obtained with transverse colon interposition (by the manual and mechanical methods) were compared with the results for the jejunal p-loop Roux en Y method (RY method) of stomach reconstruction.

Subjects

The present study assessed 126 patients who underwent total gastrectomy by the same surgeon (Y.N.) for gastric cancer between 1986 and 1996 at our department. There were 102 patients who underwent the TCI method including 48 by the manual method (36 men and 12 women aged 61.3 ± 11.8 years) and 54 by the mechanical method (43 men and 11 women aged 60.7 ± 12.3 years), and 24 patients who underwent the RY method (16 men and 8 women aged 63.4 ± 9.8 years). All the patients were younger than 75 years of age. In addition, they did not experience recurrence and were followed up for more than...
Fig. 1 Reflux prevention mechanism of the transverse colon interposition procedure (Nagamachi type II method) in cross section. (Reproduced from Nagamachi Y8).

(A) Manual transverse colon interposition method, (B) Mechanical transverse colon interposition method. The arrow in the figure indicates the valve structure. With the Nagamachi type II method, when the stump of the esophagus and the longitudinally incised taenia libera of the transverse colon are anastomosed end-to-side, in the case of the manual method, a strong taenia libera can be wrapped around the entire circumference of the stump of the esophagus as well as a strong valve structure created around the entire circumference of the anastomosis. But with the mechanical method, because in the taenia libera and esophagus are only fixed together at two places, it is regarded as unlikely that a strong valve can be created around the entire circumference of the anastomosis.

Table 1 The rehabilitation classification system developed by Mitsuno9)

<table>
<thead>
<tr>
<th>Group</th>
<th>Working person</th>
<th>Housewife or elderly person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Returned to former occupation.</td>
<td>Doing the same work as before the illness.</td>
</tr>
<tr>
<td>Ib</td>
<td>Is able to work if he or she wishes, but, because it is not necessary, is not now working.</td>
<td>Because easily fatigued, is doing less work than before the illness.</td>
</tr>
<tr>
<td>I</td>
<td>Has returned to former occupation, but is on light duties.</td>
<td>Because he or she becomes very fatigued if doing the same work as before the illness, is doing the bare minimum of work.</td>
</tr>
<tr>
<td>II</td>
<td>Has changed to a quite different occupation and is doing light work.</td>
<td>Wishes to do the same work as before, but cannot do so because health has not sufficiently recovered.</td>
</tr>
<tr>
<td>III</td>
<td>Wishes to return to work, but cannot do so because health has not sufficiently recovered.</td>
<td>Needs help in daily life. (Is, of course, not working.)</td>
</tr>
</tbody>
</table>

Methods

1. Rehabilitation

Rehabilitation at one year after the operation was analyzed by interviewing the patients on an outpatient basis and using the rehabilitation classification system developed by Mitsuno9) (Table 1).

2. Postoperative reflux esophagitis

Postoperative reflux esophagitis was diagnosed by performing endoscopy at one year after operation and assessed according to the classification of Savary & Miller10). Reflux esophagitis was defined as findings $>\text{stage 1}$.

3. Reflux symptoms

Esophageal reflux symptoms were detected by questioning the patients and assessed according to a score developed by Sakamoto11. Reflux symptoms were defined as a score of 2 or more. 0: no symptoms, 1: heartburn rarely occurs and is not serious enough to require medicine, 2: heartburn sometimes occurs, but resolves with medicine, 3: heartburn often occurs and is not controlled by medicine.

4. Esophageal pH measurement

The esophageal pH was measured in a total of 65 patients: 41 patients who underwent the TCI method (17 manual and 24 mechanical), 16 patients who underwent the RY method, and 8 patients who underwent the Billroth I method after subtotal gastrectomy. Informed consent was obtained from each patient.
Esophageal pH measurement was performed according to the procedures of the standard acid reflux test (SART)\textsuperscript{12,13}.

All patients were requested to stop taking any medicine with a known effect on esophageal pH for at least 24h before the study. After an overnight fast, the esophageal pH was measured by inserting a nasogastric tube (single bore, 14 Fr) equipped with a pH sensor (pH electrode: AE-05, Fuji Kagaku Keisoku, Osaka, pH meter: FL-5W, Fuji Kagaku Keisoku, Osaka) under the guidance of fluoroscopy. A tube was inserted into the interposed colon for TCI patients and into the efferent limb for RY patients. The tip of the gastric tube was placed 10 cm anal to the junction of the esophagus and the substitute stomach, and the pH sensor was placed 10 cm oral to the junction.

Esophageal pH was first measured with the patient lying supine. Next, with the patient in the head down (20 degrees) positions, 30 ml of hydrochloric acid (0.1 N) was injected into the substitute stomach through the nasogastric tube. The changes of esophageal pH over 20 minutes after HCl injection were measured with the pH sensor and recorded with a pen recorder (RTA-1200, Nihon Kohden, Tokyo). Reflux of HCl following injection into the substitute stomach was assessed by calculating the absolute value of the difference between the esophageal pH before and after HCl injection. The difference in esophageal pH was classified as follows, grade 1: less than 1.0, grade 2: between 1.1 and 2.0, grade 3: between 2.1 and 3.0, and grade 4: more than 3.1.

5. Manometry of the substitute stomach

Manometry was performed in a total of 17 patients: 12 patients who underwent the TCI method (7 manual and 5 mechanical) and 5 patients who underwent the RY method. Informed consent was obtained from each patient.

A polyvinyl chloride catheter assembly (o.d. 6 mm) with five side holes was used to measure the intraluminal pressure in the esophagus, at the anastomosis between the esophagus and jejunum, and another three in the efferent limb. In RY patients, the catheter was placed so that one hole was in the esophagus, one at the junction between the esophagus and interposed colon, and one in the duodenum. In RY patients, the catheter was positioned so that one hole was in the esophagus, one at the junction between the esophagus and jejunum, and another three in the efferent limb. The at the junction between the esophagus and the efferent colon or Roux limb (efferent limb). Pressures were recorded during perfusion of the gastrointestinal tract with distilled water (0.2 ml/min) by means of a minimally compliant, pneumohydraulic capillary infusion system (Arndorfer Corporation, Greendale, WI, USA). Each catheter was connected to an external pressure transducer (TP-300T, Nihon Kohden, Tokyo, Japan), which was connected to an amplifier (AP-601G, Nihon Kohden) the output of which was recorded on a multichannel recorder (RTA-1200, Nihon Kohden).

All patients were requested to stop taking any medicine with known effects on gastrointestinal motility for at least 24h before the study. After an overnight fast, the manometric assembly was inserted pernasally under fluoroscopic guidance into the interposed colon in TCI patients and into the efferent limb in RY patients. In TCI patients, the catheter was positioned so that one hole was in the esophagus, one at the junction between the esophagus and interposed colon, and one in the duodenum. In RY patients, the catheter was placed so that one hole was in the esophagus, one at the junction between the esophagus and jejunum, and another three in the efferent limb. At the junction between the esophagus and the efferent colon or between the esophagus and jejunum, the increase in intraluminal pressure was measured by the pull-through technique, and the catheter was positioned where an increase was detected. After measuring contractions at rest for 60 minutes, the patients were asked to ingest of a liquid meal (30 ml of MA-8, Morinaga Co., Tokyo: 1 ml = 1 kcal) three times at 10-min intervals with recording of the contractions.

6. His angle measurement

The His angle was measured in 89, subjects including 58 patients who underwent the TCI method (32 manual and 26 mechanical), 19 who underwent the RY method, and 12 healthy controls.

In the upright position contrast X-rays, we measured the angle formed by the line between the esophagus and the substitute stomach at the esophagus-substitute stomach anastomosis (the upper margin of the interposed colon for the TCI method, and the margin of the efferent limb for the RY method), and defined this as the His angle.

7. Statistical analysis

Fisher's direct probability test and the Mann-Whitney test were used for statistical analysis. Significance was established at the p<0.05 level. Results are expressed as the mean ± standard deviation.

Results

1. Rehabilitation

The extent of rehabilitation was significantly better in TCI patients than in RY patients (p<0.01) (Table 2). Although the rehabilitation of patients treated by the manual method was better than that of patients treated by the mechanical method, there was no significant difference between the two groups. Rehabilitation of patients treated by the manual or mechanical methods was significantly better than that of patients undergoing the RY method (p<0.0005 and p<0.005, respectively). Patients in groups la and Ib were capable of resuming their preoperative lifestyle. In additional, 58.8% of TCI patients
were able to resume their preoperative lifestyle, whereas this was possible for only 33.3% of RY patients. Groups II and III were forced to change their lifestyle after surgery due to fatigue, being unable to work as before, and they accounted for 41.2% of TCI and 66.7% of RY patients.

2. Reflux esophagitis and reflux symptoms

Table 3 shows the incidence of reflux esophagitis and reflux symptoms.

Comparison of postoperative reflux esophagitis revealed that the incidence after the TCI method (5.9% for the manual and mechanical methods combined) was significantly lower ($p<0.05$) than that after the RY method (25.0%). It was 0% for TCI by the manual method. The incidence of reflux symptoms after the TCI method was 8.8%, which was significantly lower ($p<0.0001$) than that after the RY method (45.8%). The incidence of reflux symptoms was 2.1% for the manual method, which was significantly lower than that for the mechanical method (14.8%, $p<0.05$).

3. Esophageal pH

Actual records of pH measurement are shown in Figs. 2 and 3.

1) Esophageal pH data analysis

Table 4 shows the esophageal pH of various groups of patients before and after injecting HCl. The esophageal pH of patients treated by the RY method ($7.08 \pm 0.36$) was significantly higher than that of patients treated by the manual or mechanical methods ($6.65 \pm 0.14$, $p<0.0005$ and $6.78 \pm 0.24$, $p<0.01$, respectively).

2) Esophageal pH difference after HCl injection

The absolute difference in esophageal pH was used to assess esophageal reflux caused by injecting HCl into the substitute stomach. The esophageal pH difference in patients treated by the manual method ($0.61 \pm 0.51$) was significantly smaller ($p<0.0005$) than that in patients treated by the mechanical method ($1.76 \pm 0.94$), which in turn was significantly smaller ($p<0.0001$) than that in patients treated by the RY method ($3.57 \pm 1.26$). Also, no significant difference in esophageal pH difference was observed between the manual method and the Billroth I method.

3) Esophageal pH difference and reflux symptoms

Table 5 shows the relationship between the esophageal pH difference and esophageal reflux symptoms. Patients with a grade 1 esophageal pH difference did not experience reflux symptoms. The percentage of patients with a grade 2, 3, or 4 esophageal pH difference who experienced reflux symptoms was 7.1%, 71.4, and 69.2%, respectively. Analysis of these results showed that even though there was no significant difference in the number of patients who experienced esophageal reflux between grade 1 and 2 or between grade 3 and 4, there was a significant difference between grade 2 and 3 ($p<0.0005$) or between grade 2 and 4 ($p<0.0005$). Therefore, there were more grade 3 and 4 patients with esophageal reflux.

4) Grade of esophageal pH difference

Table 6 shows the different grades of esophageal pH for various reconstruction methods. In patients treated by the manual method, the esophageal pH difference was grade

<table>
<thead>
<tr>
<th>Reconstruction method</th>
<th>No. of patients</th>
<th>Reflux esophagitis</th>
<th>Reflux symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colon interposition method</td>
<td>102</td>
<td>6 (5.9%)</td>
<td>9 (8.8%)</td>
</tr>
<tr>
<td>Manual method</td>
<td>48</td>
<td>0 (0.0%)</td>
<td>1 (2.1%)</td>
</tr>
<tr>
<td>Mechanical method</td>
<td>54</td>
<td>6 (11.1%)</td>
<td>8 (14.8%)</td>
</tr>
<tr>
<td>Jejunal ρ-loop Roux en Y method</td>
<td>24</td>
<td>6 (25.0%)</td>
<td>11 (45.8%)</td>
</tr>
</tbody>
</table>

*p $< 0.05$, ** $p < 0.005$, *** $p < 0.0001$
4. Manometry findings

Fig. 4 shows typical manometry data for the substitute stomachs. When patients treated by the RY method ingested a liquid meal, esophageal peristaltic waves were detected first and then contraction waves appeared. Among the peristaltic waves traveling towards the anus, retrograde contraction waves were seen in the Roux (efferent) limb (Fig. 4A). In RY patients, no increase of intraluminal pressure could be detected by the pull-through technique near the anastomotic site. When TCI patients ingested a liquid meal, esophageal peristaltic waves were detected first and then contraction waves appeared in the interposed transverse colon with peristaltic waves being transmitted towards the anus, but there was no retrograde transmission in any of these patients. At the junction between the esophagus and the interposed transverse colon, a decrease of intraluminal pressure caused by swallowing was detected in four out of seven patients treated by the manual method and two out of five patients treated by the mechanical method, thus confirming normal lower esophageal sphincter-like relaxation (Fig. 4B), but this was not seen in any of the five RY patients.

5. His angle

Table 7 shows the results of His angle measurement for each reconstruction method. The His angle was larger in RY patients than in TCI patients, and no significant difference was found between the manual and mechanical

1 or 2 in 94.1% and grade 3 or 4 in 5.9%. On the other hand, 87.5% of patients treated by the RY method were in grade 3 or 4 and only 12.5% were in grade 1 or 2. Esophageal reflux was mildest with the manual method, followed by the mechanical method, and reflux was severest with the RY method.
Fig. 3  Intraesophageal pH measurement before and after HCl injection into the substitute stomach (A) RY method (T. M., 71 year-old man, Grade 4). When HCl is injected, the esophageal pH decreases from 7.5 to 2.0. (B) Billroth I method after subtotal gastrectomy (N. K., 57 year-old man, Grade 1). When HCl is injected, no change in pH is observed.

Table 4  Esophageal pH

<table>
<thead>
<tr>
<th>Reconstruction method</th>
<th>No. of patients</th>
<th>Esophageal pH</th>
<th>Esophageal pH difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual method</td>
<td>17</td>
<td>6.65 ± 0.14**</td>
<td>0.61 ± 0.51'</td>
</tr>
<tr>
<td>Mechanical method</td>
<td>24</td>
<td>6.78 ± 0.24*</td>
<td>1.76 ± 0.94***</td>
</tr>
<tr>
<td>R Y method</td>
<td>16</td>
<td>7.08 ± 0.36</td>
<td>3.57 ± 1.26</td>
</tr>
<tr>
<td>Billroth I method</td>
<td>8</td>
<td>6.21 ± 0.18</td>
<td>0.60 ± 0.38</td>
</tr>
</tbody>
</table>

The absolute difference in esophageal pH was used to assess esophageal reflux caused by injecting HCl. Values are the mean ± S.D., * p<0.01 vs. the RY method. ** p<0.0005 vs. the RY method and Billroth I method. *** p<0.0001 vs. the RY method. ' p<0.0005 vs. the mechanical method

Table 5  Relationship between the esophageal pH difference and esophageal reflux symptoms

<table>
<thead>
<tr>
<th>Grade</th>
<th>No. of patients</th>
<th>Reflux symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>26</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Grade 2</td>
<td>14</td>
<td>1 (7.1%)</td>
</tr>
<tr>
<td>Grade 3</td>
<td>12</td>
<td>10 (71.4%)</td>
</tr>
<tr>
<td>Grade 4</td>
<td>13</td>
<td>9 (69.2%)</td>
</tr>
</tbody>
</table>

* p<0.0005. ** p<0.005
Table 6 Grade of esophageal pH for various types of reconstruction methods

<table>
<thead>
<tr>
<th>Reconstruction method</th>
<th>No. of patients</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 and 2</td>
</tr>
<tr>
<td>Manual method</td>
<td>17</td>
<td>16 (94.1%)</td>
</tr>
<tr>
<td>Mechanical method</td>
<td>24</td>
<td>14 (58.3%)</td>
</tr>
<tr>
<td>R Y method</td>
<td>16</td>
<td>2 (12.5%)</td>
</tr>
<tr>
<td>Billroth I method</td>
<td>8</td>
<td>8 (100%)</td>
</tr>
</tbody>
</table>

* p<0.05, ** p<0.005, *** p<0.0001

![Fig. 4](image)

(A) A patient treated by the RY method (68 year-old man) shows retrograde contraction waves (arrows) in the Roux limb. (B) A patient treated by the TC1 method (70 year-old man) shows no retrograde contraction waves in the interposed colon, and there is lower esophageal sphincter like relaxation (*) after swallowing the liquid meal at the junction between esophagus and interposed colon.

Table 7 His angle

<table>
<thead>
<tr>
<th>Reconstruction method</th>
<th>No. of patients</th>
<th>His angle (degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy controls</td>
<td>12</td>
<td>41.3 ± 2.6</td>
</tr>
<tr>
<td>Manual method</td>
<td>32</td>
<td>76.7 ± 13.8</td>
</tr>
<tr>
<td>Mechanical method</td>
<td>26</td>
<td>80.4 ± 13.5</td>
</tr>
<tr>
<td>R Y method</td>
<td>19</td>
<td>146.1 ± 34.4</td>
</tr>
</tbody>
</table>

Discussion

Postoperative reflux esophagitis occurs frequently and has an adverse effect on QOL\(^{14,15}\). The cause of reflux symptoms and reflux esophagitis after surgery on the stomach is the reflux into the esophagus of alkaline methods.
duodenal juice consisting mainly of bile and pancreatic juice. This reflux occurs after total or partial gastrectomy\(^{16,17}\), and is caused by the breakdown (due to the surgery), of the reflux-preventing mechanism at the esophago-gastric junction as well as by loss of the stomach reservoir with gastrectomy\(^{17-19}\).

Because it has been customary to use the jejunum to reconstruct the stomach after total gastrectomy, it was impossible to make an artificial fornix or reflux-preventing valve. With the Nagamachi type II method used at our department, however, a highly effective reservoir was obtained by using the transverse colon. It was possible, by employing esophago-colonic end-to-side anastomosis, to make an artificial fornix and form a sharp His angle. Also, by suturing the stump of the esophagus to the taenia libera of the transverse colon, a valve could be made to prevent reflux.

Tani\(^{20}\) reported that no high pressure zone was found at the anastomosis with any reconstruction method employing the jejunum after total gastrectomy, and in the present study the RY method created no high pressure zone at the esophago-jejunal anastomosis. The RY method differs from the TCI method in that the reservoir is small, the His angle is blunt, and there is no artificial fornix or reflux-preventing valve.

With the RY method, an ingested swallowed meal is transported by peristalsis to the jejunum which is the substitute stomach and is moved analy by the isoperistaltic waves of the jejunum, but the occurrence of an antiperistaltic wave in the jejunum can return it orally and the lack of any reflux preventing valve will lead to reflux into the esophagus.

Manometry of the substitute stomach detected a high pressure zone with both the manual and mechanical methods that was not found after the RY method. According to the TCI method creates a reflux-preventing mechanism which increases pressure at the esophago-colonic junction.

When manometry of the substitute stomach was done after the oral intake of 30ml of liquid meal, there was a pressure change resembling relaxation of the lower esophageal sphincter accompanying swallowing as well as a high pressure zone at the esophago-colonic junction after the TCI method. Thus when food is eaten in the upright position, it passed the reflux-preventing valve. In the supine position, the contents of the interposed colon remain in the fornix and apply pressure on the lower esophagus via the sharp His angle, so the reflux-preventing valve is closed and there is no reflux.

The manual and mechanical methods have in common the creation of a fornix, a reservoir with a large capacity, and a sharp His angle, but the valve structure is imperfect with the mechanical method. When the stump of the esophagus and the longitudinally incised taenia libera of the transverse colon are anastomosed end-to-side by the manual method, a strong taenia libera can be wrapped around the entire circumference of the esophageal stump and a strong valve structure can be created around the entire circumference of the anastomosis. With the mechanical method, however, part of the taenia libera is excised and the stump of the esophagus and the taenia libera are only fixed together at two places, making it unlikely that a strong valve can be created around the entire circumference of the anastomosis. When the esophageal pH was measured before injecting HCl, it was lower in patients treated by the manual method than in those receiving the mechanical method. When HCl was injected and the pH difference was recorded, there was a greater esophageal reflux with the mechanical method than with the manual method, and it was thought that the cause lay in the structure of the valve.

Before the injection of HCl, TCI patients had a lower esophageal pH than RY patients, suggesting that the inside of the esophagus was continually exposed to alkaline duodenal juice in the latter groups. Yamamoto et al\(^{21}\) reported that in patients with reflux esophagitis after surgery, the esophageal pH was >7 for much of the time, so it can be said that reflux may easily occur in RY patients. Also, the manual TCI method with its outstanding reflux-preventing function is a reconstruction method which is very effective in preventing postoperative reflux esophagitis.

After total gastrectomy, QOL is affected by poor food intake and the accompanying loss of weight, and the most frequent complaint after surgery is reflux\(^{11,22,23}\).

Our study of QOL in terms of rehabilitation after surgery showed that among groups I and II who returned to their former jobs, when the Nagamachi type II method had been used more than 85% had the same daily activities as before surgery.

At 6 months after surgery 80% of the preoperative food intake was only achieved by 40.0% of RY patients, whereas the figure for the Nagamachi type II method was 83.8%, of whom 81.1% had returned to having three meals a day. Thus, with the Nagamachi type II method, there was early recovery of food intake and the number of meals to the level before the patient’s condition deteriorated and surgery became necessary\(^{24}\).

These results show that, by providing a reflux-preventing mechanism, the Nagamachi type II method reduces the incidence of postoperative reflux esophagitis. Especially with the manual method, the incidence was 0%, making it possible to increase the food intake soon after operation, so that this reconstruction method enables the patient to enjoy a favorable return to normal life.

In conclusion, the Nagamachi type II method employs
20cm of the transverse colon and no organ with an important function is lost, good favorable postoperative QOL is obtained, and particularly with the manual method, a highly effective reservoir and effective esophageal reflux-preventing function are obtained and the occurrence of postoperative reflux esophagitis can be prevented.

References