

## Jejunal Interposition as Remedial Operation for Severe Dumping Syndrome

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**Abstract:** The remedial operation for the control of symptoms was carried out in 6 cases with severe dumping syndrome. Three male cases and 3 female cases were treated, and its age at the initial gastrectomy ranged from 24 to 64 years old, and 5 cases with gastric ulcer and 1 case with gastric cancer were observed as primary diseases. As the initial operative procedures, distal subtotal gastrectomy in 5 cases, distal hemigastrectomy in one case and Billroth II type anastomosis in 5 cases with gastric ulcer were performed, and 1 case with gastric cancer was reconstructed by Billroth I type anastomosis. Dumping symptom developed from 3 weeks to 1 month after gastrectomy in all cases except 1, and body weight loss due to labor disturbance and malnutrition was observed. They have been suffering from the syndrome for 3 to 27 years, and remarkable rapid transit of gastric contents was observed on both roentgenograph and gastric scintigram before surgery. As reoperation, the jejunum was interposed reversibly from 5 to 9cm between the gastric remnant and duodenum. Re-surgery was necessitated in 1 case, while improvement of symptoms was observed in the remaining cases, and reduction of the emptying time of gastric contents was observed by imaging diagnosis.

### Introduction

Dumping syndrome develops as a complication after gastrectomy with close relationship with meal intake. It is divided into early dumping syndrome and late dumping syndrome by the difference of the cause and development.

It is well known that the early dumping syndrome develops within 30 minutes after meal intake following gastrectomy, pyloroplasty and gastroenterostomy, and reveals systemic symptoms such as sweating, tachycardia, flushing, peripheral vasodilation, and intestinal symptoms such as bloating, hyperperistalsis, diarrhea, and abdominal pain, and continues for approximately 45 minutes. It is also known that incidence rate of this disease is 0 to 50%, even though some differences were observed depending on the operative modes.<sup>1,2,3)</sup> The early dumping syndrome is often relieved during the postoperative course, and controlled by dietary management and medical therapy. Indication of

surgery is less than 1% at least.

With regard to the incidence rate (by operative mode) in the early dumping syndrome among postoperative complications in cases with peptic ulcer in our clinic during past 15 years, it developed in 12.5% of selective proximal vagotomy, in 18.8% of selective vagotomy with resection of the pyloric antrum, and in 19.1% of distal gastrectomy. Administration of drug was unnecessary because symptoms cases were mild in all these cases.

In recent years, three patients had postgastrectomy syndromes classified as severe and unresponsive to conservative therapy.

We experienced three more additional patients who underwent initial operations in our affiliated hospital and had diagnosis of severe dumping syndrome.

These six patients underwent surgical interposition of the antiperistaltic segment of jejunum between the gastric remnant and duodenum.

The results of the management of patients who underwent this remedial operation are reported herein (Table 1), and we discuss problematical points such as operative procedure and indication of surgery for the dumping syndrome.

### Case Report

**CASE 1:** In September 1964, a 36-year-old female was admitted to the Nagasaki University Hospital due to abdominal trauma by an automobile accident. A few days later, abdominal pain in the epigastrium appeared and she underwent laparotomy and hemigastrectomy with Billroth II retrocolic antiperistaltic anastomosis because the presence of a scar at the duodenal bulb was noted. Her postoperative course was fairly satisfactory except for slight nausea and microcytic anemia and she was treated with iron therapy. In January 1975, after her catching a cold, she began to complain epigastric fullness and diarrhea. In June 1975, postprandial sweating, palpitation, nausea and dysp-

**Table 1.** Results of jejunal interposition for severe dumping syndrome

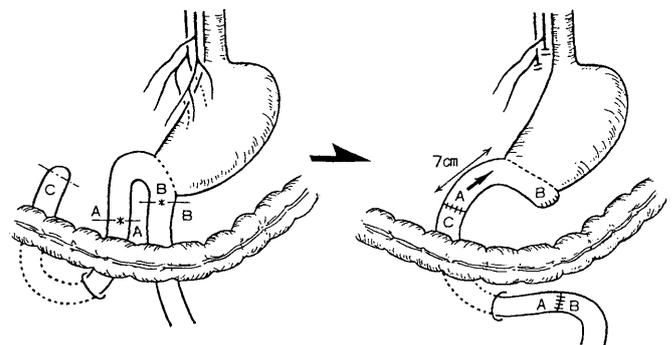
Case No. (Age, Rem.-ope.)	Indication for surgery	Original ope.	Date (Age)	Symptoms	Date of remedial op.	Results
Case 1 (K. I. 36 ♀)	gastric ulcer	hemigastrectomy retrocolic Billroth II antiperistaltic anastomosis	Sept. '64 (24ys.)	diarrhea nausea sweating (postprondial) palpitation	2/5/76	good
Case 2 (M. S. 52 ♀)	gastric ulcer	subtotal gastrectomy & r.-hemicolectomy Billroth I anastomosis	Oct. '56 (25ys.)	abdom-pain diarrhea sweating (postprondial) palpitation	#1 10/3/85 #2 2/17/86	good
Case 3 (T. A. 63 ♂)	gastric ulcer	subtotal gastrectomy retrocolic Billroth II antiperistaltic anastomosis	Dec. '62 (38ys.)	diarrhea sweating (postprondial) palpitation	5/6/87	good
Case 4 (N. K. 53 ♂)	gastric ulcer	subtotal gastrectomy Billroth I anastomosis	Oct. '72 (47ys.)	diarrhea nausea dizziness	11/5/78	excellent
Case 5 (A. F. 57 ♀)	gastric cancer	subtotal gastrectomy Billroth I anastomosis & splenectomy	8/4/78 (48ys.)	dizziness sweating (postprondial) palpitation	6/24/87	excellent asymptomatic
Case 6 (T. U. 35 ♂)	gastric ulcer	subtotal gastctomy Billroth II anastomosis → B-I convert & cholecy. (#1)	1980 (27ys.)	diarrhea abdominal pain nausea palpitation	#1 '88 #2 7/19/90 #3 6/11/91	good

nea developed on hour or one and a half hour after meals. She also had persisting diarrhea, unable to work, and lost about 5 kg in weight. Preoperative gastric emptying time was about five minutes.

On February 5, 1976 she underwent laparotomy. The stomach was resected just peoximal to the stoma with selective gastric vagotomy, the afferent loop was resected 7 cm apart from the stomach and the efferent loop was adjacent to the stomach, respectively. Reconstruction was completed in the form of antiperistaltic interposition of a 7 cm jejunal segment with Billroth I anastomosis in which proximal cut end of the afferent jejunal segment was anastomosed to the duodenal stump which was closed at the previous operation (Fig. 1). The patient had slight nausea and epigastric fullness for a few months, thereafter she became asymptomatic and regained the weight. Anemia also was corrected, and she became able to manage her household work.

CASE 2: A 52-year-old female had recurrent gastric ulcer for several years without responding to antacids and bland diet.

In 1956 she underwent subtotal gastrectomy with Billroth I anastomosis and left hemicolectomy was added to

**Fig. 1.** Scheme of operative procedure (case 1)

correct sigma elongata which was considered as a cause of her complaint of constipation.

Postoperatively her symptoms disappeared for a few months, but she began to complain palpitation, postprandial sweating, dizziness, nausea, vomiting, and abdominal pain about ten minutes after meals, especially breakfast. The symptoms were relieved slightly by lying down after meals. She was placed on a low carbohydrate diet with limited fluid intake during meals. However, the symptoms per-

sisted and she was unable to work in the morning. She has lost approximately 10 kg, and she was treated with a bland diet, iron therapy, and tranquilizers, but obtained no relief.

Preoperative roentgenologic examination showed remarkable rapid transit of the barium to the duodenum (Fig. 3-a), and barium contrast was not noticed in the stomach ten minutes after meals. Gastroscintigraph showed rapid emptying curve, and half gastric emptying times (T1/2) was about seven minutes (Fig. 4-a).

On October 3, 1985 she underwent interposition of a 9 cm segment of jejunum between the gastric remnant and duodenum with antiperistaltic anastomosis, and bilateral selective gastric vagotomy (Fig. 2 #1).

The patient's postprandial symptoms disappeared, and she felt well during the next two to three weeks. After increasing her intake of diet, she began to complain nausea and vomiting after meals. Radiographic findings showed that gastric emptying delayed markedly by the antiperistaltic movement of interposed jejunal segment (Fig. 4-b).

On February 17, 1986 she underwent resection of the interposed jejunum 4.5 cm in length, followed by good results (Fig. 2 #2). Postoperative barium contrast radiograph showed delayed emptying from the stomach with a mild antiperistaltic movement of the reversed jejunal graft (Fig. 3-b). Half gastric emptying times prolonged to 27

minutes, almost normal time (Fig. 4-c). Her symptoms disappeared, she gained about 3 kg in weight and returned to her previous occupation.

CASE 3: A 63-year-old male has had recurrent gastric ulcer for several years which did not respond to antacids. In December 1962, he underwent subtotal gastrectomy with Billroth II retrocolic antiperistaltic anastomosis.

He was well for about six months after surgery, until postprandial sweating and dizziness developed, usually occurring fifteen to twenty minutes after meals. He also had diarrhea. The symptoms were relieved by lying down

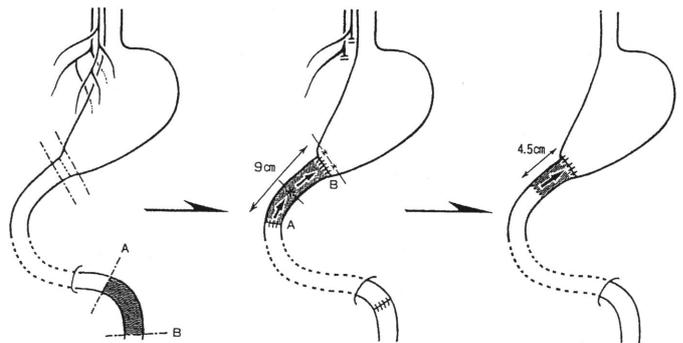
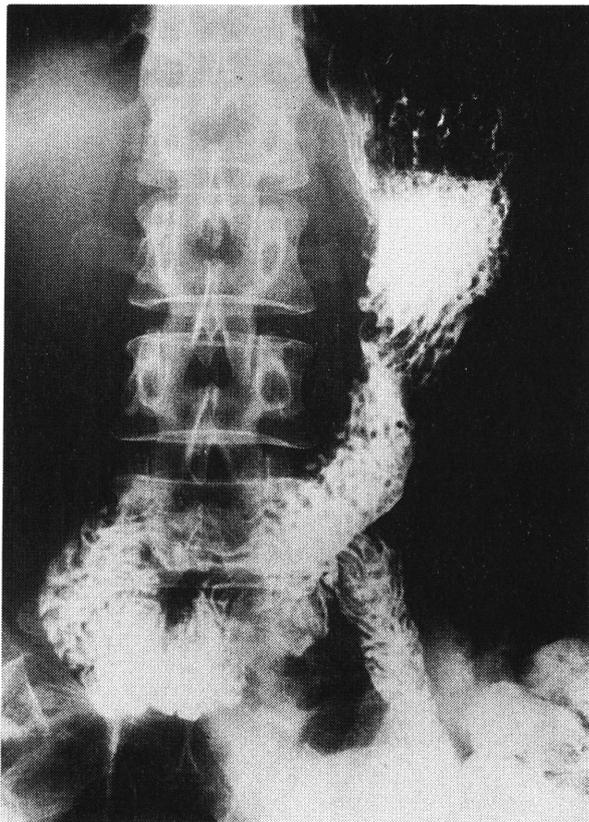
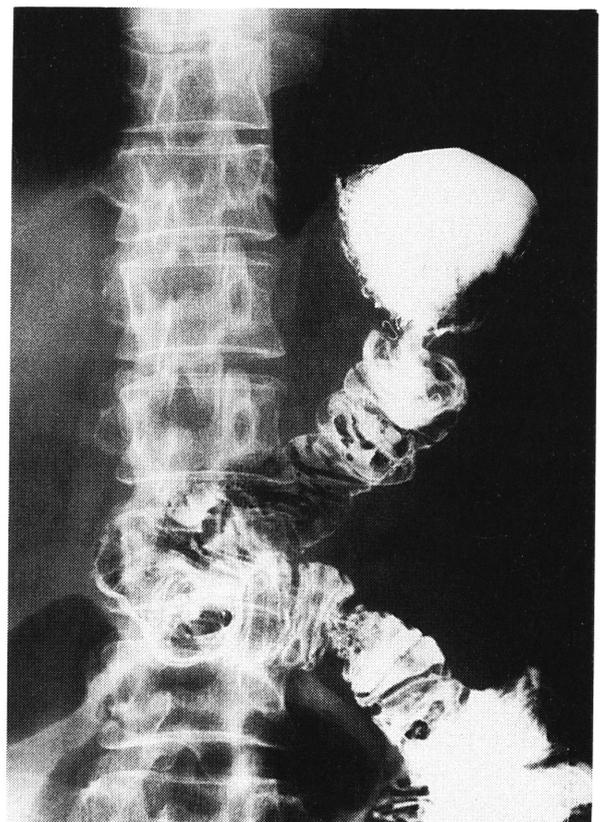


Fig. 2. Scheme of operative procedures (case 2)



(a) Radiogram after Billroth I gastrectomy



(b) Radiogram after final operation

Fig. 3. Barium contrast radiogram (case 2)

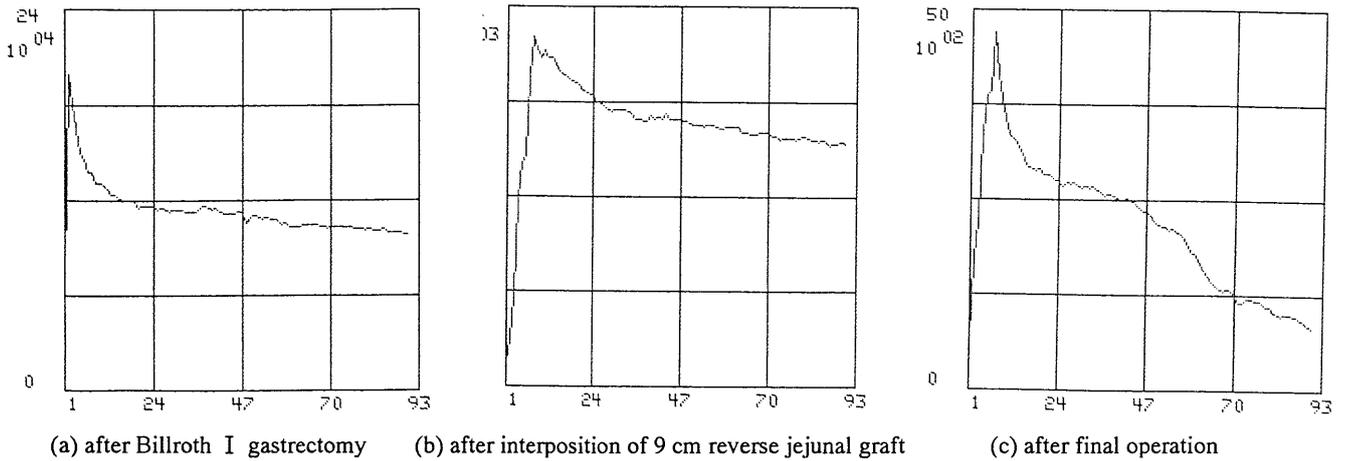


Fig. 4. Gastroscintigram (case 2)

after eating and sleeping for about an hour, but treatment with tranquilizers and bland diet did not provide any relief. His symptoms persisted and he lost about 15 kg in weight, was unable to continue his work as an employee, and he had to change his occupation to self-supporting work. Preoperative gastric emptying time was about three minutes.

On May 6, 1987 he underwent antiperistaltic interposition of a 5 cm segment of jejunum between the gastric remnant and duodenum, and bilateral selective vagotomy, followed by good results (Fig. 5). He experienced no further dizziness and sweating despite slight abdominal fullness after meals, and he was able to tolerate a high carbohydrate diet with no restriction of fluids. Postoperative gastric emptying time using barium contrast was shortened to 15 minutes from preoperative 3 minutes.

CASE 4: A 53-year-old male had hemorrhage from gastric ulcer. In October 1972 he underwent subtotal gastrectomy with Billroth I anastomosis at the Gunge Hospital. He was well for one or two months after surgery, until diarrhea and postprandial sweating developed, occurring twenty to thirty minutes after meals. Treatment with an

anticholinergic drug and diet could not relieve, symptoms which became progressively worse, and he lost about 10 kg in weight. Preoperative roentgenologic barium studies showed marked rapid emptying into the efferent loop as compared with normal patients, thereafter barium contrast was transmitted to the cecum ten minutes after meal.

On November 5, 1978 antiperistaltic interposition of a jejunal segment about 7 cm long between the gastric remnant and duodenum and selective gastric vagotomy were carried out (Fig. 6). Postoperatively, he improved, gained weight, and he is now well with excellent results 14 years after operation.

CASE 5: A 57-year-old female was admitted to the Tagawa Municipal Hospital because of gastric cancer. On August 4, 1978 she underwent subtotal gastrectomy, regional lymphadenectomy and splenectomy with Billroth I anastomosis.

Two months after the operation she had dizziness, postprandial sweating and nausea. These symptoms usually occurred within five to ten minutes after meals and were aggravated by drinking liquids during meals or eating high carbohydrate diet. Despite treatment with an anticho-

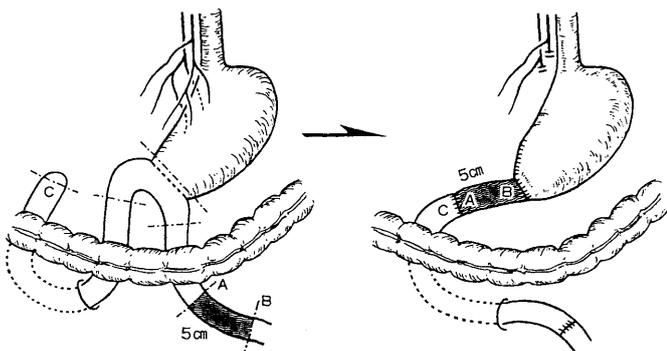


Fig. 5. Scheme of operative procedure (case 3)

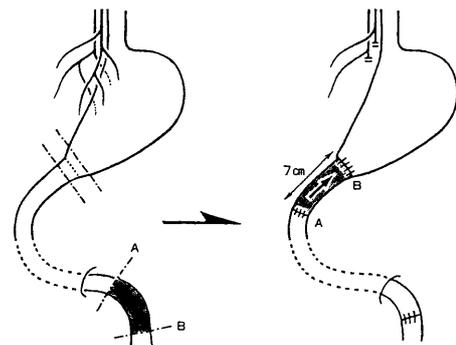


Fig. 6. Scheme of operative procedures (case 4 & 5)

linergic drug and Nauzelin (Kyowa Hakko Co. Tokyo, Japan), the symptoms were not relieved. She was unable to work as a school teacher, and retired in 1987.

On June 24, 1987 she underwent laparotomy. No evidence of recurrent stomach cancer was found, therefore interposition of a 6 cm segment of jejunum between the gastric remnant and duodenum with antiperistaltic anastomosis was carried out (Fig. 6). Postoperative gastric emptying time showed more delayed transit, and was shortened to five minutes from one minute in preoperative studies. Postoperatively her symptoms completely disappeared and she gained the lost weight, and is currently well alive.

CASE 6: A 35-year-old male was readmitted to Nagasaki University Hospital on May 3, 1992, complaining of diarrhea after gastrectomy.

In 1980, he underwent subtotal gastrectomy with Billroth II anastomosis, because of gastric ulcer at Kyoto. Shortly after the operation, he began to complain diarrhea.

In 1988, gallstone was pointed out, and he underwent convert operation to gastroduodenostomy from gastrojejunostomy as well as cholecystectomy (Fig. 7 #1). Postoperatively, he continued to complain diarrhea, and it was gradually getting worse. In July 1990 he was referred to our clinic to consult about remedial operation for severe diarrhea after gastrectomy, and was admitted in view of continued diarrhea and dumping syndrome.

His main complaint was severe diarrhea, therefore on July 19, 1990 he underwent interposition of a 10 cm reverse jejunal segment 100 cm distal to the ligament of Treitz as an appropriate procedure (Fig. 7 #2). He was well for several months after surgery until diarrhea developed five to six times every day and progressively worse.

At the time of readmission, roentgenologic examination showed rapid emptying of the barium to the small bowel within fifteen minutes after a barium meal. Gastric emptying studies with a  $^{99m}\text{Tc}$ -labeled barium meal also revealed rapid emptying from the stomach with seven minutes of half gastric emptying times (T1/2). Dumping test by pouring hyperosmolar solution (200 ml of 50% glucose) into the duodenum induced nausea and diarrhea, suggesting of dumping symptoms about twenty five minutes after infusion.

On June 11, 1992 he underwent interposition of a 5 cm reverse jejunal segment between the gastric remnant and duodenum and selective gastric vagotomy with good results (Fig. 7 #3). He had slight nausea and epigastric fullness for several days after surgery, thereafter diarrhea and epigastric fullness disappeared, and he gradually became asymptomatic.

Postoperative roentgenologic examination showed delayed emptying from the stomach one and a half hours after barium intake. Half gastric emptying time was 25 minutes, and showed slower than those of preoperative studies.

He was discharged on the 36th day after surgery and was able to return to his previous occupation.

## Discussion

The diagnostic standard of dumping syndrome is not objectively obtained, and difference of the incidence rate is more often observed by many reporters. Eleven items of the systemic symptom and 7 items of the abdominal (intestinal)

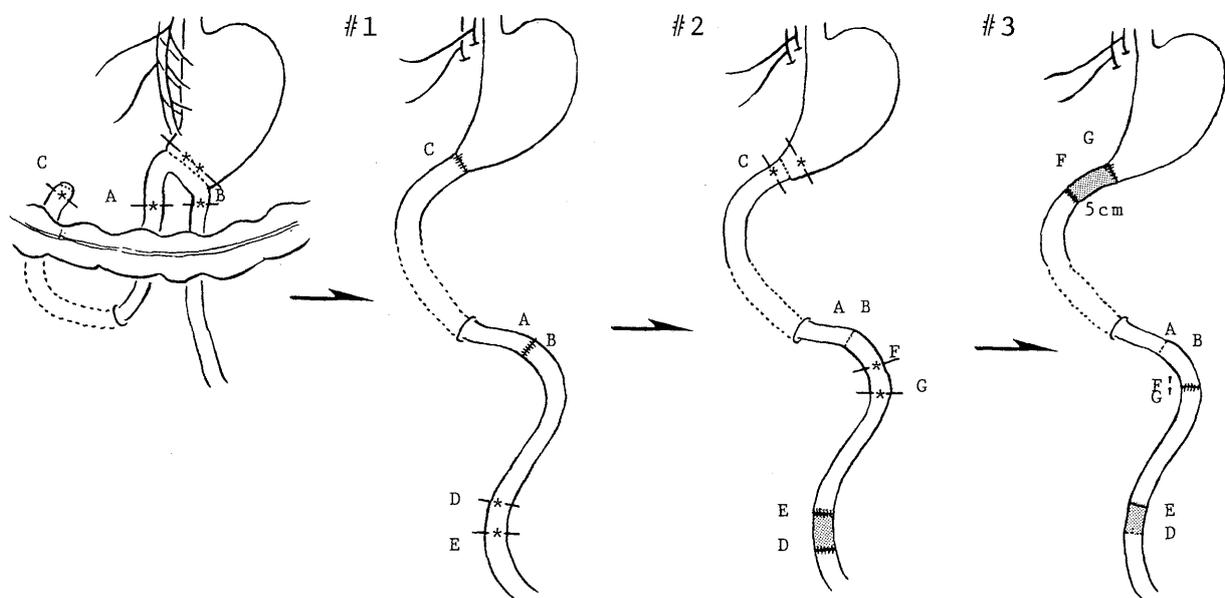


Fig. 7. Scheme of operative procedures (case 6)

symptom were proposed by Japanese Society of Gastroenterological Surgery in our country,<sup>4)</sup> and more than one item of the systemic and abdominal symptoms are defined as diagnostic criterion, and incidence rate is also calculated in our clinic by history taking and questionnaire according to this criterion. This criterion was satisfied in all 6 cases reported in this study, and symptoms such as difficulty to work, weight loss and malnutrition were defined as severe cases.

As therapeutic methods of dumping syndrome, dietary therapy and drug therapy have been generally applied, and Fenger<sup>9)</sup> reported that if dumping syndrome continues for more than one year, despite various drug therapies, and dumping syndrome develops by slow infusion of 250 ml of 50% glucose solution, then surgical therapy indicated. The dietary therapy and various drug therapy were unsuccessful in all these cases for a long time.

As the effects of the operative therapy, reduction of the inflow of food into upper small intestine and recovery of the retention capacity in the stomach are considered.

Hertz<sup>6)</sup> suggested to diminish the size of the gastrojejunal stoma and disconnect the gastrojejunostomy if the pylorus is not obstructed, but Grassi suggested anastomotic stoma less than 1.9 cm, and Mix<sup>7)</sup> corrected rapid gastric emptying by dismantling a gastrojejunostomy. Jenkins<sup>8)</sup> and Christiansen et al<sup>9)</sup> obtained the successful rate of 60 to 100% by reconstruction of gastrojejunostomy into pyloroplasty. Sewak<sup>10)</sup> succeeded in 30 cases (71%) by conversion of Billroth II method into Billroth I method of gastroenterostomy, and Woodward<sup>11)</sup> obtained effective results in 11 cases (72.7%). The jejunal interposition is considered as the most effective rational operative procedure, and three methods such as isoperistaltic jejunal interposition, antiperistaltic jejunal interposition and interposition of two separate jejunal segments (Poth pouch) between the gastric remnant and duodenum are considered to be very useful.

The jejunum of 20 to 25 cm length is used in the peristaltic interposition, and Mendoz<sup>12)</sup> and Buskin et al<sup>13)</sup> obtained favorable results in all these cases by using the procedure, and Nygaard et al<sup>14)</sup> reported that extreme improvement in 59% and improvement in 36% were obtained, but Fenger et al<sup>15)</sup> reported that relief was observed in only 20% by follow-up study of 30 cases for 32 months. The isoperistaltic jejunal interposition between the stomach and duodenum is useful, but combined use with vagotomy is essential because it is known that anastomotic ulcer develops in 30%.

As reverse jejunal interposition, Hammer<sup>16)</sup> and Willms et al<sup>17,18)</sup> used the jejunum of 6 to 10 cm, based on their experimental and clinical results. According to the comparative study by Herrington et al,<sup>1)</sup> satisfactory postoperative rate was most favorable (90%) by reversed jejunal interposition compared with iso-peristaltic interposition (20%) and Poth pouch (60%). Five cases of 6 cases progressed favorably by simple reversed graft using the jejunum of 5 to 9

cm. However, resection of the intestinal graft placed by re-surgery was unavoidable, because severe stasis and strong retention feeling after surgery developed in case 2 using jejunum of 9 cm. Therefore, length of the jejunum is the key to the successful reverse interposition with vagotomy. It is considered that space of the jejunum more than 10 cm should not be applied because unexpectedly strong movement of the interposed jejunal graft toward to the stomach remains for a long time, as observed by barium contrast study, and transit disturbance occurs certainly by atony of gastric walls by vagotomy.

Benedini et al<sup>19)</sup> attempted reversed jejunojejunostomy by conversion from Billroth II method to Billroth I method by using afferent loop, and created the increase of capacity of the remnant stomach by residual of the jejunum in stomal region, and we obtained favorable result in Case 1 by applying this operative mode. On the other hand, Woodward et al<sup>20)</sup> tried antiperistaltic jejunal interposition by Roux en Y anastomosis using the jejunum of 10 cm, and they mentioned negative viewpoint for this operative mode because re-surgery was necessitated in 3 of 5 cases with exceeding long jejunal graft. Poth et al<sup>21)</sup> reported the indication in only a few cases of the gastric remnant because Poth pouch is a complex, even though disappearance of symptoms in all 8 cases was observed by double enteroplasty placing antiperistaltically plasty-jejunum between the stomach and duodenum.

For the relief of the main symptom of diarrhea in Case 6, a 10 cm reversed jejunal interposition (antiperistaltic jejunojejunostomy) was carried out in the jejunum 100 cm distal to the ligament of Treitz. The relief of its symptom was observed by interposition of reverse jejunal graft between the stomach and duodenum because dumping syndrome continued and diarrhea exacerbated again even though relief of the diarrhea was observed. Therefore, it was considered that antiperistaltic jejunal interposition in upper and lower places of the anastomotic region of the stomach and jejunum should be generally performed in dumping syndrome associated with severe diarrhea.

Finally, it was considered that life style instruction in patients after reoperation is necessary, because many neurological factors are related to the development of this disease. Moreover, prophylactic jejunal interposition in the gastric remnant should be considered in subtotal gastrectomy for treatment in some cases, although severe dumping syndrome in such Case 5 developed rarely after gastrectomy of gastric cancer.

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