

# Superiority of Antiperistaltic Jejunal Segments in Management of Severe Dumping Syndrome

JOHN L. SAWYERS, M.D., J. LYNWOOD HERRINGTON, JR., M.D.

THE DUMPING SYNDROME with its characteristic gastrointestinal and vasomotor disturbances is the most common postprandial complaint after definitive operation for complications of gastrointestinal ulcer disease. Dumping symptoms occur after a part of the stomach is sacrificed and is lost as a storage organ, and from alteration or removal of the pyloric emptying mechanism. The physiologic effects resulting from these aberrations were described by Mix<sup>8</sup> in 1922.

Unfortunately many different postgastrectomy disorders have been erroneously labeled dumping syndrome. In this report we are discussing only patients with early postprandial dumping syndrome. Woodward<sup>15</sup> has made the plea that this entity be carefully delineated from other postgastrectomy disorders by an accurate history. Symptoms of vasomotor imbalance manifested by weakness, faintness with an intense desire to lie down, palpitation, pallor and profuse perspiration are dominant while the gastrointestinal symptoms of postprandial cramping, abdominal pain and urgent diarrhea are less prominent. Ingestion of carbohydrates, especially sweet liquids, initiate these symptoms which are similar to the effects experienced by patients having an insulin reaction.

Most patients suffering from the dumping syndrome have mild, transitory symptoms. Dumping of mild to moderate degree may be fairly well controlled by dietary measures which limit carbohydrates and restrict fluid intake with meals. However, a few patients, less than one per cent in our experience, have severe dumping symptoms with resultant excessive

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*From the Department of Surgery, Vanderbilt University and Surgical Services of Nashville Metropolitan General and St. Thomas Hospitals, Nashville, Tennessee*

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weight loss, anemia, weakness, abdominal discomfort and occasionally uncontrollable diarrhea. When restrictive dietary measures with intensive supportive treatment in the hospital fail to relieve these incapacitating symptoms, serious consideration should be given to remedial operation to prevent the patient from a life of invalidism.

During the past 12 years, we have utilized three different remedial operations in the treatment of severe, intractable dumping syndrome. This report compares the effectiveness of the isoperistaltic single jejunal segment, the double jejunal limb pouch, and the anti-peristaltic single jejunal segment interposed between the gastric pouch and duodenum.

## *Isoperistaltic Jejunal Segment*

Schoemaker of the Hague is credited by Hedenstedt<sup>1</sup> with being the first surgeon to interpose an isoperistaltic jejunal segment after gastric surgery in 1911. Henley<sup>3</sup> has reported extensive use of an interposed isoperistaltic jejunal segment between the gastric pouch and duodenum for correction of postgastrectomy syndrome in more than 300 patients. All patients improved including those with early postprandial dumping. Krause<sup>6</sup> and Hedenstedt<sup>2</sup> have emphasized the importance of adding vagotomy when using an isoperistaltic jejunal segment to prevent ulceration in the jejunal segment which occurred in 17 per cent of Henley's series of 100 patients with duodenal ulcers who had received primary interpositions of jejunum at the time of the original gastrectomy.

We have used a single interposed jejunal segment

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Reprint request: Dr. John L. Sawyers, Nashville Metropolitan General Hospital, Nashville, Tennessee 37210.

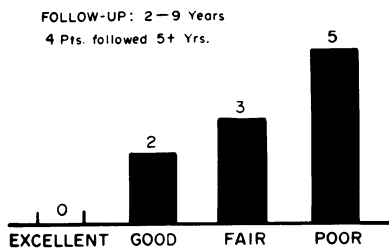


FIG. 1. Results—using isoperistaltic jejunal segment for dumping syndrome.

for patients with afferent-loop syndrome as well as in patients with dumping syndrome. The results in patients with afferent-loop syndrome have been very successful, but the results in patients with early post-prandial dumping syndrome have been disappointing.

Ten patients have undergone isoperistaltic jejunal interposition (Henley loop) operation as a remedial procedure for symptoms of the dumping syndrome. There were five men and five women. The ages ranged from 39 to 60 years; most of the patients were

in the fifth decade of life. The interval between the original operation and the remedial surgery varied from 2 to 17 years. Three patients previously had undergone an estimated two-thirds distal gastrectomy as the original operation, six patients had undergone vagotomy and a modest resection, and one patient had a vagotomy and pyloroplasty. In the three patients who had two-thirds gastric resection originally, a bilateral truncal vagotomy was done at the time of the Henley loop operation. This procedure is most important to prevent ulceration in the isoperistaltic segment. The patient with pyloroplasty had the antrum excised when the Henley loop was constructed.

One patient has been followed 9 years, two patients for 8 years, one for 5 years, one for 4 years, three for 3 years, and one for 2 years. One patient died at home approximately 2 months following operation.

There have been no excellent results obtained in the group of 10 patients (Fig. 1). Five patients, however, have noted a definite improvement in their dumping symptoms but have not been completely relieved. Two of five patients have gained weight and are judged to have a good result. The other three are considered to have fair results. Five patients had poor results. Three are being maintained on a medical regimen for the dumping symptoms, but are severely incapacitated. There was no further weight loss in these three patients and no other operation has been done.

A fourth patient was a complete failure as she developed obstruction of the Henley loop, and it had to be removed. In 1965, this 39-year-old patient underwent vagotomy and estimated 50 per cent distal gastrectomy with a Billroth II type reconstruction. She developed marked dumping symptoms and had a 25-pound weight loss. Five years later she underwent a take-down of the Billroth II anastomosis and interposition of 15 cm. jejunal segment between the gastric pouch and duodenum. The patient improved for 2 years, but the result was not excellent. At the end of this time she developed nausea, vomiting, and symptoms of high intestinal obstruction. Gastrointestinal X-ray series revealed distention of the gastric remnant and obstruction at the site of anastomosis of the stomach to the jejunum (Fig. 2). She had no free acid in the gastric pouch. At reoperation there was kinking at the proximal end of the loop with no evidence of ulceration. The jejunal segment was removed, and intestinal continuity established by an end-to-end gastroduodenostomy. She improved slightly, but has not regained her lost weight and still has moderate dumping symptoms.

The tenth patient, a 42-year-old woman, also had unsuccessful results. She underwent a 75% resection with vagotomy in 1966. She lost 60 pounds, became

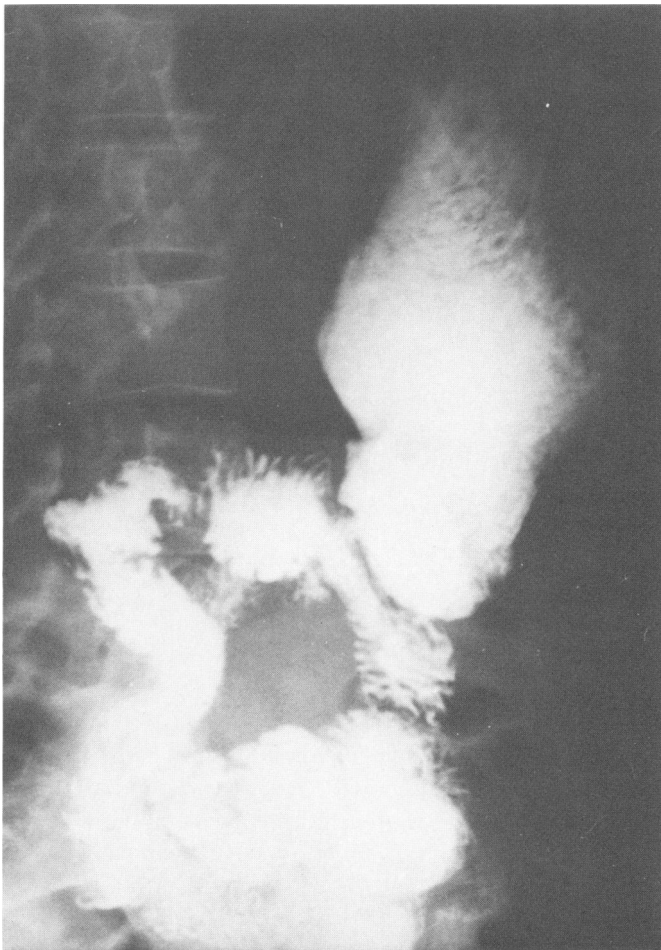


FIG. 2. Patient with isoperistaltic jejunal segment developed kinking of the Henley loop at the gastro-jejunal anastomosis and dilatation of the gastric pouch. The interposed jejunal segment was removed.

TABLE 1. *Double Limb Jejunal Pouch*

Case	Sex	Age	Original Operation	Subsequent Weight Loss	After Remedial Operation Weight Gain	Follow-Up	Result
1.	M	48	80% Res. B II, no vagotomy	85 lb.	60 lb.	12 years	*Excellent
2.	M	48	Truncal vagotomy, Antrectomy, B I	20	10	11 years	Fair
3.	M	59	80% Res. B II	40	20	11 years	°Good
4.	F	49	60% Res. B II	40	Vagotomy done 20	9 years	Good
5.	M	31	Truncal vagotomy, Antrectomy, B I	35	15	10 years	**Poor
6.	M	34	Truncal vagotomy, Antrectomy, B I	20	20	10 years	***Excellent
7.	M	40	Truncal vagotomy, Antrectomy, B II	15	0	7 years	****Fair
8.	M	52	Truncal vagotomy, Antrectomy, B I	50	20	10 years	°°Poor
9.	M	38	Truncal vagotomy, Antrectomy, B I	35	20	10 years	°°°Poor
10.	M	59	70% Res., B II	30	Vagotomy done 40	8 years	Excellent
11.	M	24	80% Res., B II Vagotomy	20	30	4 years	Excellent
12.	M	47	80% Res., B II Vagotomy	20	25	2 years	Good

\* No vagotomy

° At 3rd operation transthoracic vagotomy done. Pouch ulcer healed but constricted pouch and subsequent pouch revision performed. Patient now well.

\*\* Pouch ulcer developed, healed with subsequent transthoracic vagotomy, but patient still doing poorly.

\*\*\* Died 10 years after remedial operation of unrelated causes.

\*\*\*\* Died 7 years after remedial operation of unrelated causes.

°° Developed pouch dilation, stasis and reoperation necessary—single reversed jejunal segment inserted.

°°° Developed pouch dilation—pouch made smaller.

emaciated and, in 1969, a 15 cm. isoperistaltic segment of jejunum was inserted between the stomach remnant and duodenum. She responded well in the hospital, but there was no improvement over a 2-month follow-up at home. She died from malnutrition and severe mental depression.

#### *Double Jejunal Limb Pouch*

A double plicated iso-antiperistaltic jejunal pouch interpolated between the gastric remnant and duodenum, as described by Poth<sup>10</sup>, was used in 12 patients. The size of each segment of jejunum was from 10–15 cm. long. The isoperistaltic segment is joined to the gastric remnant, and the antiperistaltic segment is anastomosed to the duodenum. The two segments are then converted into a single receptacle. Ciné fluoroscopy studies show the pouch to empty slowly and in a piecemeal fashion.

The double limb jejunal pouch has been performed on a total of 12 patients (Table 1). There were 11 men and one woman. The ages ranged from 24 to 59 years. The interval between the original operation for duodenal ulcer and the remedial procedure varied from two to 15 years. Six of the 12 patients originally had truncal vagotomy and antrectomy performed for

a complication of duodenal ulcer. Two patients had had an estimated 80% distal gastrectomy without vagotomy as their original operation. One patient had had a 60% distal resection without vagotomy; one had an estimated 70% distal gastrectomy without vagotomy; and two patients had an 80% resection with vagotomy as their original operations.

The clinical results using a double limb jejunal pouch in patients with severe dumping syndrome are seen in Figure 3. Follow-up studies in these patients extend from 2 to 12 years and ten patients were followed for more than 5 years.

The original operative procedure for peptic ulcer disease appears to influence the clinical result obtained from using a jejunal pouch. The first patient to have this type of remedial operation originally underwent an 80% distal gastrectomy without vagotomy and has been followed for 12 years with excellent clinical results. In contrast, patient 3 who underwent an 80% gastric resection without vagotomy developed a pouch ulcer 2 years later and was treated with transthoracic vagotomy. Within a period of a few weeks, the pouch ulcer healed, but in doing so constricted the proximal portion of the pouch necessitating a third operation which consisted of revision to make a

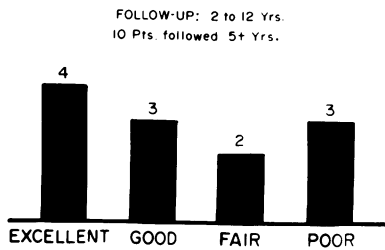


FIG. 3. Results—using double limb jejunal pouch for dumping syndrome.

smaller pouch. This patient obtained an initial poor result because vagotomy was not done, but now he is doing well with an 11-year follow-up.

Patient 5 who underwent initially a truncal vagotomy-antrectomy and a Billroth I reconstruction for ulcer, subsequently had a double limb pouch inserted, but 3 years after insertion the patient developed upper abdominal pain. He had free hydrochloric acid present and in the gastric secretions—20 mEq. over a 12-hour fast and X-rays showed the presence of a pouch ulcer (Fig. 4). The patient underwent transthoracic vagotomy and the ulcer completely healed as demonstrated by X-ray study. The pain has been relieved, but the patient continues to complain of upper abdominal discomfort and fullness and must be considered a failure. He has undergone follow-up study for 10 years. Another failure resulted in patient 8 who did well for 7 years after insertion of a double limb pouch, but then developed progressive upper abdominal fullness, nau-

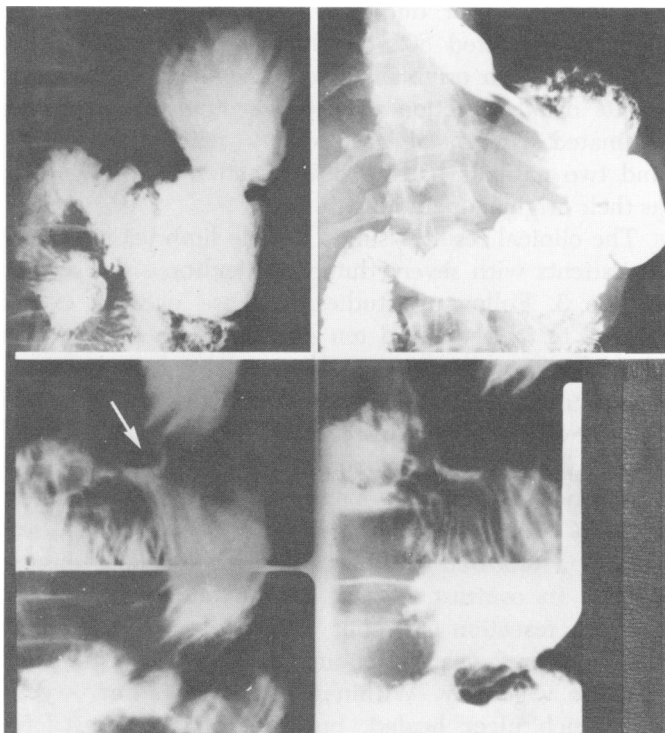


FIG. 4A. Patient with double limb jejunal pouch developed ulcer in pouch (arrow) 3 years after remedial operation.

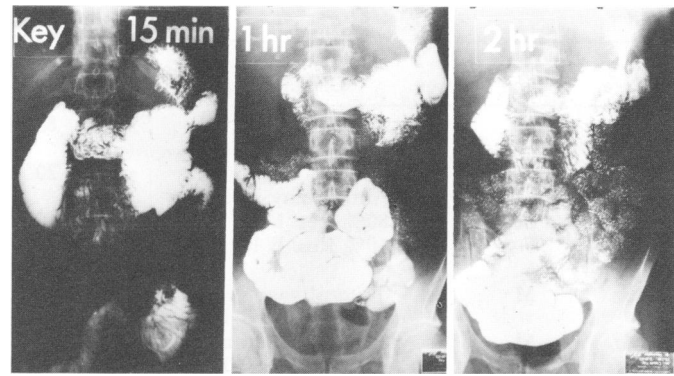


FIG. 4B. Following transthoracic vagotomy, pouch ulcer healed with residual narrowing. Because of abdominal discomfort and fullness, patient is considered to have poor result.

sea and vomiting. X-ray examination showed the pouch to be dilated and sacculated (Fig. 5). No ulceration was noted in the pouch. The pouch was revised to leave only a short antiperistaltic segment between the remaining stomach and duodenum. This patient is now doing well.

Patient 9 is considered a poor result. This man gained weight and did well for 5 years after insertion of the pouch, but then noted progressive upper abdominal discomfort and bloating which became progressively worse. This was followed by infrequent nausea and vomiting, which increased to the point that the patient vomited every day. The vomitus contained the food which he had eaten the day before. X-ray studies revealed no evidence of a pouch ulcer, but the pouch was very dilated, sacculated, and emptied poorly (Fig. 6). The pouch was revised and made smaller. Over a 6-month period this patient has gained 20 pounds and has been relieved of his difficulty.

The results are deemed fair in two patients (Cases 2 and 7) who continue to experience a rather marked amount of upper abdominal discomfort and occasional nausea and vomiting. They each, however, state that they are improved over their preoperative status.

#### *Antiperistaltic Jejunal Segment*

A single antiperistaltic jejunal segment interposed between the gastric remnant and duodenum for management of the dumping syndrome was advocated by Poth<sup>9</sup> in 1957 and reported by Schlicke<sup>13</sup> in 1963. The reversed segment prolonged gastric pouch emptying without causing obstruction. Schlicke<sup>13</sup> and later Sanders<sup>12</sup> added vagotomy when using the antiperistaltic segment and reported no obstructive phenomena. Each surgeon reported marked improvement in his patients. Reversed jejunal segments have also been used to treat dumping following Billroth II gastro-

jejunostomy without routing food into the duodenum. Jordan<sup>4</sup> reported success with this method in 1963.

During the past 11 years, we have used a single antiperistaltic jejunal segment placed between the stomach and duodenum to treat intractable dumping symptoms in 28 patients. There were 21 men and eight women with an age range from 26 to 62 years. In 23 patients the original operation for duodenal ulcer was truncal vagotomy and gastric resection removing from 40 to 75% of the distal stomach. One patient had a 70% gastrectomy without vagotomy, and four patients had truncal vagotomy and pyloroplasty. The interval between the original operation and remedial surgery was from 1 to 15 years. Each patient was severely incapacitated with early postprandial dumping symptoms. Weight loss ranged from 20 to 70 pounds with an average loss of 30 pounds. Approximately one-half of the patients complained of explosive diarrhea initiated by

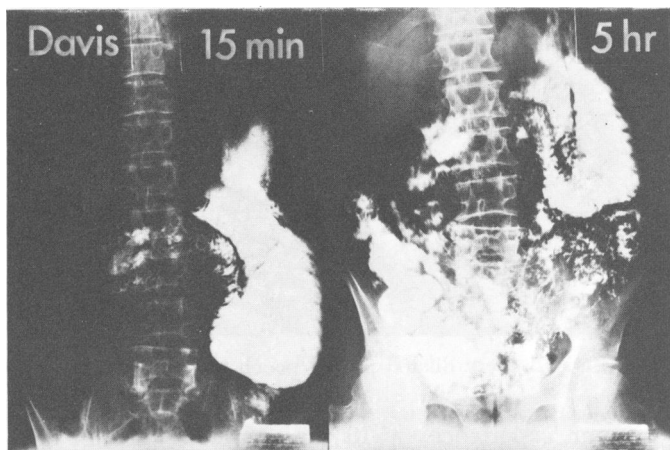


FIG. 5A. Double limb jejunal pouch functioned well for 7 years then became dilated and sacculated. Patient developed progressive upper abdominal fullness, nausea, and vomiting.

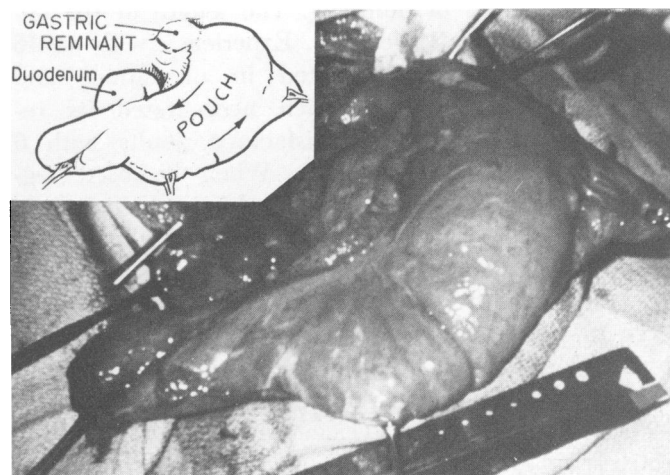


FIG. 5B. Dilated jejunum pouch at reoperation.

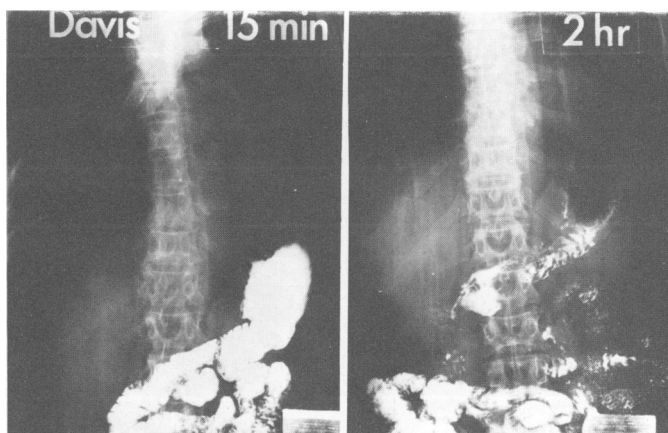


FIG. 5C. After revision of pouch to leave short antiperistaltic jejunal segment, patient did well.

eating. The results are shown in Figure 7. Twenty patients have obtained excellent results. These patients have either regained back to their ideal weight or to within 10 pounds of their ideal weight. Six patients have been improved by their remedial operation and are judged to have good results. These patients occasionally experience intermittent upper abdominal discomfort and complain of vasomotor symptoms of mild to moderate degree when challenged with a high carbohydrate diet. One patient is considered a fair result. He is improved but bothered significantly by epigastric fullness after eating. He has undergone the shortest follow-up period, 6 months. The other patients have been studied from 1 to 11 years and 14 patients have undergone more than 5 years of follow-up study. One patient died of a coronary thrombosis 3 years after remedial operation. All the other patients are living.

In one patient there was complete failure because of multiple ulcerations in her jejunal limb which was fashioned 18 cm. long. She underwent original operation, a vagotomy and gastric resection, in 1958. Over the next few years she lost 25 pounds, experienced severe vasomotor symptoms of early dumping, and in 1965 she had an 18 cm. reversed jejunal segment interpolated between the gastric remnant and duodenum. This patient did well until 1969, when she began to develop upper abdominal fullness, nausea and vomiting which increased. In 1971, X-rays showed multiple ulcers in the jejunal segment with stenosis (Fig. 8). The jejunal segment was removed and a shorter (8 cm.) segment was interpolated, after which the patient gained 30 pounds. She has been studied almost 3 years and now has an excellent result.

One patient is of unusual interest. This man originally had truncal vagotomy and pyloroplasty performed. He developed severe dumping symptoms and later underwent antrectomy with Billroth I gastrodu-

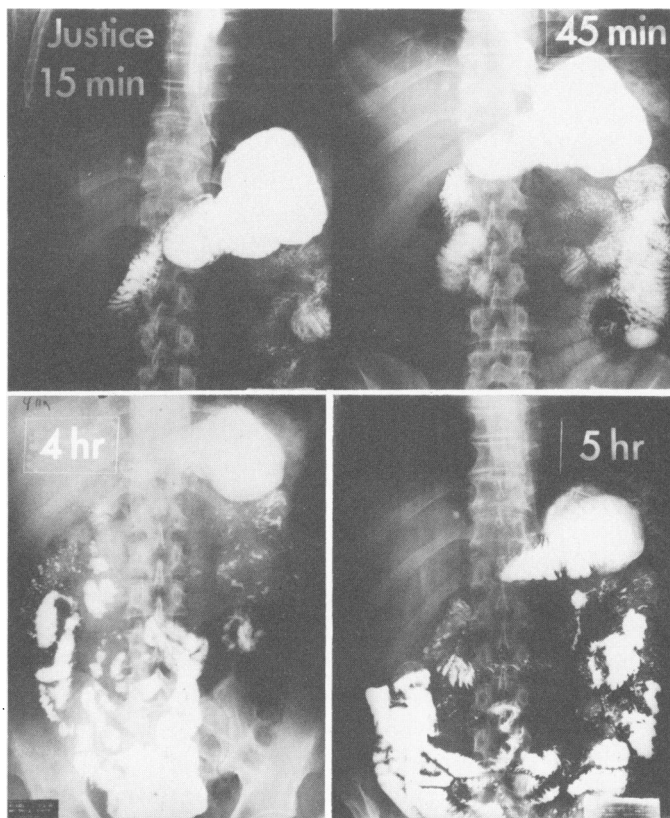


FIG. 6A. After 6 years this patient's double limb jejunal pouch became dilated, sacculated and emptied poorly.

odenostomy. There was no improvement after this operation and the patient went to London where Francis Austin Henley inserted an isoperistaltic jejunal segment between the gastric remnant and duodenum. Dumping symptoms persisted. When he was referred to us, we merely reversed the Henley isoperistaltic segment. He is now considered to have a good result.

### Discussion

Remedial operations for treatment of dumping syndrome should be proposed only after all methods of conservative management have failed. Only patients who continue to have severe, intractable dumping symptoms while in the hospital on strict dietary regimens have been subjected to remedial surgery. In most instances, several years have elapsed between the original procedure and reoperation to correct dumping symptoms.

Remedial operation to alleviate dumping symptoms is designed to restore the reservoir function of the stomach and to prolong gastric emptying time. Loss of a normal functioning pylorus, with its valve-like mechanism to slow gastric emptying, appears to be the basic problem in severe, intractable early postprandial dumping syndrome.

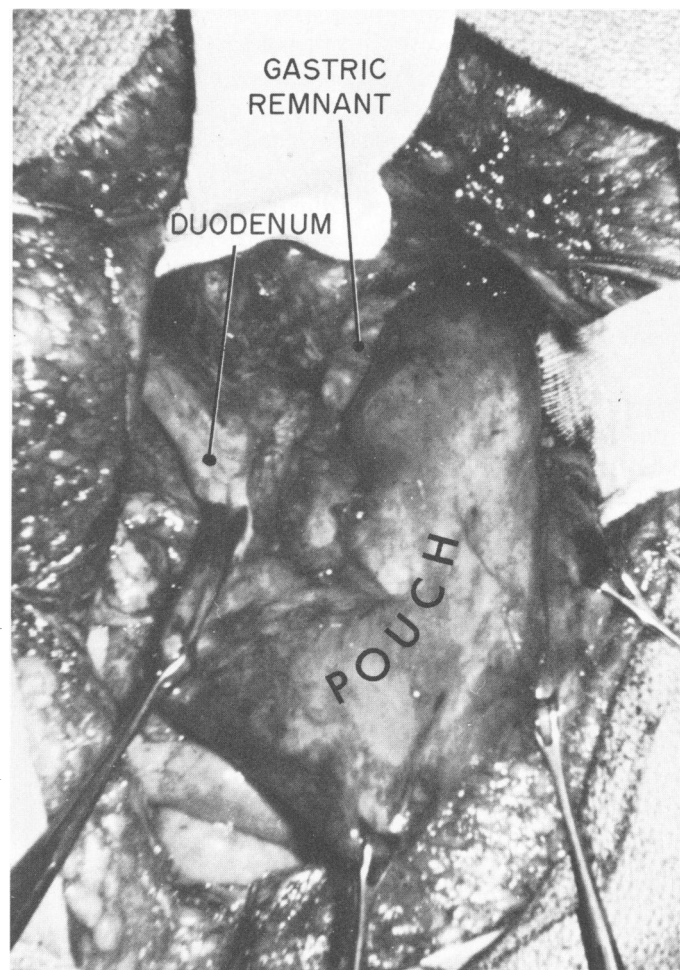


FIG. 6B. Very dilated jejunal pouch at reoperation.

In our experience, a 10 cm. reversed jejunal segment will effectively prolong the emptying time of the stomach without obstruction. Restoration of gastric reservoir function and prolongation of gastric emptying time relieve the severe vasomotor and gastrointestinal symptoms of dumping. The length of the antiperistaltic segment is critical. Experience with an 18 cm. reversed segment resulted in ulcerations and stenosis in the segment which necessitated its removal. Jordan<sup>5</sup> reports unsatisfactory results with 6 cm. reversed jejunal segments. When he used segments of 10 cm., his patients achieved satisfactory results.

We have seen no obstruction occur from use of 10 cm. antiperistaltic segments, yet these reverse segments serve to delay gastric emptying by functioning as a substitute pylorus. Cinérentgenographic studies have been obtained at various time intervals in the follow-up period and show that reversed segments function effectively as long as 10 years. As the antiperistaltic jejunal segment begins to fill from the gastric remnant, contraction occurs and much of the barium meal in

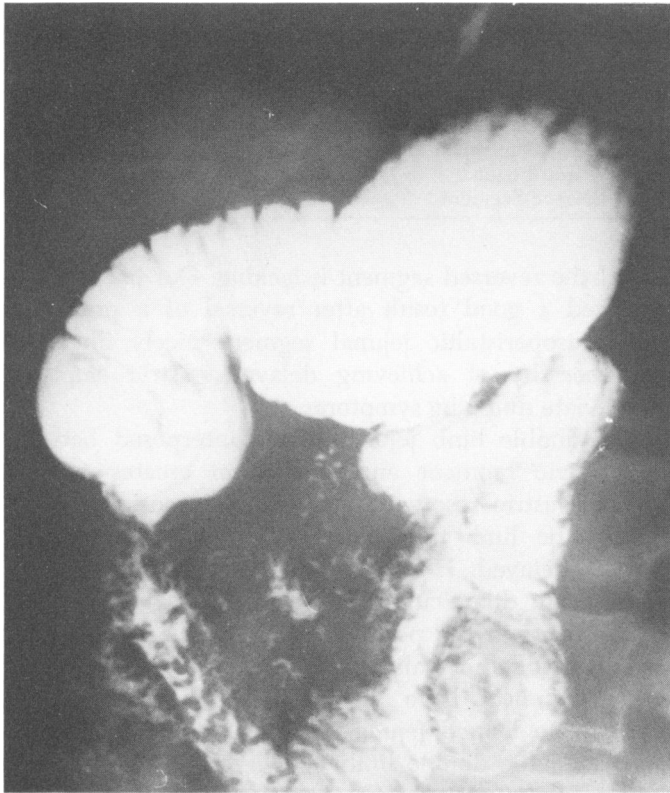


FIG. 6C. After revision to make jejunal pouch smaller, patient's stomach emptied well. He was relieved of abdominal fullness and vomiting.

the jejunal segment refluxes into the gastric pouch. Only a small portion of the meal enters from the segment into the duodenum. A meal, therefore, leaves the gastric pouch in small increments as it did before the integrity of the pylorus was violated (Fig. 9). Symptoms of alkaline or bile reflux into the gastric pouch have not been a problem in our patients, but one patient who volunteered to undergo gastroscopy examination, 6 years after insertion of a reversed jejunal segment, had bile present in the gastric pouch. The gastroscope was passed with ease into the jejunal segment which appeared to have normal mucosa and peristalsis.

We are unable to explain the good results reported by others using an isoperistaltic jejunal segment. While

FIG. 7. Results—using antiperistaltic jejunal segment for dumping syndrome.

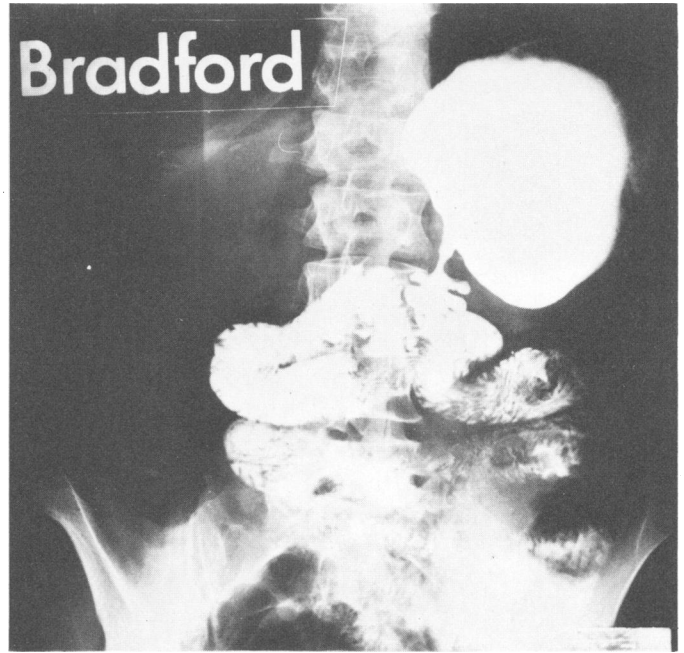
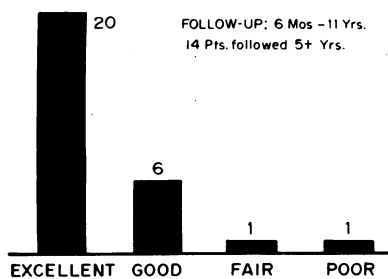


FIG. 8. The only poor result from an antiperistaltic jejunal segment. The interposed segment was too long (18 cm.). Over a 4-year period multiple ulcers and stenosis developed as shown in x-ray. After replacing this segment with 8 cm. long segment, patient did well.

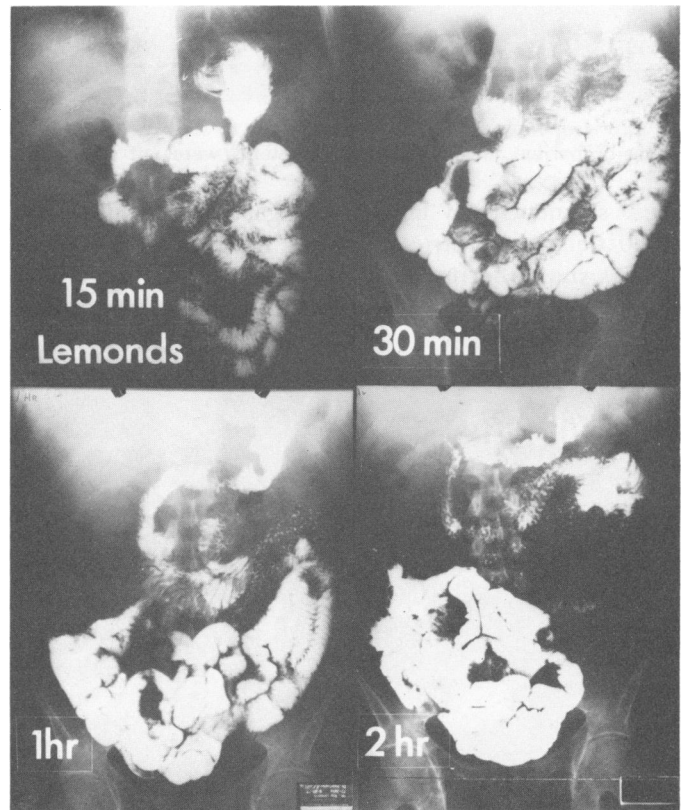


FIG. 9. X-rays of barium meal in patient with 10 cm. long antiperistaltic jejunal segment which acts as substitute pylorus to delay gastric emptying. Segment functions effectively 10 years after remedial operation.

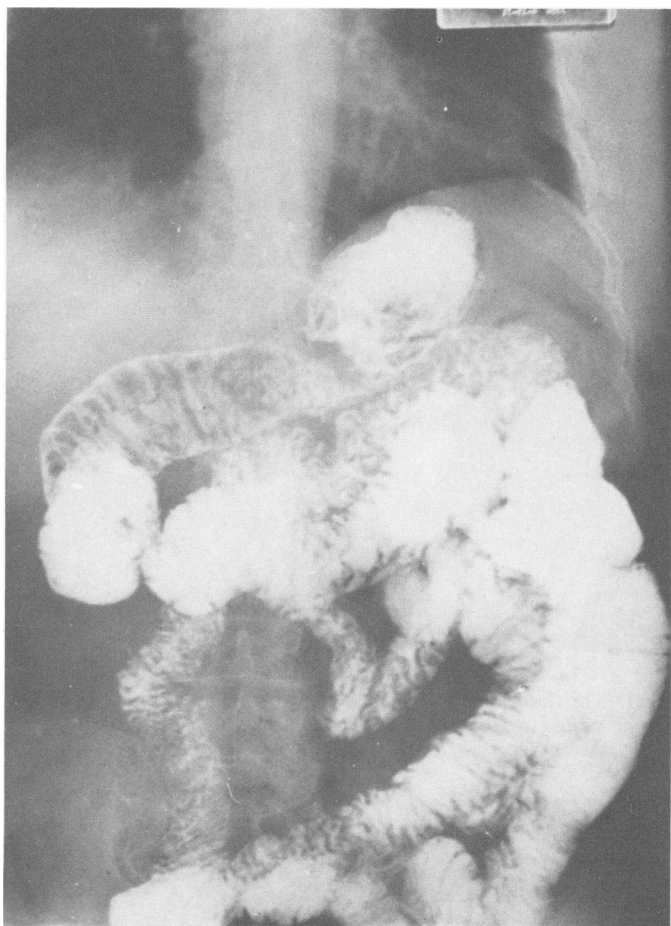


FIG. 10. Isoperistaltic jejunal segment fails to slow gastric emptying of barium meal. Dumping symptoms were not relieved.

these segments may enlarge the gastric reservoir, there is no delay in gastric emptying time (Fig. 10). Ciné studies show the barium meal to speed on through the isoperistaltic segment. The pyloric valve-like mechan-

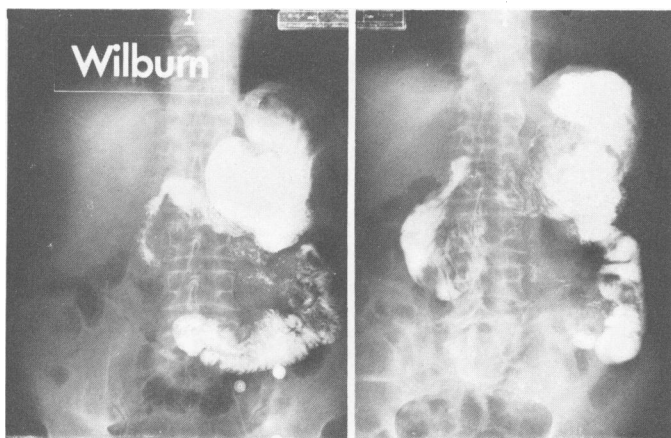


FIG. 11. Double limb jejunal pouch interposed between gastric remnant and duodenum creates a satisfactory gastric reservoir, but in a few years tends to enlarge to such a degree that stasis occurs and the pouch empties poorly.

TABLE 2. Results in 50 Patients Shows the Superiority of using a Single 10 cm. Antiperistaltic Jejunal Segment in Patients with Intractable Dumping Syndrome.

	Number of Patients Satisfactory Results	
Isoperistaltic Segment	10	20%
Double Limb Pouch	12	58%
Antiperistaltic Segment	28	93%

ism of the reversed segment is lacking. Our patient who achieved a good result after reversal of a previously placed isoperistaltic jejunal segment nicely illustrates the necessity of achieving delayed gastric emptying to alleviate dumping symptoms.

The double limb jejunal pouch interposed between the gastric remnant and duodenum creates a satisfactory gastric reservoir and by anastomosing the antiperistaltic limb to the duodenum, gastric emptying time is delayed. However, after a period of time the pouch may dilate and enlarge to such a degree that stasis occurs in the pouch (Fig. 11). The patient then complains of upper abdominal discomfort. Woodward<sup>16</sup> and Lawrence<sup>7</sup> have seen this problem develop in their triple looped jejunal pouches. From our experience with the double limb pouch, we would advocate its use only in patients who suffer from the small gastric pouch syndrome after 85 to 90% high subtotal gastric resection. In patients who had gastric resections of 50 to 60%, insertion of a jejunal pouch will eventually result in dilatation of the pouch with inadequate gastric emptying.

The 10 cm. antiperistaltic single jejunal segment appeared to function satisfactorily, without serious sequelae developing, during our follow-up studies which extend to 11 years. The operation is technically simple. The jejunal segment is passed through the transverse mesocolon, rotated counterclockwise to an antiperistaltic position and interposed between the gastric remnant and duodenum. Vagotomy is performed in those patients who have not had complete gastric vagotomies. In patients who have had pyloroplasties, we have removed the antrum for fear of producing antral stasis and stimulation of acid secretion by the gastrin mechanism. Stemmer and associates,<sup>14</sup> however, have interposed 4 to 6 cm. antiperistaltic segments between the stomach and duodenum without antrectomy and report no gastric ulcerations.

We have had no experience in the use of pyloric reconstruction for treatment of the dumping syndrome. Regan<sup>11</sup> reported good results in four patients with dumping syndrome after reconstruction of the pylorus which narrowed the lumen to admit only one finger. The longest follow-up period in his patients was 17 months. Several years ago, we attempted to treat the dumping syndrome in patients who had Billroth II



gastrojejunostomies by converting their anastomosis to a Billroth I gastroduodenostomy. This procedure did not relieve their symptoms.

Table 2 summarizes the results in the 50 patients who underwent remedial operation for dumping syndrome by interposition of jejunum between the gastric remnant and duodenum. A single 10 cm. antiperistaltic jejunal segment gave superior results and is our operation of choice for severe, intractable early postprandial dumping syndrome.

### Summary

The effectiveness of three remedial operations for management of early postprandial dumping syndrome is compared. Ten patients with isoperistaltic jejunal segments interposed between the gastric remnant and duodenum had no excellent results and good results were obtained in only two patients. In 12 patients with double iso-antiperistaltic jejunal limb pouch, excellent or good results were obtained in seven patients (58%). Unfortunately, these pouches tend to dilate and empty poorly after several years.

The best results were obtained by using a 10 cm. single antiperistaltic jejunal segment interposed between the gastric remnant and duodenum. Twenty-six of 28 patients (93%) had good to excellent results. Follow-up studies extending to 11 years demonstrate that these antiperistaltic segments continue to function effectively.

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### DISCUSSION

DR. EDWARD A. STEMMER (Long Beach): As you all know, the postgastrectomy syndrome is actually a mixture of abnormalities of which the dumping syndrome is only one. Since each of the postgastrectomy syndromes differ in etiology, it is essential that the specific syndrome be actually identified if treatment is to be effective. Establishing the diagnosis of dumping syndrome is more difficult than it may seem as demonstrated by the wide variation in the incidence of this complication reported in the literature.

Some of the confusion in the diagnosis of the dumping syndrome undoubtedly results because this entity is primarily one of symptoms rather than physical findings. As a result of animal studies conducted several years ago, we concluded that the small bowel transit time, the peak plasma insulin response and the blood glucose response after a test meal were useful objective measurements in the diagnosis of dumping syndrome. In addition, we consider it essential that the patient have both vasomotor and gastrointestinal symptoms before a diagnosis is considered established. Abdominal pain is not a prominent part of the dumping syndrome and we would question such a diagnosis if the patient's primary complaint is abdominal pain. Moreover, we discovered that if the patient's primary problem is psychiatric or a desire for compensation the results of operation are likely to be poor.

While few patients with dumping syndrome require surgical correction, we agree with the authors that antiperistaltic segments can be employed with good success provided that the diagnosis of dumping syndrome is actually established.

DR. EDWARD ROY WOODWARD (Gainesville): The authors are to be congratulated on these outstanding results in a most difficult, iatrogenic clinical problem.

In 1954, Hastings and I first used a three-limb jejunal pouch as a replacement for a subtotaly resected stomach with severe dumping, and as luck would have it, our very first patient had a brilliant result. He gained 65 pounds in the first year after operation. He had the amazing good judgment to move from Los Angeles to Florida so that I have been able to follow him for 19 years since that surgery. He has continued to be totally asymptomatic and has had no difficulties whatever with his artificial stomach.

We proceeded to treat a total of 12 patients cases from 1954 to 1963 and only once did we duplicate this result. We had the same experience that the authors report with the two-limb jejunal pouch: *i.e.* failure of adequate emptying, progressive dilatation of the pouch and symptoms of prolonged retention of ingested material. Nearly all of these pouches have been either removed or drastically revised and we do not believe that this procedure has