Intestinal Bypass

A Modification

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Six hundred sixty-four patients who have had metabolic intestinal surgery for the treatment of morbid obesity are reviewed. Particular attention is directed to difference in weight loss, morbidity and mortality in end-to-side and end-to-end shunts, the former performed in 300 patients and the latter in 262 patients. Unsatisfactory weight loss was observed in 20% of patients with end-to-side shunts, while only 8% of patients with end-to-end shunts failed to lose a sufficient amount of weight. Morbidity and mortality were significantly increased in this latter group. This led to adoption of a modification of the end-to-side operation by developing a plication to prevent reflux. Our preliminary observation indicates that in 102 patients who have had this operation, similar weight loss is attained to that of end-to-end shunts with no greater morbidity or mortality than the end-to-side type.

EARLY CONCEPT OF INTESTINAL short circuiting operation for morbid obesity[1,2] has gradually progressed to the currently accepted procedures of Payne[3] or Scott.[4] The modification of Scott came as a consequence of insufficient weight loss in certain patients who had undergone the end-to-side type of shunt. A number of theories existed as to the reason for this. Several authors felt that reflux of intestinal contents into the defunctionalized ileum resulted in increased absorption of nutrients and hence decreased weight loss.[5-7] Others believed that increased absorption developed in the shortened segment resulting in failure to lose sufficient weight. Further experience has shown that when the defunctionalized segment is removed from gastrointestinal continuity by conversion of end-to-side to end-to-end shunt additional weight is lost. The concept of reflux is, therefore, a valid cause of insufficient weight loss in most patients. Elimination of reflux should increase the degree of weight loss since this is the only essential difference between the end-to-side and the end-to-end type of shunt. Our experience with 664 patients, 102 of whom have had end-to-side shunts utilizing a modification which eliminates reflux, has resulted in similar weight loss to that occurring in comparable patients who have had end-to-end bypasses.

Submitted for publication: January 10, 1978.

Material

Our choice of operation in the mobidly obese patient has changed through the years. Initially in the 1970–1973 period, we performed the Payne Shunt, an end-to-side jejunoileal anastomosis incorporating 36.6 cm of jejunum to 10.2 cm of ileum. On studying these first 300 patients, we were dissatisfied with the decrement of weight loss. If the patient's ideal weight was calculated and we arbitrarily placed any patient within 22.6 kg (50 lbs) as having a satisfactory result, 64 or 21% of our patients' loss would be judged as unsatisfactory.

While results were frequently satisfactory as far as other physiologic parameters, such as reduction in blood pressure, reduction in fasting glucose and cholesterol were concerned; most patients measured success primarily by the amount of weight loss. Therefore, about 20% of the patients were dissatisfied with the results of their operation. On evaluation of these patients, 95% were noted to have reflux of contents into the defunctionalized segment. Because of the insufficient weight loss, in October 1973 we began to do end-to-end jejunoileostomy with an ileo-colostomy as described by Scott. We used 30.5 cm of jejunum anastomosed to 23.3 cm of ileum on 262 patients. Our results with this group, in regard to return to ideal weight, were most gratifying. Only 21 patients, or 8%, failed to reach their ideal weight within 22.6 kg. During this period we converted 11 patients from end-

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TABLE 1. *Conversion of Payne to Scott Shunt*

Case #	Original Weight (kg)	Weight at Conversion (kg)	Interval Between Operation	Interval Since Conversion	Present Weight (kg)
1	143.18	109.09	2 years	2 years	77.27
2	143.18	122.79	3 years	2 years	76.81
3	152.72	90.90	1.5 years	1.5 years	65.90
4	177.27	109.01	2.5 years	2.5 years	81.81
5	120.45	99.54	3 years	1 year	86.36
6	144.09	144.09	1 year	1 year	85.90
7	163.18	145.90	3 years	1 year	122.72
8	132.72	90.90	1 year	4 years	67.27
9	168.18	136.36	3.5 years	.5 years	129.54
10	130.90	105.45	2 years	.5 years	97.27
11	126.36	103.63	1 year	2 years	85.0

to-side type to an end-to-end shunt. Table 1 gives the statistics as far as further weight loss following the conversion operation. As noted, further weight reduction has occurred and is continuing at an encouraging rate in most patients.

The greater weight loss in the end-to-end shunt patients was accompanied by a higher morbidity and mortality.[8] Table 2 depicts the mortality seen between our two types of shunts. A more significant rise in mortality was observed with the end-to-end group (8.0%) than the end-to-side group (2.7%). Both types of bypass procedures were evaluated as to intrinsic differences. No difference was found in age, weight, or secondary disease processes. We concluded the type of bypass procedure to be the main difference. It seems logical to assume that two bowel anastomoses would result in a higher complication rate than a single anastomosis, particularly if one anastomosis involved the colon. This led us to search for a procedure which would give us the weight loss of the end-to-end procedure and the reduced complication rate of the end-to-side anastomosis.

TABLE 2. *Mortality: End-to-End vs. End-to-Side Shunts*

Cause	262 End-to-End (Scott)	300 End-to-Side (Payne)
1. Anastomotic leak	4	0
2. Electrolyte abnormality	1	1
3. Pulmonary embolism	3	2
4. Hepatic failure	6	2
5. Pneumonia	0	1
6. Myocardial infarction	0	1
7. Aspiration	3	0
8. Hypoxia	1	0
9. Necrotising enterocolitis	1	0
10. Tuberculosis	1	0
11. Unknown	1	1
Total	21	8
Per cent	8.0%	2.7%

Description of Modification

As has been previously described, the essential difference between the two procedures is the handling of the bypassed segment of bowel. A method of prevention of reflux seemed to be the answer. A surgical maneuver was devised in which the antimesenteric border of the ileum just proximal to the end-to-side jejunoileostomy was attached to the antimesenteric border of the proximal (functional) jejunum for approximately 16 cm. This maneuver which does not involve an open anastomosis prevents reflux into the proximal ileum by one of two possible mechanisms. By plicating the proximal ileum to the functional jejunal segment reflux may be prevented by keep-

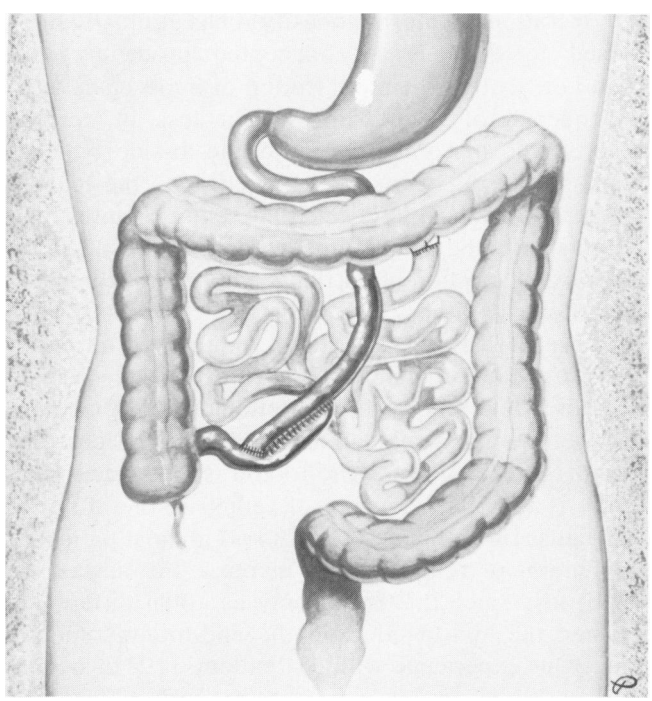

FIG. 1. A modification of the Payne shunt. Notice how the proximal ileum is tacked up to the distal aspect of the functional jejunum.

ing the defunctionalized ileum in a nondependent position, thus preventing reflux of chyme by gravity. A second possibility is that this procedure results in a partial obstruction to the reflux of chyme into the defunctionalized ileum. If this is the case the blind loop proximal ileum and distal jejunum formed would have to reach equilibrium or a closed loop obstruction (which has not occurred) would be the result. Figure 1 illustrates this procedure. The distal jejunal segment which is defunctionalized is oversewn and tacked to the mesentary of the transverse colon to prevent intussusception.[9]

Without this modification procedure, 60% of contrast studies reveal reflux into the bypassed segment in patients with end-to-side shunts. It was felt that the 40% who did not show reflux possibly had modified themselves by formation of adhesions. It has been our observation that those patients with the greatest amount of reflux lost the least amount of weight.

Discussion

The isoperistaltic end-to-side shunt with the described modification has been employed in 102 patients during the past 18 months. In two patients we have had the opportunity to reoperate on them for other reasons following the Payne Shunt. Prior to repair of a ventral hernia, a patient with less than 26 kg weight loss (after a Payne procedure) was subjected to a barium study of the gastrointestinal tract (Fig. 2). Reflux is noted in the defunctionalized segment. During repair of the hernia the abdominal cavity was entered and the modification was performed. Postoperatively a repeat barium study was performed (Fig. 3) and reflux has been completely eliminated; subsequently she has continued to lose weight. A second patient had similar x-rays and a similar result following modification.

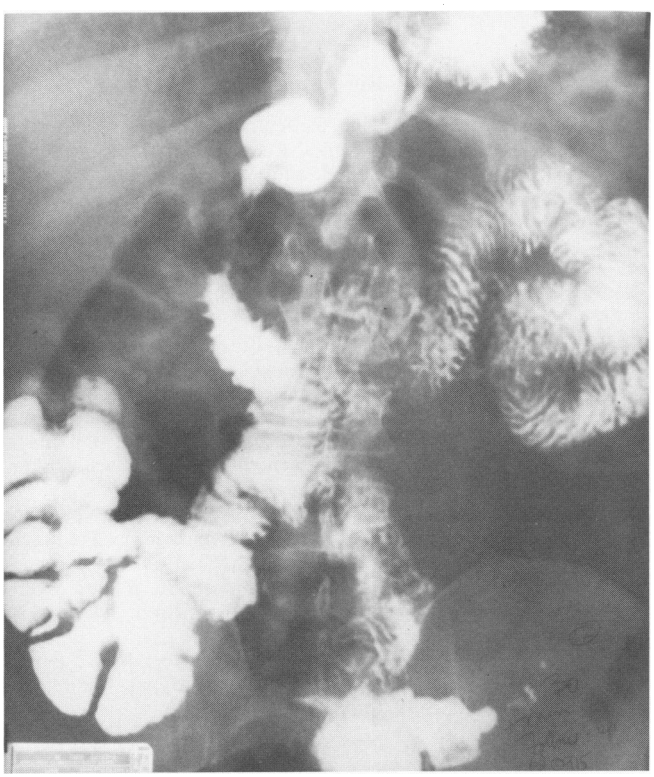

FIG. 2. Reflux in a patient with a previous Payne shunt without modification.

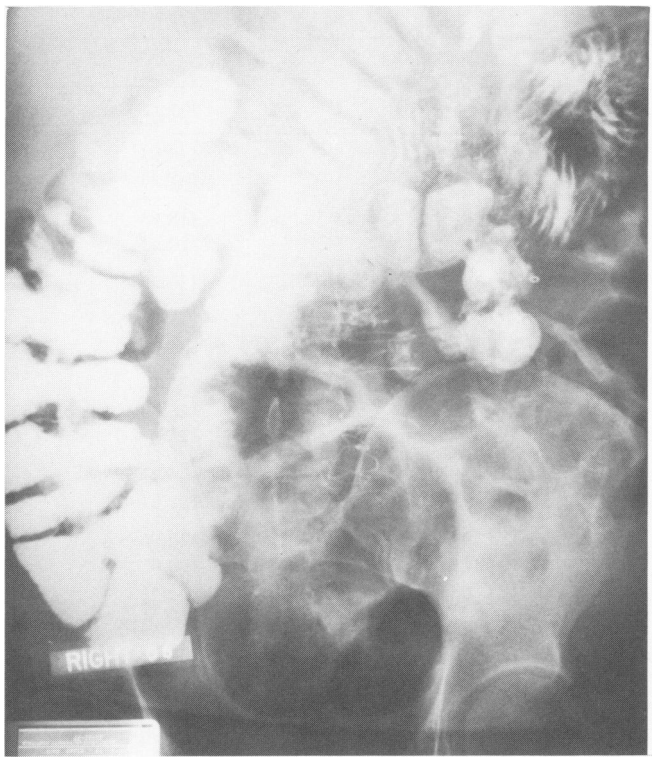

FIG. 3. The same patient after our modification. Notice the lack of reflux.

While it is much too early to critically evaluate weight loss with our modification, we have compared the results in ten consecutive patients to randomly selected end-to-end shunts, matched as equally as possible to age, height and weight. The modified shunts have been followed closely for one year. The randomly matched groups are shown in Table 3. The overall weight loss difference between groups A and B is not statistically different, although individual variation is present.

Summary

Our experience with end-to-side and end-to-end shunts in relation to weight loss, morbidity and mortality has been described. End-to-side shunts were

TABLE 3. *Weight Loss: Scott Shunt vs. Payne with Modification (kg)*

Case	Age	Ht.	Weight					
			Preop	2 mo.	4 mo.	8 mo.	1 yr.	Total Lost
1 A	36	5'9"	136.81	111.8	100.90	87.72	69.09	67.72
B	42	5'9"	141.36	—	114.54	100.90	91.36	50.0
2 A	29	5'5"	118.63	—	95.90	90.0	77.27	41.36
B	26	5'5"	120.45	105.0	99.54	90.0	75.0	45.45
3 A	30	5'2"	120.45	115.45	101.36	92.72	72.72	47.73
B	33	5'3"	145.0	—	117.72	88.63	76.36	68.64
4 A	23	5'5"	131.36	114.90	108.18	102.72	95.90	35.46
B	23	5'4"	122.27	110.0	99.09	75.45	63.63	58.64
5 A	43	5'8"	128.63	113.63	103.63	101.81	94.09	34.54
B	42	5'6"	125.0	116.36	110.45	98.63	91.81	33.19
6 A	42	5'4"	107.72	96.36	79.54	—	60.90	46.82
B	45	5'6"	111.81	83.63	83.18	74.09	63.63	48.18
7 A	29	5'6"	120.90	105.90	99.09	92.72	85.45	35.45
B	31	5'4"	120.0	—	89.54	77.27	73.18	46.82
8 A	45	5'3"	115.45	98.18	93.18	90.45	86.36	29.09
B	46	5'8"	111.36	109.09	98.63	87.72	85.90	25.46
9 A	26	5'7"	127.27	118.18	110.90	101.81	97.72	29.55
B	32	5'5"	123.18	—	106.36	99.54	94.09	29.09
10 A	30	5'4"	110.90	142.72	136.81	128.18	109.09	51.81
B	37	5'4"	155.0	125.45	116.36	—	84.54	70.46
Total wt. loss Scott's shunt								*475.93*
Total wt. loss Payne shunt with modification								*419.53*

A: Payne with modification. B: randomly matched Scott shunt.

unsatisfactory due to insufficient weight loss. End-to-end shunts produced satisfactory weight loss, but a significantly higher morbidity and mortality. Revision operations have consisted of conversion of end-to-side shunts to end-to-end shunts. While weight loss has been satisfactory, morbidity can be anticipated to develop due to the addition of the colonic anastomosis.

Our modification which is currently under evaluation incorporates the benefits of both procedures. With only one anastomosis, the morbidity is to be expected to parallel that of the Payne procedure. With the prevention of reflux we hope to find the amount of weight loss to be similar to the Scott Shunt. As the patient population increase with our modification, we believe we will be able to statistically prove its value. The long-term follow-up will be the subject of a future report. At the present time we feel the Payne Shunt with our modification may be the surgical procedure of choice for the morbidly obese patient.

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