

# Colonic pseudo-obstruction: a new complication of jejunioileal bypass<sup>1</sup>

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**SUMMARY** Five female patients ranging in age from 25 to 44 years are reported in whom jejunioileal bypass (three end-to-side and two end-to-end), performed for morbid obesity, was complicated 1½ to three years later by symptoms of colonic pseudo-obstruction. In each case, the colon was markedly elongated, dilated, and atonic but with no demonstrable organic obstruction. The cause of this complication is not known. Full thickness rectal biopsy in one case showed normal intrinsic nervous plexuses and ganglia. Serum electrolytes were normal. Functional and defunctionalized small bowel were not involved. Symptoms varied from complete colonic paralysis to incapacitating crampy abdominal pain and distention. In the three patients with end-to-side bypass, dilatation affected the entire colon, while, in the two patients with end-to-end bypass, the dilatation was localized to colon distal to the anastomosis with the defunctionalized small bowel. Resection of the affected portion of colon in one case resulted in recurrence distal to the new site of drainage of defunctioned bowel. Treatment with anti-anaerobe antibiotics in two cases produced dramatic but temporary relief of symptoms.

Jejunioileal bypass for the treatment of extreme obesity has been practised for more than 15 years. Its popularity has increased in recent years so that it is now a relatively common operation in North America and is now being adopted in the United Kingdom (Baddeley, 1973; Brewer *et al.*, 1974; Gazet *et al.*, 1974).

There are two commonly used types of operation, the end-to-side jejunioileal bypass (Payne *et al.*, 1963), and the end-to-end jejunioileal bypass (Scott *et al.*, 1971). Both operations are said to cause weight loss by reducing the absorptive area of the small bowel. Although intestinal bypass is usually highly effective in producing weight loss, there are many reports of serious complications. These include bleeding from hypoprothrombinaemia (Shibata *et al.*, 1967), tetany, fluid and electrolyte depletion (Lewis *et al.*, 1966; Morgan and Moore, 1967; Shibata *et al.*, 1967; Rowe, 1968), magnesium deficiency (Nielsen and Thaysen, 1971), severe fatty degeneration of the liver (Payne *et al.*, 1963; Bondar and Pisesky, 1967; Shibata *et al.*, 1967), which in some cases progresses to cirrhosis (Snod-

grass, 1970), polyarthritis (Shagrin *et al.*, 1971), and hyperoxaluria (Smith, *et al.*, 1972), which has resulted in urinary tract calculi (Dickstein and Frame, 1973). In some patients, these complications have resulted in deaths (DeMuth and Rottenstein, 1964; Lewis *et al.*, 1966; Bondar and Pisesky, 1967; Shibata *et al.*, 1967).

The purpose of this communication is to describe a new and serious late complication of jejunioileal bypass. Five cases are described in whom cryptogenic dilatation of the colon simulating colonic obstruction occurred 1½ to three years after jejunioileal bypass. Clinical findings are summarized in the Table.

Patient	Age (yr)	Type of bypass	Cholecystectomy	Total weight lost* (kg)	Time interval bypass to onset colonic symptoms (months)
1	30	End-to-end	Yes	68	18
2	44	End-to-side	Yes	91	18
3	50	End-to-side	Yes	27	36
4	33	End-to-side	No	38	29
5	27	End-to-end	Yes	75	18

Table Clinical details of five patients with colonic pseudo-obstruction

\*At onset of colonic symptoms.

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**Case 1**

A 29 year old white lady who weighed 131 kg (289 lb) underwent jejunoileal bypass in January 1973. Forty centimetres of jejunum were anastomosed end-to-end to 10 cm of terminal ileum and the defunctionalized small bowel was drained distally by anastomosis to the sigmoid colon. Postoperative recovery was uneventful and weight decreased to 68 kg (150 lb) over the subsequent 18 months.

Cholecystectomy had previously been performed in 1968 for symptomatic cholelithiasis.

In April 1974, the patient developed attacks of generalized cramping abdominal pain, abdominal distention, nausea, and vomiting which had begun three months previously. The attacks, which lasted one to five days, necessitated three admissions for 'intestinal obstruction' which rapidly resolved after 24 hours of nasogastric suction. No cause for the 'obstruction' was found. She was admitted for investigation of these attacks in July 1974.

On examination, the only abnormal physical findings were in the abdomen which was distended and tympanitic in the lower half. There was also tenderness to palpation but no guarding. There were no detectable hernia, no masses or organomegaly, and no free fluid. Bowel sounds were hyperactive. Rectal examination was normal and the rectum was empty. Plain radiographs showed a dilated gas-filled colon occupying the entire left side of the abdomen. Gas was also present in the rectum. Haematological examinations and all serum electrolytes were normal.

The patient was treated with intravenous fluids and nasogastric suction and symptoms resolved as rapidly as on previous occasions. After thorough decompression, a barium enema revealed markedly redundant sigmoid and descending colon which was moderately dilated. The anastomosis with the defunctionalized small bowel was visualized and shown to be widely patent. Colonoscopy was performed to the splenic flexure and showed a highly distensible colon with no mucosal or organic lesion. A clinical diagnosis of intermittent sigmoid volvulus was made and laparotomy performed.

**OPERATIVE FINDINGS**

The functional and bypassed segments of small bowel were normal and all anastomoses were patent. No volvulus was found and adhesions were minimal. The sigmoid colon had enlarged remarkably since her operation 18 months previously and coils of elongated and dilated sigmoid colon occupied the whole of the left side of the abdominal cavity. The anastomosis with the defunctionalized small bowel was situated at the point of maximal dilatation. Forty centimetres of dilated sigmoid colon

were resected and the anastomosis with the defunctionalized small bowel was moved to the proximal transverse colon. The skin was treated with delayed secondary closure which needed to be partially reopened. Postoperatively, the patient was well and entirely free from symptoms for a period of four weeks after which the preoperative symptoms gradually recurred with attacks increasing in frequency and severity. Radiological investigation during these attacks showed the colon to be dilated from the mid-transverse colon distally. As on previous occasions, symptoms remitted with non-operative management. A full thickness rectal biopsy was performed which showed normal appearing ganglia and nervous plexuses.

In December 1974, 23 months after bypass and five months after segmental colon resection, the patient was admitted with another severe attack of abdominal pain, distention, nausea and vomiting. Physical and radiological findings were as in previous attacks. In addition to the colonic dilatation, the sigmoid colon had again elongated considerably since the barium enema performed immediately after her colon resection five months previously. On this occasion, it was elected to treat the attack with a trial of antibiotics in the belief that the attacks might be related to bacterial overgrowth in the defunctionalized small bowel. Clindamycin 300 mg six hourly was administered intravenously while continuing a normal oral intake of food and fluids. Symptoms resolved dramatically. Within eight hours of starting treatment, the abdominal pain and distention had completely disappeared and the patient was passing stool and flatus normally. Abdominal girth had decreased from 90 to 80 cm in that time. After completing a five-day course of treatment, the patient was discharged well and free from symptoms. Subsequent progress was excellent for eight weeks at which time she suffered a recurrence of symptoms. Further antibiotic treatment has been withheld pending more detailed bacteriological investigations.

**Case 2**

A white lady was referred for investigation in November 1974 after an end-to-side jejunoileal bypass, 40 cm jejunum and 10 cm ileum, performed elsewhere 21 months previously. She had suffered from morbid obesity and asthma since childhood. A cholecystectomy had been performed in 1968. Her mother had died at the age of 32 years from a myocardial infarction and her sister died aged 19 years from the same cause. In February 1973, the patient weighed 147 kg (325 lb) and was severely disabled. She could walk no further than 50 yards

on the flat before angina and dyspnoea obliged her to rest. Because of this, she underwent end-to-side jejunoileal bypass, 40 cm jejunum being anastomosed to the terminal 10 cm of ileum. Because of hypoventilation, she suffered a stormy postoperative course requiring six days in an intensive care facility. Severe diarrhoea with 40 to 60 loose motions per day resulted in frequent episodes of fluid and electrolyte depletion in spite of oral supplementation. Her condition gradually improved with decreasing frequency of bowel movements during the first eight months postoperatively. By December 1973, she was well, having five to six bowel movements per day with stable serum electrolyte values on oral supplementation with potassium and magnesium.

In July 1974, while the patient remained symptom-free, mild abnormalities in liver function tests prompted the performance of a liver biopsy which showed fatty metamorphosis and a mild increase in periportal fibrous tissue. No treatment was given.

In August 1974, 18 months after bypass, the patient suddenly developed episodes of abdominal distention associated with discomfort and decreased bowel movements. The episodes lasted four to eight hours and could initially be terminated by firm massage of the abdomen which would precipitate the passage of flatus and a diarrhoeal stool. The attacks increased rapidly in frequency and severity so that, three weeks after their onset, they were occurring daily and causing considerable pain, gross distention, and obstipation. Partial relief was obtained with enemas. The attacks were precipitated by meals and partial relief was obtained by not eating. When she was referred to Harbor General Hospital 23 months after bypass and four months after the onset of abdominal distention, her weight was 56 kg (124 lb).

Physical examination revealed a middle-aged lady in obvious pain. Extensive xanthelasma were present bilaterally. She was afebrile, with dry tongue, inelastic skin, and sunken eyes. The abdomen was grossly distended and loops of distended bowel could be seen behind a thin abdominal wall, but visible peristalsis was not present. The abdomen was markedly tender with some guarding and bowel sounds were increased. There were no other abnormalities and no hernia. Haematological investigation and serum electrolytes were normal. Plain radiographs of the abdomen showed a moderately dilated gas-filled colon with fluid levels. Gas was visible in the rectum. Barium enema showed a markedly elongated colon which was dilated throughout its length but free of organic obstruction. Sigmoidoscopy was normal. The patient was treated

by decompression using a Miller-Abbot tube and intravenous fluids and symptoms regressed over 48 hours. Gradual refeeding resulted in an immediate return of symptoms on three occasions so that intravenous feeding and prolonged decompression via nasogastric tube were instituted. After two weeks of this treatment, oral feeding was slowly resumed but on the third day of oral feeding, while the patient was taking two light meals per day, symptoms recurred. Continuing the regimen of two light meals daily, abdominal pain and distention increased. The patient became obstipated and on day 5, she began to vomit. A three-day trial of cholestyramine 4 g q.i.d. had no beneficial effect. At this time, a trial of treatment with metranidazole 500 mg six hourly by mouth was started while continuing her oral intake. There was a dramatic response to treatment. Within eight hours of starting the treatment, the patient was free from pain and distention, feeling hungry, and passing stool and flatus freely. She was placed on a normal diet and remained entirely free from symptoms for three days. On the fourth day, while still taking the metranidazole, she had a recurrence of generalized abdominal pain and 12 hours later, her abdomen began to distend, and symptoms were just as severe as previously. After a full seven-day course of metranidazole, kanamycin at a dose of 500 mg intravenously, 12 hourly was added to the regime. After six days in which there was no response to treatment, the kanamycin was given orally instead of intravenously. On this combination treatment, symptoms regressed over 24 hours and the patient is currently symptom-free on combination therapy. Full bacteriological studies will be reported at a later date.

### Case 3

A 50 year old white lady was referred to Harbor General Hospital in June 1974. In December 1967, she had undergone jejunoileal bypass elsewhere for extreme obesity 95 kg (210 lb), unresponsive to dietary or medical management. Forty centimetres of jejunum were anastomosed end-to-side to 10 cm terminal ileum. In spite of continuous diarrhoea postoperatively, spontaneous weight loss did not occur but postoperative dietary management resulted in a progressive weight loss to 68 kg (150 lb) at the time of presentation to Harbor General Hospital. Cholecystectomy had been performed in July 1969 after attacks of biliary colic caused by cholelithiasis. There had been no other complication of the surgical procedure. Oral supplements of magnesium and folic acid were being taken at the time of presentation.

Current symptoms began suddenly in 1970, three years after bypass surgery, with the onset of abdominal pain and distention. Bowel movements ceased and the patient was unable to pass flatus. Nausea and anorexia were common but vomiting unusual. The symptoms occurred in attacks lasting one to five hours and terminated with the sudden release of voluminous flatus. The first attack coincided with commencing a course of erythromycin prescribed for an upper respiratory tract infection. Symptoms had increased in severity when attacks occurred daily and the pain and distention had become incapacitating.

#### PHYSICAL FINDINGS

The patient was well-nourished and the only abnormal physical findings were in the abdomen which was grossly distended and tympanitic. There was no visible peristalsis. The abdomen was soft but diffusely tender with no guarding. No masses, hernia, or free fluid were detectable. Bowel sounds were frequent and high pitched. Rectal examination was normal. Haematological examination was normal.

Plain radiographs of the abdomen revealed moderate dilatation of an elongated, gas-filled colon with occasional fluid levels. Barium enema showed no evidence of organic obstruction. Barium follow-through showed no abnormality of the functional segment of small bowel. Reflux into the defunctionalized loop occurred freely and showed no dilatation of this segment.

#### Case 4

A white lady underwent jejunoileal bypass elsewhere in March 1972 at the age of 33 years when she weighed 110 kg (243 lb). Forty centimetres of jejunum were anastomosed end-to-side to 10 cm of terminal ileum. The gall bladder was normal and left *in situ*. Postoperative recovery was uneventful with stool frequency decreasing from 20 per day to five to eight per day at six months after the operation. Weight loss in the first 18 months after the operation was 28 kg (62 lb). Apart from occasional nausea, she remained well until December 1972, when she was admitted for treatment of hypokalaemia (2 mEq/l) and hypomagnesaemia (1.1 mEq/l). In spite of oral supplementation, she suffered intermittent episodes of hypokalaemia and hypomagnesaemia subsequently which necessitated in-patient treatment on one further occasion in June 1973. Thereafter, she remained well on oral supplements until February 1974, when she presented with daily episodes of abdominal distention. The distention produced mild abdominal pain increasing

in severity during the day and resolving at night. Bowel habit was not affected. Plain abdominal radiographs showed dilated colon with fluid levels. Serum electrolyte values at this point were consistently normal but there occurred a progressive, slow fall in serum potassium values to 3.1 mEq/l by June 1974. At this time, 28 months after her original surgery and after a total weight loss of 38 kg (84 lb), the patient underwent reoperation and the length of functional small bowel was increased to include a total of 30 cm terminal ileum (2 cm of functional jejunum being sacrificed in the process) in the hope that this would cause remission of her symptoms of distention which were, at that time, felt to be due to her marginal hypokalaemia.

Postoperative recovery was uneventful but she was referred to Harbor General Hospital four weeks later when symptoms recurred more severely. In addition to distention, there occurred right lower quadrant abdominal pain, nausea, and decreased bowel movements. Attacks terminated after six to eight hours with the passage of large amounts of offensive flatus and large diarrhoeal stools. Abdominal examination revealed only marked, generalized distention with hyperactive bowel sounds. The percussion note was tympanitic. Haematological investigations were normal, including serum electrolyte values.

Plain abdominal radiographs showed dilatation of the entire colon with multiple fluid levels and air in the rectum. Barium follow through performed after decompression, was normal. The defunctionalized bowel was visualized for 20 cm and appeared normal. Barium enema showed the same elongation and dilatation seen in the previous cases with no evidence of organic obstruction.

#### Case 5

A 25 year old white lady weighing 152 kg (336 lb) underwent end-to-end jejunoileal bypass in May 1973. Forty centimetres of jejunum were anastomosed end-to-end to 10 cm terminal ileum. The defunctioned small bowel was drained by anastomosis to the transverse colon. Because of the presence of multiple small gall stones, a cholecystectomy was also performed. The immediate postoperative course was uneventful, but several weeks post-operatively, the patient began to have episodes of painless vomiting not associated with nausea. Diarrhoea was also profuse and the first six post-operative months were punctuated by repeated hospitalizations for correction of electrolyte disturbance, in spite of oral supplementation. Barium examinations revealed no identifiable cause for the vomiting. All anastomoses were patent and there

was no evidence of gastric retention or peptic ulcer disease.

The episodes of vomiting gradually subsided over the first six months and thereafter, the patient remained well and totally free from symptoms on oral potassium and magnesium until November 1974, by which time she had lost 78.8 kg (65 lb) in weight. At this time, the patient suddenly developed episodes of abdominal distention associated with obstipation. Initially, attacks were merely uncomfortable but after five to six days, became progressively more painful and began to cause nausea and, occasionally, vomiting. The attacks occurred approximately two hours after food intake, particularly in the afternoons, and lasted from two to eight hours, terminating with the passage of a diarrhoeal stool and flatus. Attacks occurred daily.

#### PHYSICAL FINDINGS

The patient was a well-nourished lady with a grossly distended, pregnant-looking abdomen which was tympanitic. There was generalized tenderness with some guarding and active bowel sounds. There were no detectable masses or hernia and rectal examination was normal. Haematological examinations were normal. Plain radiographs of the abdomen revealed an elongated gas-filled colon which was dilated from the transverse colon distally. The ascending colon proximal to the anastomosis with the defunctioned bowel, although gas-filled, was of normal calibre. Barium enema showed dilatation of the transverse and descending colon with no evidence of organic obstruction.

#### Discussion

We have described five women in whom the operation of jejunoileal bypass has been complicated by symptoms of intermittent colonic obstruction. In each case, the colon was markedly elongated, dilated, and atonic but no organic obstruction could be demonstrated. A similar colonic ileus has been described as a rare complication of localized peritonitis, abdominal operations, hypokalaemia, and haemorrhagic pancreatitis (Goldstein and Babu, 1974). Review of the literature reveals three similar cases complicating intestinal bypass in one recent series (Fikri and Cassella, 1974). The incidence of this complication cannot yet be accurately assessed. It has occurred in two patients from our own series of 31 patients (cases 1 and 5) but only 18 of our patients have had the operation for more than 18 months.

Of the five cases described here, two patients had an end-to-end procedure and three cases had an end-to-side procedure. Clearly, both types of

commonly used bypass procedures may be complicated by colonic pseudo-obstruction.

The complication occurs late, 1½ to three years after bypass. Symptoms vary in severity from complete paralysis as in cases 1 and 2, to incapacitating, crampy abdominal pain and distention as in case 3 who, nevertheless, was able to maintain normal nutrition for four years in spite of her symptoms.

The cause of this complication is unknown. Serum electrolyte values were normal in four patients and the fifth patient had only borderline hypokalaemia at the time her symptoms developed. Full thickness biopsy of the rectum performed in case 1 showed no evidence of a primary abnormality of the intrinsic nervous plexuses or ganglia. Constant exposure of the bowel mucosa to deconjugated bile salts in patients in whom the blind loop drains into the terminal ileum may conceivably be one aetiological factor.

Four of the five patients had undergone cholecystectomy before the development of their colonic symptoms. However, a trial of cholestyramine in case 2 produced no evidence of benefit and the complication occurred in two cases in whom the blind loop was not drained into the ileum.

In the three cases with end to side anastomosis, the entire colon was involved in the dilatation, whereas in the two patients with end to end anastomosis the dilatation affected only that part of the colon which was distal to the anastomosis with the defunctionalized bowel. In case 1, resection of the affected portion of sigmoid colon resulted in recurrence of the dilatation *distal* to the new site of drainage of the defunctionalized bowel in the transverse colon. This observation suggests that the contents of the blind loop, draining into the colon or terminal few inches of ileum, may be related to the pathogenesis of this complication.

It is well known that bacterial overgrowth in the small bowel, as may occur in jejunal diverticulosis or scleroderma, will occasionally present with obstructive picture due to a paralytic ileus (Phillips, 1953). Because of these observations and because the blind loop of small intestine seemed likely to be populated by anaerobic bacteria, it was elected to treat the two patients with severe symptoms with specifically anti-anaerobic antibiotics. Metronidazole, normally used for protozoan infection, is highly effective against a narrow range of strictly anaerobic organisms. In case 2, treatment with metronidazole produced a prompt and dramatic change within eight hours of starting therapy with complete resolution of pain and distention and a return of normal bowel habit. In spite of continued treatment, however, the remission lasted only three days. Subsequent treatment with kanamycin, an antibiotic

effective against a wide range of aerobic organisms, resulted in a more prolonged remission. Case 1, who was treated with a five-day course of intravenous clindamycin, experienced a similar dramatic remission which lasted for eight weeks.

Both types of commonly used bypass procedures may become complicated by colonic pseudo-obstruction, so that conversion of one procedure to the other cannot be recommended as a treatment.

These preliminary observations suggest that bacterial overgrowth in the defunctionalized loops of small bowel may play an important role in the development of serious complication although the mechanisms by which they do so is obscure.

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#### Addendum

Since this paper was submitted we have seen three other cases of pseudo-obstruction.

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