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A unique case report of jejunoileal bypass reversal with review of the literature



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ABSTRACT

INTRODUCTION: Jejunoileal bypass (JIB) was an effective treatment for morbid obesity in the 1970s, but shortly after it fell out of favor due to horrific side effects, including liver failure, nephrolithiasis and drastic vitamin deficiencies. Although there are few living people with JIB, the management of these patients can be challenging.

CASE PRESENTATION: We describe a case of a 58-year-old female with a history of JIB 46 years prior who had an impending renal failure due to nephrolithiasis. She underwent a jejunostomy feeding tube prior to reversal. After reversal, our patient developed failure to thrive with functional obstruction of the newly incorporated small bowel. This bypassed bowel underwent a severe inflammatory transformation after the introduction of enteric feeds, suggesting an immunological type response to antigens in food. It wasn't until a long and debilitating 12 months and resection of this inflamed bowel that our patient was able to regain bowel function and gain weight.

CONCLUSION: Jejunoileal bypass is an archaic procedure for morbid obesity. Due to its debilitating and at times lethal side effects, it has been replaced with newer techniques. Despite advances, there are still patients out there who have had a jejunoileal bypass. This case report and review of the literature details our experience with this procedure.

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1. Introduction

Jejunoileal bypass (JIB), popular in the 1960s, was one of the first bariatric procedures that achieved dramatic weight loss. Typically, 35 cm of proximal jejunum is anastomosed to the distal 10 cm of ileum [1] (Fig. 1. Diagram of JI bypass). This produces a mal-absorptive mechanism, which results in massive weight loss. Not long after the initial weight loss success reports, many deleterious side effects, including nephrolithiasis, severe nutritional deficiencies, hepatic cirrhosis and ultimately death began to emerge. Other procedures, such as roux-en-y gastric bypass and sleeve gastrectomy, have since replaced the JIB. There is only a small amount of current literature on these patients as many of these patients were either reversed or died from liver failure.

Here we discuss a case of a patient with longstanding history of JIB complicated over time by nutritional deficiencies and recurrent kidney stones resulting in advanced kidney disease approaching dialysis, in which reversal of JIB ultimately resulted in improvement of her nutritional deficiencies and kidney disease. The reversal process was initially complicated by nutritional deficiencies and recurrent small bowel obstruction due to unexpected changes in

the reversed proximal small bowel, characterized by severe and dense fibrotic “foreign-body” like Giant-cell reaction in the small bowel serosa causing recurrent “functional” small bowel obstruction. She endured a long clinical course, however her condition improved after removal of this diseased bowel.

2. Case presentation

Our patient is a 58-year-old Caucasian female who underwent a jejunoileal bypass in 1971 when she was 18 years old. She was compliant with vitamin supplementation and had great results with the weight loss. Over the years, she developed chronic diarrhea and was treated intermittently with metronidazole for enteritis with partial improvement. All colonoscopies performed showed normal appearing mucosa. The patient also developed recurrent calcium oxalate kidney stones, however her first symptomatic stone was discovered in 1999. She underwent four lithotripsy procedures and even a ureteral stent. In 2016, her baseline creatinine was 1.2 mg/dL with a GFR of 49 mL/min but continued to worsen over the following year partially in part due to worsening of her chronic diarrhea. Her GFR declined to 23 mL/min, which diagnosed her with stage 4 chronic kidney disease. Patient was having up to 8 bouts of diarrhea daily. Ultrasound of her kidneys demonstrated left sided hydronephrosis with multiple calculi as well as a normal appearing right kidney with multiple small non-obstructing

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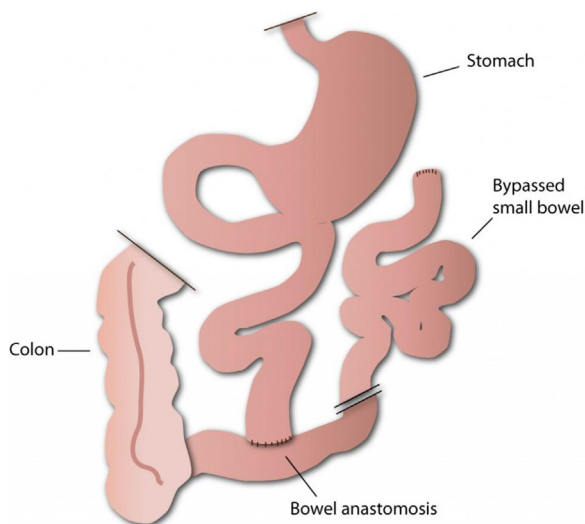


Fig. 1. Schematic of Jejunioileal bypass.

calculi. Ultimately, patient's renal function worsened to stage 4 kidney disease. Due to the threat of hemodialysis, our patient elected to undergo bypass reversal.

Prior to the reversal, we performed an open jejunostomy feeding tube placement for enteral nutrition to condition and stimulate hypertrophy of the excluded portion of the bowel, as we suspected this could be narrower and that may cause some challenges in creating her anastomosis. At this time, her serum albumin was ranging between 3.5 to 3.9 g/dL and prealbumin around 18 mg/dL. She did not have any micro-nutritional deficiencies as this was being managed closely with supplementation. This was a laparoscopic converted to open procedure due to extensive adhesions. She was initially started on elemental half strength tube feeds at 35 cc/hr for 12 h daily, however, it took several weeks for her to tolerate full strength feedings for 5 h daily. She was also eating a regular diet and her weight increased from 50 kg to 53 kg.

Six months later, she underwent open reversal of jejunio-ileal bypass. Multiple adhesions were present as would be expected, but the portion of proximal jejunum that housed the jejunostomy tube appeared to be unusually more thickened than the rest of the small bowel, and around 15 cm of involved jejunum was resected. The jejunio-ileal anastomosis was approximately 25 cm away from the ileocecal valve and the anastomosis was widely patent. The anastomosis was taken down with a stapling device, and a stapled side-to-side jejunio-jejunostomy was created. Patient's post-operative hospitalization was uneventful. She began a regular diet on post-operative day four, and was discharged the following day. Her weight at the initial post-operative visit was 51.6 kg and her albumin was 2.5 g/dL.

Three weeks after reversal, she was admitted to the hospital for nausea/vomiting and dehydration. An oral contrasted CT revealed dilation of her proximal jejunum with smaller appearing ileum. Subsequent small bowel follow through study revealed patent small bowel with contrast seen in the colon at 1.5 h, therefore ruling out mechanical obstruction as the culprit. Patient was still unable to tolerate adequate oral intake, with serum albumin down to 1.6 g/dL, so a peripherally inserted central catheter (PICC) was placed, and patient was discharged on Total Parenteral Nutrition (TPN).

During this time, patient's stool habits changed from chronic diarrhea to constipation requiring daily large volume enemas and laxatives for relief. Her TPN was discontinued, as she was able to eat in smaller portions. Monthly clinic visits revealed chronic upper abdominal pain with ability to palpate "rope-like" bowel under-

neath her skin. Repeat small bowel follow through showed rapid transit of contrast to colon but dilated segments of proximal small bowel. Her renal function was not improving, continuing to fluctuate between stage 3 and 4 renal disease, and overall nutrition status was poor with serum prealbumin of 21 mg/dL and an albumin of 2.5 g/dL.

Six months after JIB reversal and further 15 pounds of weight loss, she was re-admitted to the hospital with concerns for high-grade small bowel obstruction requiring surgical intervention. During surgery, the proximal small bowel appeared to be very dilated and thickened with transition to more normal appearance distally. There were unusually dense adhesions between multiple small bowel segments that precluded safe resection, so the abnormally appearing small bowel was bypassed with an enteroenterostomy between normal appearing distal and proximal small bowel. She also received a gastrostomy feeding tube as well as another PICC line for parenteral nutrition. Her main source of nutrition became the TPN as her gastrostomy tube output was copious and became a decompressive gastrostomy tube rather than a feeding tube. The patient continued to complain of palpating hard, "rope-like" bowel underneath her skin, borborygmi, and continued to be in a weak and debilitated state.

Patient's nutritional status continued to decline after the next couple of months and her pre-albumin dropped to 10.3 mg/dL and albumin to 1.6 g/dL. She complained of lethargy to the point of having to resign from her job, however continued to be consistent with office visits.

Due to poor quality of life and inability to fully resolve her "functional" small bowel obstruction, we decided to proceed with elective resection of defunctionalized proximal small bowel bearing in mind concerns for short gut syndrome. After extensive lysis of dense and severely fibrotic adhesions, 133 cm of hardened, diseased proximal small bowel was resected and a stapled side-to-side jejunio-ileal anastomosis was created, leaving approximately 120 cm of small bowel (30 cm jejunum and 90 cm of ileum) with preservation of the ileocecal valve.

One month post-operatively, she gained 6 pounds with the ability to tolerate regular diet without the need to vent her gastrostomy tube. Her bowel movements became more regular and spontaneous without the frequent use of laxatives or enemas. The gastric tube was subsequently removed and renal function has improved from stage 4 to stage 3, ultimately avoiding dialysis. She continues to follow-up routinely with the operative surgeon.

3. Discussion

The treatment of patients who underwent JIB can be very challenging. The wide array of chronic long-term complications can be detrimental. The task of restoration of bowel continuity can be problematic not only because of the atrophic mucosa but due to discrepancy of bowel lumen caliber. There are several learning points from our patient in which to discuss further. Here we summarize the most frequent complications these patients develop after JIB.

3.1. Liver failure

The most frequently reported complication in the literature. Approximately 30% of these patients went on to develop hepatic fibrosis and 10% died from liver failure. Liver failure normally occurred within the first two years of surgery. The cause of liver disease is thought to be multi-factorial, including increased fat deposition, protein deficiency, and exposure to toxins from bacterial overgrowth in bypassed small bowel [2,5].

3.2. Kidney stones/worsening renal function

Hyperoxaluria and nephrolithiasis are common complications from JIB. Hyperoxaluria develops in almost 90% of patients after JIB [3]. Increased urinary oxalate excretion is secondary to increased colonic absorption of dietary oxalate. Ingested calcium normally binds with oxalate in the lumen to form an insoluble complex and is excreted. However, after extensive intestinal bypass procedure like JIB, the resultant malabsorption and steatorrhea cause intraluminal calcium to bind preferentially with fatty acids, leaving soluble oxalate for colonic absorption. This in turn increases the oxalate concentration in the urine resulting in kidney stones

Renal insufficiency after JIB can develop due to obstructive uropathy secondary to recurrent nephrolithiasis. Our patient presented with nephrolithiasis 26 years after her JIB but probably had hyperoxaluria long before she became symptomatic. Mole et al. reported a 8 patient case series with a range interval from surgery to presentation of 17 months to 27 years, revealing that hyperoxaluria can cause complications many years after initial intestinal re-routing [4]. Although there are medications that have been tried over the years (cholestyramine, calcium), the only effective treatment for nephropathy is the reversal of the JI bypass. This can result in stabilization of chronic kidney disease and partial improvement in renal function [1,4]. Our patient's renal function improved from impending stage 5 kidney disease to stage 3, thus avoiding complete renal failure and dialysis.

3.3. Vitamin deficiencies

Vitamin deficiencies and electrolyte imbalances are common complications related to JIB. This is partially due to chronic diarrhea caused by two mechanisms: the first is decreased transit time and surface area for absorption and the second mechanism is the increased concentration of bile acids in the colon, inducing osmosis of water into the bowel lumen. Malabsorptive operations in general are more prone to fat-soluble vitamins A, D, E, K and B-12 deficiencies unless supplementation is carefully maintained [5].

Chronic malabsorption of vitamins can lead to a specific entity called Brown Bowel syndrome. This is a rare condition characterized by deposition of lipofuscin pigment in smooth muscle cells. It has been hypothesized to be due to a lack of vitamin E, which acts as an anti-oxidant in the mitochondria of the smooth muscle membrane. When there is a deficiency, lipofuscin is deposited into the membrane leading to atony and atrophy of the smooth muscle layer, thus resulting in nonfunctional bowel. It has been described in severe malnutrition states such as celiac sprue, inflammatory bowel disease and chronic pancreatitis, but only has been reported once as a result of JIB [6,7].

3.4. Bypass enteritis in the excluded segment of the small bowel

Malabsorptive procedures bypass varying portions of the small intestine where most nutrient absorption occurs. As a consequence, the bowel becomes defunctionalized and the mucosa becomes atrophic. The GI mucosa is an important immunologic center, holding 80% of the leukocyte population, which is required for gut homeostasis [8]. Bacterial overgrowth in the excluded small bowel can lead to frequent episodes of enteritis and chronic diarrhea. In regards to our patient, she was treated intermittently with Metronidazole over the years for presumed bypass enteritis [9].

We believe the long “defunctionalized” segment of the reversed proximal small bowel that was once excluded with the JIB, was the cause of her chronic constipation, distention, “rope-like” sensation, pain and malnutrition. We hypothesize that once the excluded small bowel mucosa was exposed to food elements, this induced an unusual immunological reaction demonstrated by remarkably

dense and scarred serosal adhesions and bowel wall thickening with “foreign body” like giant cell reaction on final pathology. This in turn led the bowel to not only be malabsorptive, but also lack normal mechanical motility. Despite incorporating this chronically neglected bowel back into the enteric tract, the small bowel never regained its ability to function normally. Multiple small bowel follow through studies revealed no mechanical obstruction; however, she most likely had a “functional” obstruction with inability to tolerate enteral feeds.

Our patient was eventually somehow able to tolerate elemental tube feeds in the previously excluded segment, but once food was incorporated into her nutrition, she began to have worsening abdominal pain and inability to tolerate feeds. This indicates that food, gastric juices and chyme, etc. . . may contain antigenic properties to induce an immune reaction. No case reports to date have described such a reaction.

There are reports of systemic effects of bypass enteritis however our patient did not experience such extra-abdominal manifestations.

3.5. Reversal experiences

More than 100,000 jejunioleal bypass procedures have been performed and many may still develop complications that need revisional surgery. To date, there are no controlled studies to discuss options for revision. There are only case series and reports.

Despite reversing the JIB for metabolic reasons, patients still want to preserve weight loss ability. In 2008, Patel et al published a paper reporting a successful JIB reversal followed by a sleeve gastrectomy [10]. The reversal was completed via an open jejunojejunal stapled anastomosis and then a year later, a vertical sleeve gastrectomy was performed. Patient tolerated these procedures without any issues.

The two-stage approach has been reported several times. This entails placing a jejunostomy feeding tube in the atrophied bypassed limb and delivering elemental tube feeds in hopes to regain function. During the second operation, the bypass is taken down and a jejunojejunal anastomosis is created. Dallal et al described a successful case in which a defunctionalized bypassed bowel transformed into functional bowel after being fed via a laparoscopically placed jejunostomy tube. His team was then able to create an intra-corporeal jejunojejunal anastomosis [11]. Ardila-Gatas et al. also reported this two stage procedure as a successful laparoscopic approach [12].

Chousleb et al reported on 12 patients who required reversal of their bariatric procedures. Four of these patients had JIB as their original procedure. The indications for reversal were malnutrition and renal failure. The original anastomosis was resected and a stapled jejunojejunal anastomosis was performed via laparotomy incision. Per report, all patients did well in the short-term follow-up [13].

4. Conclusion

Although JIB was abandoned long time ago, a small subset of these patients are still living, and surgeons should be aware of its potential side effects, indications and surgical options for reversal. Chronically excluded and defunctionalized small bowel in JIB, once reconnected, may initially preclude successful results despite proper preparation as seen in our patient, and this should be discussed with patients pre-operatively.

Conflict of interest

None.

Funding

None.

Ethical approval

Per our institutional (Palmetto Health) Human Research Protection Program Policy, “Activities that do not meet the definition of Human Research (e.g., most classroom activities, quality improvement activities, case reports with less than four cases, program evaluation, and surveillance activities that do not meet the definition of Human Research) do not require review and approval by one of Palmetto Health’s IRBs and do not need to be submitted to one of Palmetto Health’s IRBs”. Thus, this case report is exempt from submission to the Palmetto Health IRB/ethics committee.

Consent

Patient has given written consent to the publication of this case report.

Author contributions

James Tribble, MD – study design, editing paper.

Zeid Keilani, MD – study design, writing the paper, editing the paper.

Ashlee Justice, MD – writing the paper, data collection.

Registration of research studies

N/A.

Guarantor

Ashlee Justice, MD and Zeid Keilani MD.

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