

The rationale for cecorectal anastomosis for slow transit constipation

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Abstract. The most usual reconstruction after subtotal colectomy is ileo-rectal anastomosis, which requires the removal of the caecum. We propose the treatment of chronic slow-transit constipation with subtotal colectomy and antiperistaltic caecoproctostomy. The sparing of the caecum, the ileo-caecal valve and the distal ileal loop, leaving a physiologic reservoir, allowing the presence of colic bacterial flora which metabolises the undigested starch and produces short chain fatty acids, should guarantee a normal stool consistency, normal absorption of water, sodium and vitamin B12 and the prevention of renal and gallbladder lithiasis. In 1992, we started a study on the outcome of 19 patients who had undergone subtotal colectomy and antiperistaltic caeco-rectal anastomosis for slow-transit constipation. The surgical procedure was carried out without any serious complications and without mortality. The mean clinical follow-up was 64 months (range 5-132). Six months after surgery, 13 patients reported normal bowel movements with solid stool consistency, 5 reported diarrhoea and the need for antidiarrhoeal agents, and one reported constipation easily controlled with laxatives. Fifteen patients considered their quality of life as having improved compared with that before surgery. Selection of patients justify such very satisfying results. It is well known that colic resection is effective only in the case of slow transit constipation, and thus a careful physiologic assessment is needed to rule out other causes of constipation, such as outlet obstruction syndrome.

Key words: Slow transit constipation, subtotal colectomy, cecoproctostomy

Introduction

Chronic constipation rarely requires surgical treatment. Only patients affected by slow-transit constipation (colic inertia) benefit from surgical treatment, although this condition affects only 5-10% of all patients complaining of severe constipation (1) The most usual reconstruction after subtotal colectomy is ileo-rectal anastomosis, which requires the removal of the caecum, despite the fact that saving the caecum, the last ileal loop and the ileal-caecal valve yields potential benefits.

Physiology

The right colon absorbs almost 2.5 lt/die of water and 450-600 mEq/die of Na. Na is absorbed by an active mechanism which requires energy. This energy is provided by short chain fatty acids (butyrate, acetate and propionate) that aerobic colic flora produce by the fermentation of undigested starches, cellulose and other polysaccharides (2). 90% of these fatty acids are produced in the right colon and are then distributed over the surface of the whole colon to act as an energy substrate and to prevent against inflammatory and de-

generative diseases (3). Butyrate not only is absorbed by the epithelial cell of the right colon and used as an energy substrate, but also plays an important antitumoral role (4). Acetate and propionate pass into the portal blood stream, are metabolised by the liver and muscles, act as modulators of the glycolide metabolism, cause relaxation of the colic muscular layer (5), and slow intestinal motility (6). Even the anaerobic bacterial flora produce a modest quantity of short chain fatty acids by the putrefactive metabolism of peptides and proteins. This happens in the distal colon and rectum, and is associated with the production of potentially toxic substances such as amines, phenols, thiols, indoles and ammoniac ions (7). Right colon distension stimulates the mucosa to produce peptide PYY which slows gastric emptying, the ileal motility acting as the so called "colic brake".

The ileocaecal junction would seem to have more the characteristics of a sphincter than those of a valve, showing pressure at the sphincter greater than that at the gut both proximal and distal to it, a decrease in pressure associated with ileal distension, and an increase in pressure associated with caecal distension. This structure allows for an ordered progression of contents into the caecum, and prevents the backflow of the caecal contents, thus avoiding potential colonic bacterial contamination of the small bowel. The terminal ileum not only absorbs water and electrolytes, like the rest of the small intestine, but is also the site for bile salt and vitamin B12 absorption. Vitamin B12 is absorbed with an active mechanism exclusively in the last 15-30 cm of the ileum in proximity to the valve. More than 90% of bile salts are absorbed in the last 100 cm of the small bowel, in conjugated form, by an active Na-dependent mechanism (9). The absorption at 100 cm from the ileo-caecal valve is less than a third of that measured near the valve, while it is completely absent at 150 cm.

Only a small quantity of bile acids (less than 10%) is absorbed passively by the proximal small bowel and the colon in non-conjugated form due to the action of anaerobic bacterial flora. The active transport through the ileum of conjugated biliary acids is the base of the entero-hepatic cycle of bile salts which guarantees the digestion of fat independently from the biosynthesis of other biliary acids from cholesterol.

Pathophysiology

If the intestinal continuity after subtotal colectomy is achieved with an ileo-rectal anastomosis, there is a loss of isotonic fluids 7 to 10 times greater than normal, with water and sodium depletion.

The consequent activation of the renin-angiotensin-aldosterone system compensates for the loss. Aldosterone, in fact, regulates the transmembrane transportation of ions and water by means of its bond to the MR receptor for mineral corticoids. The active mechanism of compensation, however, predisposes to renal lithiasis (10-15% of these patients) by reducing the urinary volume. After a certain period of time, other compensation mechanisms come into play in the ileum: the distal ileum mucosa undergoes hypertrophy, the expression of MR reception is augmented (10), the production of PYY peptide, which slows ileal peristalsis, increases (11), and the loss of absorption capacity is halved (12).

The loss of the right portion of the colon causes a sizeable reduction in bacterial fermentation. The production and the absorption of short chain fatty acids are in fact sizeably decreased, and therefore the energy substrate necessary for the active absorption of sodium, biliary acids and vitamin B12 is reduced. The malabsorption of vitamin B12 after resection of the distal tract of the small bowel is well documented (13), and causes anaemia and psychiatric symptoms. The reduction in bile acid absorption is sizeable, and is proportional to the length of ileum resected (14). The increased hepatic production of bile acids can compensate for only small losses. Greater losses cause depletion of the bile acid pool with a consequent reduction in the absorption of fats, steatorrhoea, increased lithogenicity of bile and the formation of cholesterol gall stones, the acceleration of the intestinal peristalsis and, in some cases, severe diarrhoea (15).

The sparing of the rectum and the restoration of the intestinal continuity by means of ileo-rectal anastomosis reduces the water loss to a half or more and the loss of sodium to 2/3. The rectum in fact plays the role of a continent valve at the end of the ileum which slows the intestinal transit and favours a more efficient water and sodium transportation through the ileum, which progressively adapts. Some authors re-

port in numerous cases 4 or more bowel movements per day, and 30% or more of the patients require anti-diarrhoeal agents (16).

Diarrhoea sometimes causes incontinence (16). Owing to the loss of the ileo-caecal valve, the rectal bacteria flora contaminates the ileal tract anatomised, with an increase in the anaerobic ileal bacterial concentration. Even though the increase in bacterial concentration leads to the production of a small quantity of short chain fatty acids, it impairs the absorption, already damaged, of Vitamin B12, and promotes the de-conjugation of biliary acids, impairing the active transportation of bile salt to the other parts of the distal ileum (17).

The reduction in the bile acid pool, fat malabsorption and diarrhoea still persist. The calcium in the intestinal lumen is bonded by saponification to the non-absorbed fat and is taken from the physiologic bond with oxalates to form insoluble calcium oxalates. Consequently, the absorption of oxalates in the rectum increases, and this situation leads to hyperoxaluria and an increased risk of renal lithiasis (18).

The sparing of the caecum, the ileo-caecal valve and the distal ileal loop, leaving a physiologic reservoir, allowing the presence of colic bacterial flora which metabolises the undigested starches and produces short chain fatty acids, should guarantee a normal stool consistency, normal absorption of water, sodium and vitamin B12 and the prevention of renal and gallbladder lithiasis. The experiences in the literature in this field are discordant (19, 20).

Materials and methods

In 1992, we started a study on the outcome of 19 patients who had undergone subtotal colectomy and caeco-rectal anastomosis for slow-transit constipation.

All patients were studied by means of a careful pre-operative pathophysiologic evaluation to assess the real nature of the constipation. In 2 cases, besides inertia coli, obstructed defecation syndrome was present. Patients had suffered from constipation for an average of 20 years (range 2-50). The mean frequency of bowel movements before surgery was 1 bowel movement every 12 days (range 5-30 days).

All patients used laxatives, enemas or both. Sixteen patients complained of abdominal distension, 14 of meteorism and 7 of abdominal pain.

Surgical Techniques

After subtotal colectomy, by laparotomy in 17 cases and laparoscopically in 2, was performed through a midline incision, which consisted of the removal of the ascending, transverse, descending, and sigmoid colon, the caecum was completely mobilised. The ileocolonic artery and its branches to the caecum were carefully preserved. The ascending colon was divided a few cm above the ileo-caecal junction and subtotal colectomy was completed by transecting the rectum just below the level of the sacral promontory, below the conversion of the taenia muscle fibres where the intestinal lumen widens. Appendectomy was performed in all patients. The caecum was brought into the pelvis with no rotation, and an antiperistaltic caecoproctostomy was carried out anastomosing the caecal bed to the rectal stump using a circular stapler (Fig. 1), utilising the colonic section line as an entrance for the circular stapler.

Follow up

Patients were assessed by questionnaires, interviews and physical examination at 1 month, 6 months, 1 year and immediately before the analysis of the results of the study. The questionnaires included the following information: number of bowel movements per day; stool consistency; the presence of any involuntary stool leakage; assistance required for bowel movements; the presence of abdominal, pelvic or anorectal pain or pressure; the necessity for antidiarrhoeal agents or fibre; dietary changes; complications; quality of life. All patient underwent barium enema to assess the conditions of the caecum and of the anastomosis.

Results

The surgical procedure was carried out without any serious complications (2 cases of wound infections) and without mortality.

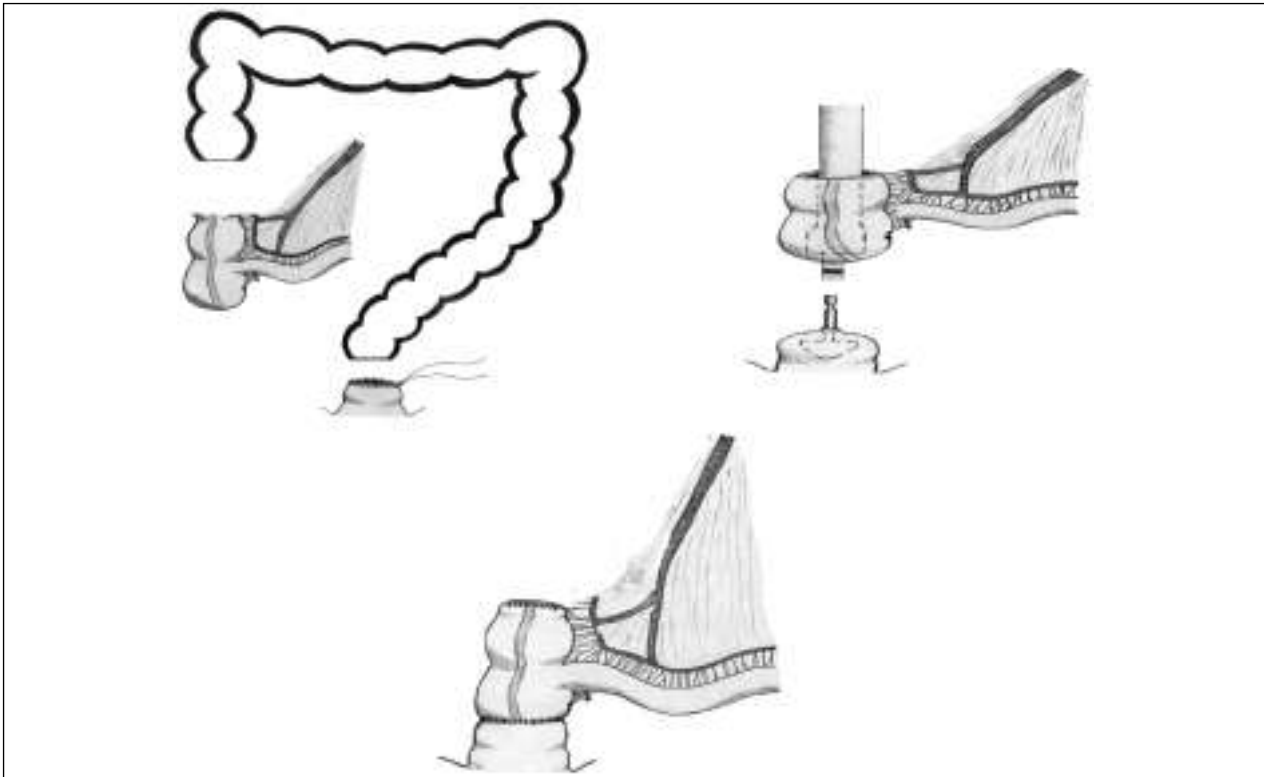


Figure 1. After subtotal colectomy, the caecum was brought into the pelvis with no rotation, and an antiperistaltic caecoproctostomy was carried out anastomosing the caecal bed to the rectal stump using a circular stapler.

The mean clinical follow-up was 64 months (range 5-132). One patient developed, one year after surgery, intestinal occlusion due to adhesions that required surgery; after two years and a half, the patient still complains of abdominal pain (with regular bowel movements).

A month after surgery, the mean frequency of bowel movements was 3.3 per day (range 1-7). Nine patients reported normal bowel movements with semiliquid stool consistency, 10 patients reported diarrhoea with more than 4 bowel movements per day. 13 patients used antidiarrhoeal agents.

Six months after surgery, 13 patients reported normal bowel movements with solid stool consistency, 5 reported diarrhoea and the need for antidiarrhoeal agents, and one reported constipation easily controlled with laxatives.

The frequency of bowel movements in this period was an average of 2.3 per day (range 0-5). Eighteen patients had a follow-up of at least one year, and

after one year the mean frequency of bowel movements was 1.5 (range 0-6): 15 patients reported normal bowel movements, 2 reported constipation controlled with laxatives and 1 reported diarrhoea with incontinence. At the last follow up visit before the analysis of the data of this study, 2 patients reported constipation controlled with laxatives and one still reported incontinence and diarrhoea. The two patients that used laxatives were the ones with outlet obstruction syndrome, and one of these reported rectal pain and tenesmus. Fifteen patients considered their quality of life as having improved compared with that before surgery (2 fairly good, 7 good, 7 very good); two patients considered their quality of life as being unsatisfactory, with no improvement from before surgery; two patients manifested serious psychiatric disturbances and were not able to give reliable answers.

The X-ray performed as a check-up in all cases a mean 22 months after surgery (range 6-60 months)

did not show any cases of anastomotic stenosis or caecum dilatation.

Discussion

The results obtained in our study for the treatment of chronic slow-transit constipation with subtotal colectomy and antiperistaltic caecoproctostomy, utilised in this experience, are very satisfying. This fact contrasts with other experiences in the literature which conclude that this technique is not useful for the treatment of constipation(19). Two possible explanations exist to justify such differing results. The first is the different selection of patients. It is well known that colic resection is effective only in the case of slow transit constipation, and thus a careful physiologic assessment is needed to rule out other causes of constipation, such as outlet obstruction syndrome (21). Unlike our own experience, the other experiences did not include adequate selection by means of a preoperative physiologic assessment.

Another possible reason which could account for the contradicting results after caecorectal anastomosis is the difference in operating procedures.

The original technique proposed by Deloyers in 1964 (22), and recently redesigned by Zinzindohoué (18), involves an isoperistaltic end-to-end anastomosis but with cranio-caudal rotation of the caecum in such a way that the anterior surface is against the retroperitoneum of the right parietocolonic gutter and the caecal base points cephalad. This procedure implies a 180° torsion of the residual mesocolon with a consequent torsion of the ileo-colonic vascular pedicle which may cause ischaemia or venous stasis. A modification of this techniques involves the rotation of the right colon from right to left (29) so that the isoperistaltic end-to end anastomosis can be performed without torsion of the vascular pedicle. However, the mesocolon passes in front of the aorta during the rotation and may thus strangulate some ileal loops, possibly causing intestinal occlusion.

The technique we propose involves an easy to perform antiperistaltic caeco-rectal anastomosis that avoids torsion of the vascular pedicle and does not require any rotation of the caecum and mesocolon.

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