

PULMONARY ASPIRATION COMPLICATING INTRAOPERATIVE SMALL-BOWEL DECOMPRESSION: A CASE REPORT AND LITERATURE REVIEW

Ian Phillips, BSc; Christopher G. Jamieson, MB BS, FRCSC

When conservative management of intestinal obstruction fails, the surgeon has two operative choices for decompression: the open procedure with enterotomies and suction and the closed procedure consisting of retrograde stripping and nasogastric suction. A previously undocumented complication of the latter procedure — pulmonary aspiration — is reported in a 20-year-old man with small-bowel obstruction. Practical modifications to the technique of small-bowel decompression are suggested. They include feeding the nasogastric tube into the distal duodenum, using a wider bore tube, inserting an esophageal balloon before extubation, using a nasogastric tube with suction throughout extubation and, immediately postoperatively, making a more conscious effort to remove all gastric contents before extubation, and milking the contents distally through the ileocecal valve.

Lorsque le traitement conservateur d'une obstruction intestinale échoue, le chirurgien a le choix entre deux interventions possibles pour la décompression : intervention sanglante avec entérotomies et succion et intervention fermée qui consiste à procéder à un dépouillage rétrograde et à une succion nasogastrique. Dans le cas d'un homme de 20 ans victime d'un blocage de l'intestin grêle, on signale une complication jamais documentée auparavant de cette dernière intervention : l'aspiration pulmonaire. On suggère des modifications pratiques de la technique de décompression de l'intestin grêle comme la mise en place d'une sonde nasogastrique dans la partie distale du duodénum, l'utilisation d'une sonde de plus gros calibre, l'introduction d'un ballon œsophagien avant l'extubation, l'utilisation d'une sonde nasogastrique avec succion pendant toute l'extubation et immédiatement après l'intervention, un effort plus conscient afin d'éliminer tout le contenu gastrique avant l'extubation et l'extraction distale du contenu par la valvule iléo-caecale.

In the early part of the 20th century, the death rate from bowel obstruction was more than 50%.¹ It is now approximately 3%, with a 12% morbidity.^{2,3} This reduction in death rate can be attributed primarily to a better understanding of fluid and electrolyte therapy, antibiotics and gastrointestinal decompression. Obstruction of the small intestine is responsible for 20% of all admissions leading to

emergency abdominal surgery and remains one of the most common indications for emergency intervention.⁴ The extent to which the management of small-bowel obstruction (SBO) has progressed over the past 2 decades has been disappointing. The subject seems to be generating less attention than in the past. It is unclear why this is so, particularly as small-bowel obstruction is still so common.⁵⁻⁷

When conservative management of SBO is unsuccessful, operative relief of the obstruction is required.⁸ One of the decisions that must be made at laparotomy is whether or not the bowel should be decompressed, and if so which technique is to be used. The two techniques of intraoperative small-bowel decompression available to the surgeon are the open procedure, using enterotomies and suction,

From the Department of Surgery, The Wellesley Hospital, University of Toronto, Toronto, Ont.

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Correspondence to: Dr. Christopher G. Jamieson, QEII Health Sciences Centre, Victoria General Hospital, Dickson Building, Room 4117, 5820 University Ave., Halifax NS B3H 1V8

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and the closed technique of retrograde stripping with nasogastric suction. Important to this decision is a sound understanding of the potential complications inherent in each technique.

We report a case of a previously undocumented complication of the retrograde stripping technique of decompression.

CASE REPORT

An otherwise healthy 20-year-old man presented with small-bowel obstruction. The patient had previously undergone surgery for a small-bowel volvulus, and adhesions were now considered to be the cause of the obstruction. Nasogastric suction and fluid resuscitation did not result in any improvement.

At laparotomy the following day many dilated loops of small bowel were noted in the abdominal cavity. Throughout the peritoneal cavity were many adhesions, including a twisted, fixed portion of omentum that was considered to be a possible cause of an internal hernia. The adhesions were lysed and the small bowel was decompressed by retrograde stripping of its contents into the stomach, with aspiration of the contents by nasogastric suction. Flatus and 1.8 L of fluid were drained from the stomach. The decompressed bowel was then placed back into the abdominal cavity and the abdomen closed.

On the completion of the operation, during extubation, the patient became severely hypoxic and refractory to oxygen therapy. Aspiration of gastric contents was presumed to have occurred. The patient was immediately reintubated and transferred to the intensive care unit.

Subsequent bronchoscopy showed aspiration of a large volume of gastric contents, with burns to the bronchial

mucosa consistent with an acid inhalation injury. Management involved maintaining pulmonary artery wedge pressures below 10 mm Hg and mechanical ventilation. These measures resulted in a rapid improvement in oxygenation. The following day the patient was extubated, but remained on antibiotics for his aspiration pneumonia.

The patient's condition gradually improved and he was eventually discharged home 8 days postoperatively.

DISCUSSION

The history of small-bowel decompression dates back as early as 1889 when Nicholas Senn⁹ advised of the importance of emptying the distended intestine at the time the obstruction is relieved. The first reported attempt at decompression was by Monks in 1903.¹⁰ In 1926, Holden described milking the luminal contents into a bucket.¹¹ Monynihan¹² used a needle and aspiration technique, but there has been criticism of this technique because it decompresses only one loop of bowel at a time, requires multiple puncture sites, creates the risk of leakage and usually removes only flatus.¹³ Wagensteen in 1955¹⁴ and Savage in 1960¹⁵ developed special rigid suction devices that entered the lumen through a single enterotomy.¹⁶ The disadvantages associated with these techniques include increased edema in the bowel wall,¹⁷ direct trauma to the mucous membrane and spillage of intestinal contents resulting in wound infection,¹⁸ sepsis, abscess and fistula formation, and the difficulty of the technique.¹⁹ In 1959, Baker proposed the passage of a long (1.8 m) tube with a small balloon at its distal end, inserted by jejunostomy and threaded through the entire length of the small bowel.¹¹ This procedure provided a route for decompression along with a

method of anchoring the bowel for 10 to 12 days, thus promoting beneficial adhesions. However, many believe that the jejunostomy route carries significant and probably excessive risks.²⁰

The technique of retrograde stripping of the bowel contents into the stomach was first reported in 1968 by Jones and Matheson,²¹ and by Ashby,²² who reported 34 cases of operative decompression with no complications. The technique involves distal traction of the distended intestine, "milking" of the bowel between the surgeon's fingers and periodic compression of the duodenum to force the contents into the stomach (Fig. 1). From the stomach, the intestinal contents are aspirated through a nasogastric tube. The main advantage of this technique is that it avoids intra-abdominal sepsis, abscess and fistula formation that can result from compromise of the bowel wall.^{22,23} For this reason the retrograde stripping technique is the most popular procedure for bowel decompression at some centres.²⁴

Of importance to the surgeon is whether or not intraoperative small-bowel decompression is necessary. There has been conflicting evidence as to whether bowel decompression expedites the return of intestinal motility.^{11,23,25,26} There are a number of reasons why bowel decompression may be indicated during the operative procedure to relieve obstruction.

- Dilated bowel can impede wound closure, which increases the risk of wound dehiscence.¹⁰
- It is not advantageous to have a large volume of infected fluid pass through the site of an anastomosis.²⁵
- It has been suggested that deflation of the bowel decreases the risk of postoperative adhesions.^{13,22}
- Relieving abdominal distension may decrease the impairment of diaphragmatic movements, which tend

to have adverse effects on respiration and venous return.^{13,22}

The decision on whether to decompress the bowel during the operative relief of bowel obstruction must be made by weighing these benefits of decompression with the possible risks associated with the two techniques of decompression.²⁷⁻²⁹

The retrograde stripping technique has been criticized for excessive manipulation of the bowel, resulting in aggravation of the edematous state of the distended bowel.²² However, this should be compared to the invasive needle puncture or Savage sucker technique, and to the extent of handling required to replace the bowel

before closure, if decompression is not performed. In 1971, Shields and Dudley²³ concluded, through the use of rabbit bowel, that retrograde stripping increases the extent of bowel edema 12 hours later, although this initial edema subsides promptly thereafter. We experienced the serious and potentially lethal complication of pulmonary aspiration after the retrograde procedure, and to our knowledge this complication has not been reported in the literature. However, it is interesting that in a "typical" case presented by Ashby in 1968,²² promoting the use of retrograde stripping, he mentions a severe postoperative chest infection. There is no mention as to

whether this may have occurred because of aspiration pneumonia.

In our opinion the technique of retrograde bowel stripping can predispose the patient to pulmonary aspiration. It has been reported that aspiration pneumonia associated with intestinal obstruction is particularly virulent and carries a poor prognosis. A reduced level of consciousness and the presence of a nasogastric tube are predisposing factors.³⁰ The severity of the pulmonary aspiration depends on the extent and acidity of the aspirated contents.^{31,32} It has been concluded that the demise of many of the patients who experience pneumonia after aspiration of gastric contents is caused by combined respiratory insufficiency after mechanical obstruction and chemical pneumonitis arising from the low pH of the gastric aspirate.³¹

The risk of pulmonary aspiration suggests the need to modify the procedure. One proposal involves feeding the nasogastric tube more distally through the pylorus and into the distal duodenum, which can be done at the time of the surgery. This may prevent contents entering the stomach and hence being available for aspiration. Other possible modifications include the following: use of a wider bore tube (rectal versus nasogastric tube) in an attempt to adequately drain the stomach of intestinal contents before extubation; use of an esophageal balloon before extubation; a more conscious effort to suction all gastric contents before extubation; use of a nasogastric tube with suction throughout extubation and in the immediate postoperative period; endotracheal intubation continued into the immediate postoperative period and milking of contents distally through the ileocecal valve for removal through an extended rectal tube.

In summary, pulmonary aspiration

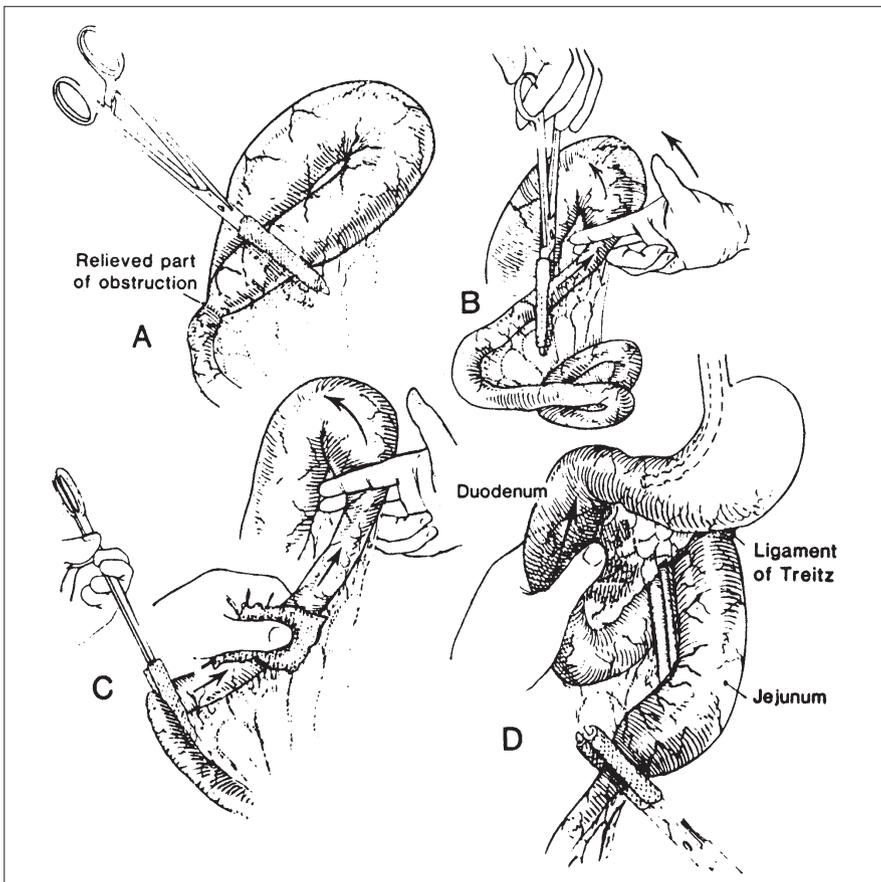


FIG. 1. Technique of retrograde intraoperative intraluminal decompression of dilated small intestine. (A) Clamp is applied with single click of handle. (B) Double finger technique (index and middle fingers). (C) Distal traction with surgeon's left hand; assistant supports weight of distal clamp. (D) Periodic compression of duodenal contents back into stomach. (Reproduced by permission from Mucha P Jr. Small intestinal obstruction [review]. *Surg Clin North Am* 1987;67[3]:597-620.)

is a potentially serious complication of closed bowel decompression. Simple modifications to the retrograde stripping technique can reduce this risk.

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