Intestinal Obstruction — 5 cases

Choice of Subject

Much of modern surgery is concerned with diseases that cause obstruction of any of the tubes in the human body. Thus, the biliary system may become obstructed by a gall-stone and require an operation to relieve the subsequent jaundice. Embolism from a venous thrombosis can occlude the pulmonary artery or one of its main branches and cause sudden death. Chronic inflammation of the lacrimal sac causes a continuous overflow of tears and may require dacrocystorhinostomy.

The intestinal tube is one of the most commonly obstructed. Green (1963) observed in a general hospital admitting an average of 1,650 general surgical emergencies per annum, 444 cases of intestinal obstruction were seen over a six year period.

Purpose of Article

"There is probably no field in surgery, with the possible exception of surgery of the stomach, in which basic physiology has more accurately led the clinician to a significant refinement of his techniques than the field of intestinal obstruction. It has been pointed out repeatedly that concomitant with a greater understanding of the pathologic physiology of this disease has come a steady decline in its mortality and morbidity." (Miller, Mackie & Rhoads)

The purpose of this article is not to introduce some revolutionary concept into the "understanding of the pathologic physiology of this disease." Nor is it intended to be another pebble on the cairn that will guide the "clinician to a significant refinement of his techniques."

The vast volume of literature on the subject of intestinal obstruction, which was estimated as more than 18,000 articles by 1957 (Cantor & Reynolds) is enough to deter the keenest of writers. Nevertheless, the following article presents five cases of this disease, which interested the author as a student on his surgical clinique. The accompanying discussion about the underlying cause and mechanism of obstruction is the fruit of research into the literature that was stimulated by each case.
Selection of Cases

Intestinal obstruction is traditionally classified on an aetiological basis:

A. Adynamic or paralytic obstruction — occurring when all or a segment of the bowel fails to transmit the normal peristaltic wave.

B. Dynamic obstruction — due to an obstructing agent or process which may lie in one of three situations in relation to the intestinal wall:
   1. Intermural — inside the lumen.
   2. Intramural — within the wall.
   3. Extramural — outside the wall.

The primary cause of obstruction in the following cases illustrates each of these four main groups. Contributory factors, which otherwise would have necessitated one case occupying more than one group, are only mentioned in passing. The final case was originally chosen as a remarkable example of all four groups.

William Park (58yr.) Postoperative paralytic ileus

History

This man was first admitted to the Royal Infirmary nine years ago with a perforated duodenal ulcer. No record of his treatment was available; but it was known to involve an operation.

He remained well until 10 months ago when he began to suffer from aching pain in the upper abdomen and intermittent vomiting. These symptoms have persisted since then, increasing in severity until the time of admission, when they constituted an emergency.

Hospital course

Following physical examination and investigations a diagnosis of pyloric stenosis was made. Gastro-enterostomy was performed 4 days later. The post-operative course was as follows, the numbers indicating the number of days after operation.

2 The nasogastric tube was removed but had to be re-inserted and gastric aspiration begun again because of the development of a succussion splash after a few hours.
3 The tube was again withdrawn because aspiration during the previous 24 hours had only withdrawn 110 mL of fluid.
6 The patient was sent to the X-ray department for a gastrografin meal; but on arrival was found to be in a severe state of collapse. He was returned to the ward immediately where an intravenous infusion was started. The nasogastric tube was re-inserted and 2 litres of fluid withdrawn.
Incision stitches removed.

The wound burst open — gaping 2—3" wide. The opportunity was taken to inspect the stoma which appeared normal. The wound was closed with interrupted through and through stitches.

The clinical condition had improved so much that the nasogastric tube was removed and the patient started taking solids by mouth.

The intravenous drip was discontinued. A slight succussion splash could still be elicited.

The splash had disappeared.

The patient was discharged for convalescence in apparent good health. His further recovery was uneventful except for a moderate collapse of the left lower lobe with basal effusion which necessitated readmission 3 weeks after discharge. This responded well to thoracentesis and physiotherapy.

**Discussion**

Postoperative ileus of a mild degree follows the majority of abdominal operations, peristalsis normally recovering after 12 to 24 hours. In certain cases, such as this one, functional paralysis of the intestine persists for a prolonged period. The mechanism of obstruction differs in the two circumstances and is the basis on which Moir distinguishes two types of ileus:

A. **ACTIVE** ileus is a defensive reflex phenomenon produced by opening the abdomen, handling the intestines and any intra-abdominal manipulation. Reflex sympathetic activity diminishes or abolishes bowel movement with subsequent distension.

B. **PARALYTIC** ileus arises from interference with the integrity of the blood supply to the bowel, thus preventing normal muscular function. The four main intra-abdominal causes are as follows.

1. Peritonitis
   Inflammation of the bowel wall and mesentery leads to oedema and venous congestion. The blood supply and nervous impulses are thus interfered with and normal muscular contraction becomes inadequate. The intestine dilates and further incapacitates muscular action until this is no longer possible and the paralysed bowel becomes inert, distended and waterlogged.

2. Postoperative ileus
   This is initially the active type; but if prolonged leads to exhaustion of the neuromuscular mechanism.

3. Intestinal obstruction
   Powerful muscular contractions are made in an attempt to overcome the obstruction. This again exhausts the neuromuscular mechanism.

4. Mesenteric vascular occlusion
   This is a simple example of the prevention of normal muscular function by interference with the blood supply to the bowel.
Any of the five cases in this article could have been cited as examples of paralytic ileus because they all showed intestinal obstruction. The following case also showed prolonged ileus postoperatively and this was assumed at the time to be due to the presence of pus in the abdomen.

The above case however was used to illustrate this form of intestinal obstruction because paralytic ileus was thought to be the cause rather than the result. No other cause for the prolonged ileus was apparent except for the operation itself, which involved opening the abdomen, handling the intestine and much intra-abdominal manipulation.

Elizabeth Elliot (34 years) Intermural food bolus

History

On the day prior to admission, this patient gradually developed central abdominal pain which was crampy colicky in nature and persisted until admission. She felt nauseated and vomited on many occasions.

Hospital Course

On admission, the patient complained also of thirst and appeared dehydrated. The tongue was furred and there was generalised tenderness in the right hypochondrium. Bowel sounds were present. Rectal exam revealed no abnormality.

A diagnosis of intestinal obstruction was made on clinical grounds and confirmed by X-ray which showed gaseous distension of the full small bowel with numerous fluid levels — compatible with partial obstruction of the lower small bowel.

Because of diminished air entry at the base of the right lung and also on account of several opacities in the right upper zone of the chest X-ray it was thought that this patient might have had tuberculosis. This was postulated as a cause of adhesions producing the obstruction.

However, at operation, the same day, a benign stricture was found in the upper ileum. Inflammatory changes had reduced the lumen of the bowel to less than the diameter of a little finger and obstruction had been precipitated by a foreign body which had impacted in this stricture. This turned out later to be a mushroom.

The affected segment was resected and an end-to-end anastomosis performed. The wound was closed in layers around a corrugated drain.

Postoperatively, the patient required to be maintained on nasogastric aspiration and intravenous therapy for a prolonged period.
Paralytic ileus due to pus in the abdomen was suspected because of the presence of pyrexia, absent bowel sounds and absolute constipation.

On the 11th day after operation, bowel sounds were heard for the first time and on the 13th day, visible peristalsis was observed and a soft motion passed.

Eventually, all the patient's symptoms resolved and she was discharged home 3 weeks after her operation.

Pathology

The specimen showed inflammatory changes and two small diverticulae in the wall. It was difficult for the pathologist to decide which of the following sequences had in fact taken place.

1. The diverticulae constituted the primary lesion with inflammation, obstruction and consequent fibrosis.
2. An inflammatory lesion of unknown aetiology had produced both the fibrosis and the diverticulae.

All that could be said with certainty was that there was no evidence of any specific inflammation.

Discussion

Intestinal obstruction due to a food bolus remains a rare but interesting and well-recognised surgical emergency. In Green's series, quoted in the opening paragraphs of this article, the incidence of food bolus obstruction was approximately 1.4%. Ward-McQuaid has reviewed 178 cases of "Intestinal Obstruction due to Food" and found that of 45 different substances, mushrooms were fourth on the list, being the obstructing agent in 9 cases.

In this last article, various predisposing factors are noted.

1. Foodstuff
   a. rich in fibre
   b. swell as water is taken up
   c. resistant to digestive juices
   d. uncooked
   e. unripe
2. Mastication — absent or inefficient due to the following.
   a. edentulous
   b. bolting
3. Empty stomach — The foodstuff is squeezed into a bolus in the small intestine — symptoms being precipitated by the next meal.
4. Excessive fluid intake
   a. dilutes digestive juices.
   b. causes dessicated foods to swell.

Davies and Lewis, although basing their conclusions on a much smaller series of cases (15 patients) deal with the problem of absent or inefficient mastication in a little more detail.

a. Teeth
   i. absent or poor natural teeth.
   ii. ill-fitting or inefficient dentures.
b. Eating habits — in the presence of a full set of teeth.
   i. inadequate mastication as a result of hurry, accident, drunkenness or even politeness.
   ii. bolting without chewing — especially in children.

In addition, other intra-abdominal lesions are quoted as predisposing factors to obstruction by food, e.g. diverticulae, strictures and intestinal anastomoses. For example, Norberg quotes 15 cases of obstruction by food after partial gastrectomy.

Although no information was available about this patient's dentition in her case notes, she demonstrates two of the other factors that predispose to obstruction by food. Since there was no evidence of an underlying disease process, it is reasonable to assume that the two diverticulae were congenital and that the stricture was the result of inflammation, obstruction and consequent fibrosis.

Wasyl Ostapuik (41 years) Carcinoma of the Colon

History

This man presented with a 2 week history of recurrent attacks of central abdominal pain radiating over to the left loin. These attacks had been accompanied by vomiting which had increased recently — occurring 3 times in the 24 hours prior to admission. The pain had also become more persistent. The vomitus was bile-stained and passing it afforded no relief.

On further questioning, the patient disclosed that his appetite had been poor for 2 weeks and that he had been constipated for 1 week. He had noticed no blood nor mucus in the stool.

Hospital course

On admission, slight tenderness could be elicited over a wide area below the umbilicus. The colon was palpably distended down both sides of the abdomen and subcostally. The doughy consistency of the distending material led the house surgeon to believe that it was faecal. However, the rectum was empty apart from a few small lumps of faeces.

A diagnosis of large bowel obstruction was made on clinical grounds and confirmed by radiography, which showed marked distension and fluid levels present in large and small bowel — the distension of the large bowel extending into the pelvis. (see page 7)

Soon after admission, the patient was taken to theatre and exploratory laparotomy revealed a constricting carcinoma completely encircling the mid-point of the pelvic colon. There was no evidence of lymphatic spread nor of hepatic metastasis and the remainder of the abdomen appeared normal. A transverse colostomy was performed and the abdomen closed in layers.

After 1 week's convalescence, pelvic colectomy and an end-to-end anastomosis were performed. The postoperative course was normal except for a mild chest infection. The colostomy was closed 3 weeks later.
Fig. 1. Supine film showing marked distension in the large and small bowel -- extending into the pelvis.

Fig. 2. Erect film showing multiple fluid levels in the large and small bowel.
Discussion

Acute obstruction is one of the common presentations of carcinoma situated in the pelvic or sigmoid colon. The following figures are taken from a series of 714 cases of carcinoma of the colon and rectum studied by Muir.

<table>
<thead>
<tr>
<th>Site of carcinoma</th>
<th>No. of patients</th>
<th>Acute obstruction(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>right colon</td>
<td>109</td>
<td>8.2</td>
</tr>
<tr>
<td>left colon</td>
<td>74</td>
<td>21.6</td>
</tr>
<tr>
<td>sigmoid colon</td>
<td>114</td>
<td>28.9</td>
</tr>
<tr>
<td>rectum &amp; rectosigmoid</td>
<td>417</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Gruenfeld considers there to be 4 factors contributing towards obstruction in colonic carcinoma:

1. inflammatory oedema
2. impaction of solidifying faeces
3. kinking of the bowel at the tumour site
4. fatigue of intestinal musculature above the stenosis

Some workers believe that obstruction is dependent too on the amount of fibrosis present — this being a reaction on the part of the host to the cancer cells present. (Nickell & Dockerty)

There are various reasons why obstruction is a commoner presentation in carcinoma of the left colon compared with the same lesion on the right side. (Ranken, Bargen & Buie)

1. The intestinal wall is smaller in diameter and less elastic.
2. The faecal current is formed and hard and very different from the liquid stream in the right colon.
3. Pathologically, carcinoma of the left colon has a tendency to form "napkin ring" lesions encircling the lumen and slowly producing stenosis.

Patrick Clayden (17 yrs.) Intraperitoneal Adhesions

Present Illness

This boy presented as an emergency with a 5-hour history of colicky abdominal pain radiating through to the back associated with retching and auto-emesis.

On examination, the abdomen was moderately distended and bore the scars of 3 previous operations with much keloid formation. (see photograph overleaf)

The scarred abdomen and auto-emesis were at first thought to be features of a Munchausen Syndrome; but this diagnosis was dropped in preference for something organic when a gross succussion splash was demonstrated.
Abdominal wound at completion of laparotomy for the most recent admission. (details below)
The incision was made through dense keloid in a scar following surgery for division of numerous fibrinous adhesions of small bowel. (August, 1962)

Scar from laparotomy for small bowel obstruction requiring division of adhesions and resection of a gangrenous segment. (July, 1962)

Scar after removal of moderately inflamed appendix. (November, 1961)

Fig. 3. Abdomen of Patrick Clayden showing numerous operational scars.

Hospital Course

A straight X-ray of the abdomen showed a few gas-filled loops containing large amounts of fluid in some of the gut.

A conservative regime of nasogastric aspiration and intramuscular Pethidine was initiated and produced rapid disappearance of all clinical features. The patient was discharged 3 days after admission.

Three days after discharge, he was re-admitted as an emergency with acute small bowel obstruction. With the history of previous episodes of adhesions, these were again assumed to be the cause of his obstruction and he was taken to the operating theatre soon after admission.

At laparotomy, a very tight adhesion was discovered between the jejunum and the anterior abdominal wall, which was causing kinking and obstruction of the bowel. Many collapsed coils of intestine were lying in the pelvis and right iliac fossa, where they were bound together by numerous adhesions. The main obstructing adhesion was divided and all the matted coils of bowel were freed by careful division of the many adhesions.
Discussion

The standard textbook description of adhesions between the visceral and parietal layers of peritoneum is that they represent scars formed in the healing of the damaged tissue. However, recent studies on rats by Ellis suggest that adhesions have a more important role.

He found that large defects of the parietal peritoneum healed rapidly and usually without adhesion formation. Dragging such defects together under tension nearly always caused adhesions. Injection studies revealed the adhesions to be vascular ingrowths into the parietes. Any other procedure designed to produce an area of ischaemia on the parietal wall whether by crush injury, firm ligation or free grafting were similarly followed by vascular adhesions.

He concluded that intraperitoneal adhesions were active vascular grafts developing in response to the stimulus of ischaemic tissue.

This was the third operation for adhesive obstruction which this patient had undergone in a period of 4 years. The surgeon in charge of his case during the last admission wrote, "With the dense keloid formation in his operational scars, this suggests that he is more prone to form plastic adhesions. Why certain individuals are more prone to do this is quite unknown." Humphries cites a case of post-operative intestinal obstruction in another patient with keloid scars. He thought it reasonable to assume that people with a tendency towards tumours of fibrous tissue should also be predisposed to develop fibrous adhesions after a laparotomy.

Case 5  George Henderson (49 yrs.)  Faecal impaction with volvulus

History

This man presented with a history of abdominal pain which had developed over the course of the previous 5 days. He was deaf and dumb from an attack of cerebral meningitis at the age of 5 years and it was thus impossible to collect an accurate story from him. However, his G.P. had written in an accompanying note, "He probably had diarrhoea and vomited several times. This state of affairs has continued and though I think that he has been going to the toilet frequently, his bowels have not moved for the past 2 days."

Additional information was also collected from sisters with whom this patient was staying. It appeared that he had always been constipated and took a lot of laxatives. He was also supposed to have had bleeding piles a short while before admission.

Hospital course

On examination, the abdomen was grossly distended and tympanic to percussion. There were no palpable masses, no herniae nor scars. Rectally, there were no faeces nor tenderness; but the prostate was thought to be a little enlarged considering the patient's age.
Fig. 4. Straight X-ray of the abdomen showing gross gaseous distension of the colon with a large faecal residue.

At laparotomy, the pelvic colon was found to be enormously distended and was occupying the greater part of the peritoneal cavity. Obstruction was due to a volvulus of the loop around its very narrow base. The appearances were suggestive of long-continuing partial obstruction with some recent acute obstruction.
The colon was decompressed by suction enterotomy at several sites. The redundant loop was removed by a Paul-Mikulicz type of resection.

After 5 weeks of convalescence, it was decided to close the colostomy that had been performed at the above operation, since it was found to be impossible to educate the patient in its management. It was also felt that he could not return to his home whilst he still had an artificial anus.

He was thus readmitted for closure of the colostomy and subsequently developed complete obstruction of the large bowel. At laparotomy, the caecum and the whole of the colon round to the site of closure were enormously distended. The site of closure of the previous colostomy was the seat of numerous adhesions of loops of small bowel, some of which showed kinking and early obstruction. The stoma itself could admit 1½ fingers; but was extremely hard and indurated with oedema.

After decompression of the colon by suction enterotomy and after lysis of adhesions, a caecostomy was formed using a Depezzer self-retaining catheter.

Subsequently, the patient made a reasonable, but slow recovery. By the time he was discharged, his bowels were functioning fairly well and his caecostomy, apart from some very slight discharge, had closed. After convalescence, his bowels were opening normally and regularly. The abdominal wall was sound and all wounds had healed. There were two small stitch granulomata in the operational scar.

One and a half years later he was readmitted as an emergency complaining of pain in the right iliac fossa accompanied by constipation for several days. On the day prior to admission he had had some diarrhoea which was thought to be due to faecal impaction. The rectum was evacuated digitally and glycine suppositories given.

However, because of increasing abdominal distension and decreasing return from daily enemata, a left iliac colostomy was performed 9 days after admission to relieve the obstruction. A full thickness biopsy of the rectum was also performed at operation; but this showed no evidence of an aganglionic segment.

Some oedema developed around the colostomy, but this had subsided by the time the patient was discharged for convalescence. The colostomy was thought at that time to have settled to satisfactory function, but was not ready for closure. Accordingly, it was decided that he should thus spend another two months or so at home before the latter was considered.

Discussion

This patient was originally selected as an excellent example of all three types of dynamic intestinal obstruction. However, the rectal
biopsy excluded Hirschsprung's disease — the megacolon in this case probably being purely secondary to long-standing constipation. Nevertheless, the other features of his case, namely faecal impaction with volvulus, especially when taken into consideration with the fact that this patient was mentally defective, provide an excellent basis for discussion.

Three factors contribute to obstruction in this patient's case. The basic problem was probably the mental defect following encephalitis or its sequelae in childhood. This no doubt contributed to the development of faecal impaction, which, in its turn was an important factor in producing the volvulus. Sawyer, Sawyer and Sawyer have observed that volvulus of the sigmoid colon is most commonly seen in older patients, frequently those in mental institutions. In contrast to volvulus of the right colon, which is related to failure of mesenteric fixation during development, the sigmoid volvulus is more an acquired problem. The long redundant loop and narrowed, shortened mesentery are probably a result of chronic constipation or a high-residue diet of vegetables. This explains why sigmoid volvulus is most commonly seen in older patients, especially in mental institutions.

The two main factors which favour the ease with which a loop of bowel will rotate have been mentioned in the last paragraph. These were recognised as early as 1876 by Leichtenstern as:

1. increased length of the sigmoid flexure.
2. narrowing of its mesenteric attachment so that the ends of its two limbs are brought closer together.

Bockus has enlarged on these 2 factors and has observed that the first may be congenital or may result from prolonged bowel stasis. The second may also be congenital or may be the result of inflammatory changes due to:

   a. vascular changes due to repeated partial twisting.
   b. adhesions following longstanding bowel stasis.

The same author also distinguishes four precipitating factors in the development of volvulus:

1. Chronic constipation produces a large faecal mass in the sigmoid which pulls and stretches the loop and draws its ends more closely together.
2. Unequal distribution of faeces may cause one portion of the loop to be heavier. This may then slip over the less distended portion and produce a twist.
3. Extrinsic masses such as an ovarian cyst may press on the sigmoid.
4. Dietary indiscretion or purgatives may produce violent peristaltic activity.

The importance of faecal impaction in the production of sigmoid volvulus is thus seen. Bockus considers 3 groups of factors that can lead to faecal impaction. These will be dealt with overleaf.
A. Functional

1. bed rest — postoperatively or in late life.
2. debility — because of muscular atony and physical inactivity evacuations often become incomplete — faecal impaction developing finally.
3. acquired functional megacolon — due to faulty bowel habit.
4. mental illness — multiple factors are involved, including:
   a. ignoring the urge to defaecate.
   b. poor personal habits.

B. Pharmacological

1. aluminium and bismuth preparations are hydrophilic colloids which harden the stool.
2. anticholinergic agents decrease bowel motility.

C. Organic

1. congenital megacolon.
2. benign or malignant strictures.
3. anal disease associated with spasm.
4. organic neurological conditions producing delayed colonic emptying:
   a. absence of the urge to defaecate.
   b. weakness of abdominal or perineal muscles.
   c. decreased propulsive peristalsis.
5. nidus for faecal impaction.

The importance of the three factors in this case — mental defect, faecal impaction and volvulus — are thus seen. Each one leads on to the next until the cumulative effect of all three is to obstruct the intestines.

Summary

Five cases of intestinal obstruction are presented — the first four each illustrating one group from an aetiological classification. The final case is an example of a combination of these groups and illustrates how factors from each are inter-related and produce intestinal obstruction together. Each case is accompanied by a discussion based primarily on the underlying cause and mechanism of obstruction.

References overleaf
References

   W.B. Saunders Co. Philadelphia
   The Williams & Wilkins Co. Baltimore
8. Leichtenstern, L. (1876) Verengerung, Verschliesungen und Lage-
   veränderungen des Darmes. von Ziemssen's Handbuch, 7 (part 2).
    W.B. Saunders Co. Philadelphia

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