Case report

Small bowel diaphragm disease from long-term non-steroidal anti-inflammatory use

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SUMMARY

Small bowel diaphragm disease (SBDD) is characterised by circumferential lesions of short length (<5 mm), causing intrinsic stenosis of the small bowel lumen. A 63-year-old woman with a history of long-term non-steroidal anti-inflammatory use, presented with a 12-month history of intermittent episodes of colicky abdominal pain, nausea and vomiting. Her only past surgery was a laparoscopic hysterectomy. Abdominal CT demonstrated an area of thickening in the mid small bowel, however a diagnostic laparoscopy failed to demonstrate adhesions or any external abnormality. A capsule endoscope did not progress beyond the mid small bowel at the site of a suspected diaphragm. The patient underwent a laparotomy and using the retained capsule as a marker, the area of bowel affected by SBDD was identified. With an ageing population and the widespread use of non-steroidal anti-inflammatory drugs, general surgeons may see an increase in the incidence of SBDD.

BACKGROUND

While the detrimental effects of non-steroidal anti-inflammatory drugs (NSAIDs) on gastric and duodenal mucosa are well recognised, less familiar is the damage caused to the small bowel mucosa distal to the duodenum.^{1,2} Small bowel diaphragm disease (SBDD), first described by Lang *et al* in 1988, is a complication of NSAID use and is characterised by circumferential lesions of short length (<5 mm), causing intrinsic stenosis of the small bowel lumen.^{3,4} We present the case of a 63-year-old woman with histologically confirmed SBDD.

CASE PRESENTATION

A 63-year-old woman presented with a 12-month history of intermittent colicky abdominal pain, nausea and postprandial vomiting. She had adopted a liquid diet to mitigate these symptoms. She had become increasingly constipated with her bowels only moving every 3 to 4 days. She had lost 6 kg in weight over the preceding 12 months. She gave no personal or family history of inflammatory bowel disease, bowel cancer or coeliac disease. Of note, she suffered from cervical spinal stenosis for which she had been taking a long-acting NSAID for 10 years. Surgically, she had undergone laparoscopic hysterectomy 12 months prior.

She had seen by two surgeons at other centres in the preceding year for these symptoms before her current presentation. Two abdominal CT scans

had demonstrated mildly dilated small bowel loops but oral contrast had passed through into the colon. Both prior surgeons had made a provisional diagnosis of partial small bowel obstructions due to adhesions and the patient was treated conservatively during the acute admissions.

A gastroscopy was performed to investigate her postprandial symptoms which demonstrated a small hiatus hernia, however not significant to attribute her symptoms. Colonoscopy demonstrated only mild diverticular disease.

The second surgeon performed a diagnostic laparoscopy during a subsequent admission with the intent of proceeding with adhesiolysis if adhesive small bowel obstruction was present. This procedure did not demonstrate adhesions and the small bowel, examined in its entirety appeared normal, with no change in calibre.

The patient remained intermittently unwell with pain and occasional vomiting and came to our hospital for a third opinion. On presentation, examination revealed a temperature of 36.8 °C, heart rate of 76 bpm and the blood pressure was 130/84 mm Hg. The patient's abdomen was not distended and was non-tender. There were no incisional or inguinal hernia present. Bowel sounds were high-pitched but there was no succussion splash.

Biochemical studies to investigate for Crohn's disease (perinuclear anti-neutrophil and anti-Saccharomyces Cerevisiae antibody, lactose intolerance testing and coeliac disease (total immunoglobulin A, IgA tissue transglutaminase antibody) were unremarkable. Eosinophilic enteritis is relatively common in our region, however the eosinophil count was normal. Ultrasound of the abdomen did not demonstrate gallstones.

A repeat contrast-enhanced CT scan of the abdomen and pelvis demonstrated an 11 cm segment of thickened ileum with proximal small bowel dilatation (see figure 1). The differential diagnosis remained Crohn's disease or eosinophilic enteritis. Given the CT findings, another diagnostic laparoscopy was performed at our centre to determine the segment of bowel affected by disease. Again, there were no visible external small bowel abnormalities and no evidence of the thickened area of small bowel as seen on the CT.

Because of the negative laparoscopy findings, we entertained the diagnosis of SBDD. As the investigations so far had been unable to pinpoint the level of obstruction, the decision was made to proceed with capsule endoscopy, accepting the risk

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Figure 1 Coronal CT abdominal scan – the three green arrow heads point to a strictured segment of mid ileum. The strictured segment has a thickened bowel wall and the lumen is almost obliterated in comparison the proximal ileum (blue arrows). The blue arrow heads demonstrate a segment of thin walled bowel with a patent lumen.

of capsule retention. The study demonstrated multiple erosions and diaphragms in the small bowel ([figure 2](#)). The capsule did not progress beyond the mid small bowel after 4 days ([figure 3](#)).

TREATMENT

A laparotomy was performed with meticulous inspection of the small bowel from the duodenal-jejunal flexure to the terminal ileum. The serosa had a healthy appearance. There was no mesenteric fat wrapping. The capsule was found by palpation in the mid-ileum and the bowel was subtly thickened at this point. The bowel was opened at the capsule site and an intraluminal diaphragm was seen causing a 90% obstruction of the lumen (see [figure 2](#)). An on-table enteroscope was introduced and passed distal to the web to inspect the small bowel for synchronous strictures that the capsule did not assess. This was done to reduce the risk of leak from the subsequent small bowel anastomosis due to distal obstruction and back pressure on the anastomoses.

Figure 2 Capsule endoscopy – demonstrating the narrowing of the small bowel lumen consistent with a small bowel diaphragm through which the capsule could not progress (green circle). The blue arrow heads point to the base of the diaphragm in continuity with the small bowel wall mucosa.

Figure 3 Abdominal X-ray - 4 days after commencement of the capsule endoscopy study, the radio-opaque capsule (arrow head) can be seen in the left lower quadrant of the abdomen causing a low-grade bowel obstruction.

Over the next 11 cm of small bowel, five other partial small bowel diaphragms were found (see [figure 4](#)). Small bowel resection of the diseased segment was performed and a stapled side-to-side anastomoses fashioned.

OUTCOME AND FOLLOW-UP

The patient made an excellent recovery and was discharged on the fourth postoperative day. Histology of the resected specimen confirmed SBDD with multiple diaphragm lesions over an 11 cm segment. There were no findings to suggest Crohn's disease or malignancy. [Figure 5](#) demonstrates some of the microscopic histological features of a diaphragm lesion. The patient was educated to refrain from all NSAID use.

Following a 4-year period of being pain-free and tolerating a full diet, the patient represented with recurrent symptoms of subacute small bowel obstruction. The patient denied further

Figure 4 Macroscopic view of the transversely opened small bowel segment demonstrating multiple regions of diaphragm disease (arrows).

Figure 5 Microscopic histological features - section of intestinal mucosa which demonstrates the relative height of a diaphragm lesion (green arrowhead) compared with the adjacent plicae circularis. There is ulceration at the free edge of the diaphragm lesion (blue arrowhead). Additionally, mixed inflammation in the lamina propria and fibromuscular infiltration of the submucosa.

NSAID use. Her symptoms did not settle with conservative management and concerned that her disease had recurred, she underwent an exploratory laparotomy and on-table enteroscopy. At laparotomy, there were no intra-abdominal adhesions. The previous side-to-side small bowel anastomosis was identified 20 cm proximal to the ileocaecal valve and appeared to be the site of small bowel obstruction. An enterotomy was made just proximal to the anastomosis to facilitate on-table enteroscopy. A tight inflammatory stricture was seen at the anastomosis with a food bezoar proximal to the stricture. Further enteroscopy revealed no other diaphragm disease. The anastomosis was resected and a new side-to-side stapled anastomosis performed. The histology of the resected specimen demonstrated submucosal fibrosis. The patient discharged home 4 days postoperatively tolerating a full diet and has remained well after a year of follow-up.

DISCUSSION

NSAIDs are one of the most widely prescribed drugs in the world for a multitude of indications including analgesia, heart disease and as in the case we have presented, rheumatological conditions.^{2,5} In an attempt to mitigate the gastroduodenal complications of NSAIDs, including ulceration and bleeding, enteric coated and slow release formulations have been developed.^{1,6} It is hypothesised these modified released NSAIDs may be responsible for the adverse effects on the small bowel, including SBDD.⁴ As this condition has been reported in a bypassed segment of bowel, the absence of direct mucosal contact does not preclude formation of SBDD, suggesting a more likely multifactorial mechanism of injury and systemic effect of NSAIDs.^{4,7}

NSAIDs reduce villous microcirculation, resulting in a reactive inflammatory process and increased mucosal permeability.⁴ This facilitates luminal assailants such as native gut flora and bile to gain access to the mucosa and further augment inflammation resulting in ulceration, strictures and formation of mucosal diaphragms.^{4,8}

In a capsule endoscopy study of 160 patients taking NSAIDs for 3 months or longer duration, two per cent of participants were found to have SBDD.⁹ With an ageing population and the

widespread use of NSAIDs for rheumatoid conditions and heart disease, it may be that clinicians encounter an increasing incidence of SBDD.² SBDD should be included in the differential diagnosis of small bowel obstruction especially when the symptoms are chronic or where the patient has not had significant previous surgery to suggest adhesions or internal herniation.

The most common manifestations of clinically significant SBDD is gastrointestinal bleeding (72.9%), bowel obstruction (65.8%), weight loss (18.1%) and constipation (10.3%).² Our case presented with symptoms of subacute bowel obstruction, however there was a significant delay in diagnosis owing to the little known nature of this condition in the general surgery community. Other non-specific presentations like weight loss and constipation warrant exclusion of inflammatory bowel disease, coeliac disease, food intolerances and more significantly, bowel cancer. Establishing the diagnosis of SBDD is often a process of elimination.

A case series of 12 patients with histologically proven SBDD reviewed the findings of preoperative CT abdominal scans. The most common findings were strictures ranging in length from 0.5 to 10 cm (92%), bowel wall thickening (67%), mucosal hyperenhancement (50%) and mild small-bowel dilatation (42%).⁸ A major limitation of this study was the retrospective nature and fact radiologist were not blinded to the histological findings of the operative specimen. This alludes to the possibility that subtle imaging features which may be missed without adequate history. Supporting this idea, in 42% of patients, more strictures were found in the resected specimen than were identified at CT.⁸ Use of oral barium contrast may show the diaphragms, but they are as easily overlooked as resembling exaggerated plicae circulares.² MRI is another useful imaging modality in the workup for SBDD. Motion-robust pulse sequences are able to define the plicae circulares and diaphragms without motion artefact as a result of the rapidly acquired images. One particular advantage this modality has over CT enterography is that it may be helpful in distinguishing exaggerated plicae circulares from diaphragms, as they display small bowel peristalsis over time.¹⁰

Capsule endoscopy directly visualises lesions, appearing as discs of mucosa protruding circumferentially into the intestinal lumen, often with an ulcerated free edge.^{2,8} Despite being diagnostically effective, capsule endoscopy has a significant risk of capsule retention, precipitating bowel obstruction. In Li's capsule series of 1000 patients, SBDD was the most common cause of capsule retention (79%, n=11) and certainly this occurred in the case we have presented.^{2,11} If capsule endoscopy is employed where there is a high suspicion of SBDD, the attending surgeon should be prepared to perform emergent laparotomy should the capsule be retained and the patient present obstructed. The halted capsule does however give the advantage of identifying the obstructed point where the external small bowel appears macroscopically normal.

Diagnostic laparoscopy may reveal a subtle dilatation of small bowel proximal to the SBDD however the absence of this finding does not exclude SBDD.¹² The bowel may appear to be macroscopically normal as the serosal surface and mesentery are often unaffected unlike in Crohn's disease.¹³ The patient we present did not have any obvious abnormal findings at diagnostic laparoscopy. Laparotomy, despite being more invasive, provides the surgeon the added advantage of palpating the small bowel. A useful adjunct during laparotomy is intraoperative enteroscopy in situations diaphragms are not palpable and additionally facilitate exploration and exclusion of synchronous lesions.² It is important that all diaphragm lesions are found to prevent

further obstruction distally and potential anastomotic leak from back pressure on a new anastomosis.

Li *et al* in a 1000 patient capsule endoscopy series, report 11 patients with retained capsules as a result of histologically confirmed SBDD. All 11 patients proceeded to laparotomy with resection of the affected small bowel segment. In a mean follow-up period of 10 months, no patient had return of obstructive symptoms. Additionally to resecting the culprit lesion, cessation of all NSAID medications was advised.¹¹ While there have been small series of SBDD being treated by double balloon enteroscopy and dilatation, the long-term effectiveness of this treatment remains unknown.¹⁴ Mehdizadeh report three cases treated with dilatation with complete resolution of obstructive symptoms however only a 3 month follow-up period.¹⁴

The exact aetiology of the anastomotic stricture 4 years later in our case is unclear. It is possible that an area of SBDD affected bowel was present at the anastomosis site and this strictured over time.

Learning points

- ▶ With an ageing population and widespread use of non-steroidal anti-inflammatory drugs for rheumatoid conditions and heart disease, general surgeons may see a rising incidence of small bowel diaphragm disease (SBDD).
- ▶ Capsule endoscopy is diagnostic of SBDD, however the surgeon and the patient must be prepared to operate should the capsule not pass.
- ▶ The external appearance of the small bowel in SBDD are subtle and can be missed at laparoscopy. Laparotomy provides the surgeon with the ability to palpate the small bowel to detect thickening.
- ▶ Intraoperative enteroscopy is a useful adjunct during laparotomy to identify and resect all obstructing diaphragms.

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