The complications of Crohn's disease part one: The complications of acute and chronic intestinal disease

Poster No.: R-0098
Congress: 2014 CSM
Type: Scientific Exhibit
Authors: A. Galvin\textsuperscript{1}, G. Noe\textsuperscript{2}, M. Seale\textsuperscript{1}, T. Sutherland\textsuperscript{1}; \textsuperscript{1}MELBOURNE/AU, \textsuperscript{2}HEIDELBERG/AU
Keywords: Abdomen, Gastrointestinal tract, Small bowel, MR, CT, Endoscopy, Dilation, Inflammation, Abscess
DOI: 10.1594/ranzcr2014/R-0098

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply RANZCR/AIR/ACPSEM's endorsement, sponsorship or recommendation of the third party, information, product or service. RANZCR/AIR/ACPSEM is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold RANZCR/AIR/ACPSEM harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, .ppt slideshows, .doc documents and any other multimedia files are not available in the pdf version of presentations.
Aim

Crohn's Disease is an idiopathic inflammatory disorder, which can affect any part of the gastrointestinal tract. It is characterized by bowel erosions, ulceration and full thickness bowel wall inflammation, and histologically by the formation of non-caseating granulomas. This poster aims to illustrate the manifestations and complications of active transmural inflammation and ulceration as well as the complications of chronic, relapsing disease. Further, to describe the spectrum of complications related to perianal Crohn’s disease and finally to outline the post-operative complications of Crohn’s patients and the morbidity related to recurrent bowel resections.

Methods and materials

A review of the literature supplemented with case examples from the author's institution, to illustrate the spectrum of complications related to Crohn's enteritis and perianal disease.

Results

Acute Complications

The majority of Crohn's patients, approximately 80%, have small bowel involvement, however a significant proportion (50%), also have colonic involvement. 15-20% of patients have large bowel involvement only\(^1\). Approximately 20% with small or large bowel involvement also have perianal disease, while perianal disease alone is rare at less than 5%\(^2\). The initial presentation of disease is variable and can involve diarrhoea, fever, sepsis, abdominal pain, obstruction or bloating. In approximately 20% of patients, the first presentation mimics appendicitis or bowel perforation, with RLQ pain, fever and diarrhoea\(^3\). After the initial diagnosis and treatment, approximately 50% of patients relapse and overall 10% go on to a chronic relapsing course of disease\(^4\).

Bowel Obstruction

The most common complication of Crohn's disease is small bowel obstruction. In the setting of active disease, obstruction occurs due to inflammatory oedema and spasm (Figure 1 and 2). In chronic disease, the repeated bouts of inflammation result in fibrosis
and strictures. Overall 5% of small bowel obstructions are due to inflammatory bowel disease\(^5\).

\textit{Perforation and Abscess Formation}

Transmural ulceration is the process by which the majority of Crohn's complications occur (Figure 3). It is characteristic of Crohn's disease and the eventual breach of the serosa leads to perforation, abscess and fistula formation. The consequent inflammatory reactions involved also set the scene for formation of adhesions and resultant bowel obstruction. Transmural ulceration in active disease typically results in microperforation and contained collections (Figure 4 and 5), while free perforation is less common (Figure 6). A rare manifestation of transmural ulceration is penetration into the mesenteric vasculature with resultant mesenteric and portal venous gas (Figure 7 and 8).

MRI Enteropathy is sensitive for the detection of abscess, although less sensitive than CT for the detection of gas. On MRI imaging, an abscess can demonstrate peripheral enhancement as well as internal diffusion restriction (Figure 9 and 10). Perforation may also occur into adjacent structures, such as the retroperitoneum, with resultant abscess formation. For example, distal ileal inflammation can perforate posteriorly and progress to formation of ileopsoas abscess (Figure 11). It is important that the presence of an abscess is recognised and documented, as it is a contraindication for the commencement of biologic therapies.

\textit{Toxic Megacolon}

Crohn's patients with colonic involvement may present with acute colitis. The entity of Toxic Megacolon is rare in Crohn's disease with an estimated incidence of 2% in the 1980's and further reduced with the advent of biologic therapies\(^6\).

\textit{Chronic Disease and Complications}

\textit{Fistulizing Disease and Complications}

Fistulizing or fibrostenotic presentations are the predominant patterns in the long term evolution of Crohn's Disease. Based on population studies in the USA, the cumulative risk of developing a fistula is 33% after 10 years and 50% after 20 years\(^7\). Fistulizing disease is notoriously difficult to treat. Although complicating sepsis may necessitate surgical intervention, surgery is generally avoided as it can instigate the development of further fistulas. MRI is the mainstay of fistula imaging, although prone positioning can sometimes distort anatomy (Figure 12 and 13).
Fibrostenotic Disease

Fibrostenotic Disease is where chronic inflammation results in fatty infiltration of the bowel wall and fibrofatty proliferation of the adjacent mesenteric fat. The wall fibrosis in turn results in strictures\(^8\) (Figure 14). A stricture is considered functionally significant if there is upstream dilatation of more than 3 cm. The same process can result in abdominal adhesions, which can also develop following abdominal surgery. The key imaging features are angled or tethered loops in the absence of adjacent mural thickening.

Short Gut Syndrome

An important complication of chronic disease is Short Gut Syndrome. This is a global malabsorption syndrome due to insufficient absorptive capacity and/or disturbed gastrointestinal regulation resulting from extensive small bowel resections. This entity may occur after resection of 50% of the small bowel and will certainly occur with more than 70% resection, or where there is less than 100cm of bowel remaining\(^9\). If the colon remains, it can adapt and adopt some digestive functions such as absorption of short chain fatty acids and increased water and electrolyte absorption. This syndrome leads to the difficult clinical request of providing a measurement of the residual small bowel, which is difficult to accurately assess radiologically.

Post-Operative Complications

The majority of Crohn's patients will undergo at least one surgical procedure in their lifetime and studies show close to 50% will have had an operation within 5 years of diagnosis\(^10\). The spectrum of post-operative complications includes collections, anastomotic leak and breakdown, adhesions, intussusception and obstruction as well as abdominal hernias (Figure 15). The rate of anastomotic failure is higher in Crohn's disease than in other bowel resections, due to the risk of disease occurring at the operative site. The risk of post-operative recurrence is increased in smokers, and where there was pre-existing fistulizing disease. A less well-known complication of abdominal surgery is the formation of a peritoneal inclusion cyst. This involves loculated fluid trapped within peritoneal adhesions, typically surrounding the ovary (Figure 16). It is a non-neoplastic reactive mesothelial proliferation and typically occurs in pre-menopausal women with a history of previous surgery, trauma or inflammation.

Perianal Disease

Perianal disease is a significant cause of morbidity in Crohn's patients. A perianal fistula is defined as an abnormal communication between the anal canal and the skin of the perineum. Perianal MRI allows an accurate delineation of disease and is a helpful tool for surgical planning. One of the complications of perianal disease is the formation of
ischioanal and pelvic collections (Figure 17). A major cause of morbidity are fistulas to the genitourinary tract, which are commonly symptomatic and a cause of recurrent infections in Crohn’s patients (Figure 18). A serious potential complication of perianal disease is the development of pelvic osteomyelitis, typically involving the sacrum and coccyx (Figure 19).

**Malignancy**

Overall Crohn’s patients have an increased mortality compared to the general population. This is due to bowel disease but also due to an increased rate of malignancy. Crohn’s patients are at a 6 x greater risk of developing small bowel adenocarcinoma than the general population, with more aggressive tumors and tumors occurring at a younger age. The tendency of tumors to occur in the distal ileum is also supportive of the link (Figure 20). There is also an increased risk of colorectal carcinoma, although less so than with Ulcerative Colitis. This is thought to occur via the dysplasia sequence, and therefore is seen in patients with colonic Crohn’s disease. By the same process, gastrointestinal lymphoma would be thought to be more common in Crohn's disease however studies have not shown a statistical significance\textsuperscript{11}. Extra-intestinal lymphoma is however more common in Crohn’s disease (Figure 21). There is a suggestion that Crohn’s patients may have associated T or B cell deficits and more recently the Biologic agents have been shown to be associated with an increased risk of Non-Hodgkins Lymphoma.

**Images for this section:**
**Fig. 1:** Inflammation of the distal ileum with mural oedema and surrounding inflammatory stranding and fluid.
**Fig. 2**: Coronal imaging of patient in Figure 1. The active inflammation of the distal ileum results in a small bowel obstruction. Markedly dilated ileal loops with formed fecal matter.

**Fig. 3**: T2 HASTE series demonstrating deep transmural ulceration of the terminal ileum.
Fig. 4: Active disease of the neoterminal ileum in a 32 yr old, with resultant small bowel obstruction. Perforation at the neoterminal ileum with phlegmon formation.
**Fig. 5:** Coronal imaging of patient in Figure 4. Microperforation and phlegmon at the terminal ileum, with proximal small bowel obstruction.
**Fig. 6:** Disease of the distal ileum resulting in perforation and a large volume of free intraperitoneal gas.

**Fig. 7:** Distal ileal disease resulting in ulceration into the mesenteric venous vasculature in a young Crohn's patient. Gas is seen in a mesenteric vein.
Fig. 8: More proximal image of patient in Figure 7. Ulceration into the mesenteric vasculature, ultimately resulting in portal venous gas.
**Fig. 9:** DWI B800. Contained perforation and abscess 10 cm from the ileocaecal valve. The abscess demonstrates high signal on DWI.
Fig. 10: Corresponding ADC map for Figure 9, confirms internal diffusion restriction of the distal ileal abscess.
**Fig. 11:** T1 FS C+ coronal imaging demonstrates a loculated ileopsoas abscess formed due to terminal ileal inflammation, ulceration and sinus formation.
**Fig. 12:** T1 FS C+ MRI demonstrating an enhancing fistula between the distal ileum and sigmoid colon, a common pattern of fistulation.

**Fig. 13:** T2 weighted imaging of a complex fistula which developed after ileocolic resection. Inverted Y shaped fistula, with tethering of the bladder.
Fig. 14: Chronic disease of the distal ileum with fibrofatty proliferation and stricture formation.

Fig. 15: Incarcerated loop of small bowel in a parastomal hernia above an end ileostomy. This results in small bowel obstruction and ultimately perforation.
Fig. 16: Peritoneal inclusion cyst. 27 yr old Crohn's patient with history of 2 prior ileal resections. T2 hyper intense cystic structure surrounding the left ovary.
**Fig. 17**: Coronal T2 STIR. Complex perianal disease with suprasphincteric fistula and supralevator collection.

**Fig. 18**: Sagittal T2 FS. Anovaginal fistula demonstrated by a T2 hyperintense tract.
**Fig. 19:** Sagittal T2 STIR. Complex branching perianal fistula, with sinus extending to the coccyx. Changes of bone marrow oedema in the distal coccygeal segment, also displaying abnormal enhancement, suspicious for osteomyelitis.

**Fig. 20:** 58 yr old male with long history of Crohn's disease. Malignant stricture of the distal ileum.
Fig. 21: Crohn’s patient having multiple CT KUB studies for renal stone disease demonstrated a slowing enlarging mesenteric nodal mass. Biopsy diagnosis of lymphoma.
Conclusion

The complications related to transmural inflammation and ulceration in Crohn's disease are varied and a significant cause of morbidity. Knowledge of these complications is important for all Abdominal and General Radiologists to aid the planning of medical and surgical therapies.

Personal information

References

References