

The Acute Abdomen: Beware the Lurking Colon Cancer

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Learning Objectives

Aims:

- Demonstrate the role of multi detector computerized tomography (MDCT) in the detection of colorectal malignancy in patients presenting with an acute abdomen.
- Illustrate the pertinent MDCT features of colorectal cancer in a wide range of clinical presentations.
- Highlight the relevant features that indicate a malignant aetiology and provide a systematic approach to interpret these findings.
- Emphasize the value of CT in clinical triage to guide further management.

Background

- Colorectal cancer is the third most common cancer in the UK¹. In England, 22% of colorectal cancers present in the emergency setting and ranging between 14 to 33% worldwide.²
- Despite national colon cancer screening programmes, patients may still have the diagnosis of colorectal cancer (CRC) first made in the acute setting. There is a broad range of clinical presentations which can typically be secondary to intestinal obstruction, perforation or gastrointestinal haemorrhage. Alternatively, the presentation may mimic other common surgical emergencies such as acute appendicitis or sigmoid diverticulitis.
- Historically, the diagnosis of a malignancy in the acute setting would have often been made during emergency surgery. However, given the increasing utility of CT in the acute setting, the diagnosis of CRC is often first made by the radiologist. Hence the radiologist plays a pivotal role in making a prompt diagnosis to avoid unwanted morbidity. This is to the extent that a diagnostic laparotomy is rarely performed without complete imaging work typically with MDCT.

Background

- Early diagnosis of CRC on CT in patients with an acute abdomen is key in guiding surgical management and the initial decision making process.
- In our institution, a portal venous phase CT scan is acquired with a 60 second delay, routinely without oral contrast for patients presenting with acute abdominal symptoms in the emergency setting. All scans are reviewed using multi-reformats on a PACS workstation. For specific clinical scenarios, the protocol may be modified accordingly.
- In addition the increasing role of radiological intervention for instance colonic stenting has a beneficial role in reducing morbidity and improving patient time to recovery.
- Our series of cases demonstrate a range of clinical presentations of colorectal cancer in the acute setting. We will provide useful learning points with reference to each case to guide interpretation and highlight pitfalls.

Case 1A: Left sided Colonic Obstruction



51 year old male presented with weight loss, intermittent vomiting and abdominal distension. (a) Axial image demonstrates marked colonic dilatation (*) with abrupt transition at the mid sigmoid. Note subtle short annular stricture with shouldered margin at this site (arrow head).
(b) Dilated small bowel indicating an incompetent ileocecal valve (*).

Case 1A: Left sided Colonic Obstruction



(c)

(c) Shows stent traversing stenosing tumour over the guide-wire . (*) Contrast in the lumen of bowel outlines short "apple core stricture" characteristic of a primary CRC (arrow head) (d) Successful stent deployment outlining stenosing tumour (arrow heads).

Case 1B: Left sided Colonic Obstruction





(a)

76 year old female presented with right sided abdominal pain and constipation. (a) Plain abdominal radiograph (PAR) demonstrated large bowel dilatation (*) with paucity of gas in the distal sigmoid and rectum (arrow head)). (b) Axial CT image confirms colonic obstruction with transition point in the mid sigmoid (arrow head).

Case 1B: Left sided Colonic Obstruction



(c) Note subtle short stenosing lesion visible on the sagittal image with shouldering margins characteristic for CRC (arrow head). (d) Coronal image demonstrated distended caecum measuring 10cm which was thin walled and concerning for impending perforation (arrow heads). Note collapsed small bowel loops suggestive of competent ileo-caecal valve (*). Trace of fluid around the liver is reactive to the obstructed state (†).

Case 2: Right sided Colonic Obstruction



75 year old lady with gradual onset of absolute constipation and significant abdominal pain. Noted to be anaemic. (a) PAR shows dilated caecum (*) with absence of colonic gas distally and dilated small bowel loops. A malignant obstruction was more likely given presentation however a caecal volvulus was considered in the differential. (b) Axial slice demonstrating the distended caecum (*) and small bowel loops seen on PAR. (c) Stenosing tumour at the hepatic flexure. Note the indistinct spiculated outline of the colonic wall (arrow head).

Case 1A, 1B & 2 Learning points

- It is common for colorectal carcinoma to present as large bowel obstruction in up to 50% of cases.³
- In our two cases of left sided colonic obstruction, the tumours are subtle representing short annular "cicatrizing" lesions.
 This type of lesion can be overlooked on the axial images alone and hence the importance of review of the multiplanar reformatted images.
- Acute abdominal CT should routinely be interpreted with availability of instant multi-planar reformats and in our practice is considered incomplete without multiplanar assessment.
- The caecum should be routinely interrogated for signs of ischemia and note should be made for competence of ileocecal valve in the report.
- The presence of right iliac fossa peritonism and sign of ischemia of the caecum, as in Case 1B, is a sign of impending colonic perforation. Identifying this feature is crucial as it is a relative contraindication for colonic stenting and requires prompt surgical intervention.
- This is in contrast to case 1A, where colonic stent placement avoided the need for emergency colostomy and facilitated a single step elective sigmoid colectomy.

Case 3: Colonic Perforation



Case 3: 81 year old male presented with severe LIF pain and peritonism. (a) Axial image demonstrating disruption of the colon ic wall (arrow heads) with a large extruded bolus of faecal matter in keeping with a stercoral perforation(*). (b) Coronal image shows this was secondary to a distal stricturing sigmoid tumour (arrow heads). Note clean fat planes around the tumour and absence of generalised pneumo-peritoneum or significant fluid contamination.

Case 4: Colonic Perforation



Case 4: 78 year old male with 10 day history of constipation and not passing flatus. (a) Axial CT image demonstrates an obstructing annular mid sigmoid colonic tumour (arrow head). Note clean fat planes adjacent to tumour. (b) Axial CT (lung windows) demonstrates extensive pneumo-peritoneum. There is gross distension of the caecum greater than 10cm (*) with evidence of pneumatosis (arrow heads). The perforation was felt to be due to caecal ischemia rather than at the site of the tumour.

Case 3, 4 & 5 Learning Points

- Perforation from colonic obstruction may be directly at the site of tumour or related to a non tumour related aetiology.
- In Case 3 and 4 the perforation was not at the site of the tumour but secondary to an ischemic complication from the underlying large bowel obstruction due to sustained colonic distension.
- Stercoral perforation is perforation of the bowel due to pressure necrosis from impacted faeces accounting for approximately 3 % of all colonic perforations.³ Faecal impaction causes increased intraluminal pressure which results in trans-mural ischaemic necrosis and may eventually lead to perforation and faecal peritonitis which carries high risk of mortality.⁴
- The most common site of stercoral perforation is the sigmoid due to its vascular supply especially the region known as Sudeck's point.⁵

Case 5: Colonic Perforation



(a)

61 year old male presenting with left sided abdominal pain, fever and rigors clinically presumed to be acute sigmoid diverticulitis. (a) Axial image demonstrating disproportionate degree of fat stranding and localised extra-luminal locules of gas in the peri-colonic fat adjacent to thickened segment of distal descending colon consistent with a localised perforation (arrow head). (b) Gas locules dissecting from the stenosing tumour consistent with localised tumour perforation (arrow heads). (c) Coronal image shows short segment annular lesion which demonstrates characteristic 'apple core' morphology typical of a CRC. Characteristic extramural nodular tongues of tumour seen (arrow head) extending into the mesenteric aspect a feature of transmural extension of tumour. Note adjacent localised nodes.

Case 5 Learning Points

- Localised perforation can mimic acute colonic diverticulitis. In this case the initial diagnosis of cancer was made on CT.
- Note the presence of extramural tongues of tumour along the mesentery . This is a feature of trans-mural extension of tumour (T3 disease), a hallmark of underlying malignancy.
- The presence of a direct tumour perforation in this case is a further adverse prognostic factor. This upstages the cancer to T4 disease due to peritoneal contamination of malignant cells.

Case 6: Incidental Tumour in Renal Colic



55 year old female presented with acute right loin to groin pain with microscopic haematuria. This was clinically presumed to be renal colic. (a) Non-contrast CT urinary tract scan was performed. Scan was negative for renal calculi however demonstrated circumferential thickening of the proximal ascending colon (arrow head). Note subtle extramural nodular tongues of tissue (*) and mild localised fat stranding highly suspicious for an incidental primary CRC.

Case 6: Incidental Tumour in Renal Colic





(b)

(c)

(b & c) Follow up contrast CT Abdomen (axial and coronal) confirms enhancing circumferential, annular lesion (arrow head) which was confirmed to represent CRC on endoscopy. Note clustering of tiny round lymph nodes adjacent to the thickened segment (*).

Case 6 Learning Points

- Presence of short segment soft tissue thickening of the colonic wall, in particular with subtle extra-mural nodular irregularity and peri-colonic fat stranding, requires close assessment with reformatted images to assess for the presence of an underlying CRC. Endoscopic correlation is often indicated to exclude CRC.
- Employing a systematic approach when reviewing acute CT to exclude other unsuspected findings apart from addressing the clinical question is key part of the radiologist's role.
- In particular, thorough assessment of the colon is important to avoid misdiagnosis that may provide an explanation for symptoms.
- In this case, right sided colicky pain may have been from intermittent obstructive symptoms.

Case 7: Acute Appendicitis





65 year old female presented with right sided abdominal pain and vomiting. (a, b) Appendix is distended, fluid filled and thick-walled with marked peri-appendiceal fat stranding (arrow head). (c) At the base of the caecal pole, there is an enhancing soft tissue mass best appreciated on the sagittal reformat (arrowhead, see also image b). Appearances were in keeping with a retro-caecal appendicitis (⁺) secondary to an obstructing caecal pole tumour.

Case 7 Learning Points

- Acute appendicitis is less common in the older population with only 5-10% of cases occurring in this subgroup.⁶
- Lai et al⁷ reported incidence of appendicitis associated with colon cancer as 0.85%.
- In patients over 40 years who present with acute appendicitis, there should be a high index of suspicion for an obstructing tumour.⁷
- Our case demonstrates an enhancing mass in the base. No calcified appendicolith noted.
- This case again highlights the importance of reformatting as the tumour can be better delineated on the sagittal image.
- If there is radiological suspicion of CRC, this should be conveyed and discussed directly with the surgeon as the nature of surgery would significantly differ i.e. (right hemi-colectomy vs appendectomy).

Case 8: Perforation of Pseudomyxoma Retroperitonei



(a)

(b)

(c)

76 year old male presented with two week history of right groin swelling, hip flexion and weight loss. (a) Plain abdominal radiograph showed loss of the right psoas shadow (*) (b) Complex fluid collection in the right groin (*). (c) Note abnormal low density circumferential thickening involving the caecal pole in keeping with a primary mucinous tumour (arrow heads)

Case 8: Perforation of Pseudomyxoma Retroperitonei



(d & e) There is is contiguous fluid that can traced in the retroperitoneum along the the right psoas muscle cranially and caudally that tracks into the right groin along the psoas insertion (arrow heads). Note the interspersed fat between the fluid(*). Discrete omental nodules consistent with metastatic disease (†). (f) Use of lung windows confirms that area of low density within the contiguous fluid is fat attenuation rather than free intraperitoneal gas.

Case 8 Learning Points

- Case 8 illustrates a retroperitoneal perforation of a mucinous caecal tumour along the psoas muscle giving rise to a 'pseudomyxoma retroperitonei'.
- The combined appearance of fluid interspersed with fat along the psoas represents mucin from the perforated tumour. It can be easily be misinterpreted for an abscess. The appearances of the fat on soft tissue windows could be mistaken for gas associated with an infected collection. Hence the value of using lung windows to distinguish gas from fat attenuation.
- CT offers global assessment of the abdominal cavity which allows detection of further sites of disease, as in our case, the presence of omental metastases. This then aides in the multidisciplinary approach and further surgical planning.

Case 9: Colonic Carcinoma Mimicking Inflammatory Bowel Disease



(a)

74 year old female presented with short history abdominal cramps and vomiting. (a) Abdominal radiograph demonstrates distended small bowel loops (*). (b) Axial image shows long segment of oedematous terminal ileum (arrow heads) leading to collapsed thickened caecum(*). No concerning extramural changes seen in the caecum. No mechanical small bowel obstructive features seen. Patients symptoms settled on conservative management. The working diagnosis was an acute ileitis. However, colonoscopy was recommended.

Case 9: Colonic Carcinoma Mimicking Inflammatory Bowel Disease



Colonoscopy demonstrated a caecal tumour. (c & d) CT performed 2 weeks after colonoscopy demonstrated interval resolution in terminal ileum oedema but demonstrates subtle annular thickening of the ascending colon just above the ileo-caecal valve (arrow heads). In retrospect the appearances of the terminal ileum at the acute initial scan was most likely due to oedema due to an intermittent post-obstructive state as x ray on admission showed dilated small bowel loops. This is a potential pitfall which may mimic an acute ileitis.

Case 9 Learning Points

- Following relief of bowel obstruction in the "post obstructive state" the affected segment may appear acutely oedematous and can be falsely interpreted as an acute inflammatory thickening.
- In case 9, the terminal ileum oedema was a reflection of the post obstructive state secondary to the caecal tumour.
- Clinical correlation is essential and follow up imaging with endoscopic correlation is indicated in this setting.
- Axial T2 weighted MR Liver from Case 1 performed day 5 following colonic stent insertion. Successful decompression was achieved.. Note striking T2 hyper-intensity of the bowel mucosa due to post obstructive state. (arrow heads).



Case 10: Colorectal Carcinoma vs Inflammatory Bowel disease



58 year old female with a background of Crohns disease for more than 20 years presented with increasing right sided cramping abdominal pain. (a & b) Axial image shows thickening of the terminal ileum which has a target like appearance and preservation of the stratified layers (arrow heads). This is characteristic of known terminal ileum Crohns disease. Adjacent to it, at the ileo-caecal junction there is disruption of the layers of the gut wall with replacement of the normal fat attenuation of the ileo-caecal value with a low density mass. Note discrete extramural nodular bulge anteriorly, strongly suspicious to represent presence of tumour in background of known Crohn's disease (*).

Case 10 Learning Points

- Patients with longstanding inflammatory bowel disease are at increased risk of developing colorectal cancer. The most significant risk factors being disease duration and extent.⁸
- Inflammatory bowel wall thickening typically preserves the stratified layered appearance (target sign) on CT. Tumour usually results in disruption of the bowel wall and loss of the normal layered appearance as illustrated in our case.
- The presence of contiguous nodular bulge of the abnormally thickened colonic wall is another strong feature that indicates transmural spread of tumour.
- The CRC was confirmed on endoscopy, having been first detected on CT.

Case 11: Colo-colic intussusception



35 year old female with background of cystic fibrosis presented with abdominal distension and unable to open bowels for 5 days. Patient underwent gastrograffin challenge. (a) Abdominal radiograph performed after 2 hours showed abrupt cut off in the distal descending colon (*). A CT scan was organised to assess this further.

Case 11: Colo-colic intussusception



CT images demonstrated a "mass" representing a large colo-colic intussusception. (a) Axial slice shows a bowel within bowel configuration demonstrating in drawing of mesenteric fat and engorged vessels (†) classical for an intussusception(arrowheads). Gastrograffin remains in the dilated proximal colon (*) (b) Sagittal image demonstrates intussusception (arrow heads). Due to degree of oedema, a clear lead point not visible but strongly suspicious for an underlying colonic neoplasm. Endoscopy was unsuccessful at providing any further clues and the patient underwent laparotomy.

Case 11 Learning Points

- Intussusception although common in children is rare in adults representing only 5% of cases. In contrast to the paediatric population, 70 90% of adult cases have a recognizable pathological lead point,⁹ with 64% of colocolic intussusception lesions being attributed to malignant adenocarcinoma.¹⁰
- In adult population presenting with a colo-colic intussusception an underlying neoplastic lesion of the colon remains frequently the underlying aetiology and all efforts should be to rule out to identify an underlying lead point. In our case, the definitive diagnosis was made at the time of laparotomy which is often the case as the intussusception masks the offending lesion.
- The characteristic appearances, notably the in drawing of mesenteric fat and vessels giving rise to a target like/ sausage shaped mass allow prompt recognition of this diagnosis.
- As cystic fibrosis patients are now living longer into adulthood there is an increasing incidence of GI
 malignancies reported in this cohort. However, due to several abdominal complications associated with CF,
 diagnosis of an underlying CRC is often delayed.¹¹

Conclusion

- Colorectal carcinoma can present with a wide range of symptoms and in the acute setting is a great mimicker of other common acute abdominal pathologies.
- MDCT is increasingly performed in the acute setting to make a radiological diagnosis and guide clinical management.
- Hence, awareness and prompt identification of colorectal carcinoma on CT by the radiologist is imperative in avoiding delay and crucial to avoid unwanted patient morbidity.

References

- 1. Colorectal cancer: the diagnosis and management of colorectal cancer. NICE Clinical guidelines. https://www.nice.org.uk/guidance/cg131/documents/colorectal-cancer-full-guideline (accessed 15/4/18)
- 2. Renzi C, Lyratzopoulos G, Card T, Chu TPC, Macleod U, Rachet B. Do colorectal cancer patients diagnosed as an emergency differ from non-emergency patients in their consultation patterns and symptoms? A longitudinal data-linkage study in England. Br J Cancer 2016 27; 115 (7): 866-875.
- 3. Maddu KK, Mittal P, Arepalli CD, Shuaib W, Tewari A and Khosa F. Colorectal Emergencies and Related Complications: A Comprehensive Imaging Review- Noninfectious and Noninflammatory Emergencies of Colon. AJR Am J Roentgenol 2014 203:1217-29.
- 4. Heffernan C, Pachter HL, Megibow AJ, Machari M. Stercoral colitis leading to Fatal Peritonitis: CT findings. AJR Am J Roentgenol 2005; 184:1189-1193.
- 5. Wu CH et al. Necrotic stercoral colitis: Importance of computed tomography findings. World J Gastroenterol 2011;17(3): 379–384.
- 6. Omari AH, Khammash MR, Qasaimeh GR, Shammari AK, Yaseen MKB, Hammori SK. Acute appendicitis in the elderly: risk factors for perforation. World J Emerg Surg 2014; 9:6.
- 7. Lai HW, Loong CC, Tai LC, Wu CW, Lui WY. Incidence and odds ratio of appendicitis as first manifestation of colon cancer: a retrospective analysis of 1873 patients. J Gastroenterol Hepatol 2006; 21 (11): 1693-1696.
- 8. Kim ER, Chang DK. Colorectal cancer in inflammatory bowel disease: The risk, pathogenesis, prevention and diagnosis. World Journal of Gastroenterology : WJG. 2014;20(29):9872-9881.
- 9. Wilson et al.: Adult Colocolic Intussusception and Literature Review . Case Rep Gastroenterol 2013;7:381–387.
- 10. Yakan S, Caliskan C, Makay O, Denecli AG, Korkut MA: Intussusception in adults: clinical characteristics, diagnosis and operative strategies. World J Gastroenterol 2009;15:1985–1989
- 11. M Robertson et al. Review of abdominal manifestations of cystic fibrosis in adult patients. RadioGraphics 2006; 26:679 690