

Abdominal Cocoon with Abdominal Tuberculosis: A Rare Cause of Bowel Obstruction— A Cross-Sectional Diagnostic Imaging Case Series

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Abstract

Abdominal cocoon/ encapsulating peritoneal sclerosis [EPS] is an infrequent etiology of acute / subacute bowel obstruction. It is caused by total / partial encasement or cocooning of the bowel by a thick fibro-collagenous membrane. The most common cause is chronic peritonitis which can be infective [most commonly abdominal Koch's], inflammatory, post-operative or post dialysis. This article reviews the imaging appearances of this condition in a series of four cases. Investigations include plain radiogram, ultrasound and cross-sectional imaging. Former two provide an index of suspicion for this diagnosis but mainstay imaging remains contrast enhanced computed tomography (CECT) as it demonstrates the location and the cause with greater detail, along with any associated complications. It demonstrated cocooning of the bowel with a sac, clumping of loops with minimal ascites. Operative findings and peritoneal aspiration biochemical tests are confirmative. Medical and surgical management are equally important for favorable prognosis and long term outcomes

Keywords: Abdominal Tuberculosis, CT Scan, Gastroenteroradiology

Introduction

Encapsulating peritoneal sclerosis [EPS] or abdominal cocoon is a rare understudied cause of bowel obstruction. It has also been known as sclerosing peritonitis, encapsulating peritonitis, and peritonitis chronica fibrosa incapsulata. ^[1]

Various common etiologies include: patients on peritoneal dialysis, granulomatous etiology such as abdominal tuberculosis, sarcoidosis, fibrogenic foreign material, malignancies and postoperative status. ^{[1][2][3]}

Clinical findings include palpable abdominal mass, fever and features of small bowel obstruction. Management strategy is usually surgical, hence an accurate preoperative diagnosis is essential.

Adhesiolysis and dissection of the cocoon remain the standard. Recently, there has been a shift towards conservative treatment strategies, in the form of immunosuppressants (corticosteroids, cyclophosphamide, azathioprine and mycophenolate mofetil)^[4], cessation of dialysis, renin-angiotensin-aldosterone system inhibitor therapy and tamoxifen therapy^[5].

What is already known?

This study is pertaining to a common disease entity, abdominal tuberculosis and its particular manifestation of abdominal cocoon. Although this is a rare presentation, there are studies demonstrating

the approach, clinical and pathological diagnosis along with its management.

What is new in this study?

The radiological manifestations given in previous studies do not provide specific diagnostic features for this condition. In our study, we have tried to delineate common findings and identified specific features to clinch the diagnosis as encapsulating peritonitis.

What are the future clinical and research implications?

With this study, clinicians and radiologists can make a specific accurate diagnosis without the hassle of added further investigations, this way patient can have a correct diagnosis with adequate and appropriate management.

Methods

After taking the requisite informed consent, retrospective review of medical records of 4 patients of EPS who were diagnosed and managed in our hospital from 2016-2019 was done. Follow up records of these patients were also included. This included discharge summaries, laboratory and histopathological reports on hospital information system, radiographic images on PACS and outpatient records from Medical records department. Findings were compared with the current available literature on this entity.

Cases:

Case 1

27 year old male patient came with complaints of pain abdomen in the left quadrant with associated nausea and vomiting. Ascitic fluid showed acid fast bacilli and Gene expert proved *M. tuberculosis* as positive. Plain radiogram showed non specific bowel dilatation. CECT abdomen showed that the entire small bowel loops were seen crowded in a thin walled sac like structure extending cranially from the level of cardia of stomach and inferiorly into the pelvic cavity. The superior mesenteric vein and artery supplying the small bowel loops were seen entering into the sac inferiorly to the transverse mesocolon. Few small bowel loops appeared dilated. Minimal free fluid was noted in the periphery of the sac [Fig. 1]. Diagnostic laparotomy showed peritoneal nodularity with cocooning of the whole small bowel. Dissection of cocoon done. Peritoneal biopsy

revealed *M. tuberculosis* positive. Patient responded to the treatment with a hospital stay of 15 days. On follow up, no recurrence noted in 1 year.

Case 2

36 year old male patient came with complaints of pain abdomen, abdominal distension and occasional vomiting. Patient was also a known case of abdominal tuberculosis with default treatment.

USG showed sluggish bowel movement. CECT abdomen showed dilated clumped small bowel in the mid and distal ileum seen encapsulated within a sac like structure in the infra-hepatic region and extending throughout the right side of the abdominal cavity with displacement of large bowel loops laterally, compressing the ascending colon, caecum and proximal ureter causing upstream dilatation of the right pelvicalyceal system. Low grade small bowel obstruction with small bowel faeces sign noted. However the oral contrast was seen opacifying the distal small bowel and the colon; suggesting subacute obstruction [Fig -2]. Patient underwent laparotomy which confirmed imaging findings, peritoneal biopsy confirmed tubercular etiology. Thereafter anti-tubercular therapy was started. Follow up after 6 months showed significant improvement in symptoms.

Case 3

16 year old female patient came with complains of pain abdomen, vomiting and loss of appetite and weight.

Chest X-ray showed right lower lobe consolidatory changes. USG showed ascites with thickened bowel loops in the lumbar quadrants. CECT showed clumping of distal jejunum and ileal bowel loops in a sac like structure noted in the left lumbar, right iliac and pelvic quadrants with surrounding heterogenous loculated fluid with compression of the ascending colon and pulling up of caecum. Few collapsed loops were showing pronounced arterial enhancement. Minimal free fluid noted in the pelvic cavity. [Fig 3] Patient was taken up for surgery and intraoperative findings showed moderate ascites, cocooning of the whole small bowel and plastered omentum. Peritoneal lavage and dissection of cocoon was done. Omental biopsy revealed positive for granulomatous infection. Patient showed significant improvement in symptoms.

Case 4

45 year old male patient came with complaints of pain abdomen, nausea, vomiting and constipation.

USG showed thickened bowel loops in the right iliac fossa. Contrast enhanced CT of the abdomen showed a clumped appearance of multiple ileal loops in the umbilical quadrant and right iliac fossa with a sac like structure around it and crowding of mesenteric vessels within. Ileo-caecal junction and large bowel appeared normal. No obvious free fluid / free air was seen. Peritoneal fluid aspiration was positive for granulomatous etiology. Patient was taken up for surgery- exploratory laparotomy which showed abdominal cocoon, total encapsulation of jejunum and ileum as well as omental thickening[Fig 4]. Adhesiolysis was done. Biopsy of omentum showed positive for non-specific granulomatous etiology. Patient withstood procedure well. Follow up after 3 months showed significant improvement in patient condition.

Case 5

37 year old male patient came with complaints of pain abdomen and vomiting.

USG showed thickened bowel loops in the right iliac fossa. Contrast enhanced CT of the abdomen showed clumped small bowel loops (proximal jejunal loops) noted in the left hemi-abdomen which is seen enclosed within a sac formed by thickened peritoneum. The sac is seen compressing the left ureter posteriorly and sigmoid colon & superior wall of urinary bladder inferiorly. The jejunal loops are seen in close proximity to the anterior abdominal wall in the left paramedian umbilical region – suggestive of adhesions Mild free fluid was seen. Peritoneal fluid aspiration was positive for acid fast bacilli. Patient was managed conservatively with intravenous fluids and naso-jejunal tube insertion.

Case 6

30 year old male patient came with complaints of acute pain abdomen, vomiting and constipation. Known case of carcinoma rectum post ileostomy and adjuvant chemotherapy, S/P stoma closure, USG showed thickened bowel loops in the region of post operative site.

Contrast enhanced CT of the abdomen showed a clumping of small bowel loops noted from the level of ileostomy site upto the proximal jejunum, Proximal to which there is dilatation of proximal jejunal loop, duodenum and stomach - obstruction-likely secondary to postoperative inflammatory adhesions. The clumped small bowel seen in close proximity with mid and lower anterior abdominal wall predominantly on left side-- possibility of interbowel, mesentery and omental adhesions.

Mild amount of free fluid was seen in the peritoneal cavity. Peritoneal fluid aspiration was positive for granulomatous etiology. Patient was managed conservatively with intravenous fluids and naso-jejunal tube insertion.

Discussion :

In our series, 6 cases presented with complaints of pain abdomen, nausea and vomiting. The findings on Xray and ultrasound were nonspecific and suggested some bowel pathology but could not be characterized further.

CECT with oral and intravenous contrast demonstrated certain pertinent features which offered an accurate preoperative diagnosis. Overall the CT features were distinctive and remarkably similar in these four cases. Imaging demonstrated features of clumping of bowel loops surrounded by a sac like membrane, compression of adjacent structures and subacute small bowel obstruction, common to all. The amount of small bowel involvement was variable ranging from total to segmental or even skip involvement . Large bowel was uninvolved. Some amount of ascites was present in all cases. Acute obstructive features typically seen in mechanical obstruction such as transitional zone, significant bowel dilatation and multiple fluid levels were not distinctive .There were no infarctions or gangrenous changes. Abdominal or peritoneal tuberculosis was the underlying cause in all cases .

The chronic inflammatory response incited by omental or mesenteric peritoneal lining involvement somehow resulting in inter bowel loop adhesions and encapsulation which may account for the characteristic findings . The surprising similarity of findings, lack of large bowel involvement and absence of significant acute features is however difficult to explain and may be related to a peritoneal

localizing process in response to a chronic granulomatous infection .

Histopathology in all cases revealed a fibro collagenous membrane with associated chronic inflammatory reaction which is similar to other studies describing this entity^[7].

A brief summary of all cases has been provided in Table I.

In our hospital, surgical management was the preferred treatment as the patients presented with features of subacute small bowel obstruction and persistence of symptoms despite conservative measures. The intraoperative findings confirmed the imaging features .

The importance of CT lies in accurate diagnosis and other details such as site and location of bowel involved, thickness of the sac, the proximal and distant aspect of the sac, associated compression of other structures and presence of small bowel obstruction.

Conclusion:

In conclusion encapsulating peritoneal sclerosis is a rare condition with characteristic imaging features permitting an accurate preoperative diagnosis on cross sectional imaging. The management of this condition is usually surgical with dissection of the sac and adhesiolysis resulting in excellent outcomes, although in some cases conservative management is also possible if the bowel obstruction is not acute .

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Table 1

Patient details	Presentation	CT findings	Biochemical/ HPE findings	Intraoperative findings
27/M	Pain abdomen, left quadrant, nausea and vomiting	Entire small bowel encased in a sac with dilated small bowel loops and free fluid	Ascitic fluid-positive for acid fast bacilli Gene Xpert - positive for M. tuberculosis Peritoneal biopsy: Positive for tubercular bacteria	Peritoneal nodularity, cocooning of small bowel, free fluid

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36/M	Pain abdomen, abdominal distension and occasional vomiting, Known case of pulmonary tuberculosis on default treatment	Dilated clumped ileal loops seen encapsulated within a sac like structure in the infrahepatic region and extending throughout the right side of the abdominal cavity with grade I small bowel obstruction and compression of adjacent structures	Ascitic fluid positive for acid fast bacilli	Thin sac with encapsulation of small bowel in right lumbar quadrant and iliac fossa .
16/F	Pain abdomen, vomiting and loss of appetite and weight.	Clumping of distal jejunum and ileal bowel loops in a sac like structure predominantly in the left lumbar, right iliac and pelvic quadrants with surrounding heterogenous loculated fluid	Omental biopsy revealed positive for granulomatous infection	Moderate ascites, cocooning of the whole small bowel and plastered omentum
47/M	pain abdomen, nausea, vomiting and constipation	Clumped appearance of multiple ileal loops in the umbilical quadrant and right iliac fossa, with crowding of mesenteric vessels with thin ill-defined membrane- like structure seen around the clumped bowel loops with no significant bowel dilatation.	Peritoneal fluid aspiration- positive granulomatous etiology Omental biopsy showed non-specific granulomatous etiology	Abdominal cocoon, total encapsulation of jejunum and ileum and omental thickening
37Y/M	K/c/o Abdominal tuberculosis and sclerosing encapsulating peritonitis. Post exploratory laparotomy and loop ileostomy status. For ileostomy reversal.	Evidence of clumped small bowel loops (proximal jejunal loops) noted in the left hemi-abdomen which is seen enclosed within a sac formed by thickened peritoneum. The sac is seen compressing the left ureter posteriorly and sigmoid colon & superior wall of urinary bladder inferiorly. The jejunal loops are seen in close proximity to the anterior abdominal wall in the left paramedian umbilical region - s/o adhesions	Ascitic fluid positive for acid fast bacilli	Managed conservatively.
30Y/M	Known case of carcinoma rectum post iliostomy and adjuvant chemotherapy S/P stoma closure	There is evidence of clumping of small bowel loops noted from the level of ileostomy site upto the proximal jejunum, Proximal to which there is dilatation of proximal jejunal loop, duodenum and stomach - obstruction- likely secondary to postoperative	Peritoneal fluid aspiration- positive granulomatous etiology	Managed conservatively.

		<p>inflammatory adhesions.</p> <p>The clumped small bowel seen in close proximity with mid and lower anterior abdominal wall predominantly on left side--possibility of inter bowel, mesentery and omental adhesions.</p> <p>Visualized large bowel shows symmetric circumferential wall thickening and edema suggestive of colitis.</p>		
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Figures

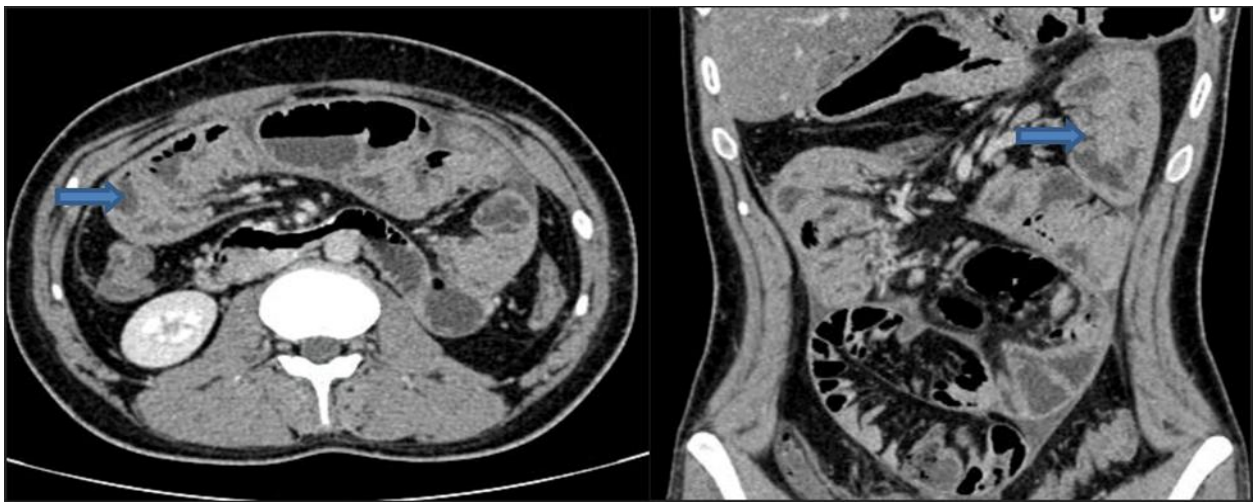


Fig. 1- Axial & Coronal CT of case 1 shows clumping of bowel loops within a sac with few dilated bowel loops



Fig. 2 - Axial CT of case 2 shows small bowel loops encased within a sac with dilation of bowel loops & Sagittal CT of the same case shows the sac causing mild compression of the left pelvic calyceal system



Fig. 3- Coronal CT of case 3 shows pelvic free fluid[➡], clumped bowel loops[➡] and compressed caecum [➡]

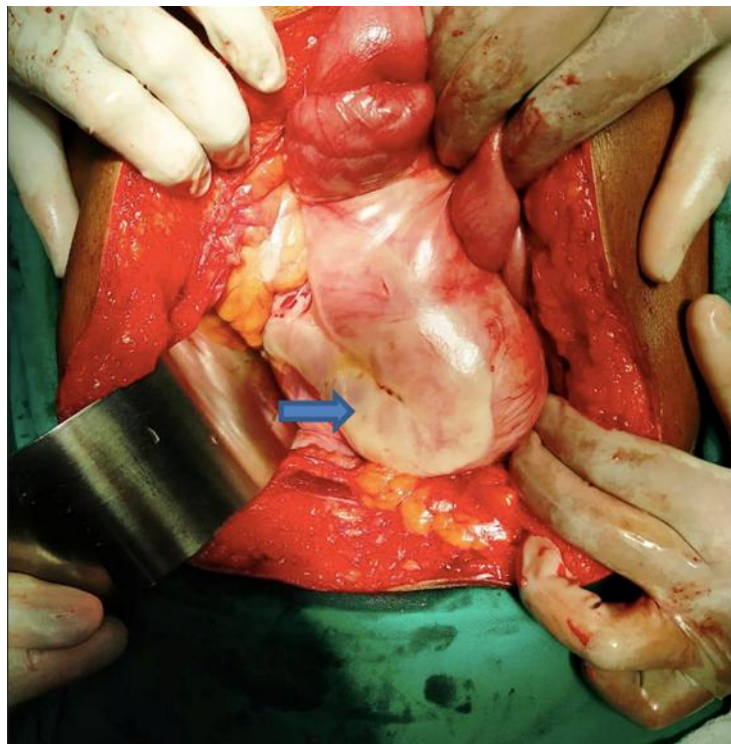


Fig.4 - Intraoperative image demonstrating a white sac around bowel loops