Case report

Trapped in the Cocoon : A Rare Case of Bowel Obstruction from Abdominal Cocoon Syndrome

ABSTRACT

Introduction: Abdominal cocoon syndrome (ACS), or encapsulated peritoneal sclerosis (EPS), is a rare cause of small bowel obstruction characterized by fibrous encapsulation of the intestines. It often presents with nonspecific clinical and radiologic features. The exact etiology remains unknown.

Case Presentation: A 58-year-old male presented with clinical signs of complete small bowel obstruction. CT imaging revealed clustered small bowel loops within a sac-like structure. Exploratory laparotomy, performed for abdominal cocoonwith small bowel obstruction, demonstrated that the small bowel was encased in a thick fibrocollagenous membrane with dense adhesions, without evidence of ischemia. Adhesiolysis was successfully performed to release the trapped bowel. Histopathology confirmed EPS without evidence of malignancy or tuberculosis. The patient remained asymptomatic at one-year follow-up.

Discussion: Preoperative diagnosis of the rare ACS is challenging. Although CT imaging may suggest the condition through characteristic findings, definitive diagnosis is typically made intraoperatively. Surgical excision of the fibrous membrane with meticulous adhesiolysis remains the treatment of choice, whether performed laparoscopically or via open surgery, and in both elective and urgent settings. Histopathologic evaluation is essential for distinguishing between primary and secondary forms, with subsequent management guided by the histopathologic findings.

Conclusion: Abdominal cocoon syndrome (ACS) causing small bowel obstruction is a rare condition. While characteristic CT findings can assist in preoperative

diagnosis, definitive diagnosis is established intraoperatively. Non-operative management is generally unsuccessful and may lead to complete obstruction or bowel ischemia. The true etiology of ACS requires further investigation to guide definitive treatment.

Keywords: Abdominal cocoon syndrome, Encapsulated peritoneal sclerosis, Small bowel obstruction, Adhesiolysis

1. INTRODUCTION

Abdominal cocoon syndrome (AxCS), also known as encapsulated peritoneal sclerosis (ESP), is a rare condition characterized by the progressive formation of a dense fibrocollagenous membrane encasing the small bowel within the peritoneal cavity, leading to reduce interbowel loop space, impaired peristalsis and intestinal obstruction (1, 2), arising from recurrent episodes of low grade or subclinical peritonitis (2). Over time, this condition progresses to sclerosis and thick membrane formation, leading to the development of a cocoon-like structure (1).

The syndrome is classified into two types: **primary (idiopathic)** and **secondary**. Idiopathic ACS, more prevalent in tropical and subtropical regions, commonly affects young individuals—particularly females—without any identifiable predisposing factors (2). In contrast, secondary ACS arises as a consequence of chronic peritoneal inflammation associated with conditions such as prior abdominal surgery, peritoneal dialysis, intra-abdominal infections (including tuberculosis), organ transplantation, autoimmune disease, or prolonged medication use (1, 2).

Preoperative diagnosis of ACS remains challenging due to its nonspecific clinical presentation, often mimicking other causes of small bowel obstruction. Patients typically present with recurrent episodes of abdominal pain, nausea, vomiting, distension, and constipation (clinical small bowel obstruction). Although computed tomography (CT) and magnetic resonance imaging (MRI) may demonstrate suggestive findings—such as clustered small bowel loops encapsulated within a sac-like structure or the characteristic “cauliflower sign”—definitive diagnosis is usually established intraoperatively (3, 4). Awareness of this rare entity is crucial, as timely surgical intervention with excision of the fibrous membrane and adhesiolysis - whether performed laparoscopically or via open surgery, and in both elective and urgent settings - can significantly improve patient outcomes and prevent unnecessary bowel resection when obstruction occurs (5).

2. CASE PRESENTATION

A 58-year-old male, a known case of abdominal cocoon diagnosed by CT scan due to chronic abdominal pain, presented to the Acute Care Surgery service with progressive generalized abdominal pain, nausea, vomiting and obstipation persisting for more than 6 hours. Physical examination revealed that he was afebrile with stable vital signs. Abdominal

examination showed mild distention with hyperactive bowel sounds above the umbilicus and a palpable bowel loop, but no tenderness or peritoneal signs. Digital rectal examination revealed an empty rectum. Laboratory investigations were within normal limits except for mild metabolic acidosis (bicarbonate 20 mmol/L). Abdominal radiographs showed a soft tissue mass-like lesion at left-sided abdomen and multiple air-fluid levels at mid abdomen (Fig.1). Complete small bowel obstruction was diagnosed, and contrast-enhanced CT was performed, revealing a sac-like encapsulated area in the left to mid-abdomen with enhancing peritoneal lining—findings that are consistent with abdominal cocoon syndrome. There was also a closed-loop small bowel obstruction within the sac (Fig 2). The patient underwent exploratory laparotomy with adhesiolysis and incidental appendectomy. Intraoperatively, the entire small bowel was encased in a thick fibrous whitish capsule with dense adhesions and a transition point at the distal jejunum; bowel was viable with no masses or lesions. Approximately 50 mL of clear yellow ascites was noted (Fig 3). The postoperative course was uneventful, and the patient was safely discharged home without recurrence at 1-year follow-up. Histopathological examination revealed thickened fibrocollagenous tissue with lymphoplasmacytic infiltration, compatible with encapsulated peritoneal sclerosis, without granuloma, TB-related, malignancy, or features of IgG4-related disease. The patients' data are summarized along with a literature review in Table 1.

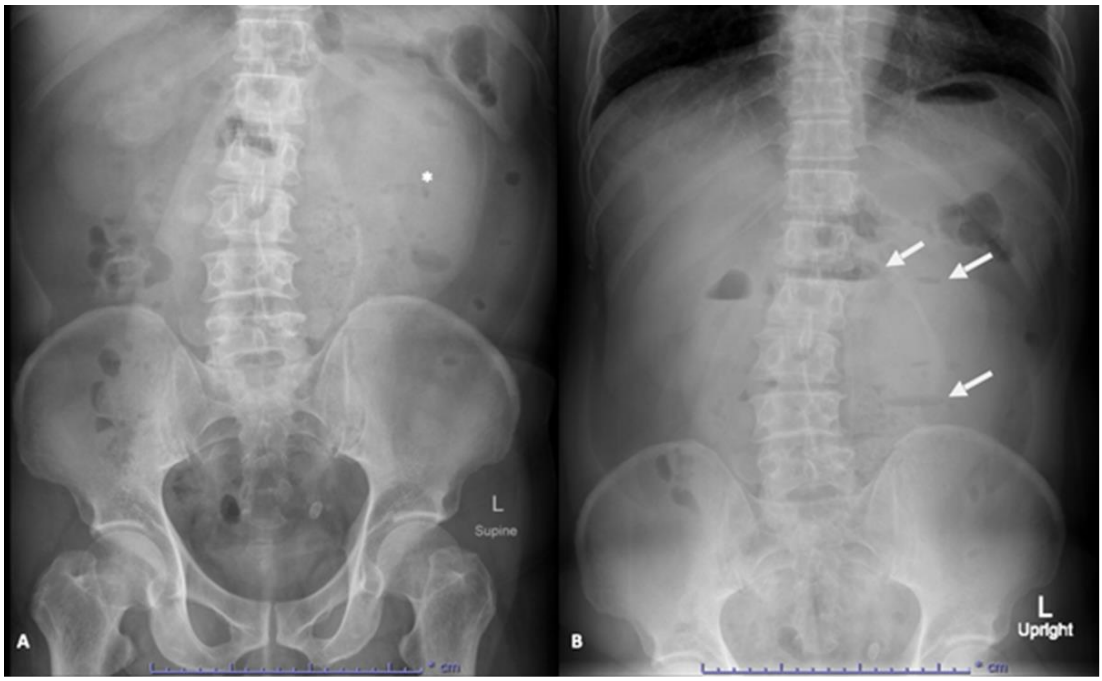

Fig.1 Supine (A) and upright (B) abdominal radiographs showed a soft tissue mass-like lesion at left-sided abdomen (asterisk) and multiple air-fluid levels at mid abdomen (arrows).

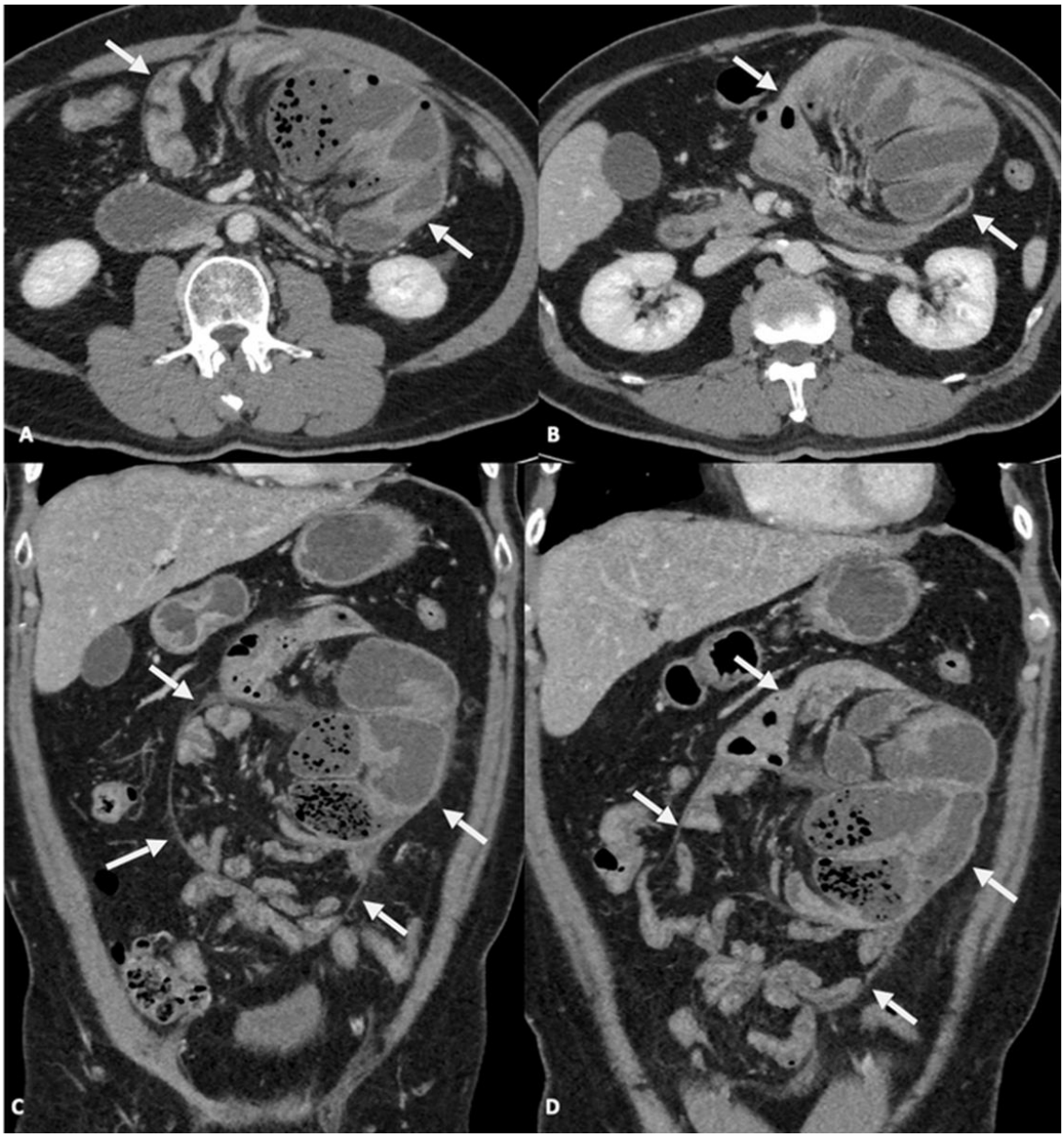

Fig. 2 Axial (A and B) and coronal-reformatted (C and D) CT images showed a sac-like encapsulated area with enhancing peritoneal lining at left to mid abdomen (arrows). Also note closed-loop small bowel obstruction with in the sac.

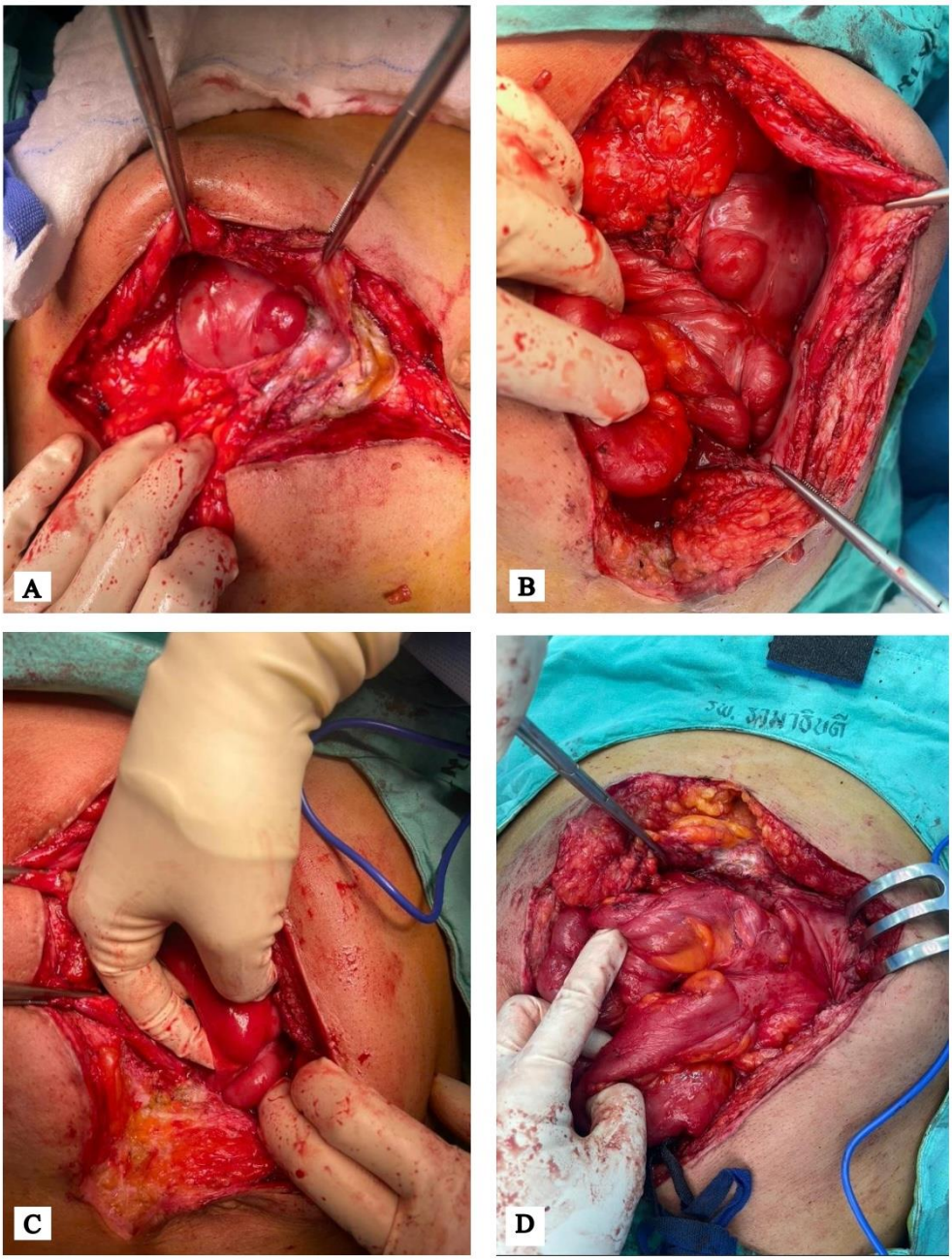

Fig. 3 Intraoperative Findings: (A) the small bowel was encased in a thick fibrous whitish capsule (B) dense adhesions between bowel loop and fibrocollagenous tissue (C) a transition point at the distal jejunum (D) viable bowel with no masses or lesions

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Table 1 Review literature of the reported cases of Abdominal Cocoon Syndrome

Study Author(s), Year	Age	Gender	Underlying	Presentation	Key CT feature	Operation	Intraoperative findings	**Primary causes** Infectious/ Autoimmune related disease	Outcome	Complications
Current Case report	58	Male	None	- Obstruction - Generalized abdominal pain with nausea & vomiting	Sac-like encapsulated area in the left to mid-abdomen with enhancing peritoneal lining with closed-loop small bowel obstruction in the sac	Explore laparotomy with adhesiolysis with appendectomy	The entire small bowel was encased in a thick fibrous whitish capsule with dense adhesions and a transition point at the distal jejunum with 50 mL of clear yellow ascites	No	Full recovery	No
Fazeela Bibi et al., 2025 (9)	15	Male	None	- Obstruction - Acute abdominal pain, nausea, vomiting and constipation	Encapsulation of small intestine loops within a sac-like membrane, with a concurrent gut malrotation (left-sided displacement of the colon)	Explore laparotomy with adhesiolysis and appendectomy	Abdominal viscera encased within at thick fibrous membrane containing ascitic fluid	No	Full recovery	No
Hong-Jun Zheng et al., 2025 (10)	10	Girl	congenital ileal atresia S/P emergency surgery	- Obstruction - Abdominal pain, vomiting, and cessation of flatus and defecation	Soft tissue structures surrounding the small intestine and exhibiting a distinctive "accordion-like" appearance causing intestinal obstruction	- **Failed NOM** - Explore laparotomy with fibrous membrane dissection	Small intestine, colon, and liver coverd with a dense, translucent fibrous membrane	No	Full recovery	No
Zainab Alammar et al., 2025 (11)	56	Male	None	- Obstruction - Generalized abdominal pain, obstipation, and vomiting	Clustered ileal loops in the pelvis with multiple transitional zones and dilated proximal small bowel loops	Exploratory laparotomy with adhesiolysis and small bowel resection with side-to-side enteroenterostomy	A thick, pale peritoneum and whitish turbid fluid with encapsulated small bowel by dense adhesions	No	Full recovery	- Collection - Fascia dehiscence
Faisal F Alnazawi et al., 2025 (12)	31	Male	None	Recurrent abdominal pain and abdominal distention with unintentional significant weight loss	A clustering of small bowel loops likely encapsulated within a sac-like structure	- **Failed NOM** - Explore laparotomy with adhesiolysis with appendectomy	Encapsulated small bowel with a thick fibrous capsule on the right and left sides of the abdomen, with the adhesions within the capsule, no peritoneal fluid	No	Full recovery	Bowel ileus
Laicheng Zhu et al., 2025 (Shanghai, China) (13)	60	Male	None	- Recurrent obstruction - Abdominal distention with pain, flatulence, obstipation	Smooth crescent-shaped rim circling the bowel cluster, a feature highly suggestive of a fibrous capsule.	- **Failed NOM** - Laparoscopic **convert** to laparotomy and adhesiolysis	Small bowel adhesions forming a conglomerate mass with fibrinous membrane covering both intestinal serosa and mesentery and retracted omentum encasing the gastric greater curvature and transverse colon	No	Full recovery	No
Louis Britten-Jones et al., 2025 (Australia) (14)	52	Male	Alcoholic liver cirrhosis Child-Pugh C	- Acute confusion, abdominal pain, and intractable vomiting	Multiple dilated small bowel loops with air-fluid levels, encapsulated within thickened peritoneum with collapsed distal bowel loops	NOM due to high risk for surgery		No	Death	No
Anass Barchid et al., 2025 (Morocco) (15)	35	Male	None	- Obstruction - Generalize abdominal pain, vomiting, absence of stool and gas passage, and general malaise	A large pneumoperitoneum, a wall defect in an intestinal loop in the left lower quadrant, and small bowel distension, with loops appearing encapsulated within a thin, contrast-enhanced peritoneal capsule, resembling a cocoon	Explore laparotomy with small bowel resection with double ileostomy	A fibrous capsule surrounding the entire small intestine, with multiple adhesions between the loops of the small intestine and between the intestine and the capsule, a perforation at 50 cm from the first jejunal loop, causing leakage of digestive fluid	Intestinal tuberculosis with granulomatous inflammation	Full recovery	No

Menberu et al., 2024 (Ethiopia) (16)	60	Male	None	- Obstruction - Abdominal pain, vomiting, obstipation and abdominal distension	A centrally located distended bowel loop with multiple air-fluid levels from plain abdominal radiograph (no CT)	Explore laparotomy with adhesiolysis with resected encapsulated small bowel with end-to-side ileotransverse anastomosis	The distal ileum was adherent with a whitish, thick fibrous band forming a mass, distal ileum was accidentally perforated during manipulation	No	Full recovery	No
MN Almouwalld, 2024 (SAU) (17)	55	Female	None	- Progressive abdominal distension, abdominal pain, and significant weight loss	"Cocoon-like" encapsulation of the small bowel loops with associated ascites and peritoneal thickening, suggestive of encapsulating peritonitis sclerosis	- **Failed NOM** Explore laparotomy with adhesiolysis	Thick fibrous capsule encapsulating the small bowel	No	Full recovery	No
Hassine HB et al., 2024 (Tunisia) (18)	67	Male	None	- Obstruction - Constipation, vomiting, and abdominal pain	Thick fibro-collagenous membrane centrally located in the abdominal cavity, with collapsed large bowel loops and minimal surrounding fluid	Explore laparotomy with adhesiolysis	Encapsulation of the entire small bowel in a thickened sclerosing membrane	No	Full recovery	No
Emrah Akin et al., 2023 (Turkey) (19)	63	Male	None	- Abdominal pain, nausea, and vomiting	A thin membrane surrounded the small intestines in the periumbilical region with localized free fluid and free air particles with a 3 x 6 cm abscess in the proximal jejunum mesentery localization	Laparoscopic **converted** to laparotomy with adhesiolysis with segmental small bowel resection	A smooth surfaced membrane with intensive adhesions to the small intestine with perforation site of small bowel at 90 cm away from the Treitz ligament due to the foreign body (fishbone)	No	Full recovery	No

3. DISCUSSION

Abdominal cocoon syndrome (ACS), also known as encapsulated peritoneal sclerosis (EPS) is a rare disease characterized by partial or complete encasement of the small intestine by a thick, fibrocollagenous membrane, resulting in varying degrees of intestinal obstruction (1). Despite over a century since its initial description, ACS remains a diagnostic challenge owing to its rarity and nonspecific clinical presentation. Patients typically present with symptoms of small bowel obstruction which often mimic those of more common causes of obstruction (1). A summary of the literature review on the presentations, imaging, management, causes, and outcomes of ACS is presented in Table 1. Our literature review found that the age of onset varies widely, ranging from 10 to 67 years, although most cases occur after the age of 40, with a mean age of 42 years. The predominant clinical presentation, observed uniformly across reported cases, is small bowel obstruction including our reported case.

Preoperative diagnosis of ACS is notoriously difficult due to the nonspecific nature of clinical and imaging findings. While plain abdominal radiographs often show features consistent with bowel obstruction, they are not diagnostic. Contrast-enhanced computed tomography (CECT) remains the modality of choice for preoperative assessment (1, 3).

From the review and our reported case, we found typical CT finding of clustered small bowel loops encased by a thin or thick membrane, the presence of ascitic fluid between bowel loops, peritoneal thickening, and occasionally the *bottle gourd sign*—a dilated second and third part of the duodenum caused by distal encasement (3, 4) which can assist in establishing the diagnosis. In our reported case, CT imaging demonstrated a sac-like

encapsulated small bowel segment with a transition point at the distal duodenum and reduced wall enhancement, findings highly suggestive of ACS.

Non-operative management of small bowel obstruction in ACS is rarely successful and carries a high risk of recurrent or complete obstruction. Based on our review, exploratory laparotomy remains the operative approach of choice, as laparoscopic attempts are often unsuccessful and frequently require conversion to open surgery. Definitive diagnosis is typically made intraoperatively, as most patients are diagnosed during exploratory laparotomy after failure of conservative management. Intraoperative findings commonly include the small bowel completely or partially enclosed by a whitish, fibrotic membrane, often accompanied by serous ascites and dense interloop adhesions. The principal surgical objective is the careful excision of the fibrous encapsulating membrane and meticulous adhesiolysis to free the entrapped bowel loops while preserving intestinal integrity. In large reviews of primary EPS, more than 95% of symptomatic patients ultimately required surgery after failed conservative management, with significantly better outcomes in primary compared to secondary forms (1, 7).

Histopathology remains the gold standard for confirming the diagnosis and distinguishing ACS from mimicking conditions such as peritoneal carcinomatosis and tuberculous peritonitis. In endemic regions, tuberculosis must always be excluded, as peritoneal TB can present with a thick fibrinous exudate mimicking the fibrotic cocoon seen in ACS.

From the review, pathologic reports indicate that most cases arise from primary cause (idiopathic) including our reported case. ACS is classified into two forms: primary (idiopathic) and secondary. The idiopathic form occurs without an identifiable underlying cause and is most frequently reported in young females(1, 2, 6). The pathogenesis remains unclear, though theories suggest the involvement of cytokine-mediated fibroblast activation and angiogenic factors leading to peritoneal fibrosis. Secondary ACS, on the other hand, develops secondary to chronic peritoneal inflammation associated with previous abdominal surgery, peritoneal dialysis, recurrent peritonitis, tuberculosis, liver transplantation, or prolonged medication use, such as β-blockers (1).

Postoperative complications include transient ileus, early postoperative bowel obstruction, and surgical site infection, which are generally self-limiting (7, 8). For secondary EPS, treatment of the underlying cause remainsessential. Currently, there are no established protocols for management of secondary EPS. Early prophylaxis of EPS is recommended, focusing on glucocorticoids, tamoxifen and immunosuppressive agents (1). However, dosing and duration of these medical interventions are not well-defined due to the limited evidence of large clinical trials. Therefore, the management of both primary and secondary encapsulating peritoneal sclerosis (EPS) requires a comprehensive, multidisciplinary approach tailored to each patient’s clinical condition, underlying etiology, and disease severity.

4. CONCLUSION

Abdominal cocoon syndrome (ACS) causing small bowel obstruction is a rare condition. While characteristic CT findings can assist in preoperative diagnosis, definitive diagnosis is established intraoperatively. Non-operative management is generally unsuccessful and may

lead to complete obstruction or bowel ischemia. The condition is predominantly idiopathic, and postoperative outcomes are generally favorable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

CONSENT

All authors declare that 'written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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DEFINITIONS, ACRONYMS, ABBREVIATIONS

ACS: Abdominal Cocoon syndrome, **EPS**: encapsulated peritoneal sclerosis

APPENDIX