



## Case report

## Appendiceal knotting causing small bowel obstruction: A rare case report

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## ABSTRACT

**Introduction and importance:** Appendicitis causing intestinal obstruction by forming a knot around a small bowel is uncommon. Preoperative diagnosis is challenging as the typical presentations of appendicitis are not usually seen. The diagnosis of appendicular knotting is usually an intraoperative surprise.

**Case presentation:** A 34-year-old male patient (BMI-20.86 kg/m<sup>2</sup>) presented to the surgical emergency unit with colicky central abdominal pain of 2-days duration, which later involved the whole abdomen. In association with this, he had a history of frequent vomiting of ingested matter which later became bilious. The abdominal examination revealed diffuse abdominal tenderness with guarding and rigidity. On midline exploratory laparotomy, the inflamed appendix which was adherent to the distal part of the ileum was observed. The appendix and the encircled segment of the distal ileum were both gangrenous, and the patient underwent resection of the bowel segment in addition to appendectomy.

**Clinical discussion:** Whenever an appendix wraps around an intestine or its tip adheres with small bowel, cecum, or posterior peritoneum forming a ring-like structure, and a segment of a bowel herniates through an opening can cause a closed-loop obstruction with or without strangulation. The management for ileo-appendicular knotting associated with gangrenous bowel could be appendectomy and resection of the bowel segment. Postoperatively, the patient had developed diarrhea caused by ileocecal resection, which later subsided by medication.

**Conclusion:** Ileo-appendicular knotting is a rare cause of small intestinal obstruction, and it's challenging to diagnose during the preoperative period. As surgeons dealing with acute abdomen in routine clinical practice, knowledge of this unusual case is helpful for clinical suspicion and evidence-based management.

## 1. Introduction

Acute appendicitis (AA) and small bowel obstruction (SBO) are common causes of acute abdomen [1–3]. However, SBO [4] caused by an inflamed appendix forming a knot around a small bowel is rare. Appendiceal knotting (AK) was first described by Hotchkiss as early as 1901; however, limited cases have been reported in the literature.

Preoperative diagnosis of AK as a secondary cause of SBO is quite challenging. AK has no more specific features other than other causes of SBO. The misdiagnosis could be explained by the rarity of the cases and accompanied by a paucity of clinical experience. Though the radiologist experience plays a vital role, scarcity of imaging modalities like abdominal CT scan limits the diagnostic capacity, particularly in resource-limited settings [4–7].

Here, we report a case of a 34-year-old male patient who presented with SBO secondary to ileo-appendicular knotting that was not detected

preoperatively and confirmed during the intraoperative period. The management option is determined by intraoperative findings.

This study was reported in line with SCARE 2020 criteria [8] and registered according to the Declaration of Helsinki 2013 at [www.researchregistry.com](http://www.researchregistry.com) with the research registry UIN: research registry 7705.

## 2. Case presentation

A 34-year-old male patient was admitted to the emergency surgical unit with a complaint of colicky central abdominal pain initially and later involving the whole abdomen for the last 2 days. This was associated with nausea and frequent vomiting of ingested matter which later becomes bilious. Otherwise, the patient had no previous history of abdominal surgery, abdominal trauma, prior medical illness, family history of similar illness, or history of any drug intake.

On physical examination, vital signs revealed a blood pressure of

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Fig. 1. Erect plain abdominal X-ray showing dilated small bowel with multiple air-fluid levels.

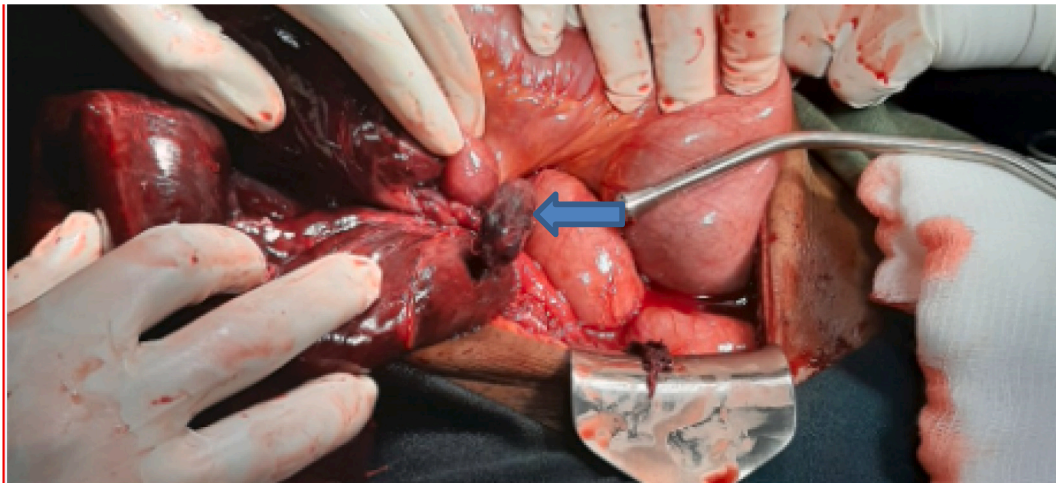


Fig. 2. Shows the Appendicular Knot around the distal ileum.

130/70 mmHg, a pulse rate of 128/min, a respiratory rate of 28/min, and a temperature of 36.8C. Anthropometric measures showed a weight of 61 kg, a height of 171 cm, and a body mass index (BMI) of 20.86 kg/m<sup>2</sup>. On abdominal examination, there was diffuse abdominal tenderness with guarding and rigidity. Complete blood count (CBC) revealed leukocytosis (17600), and 87% were neutrophils. Abdominal ultrasound has shown distended bowel loops, and intraperitoneal fluid, but the appendix was difficult to be visualized. A plain erect abdominal X-ray showed features of small bowel obstruction with distended small bowels and multiple air-fluid levels (Fig. 1).

With the preoperative diagnosis of SBO secondary to gangrenous small bowel volvulus and resuscitated with crystalloid solution, the

patient was taken to an operating theater for emergency exploratory laparotomy.

After sterile technique and draped, midline vertical incision was performed. Intraoperatively, we found an inflamed appendix wrapped around the distal ileum. The inflamed appendix formed a knot or tourniquet around 50 cm distal ileum and caused a closed-loop SBO. The appendix and the encircled segment of the ileum were gangrenous (Fig. 2). The tip of the inflamed appendix was adherent to the cecum, forming a knot around the distal 50 cm ileum resulting in a distended small bowel proximal to the knotting (Fig. 3). Even after an appendectomy, the ileum failed to regain its viability; as a result, we resected the gangrenous ileum (Fig. 4).

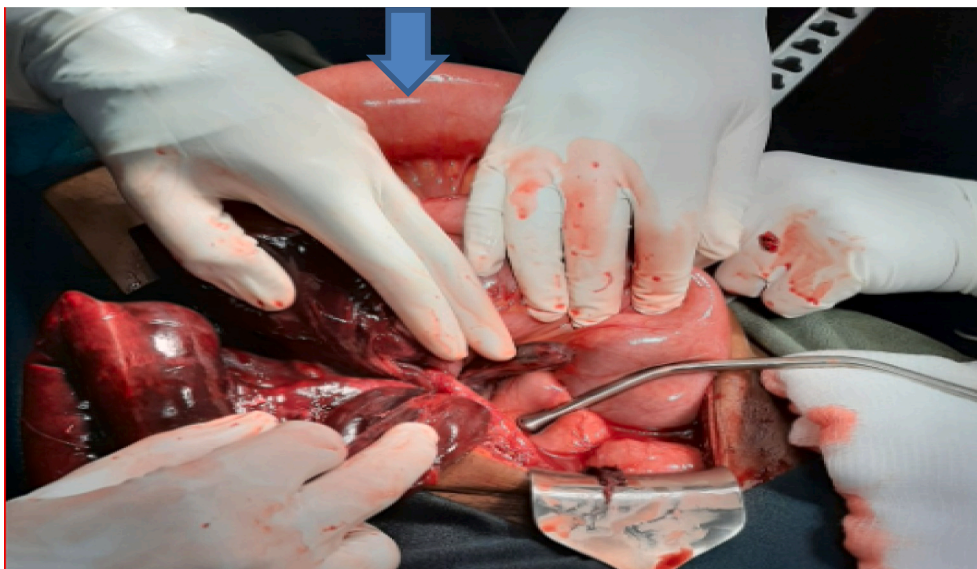


Fig. 3. Shows the proximal bowel distension due to obstruction by a wrapped appendix.

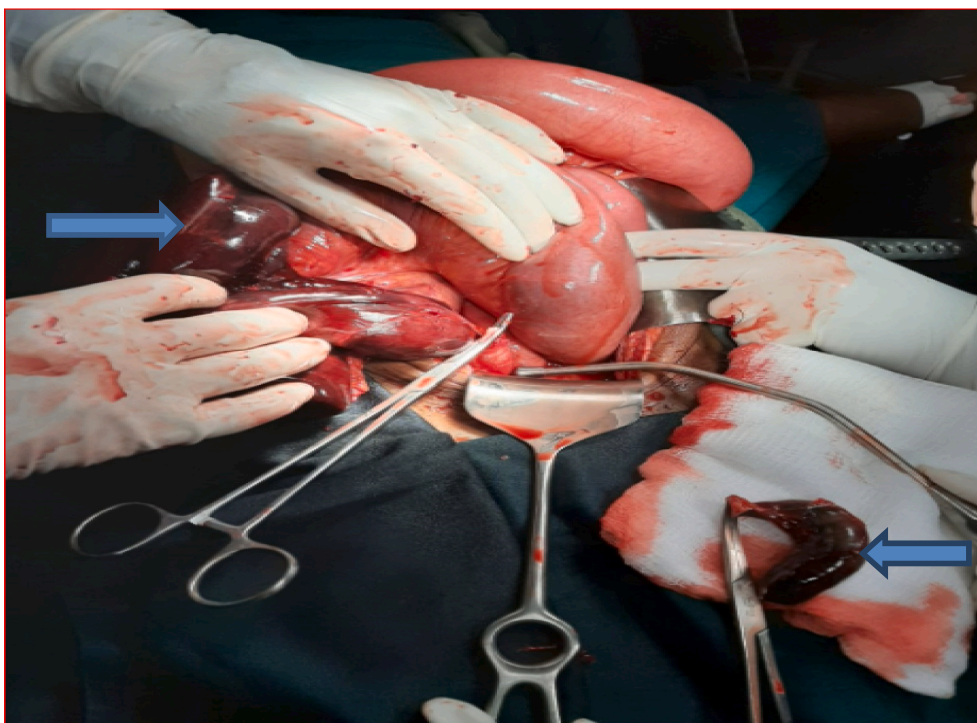


Fig. 4. Shows the dark ileum even after appendectomy.

Since there was no remaining viable ileum distal to the resected gangrenous ileal part and ileocecal anastomosis is not recommended, the cecum was resected together with the gangrenous ileum, and end to end ileo-ascending colon anastomosis was performed. Postoperatively, the patient had an uneventful recovery other than occasional watery diarrhea. The patient was discharged home on the 7th postoperative day; with Loperamide tablet (1/day), and diarrhea stopped after three weeks.

### 3. Discussion

Appendicitis can cause small bowel obstruction by its adynamic,

mechanical effects, **or by** resulting in mesenteric ischemia. The mechanical effects can cause non-strangulated or strangulated bowel [12]. However, a wide range of underlying etiologies are known to cause SBO, an AA causing SBO is extremely rare, and the reported cases were few works of literature [3,4].

Similar to our cases, multiple studies had reported ileo-appendicular knotting as one of the rare mechanical causes of small bowel obstruction [4-7,9,10]. It happens whenever an appendix wraps around an intestine, or its tip adheres with small bowel, cecum, or posterior peritoneum forming a ring-like structure [7,9]. The knotting happens as a segment of a bowel herniates through an opening formed when the tip of the appendix is adherent to the adjacent structures [9].



In agreement with another case report, we failed to diagnose the ileo-appendicular knotting preoperatively and we detected it during laparotomy [6].

An abdominal CT scan with contrast might suggest some information regarding secondary causes of SBO [14,15]. However, as our setup lacks this imaging, referring to other hospitals for CT scans might complicate the outcomes in a patient who developed generalized peritonitis. As straightforward clinical parameters and abdominal x-ray suggested gangrenous SBO: The surgeon performed immediate exploratory laparotomy.

The management of ileo-appendicular knotting depends on the parts of the bowel involved and the level of strangulation. It ranges from appendectomy to the resection of gangrenous bowel [11]. Unlike other similar case reports, our patient developed occasional watery diarrhea from the 2nd (day of feeding resumption) to the 3rd week postoperative day. After possible infectious causes of diarrhea were ruled out, the patient received loperamide (1/day) until diarrhea subsided. This observed change might occur due to the resection of the ileocecal valve that slows the transit of small bowel contents [13].

The strength of our case report might be, we early diagnosed gangrenous SBO with available resources and performed timely surgical intervention. Secondly, the treatment for postoperative diarrhea was successful. In our hospital, histopathological exams, and abdominal CT scans were unavailable. Despite substandard imaging diagnostic modalities are used, we believe this case report will provide input for surgical practice and the scientific world.

#### 4. Conclusion

Appendicular knotting is a rare mechanical cause of SBO. The resection of the ileocecal valve could cause postoperative diarrhea. As surgeons dealing with acute abdomen in routine clinical practice, knowledge of this unusual case is helpful for clinical suspicion and subsequent management.

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Ethical approval is not required to write a case report.

#### Consent

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 Editor-in-Chief of this journal on request.

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Dereje Zewdu.

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#### CRediT authorship contribution statement

Mekete Wondwosen: contributed to study concept and design, data collection, and manuscript writing.

Temesgen Tantu: contributed to data interpretation and writing the paper.

Dereje Zewdu: contributed to data collection, writing, and reviewing the manuscript.

#### Declaration of competing interest

None.

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#### References

- [1] M.S. Obsa, B.G. Adema, G.M. Shanka, E.A. Lake, G.A. Azeze, R.O. Fite, Prevalence of acute appendicitis among patient admitted for acute abdomen in Ethiopia: systematic review and meta-analysis, *Int. J. Surg. Open* 26 (2020) 154–160.
- [2] M. Ferris, S. Quan, B.S. Kaplan, N. Molodecky, C.G. Ball, G.W. Chernoff, N. Bhala, S. Ghosh, E. Dixon, S. Ng, G.G. Kaplan, The global incidence of appendicitis: a systematic review of population-based studies, *Ann. Surg.* 266 (2) (2017) 237–241.
- [3] U. Soressa, A. Mamo, D. Hiko, N. Pentahun, Prevalence, causes, and management outcome of intestinal obstruction in Adama Hospital, Ethiopia, *BMC Surg.* 16 (1) (2016) 1–8.
- [4] G. Miller, J. Boman, I. Shrier, P.H. Gordon, Etiology of small bowel obstruction, *Am. J. Surg.* 180 (1) (2000) 33–36.
- [5] L.W.V. Hotchkiss, Acute intestinal obstruction following appendicitis. A report of three cases successfully operated upon, *Ann. Surg.* 34 (5) (1901) 660.
- [6] M. Jg, K. Sa, A. Lj, A. Ea, Intestinal obstruction caused by appendicitis: a systematic review, *J. West Afr. Coll. Surg.* 7 (3) (2017) 94.
- [7] C. Chatterjee, S. Dash, S. Gupta, S. Ghosh, Appendiceal knotting causing small bowel strangulation, *J. Res. Med. Sci.* 19 (10) (2014) 1016.
- [8] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230.
- [9] A.T. Kifle, S. Tesfaye, Appendico ilial knotting: a rare cause of small bowel obstruction, *J. Surg. Case Rep.* 2018 (5) (2018), rjy088.
- [10] I. Lawani, C.Y. Houndje, Y.I. Souaïbou, D.G. Gbessi, S.G. Attolou, F.H. Gnangnon, K.S. Komadan, H. Koco, F.M. Dossou, J.L. Olory-Togbé, Internal hernia strangulated on appendicular tourniquet: a case report of an exceptional anomaly of the appendix revealed by a rare hernia, *Surg. Case Rep.* 5 (1) (2019) 1–4.
- [11] O. Malý, J. Páral, Appendicitis as a rare cause of mechanical small-bowel obstruction: a literature review of case reports, *Int. J. Surg. Case Rep.* 29 (2016) 180–184.
- [12] P.G. Mohandas, L. Bhandari, Appendicitis as a cause of intestinal strangulation: a case report and review, *World J. Emerg. Surg.* 4 (2009) 34.
- [13] A.O. Singleton Jr., D. Redmond, J.E. McMurray, Effects of ileocecal resection on small bowel transit and absorption, *Ann. Surg.* 159 (5) (1964) 690.
- [14] E.J. Balthazar, M.E. Liebeskind, M. Macari, Intestinal ischemia in patients whom small bowel obstruction is suspected: evaluation of accuracy, limitations, and clinical implications of CT in diagnosis, *Radiology* 205 (2) (1997) 519–522.
- [15] M. Assenza, G. Ricci, P. Bartolucci, C. Modini, Mechanical small bowel obstruction due to an inflamed appendix wrapping around the last loop of ileum, *G Chir.* 26 (6–7) (2005) 261–266.