



Case Report

Jejunal closed-loop obstruction without prior abdominal surgery during COVID-19 ICU admittance: A case report

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ARTICLE INFO

Keywords:

Jejunal closed loop obstruction

Virgin abdomen

COVID-19

Adhesion

Case report

Prone position

ABSTRACT

Introduction: and importance: Closed-loop obstruction is a specific case of small bowel obstruction in which two sites of the bowel obstruct at one adjacent location. This can result in strangulation with high mortality. This condition is most often observed after abdominal surgery. The exact underlying pathology in patients without prior abdominal surgery is still largely unclear, and only scarce literature on the role of COVID-19 or long-term prone position is available.

Case presentation: A 74-year-old male patient without prior abdominal surgery was presented to the emergency department with pulmonary and gastro-intestinal symptoms of COVID-19. The patient was known to have diverticulosis of colon and sigmoid. After a complicated ICU course, the patient developed a jejunal closed loop obstruction, and a diagnostic laparoscopy was performed. Fixation of the omentum to the retroperitoneum was released, without observation of further adhesions, bowel torsion or ischemic bowel. Further abdominal course was uncomplicated, however, unfortunately the patient died following pulmonary deterioration.

Clinical discussion: The differential diagnosis of small bowel obstruction is extensive; however, adhesions are most often observed. In patients without prior surgery, also adhesions are observed, mainly caused by earlier infections. There might be a role for abdominal COVID-19 infection and prolonged prone position in the emergence of adhesions; however, literature is lacking. Alternatively, asymptomatic diverticulitis might have led to adhesion formation.

Conclusion: Closed loop obstructions in patients without prior abdominal surgery are uncommon and post-infectious abdominal status might cause adhesions. It is unclear whether abdominal manifestations of COVID-19 and prolonged prone position can also cause adhesions and, thereby, small bowel obstructions.

1. Introduction and importance

Small bowel obstruction is presented as partial or complete blockage of the small intestine and carries a broad differential diagnosis; however, adhesions remain the most common etiology (65%) [1]. This clinical condition accounts for 20% of acute surgical procedures [2].

A small bowel obstruction can also present as a closed loop, in which two sites of the bowel are obstructed at one adjacent location, resulting in a closed loop. In the colon, closed loop obstruction is known as volvulus. The differential diagnosis of a closed loop obstruction in the small bowel consists of adhesions, internal herniation or bowel torsion. Closed loop obstruction results in strangulation in 10% of the cases and

this situation has a mortality of 10–35% [3]. Therefore, strangulation should be excluded immediately, and progression of a closed loop into strangulation should be kept in mind.

The Coronavirus disease 2019 (COVID-19) is a current ongoing pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Most patients present with fever, respiratory symptoms, fatigue, myalgia, headache, and in some cases, loss of smell and taste and nausea or vomiting are observed [4]. To the best of our knowledge, no clear correlation between COVID-19 infection and small bowel obstruction is available in the literature. We describe a case of a patient without prior abdominal surgery who developed a jejunal closed loop obstruction on the 89th day of ICU admittance with prolonged prone

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<https://doi.org/10.1016/j.amsu.2021.102729>

Received 23 July 2021; Received in revised form 12 August 2021; Accepted 15 August 2021

Available online 19 August 2021

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position following severe COVID-19 infection. The current work has been reported in line with the SCARE 2020 criteria [5]. 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.

1.1. Case presentation

A 74-year-old Caucasian male patient with a history of obesity, coronary artery bypass graft 16 years before the current presentation and lung emphysema, had been admitted to the emergency department of a community hospital, following progressive shortness of breath, a newly developed cough, and low-grade fever. He also developed loose stools with an increased frequency up to four times a day, without blood or mucus. The patient did not have an abdominal surgical history. He had a smoking history of 30 packyears; however, the patient ceased smoking more than 25 years earlier, and he sporadically drank alcohol. The patient had no significant drug, family, genetic or psychosocial history. Chest X-ray was suspect for COVID-19, and a SARS-CoV-2 polymerase chain reaction confirmed this diagnosis. High-resolution computed tomography revealed bilateral ground glass opacities without signs of lung embolies (Fig. 1). The patient was admitted to the COVID cohort ward due to hypoxemia following COVID-19 infection.

The patient was admitted to the ICU following further pulmonary deterioration three days after emergency department presentation. The following complicated ICU course included, but was not limited to, non-resolving ARDS, acute kidney injury, COVID-associated pulmonary aspergillosis, cytomegalovirus pneumonia, purulent cystitis, and other superinfections, cardio-pulmonary resuscitation following endotracheal tube obstruction, severe ICU acquired weakness and autoimmune hemolytic anemia. During the ICU admittance, the patient was initially intubated and received medical treatment using ceftriaxone, dexamethasone, and therapeutic low-molecular-weight heparin. No remdesivir or immune modulating therapy was administered.

Nausea and vomitus were observed after 89 days of ICU admittance, while there was an absence of defecation for two days. The patient had left paraumbilical pain. Pulse rate was 100/min, blood pressure was 150/60 mmHg, and the temperature was 37.4 °Celsius. Abdominal examination revealed panniculus, high-pitched tinkling bowel sounds, hypertympanic sounds on percussion, and left paraumbilical tenderness.

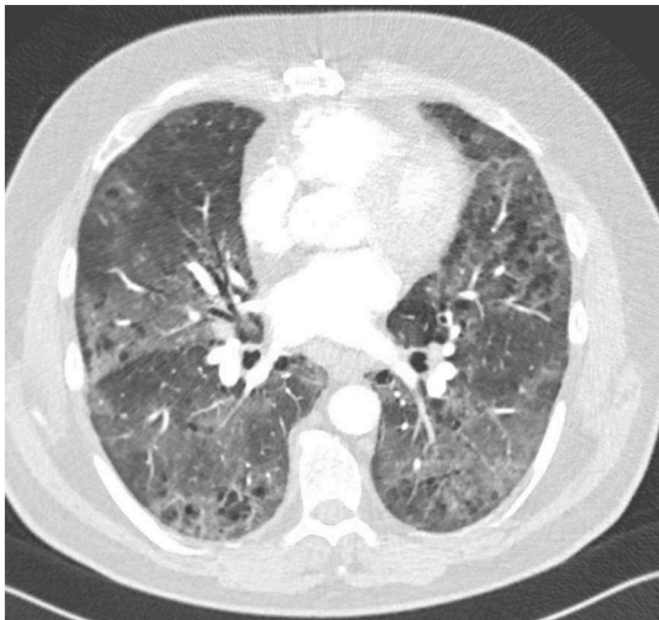


Fig. 1. HRCT on admittance revealing extensive ground glass opacities.

Laboratory tests revealed a white blood cell (WBC) count of $11.6 \times 10^9/L$ and a C-reactive protein (CRP) level of 111 mg/L. Abdominal computed tomography (CT) showed proximal ileum closed loop obstruction presumably following adhesions or internal herniation resulting in dilated small bowel loops up to 4 cm (Fig. 2). No signs of wall thickening, lack of bowel wall enhancement, mesenteric edema or pneumatosis intestinalis were observed. Additionally, diverticulosis of the colon and sigmoid was observed.

After careful consideration with patient and family, a diagnostic laparoscopy was performed by the a gastro-intestinal surgeon assisted by a surgical resident under general anesthesia, which revealed fixation of the omentum to the retroperitoneum. The omentum was released, and extensive small bowel exploration was performed. A jejunal wall indentation was noticed; however, without further adhesions or a bowel torsion (Fig. 3). No other obstructions were observed, and the small bowel presented vitality from the ligament of Treitz up to the ileocecal transition. The postoperative course was in line with the preoperative ICU course, and there were no signs of nausea, vomitus and ileus. Gastroenteric tube feeding was initiated on the first postoperative day and spontaneous stools were observed on the second postoperative day. Initially, further gradual respiratory recovery followed over the following months, without additional gastrointestinal complaints. Unfortunately, later pulmonary deterioration led to the inability to release the patient from mechanical ventilation and after 158 ICU days the patient died following discontinuation of any treatment.

1.2. Clinical discussion

Small bowel obstructions account for approximately 350,000 annual hospital admissions in the USA [6]. Furthermore, obstructive symptoms and chronic postoperative pain impose a burden to many patients and a total amount of 30,000 deaths can be attributed to small bowel obstructions yearly [7]. The differential diagnosis of small bowel obstructions (in patients with and without prior surgery) include: adhesions (65%), abdominal wall hernias (10%), neoplasms (5%), Crohn's disease (5%), and other (15%) including diverticulitis, Meckel's diverticulum, adult intestinal malrotation, mesenteric ischemia, appendicitis, enteritis, intussusception, gallstone ileus, endometriosis,



Fig. 2A. Double caliber jump in the jejunum revealing closed loop obstruction in coronal view.



Fig. 2B. Caliber jump in the jejunum in axial view.

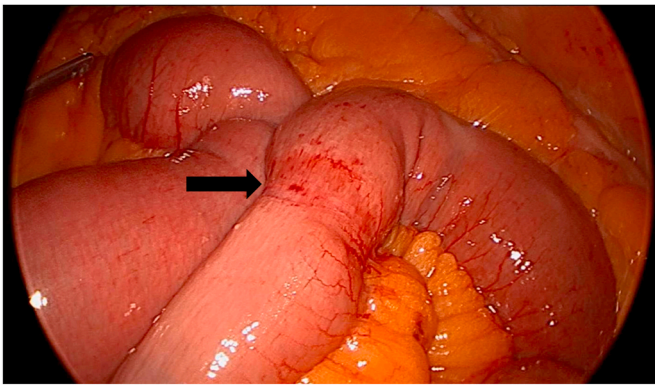


Fig. 3. Perioperatively exposed single indentation in the jejunum (arrow).

bezoars, foreign bodies, blunt trauma and iatrogenic causes and medication-induced strictures [1].

No clear correlation between COVID-19 and small bowel obstruction can be deduced from the current literature. One case, however, described an exacerbation of a congenital adhesion band leading to small bowel stricture due to COVID-19-related superior mesenteric vein thrombosis [8]. Bowel ischemia with transmural infarction led to the development of bowel stricture as a result of venous COVID-19-related coagulopathy and partial small bowel resection was performed. Multiple other cases of bowel ischemia following COVID-19 were reported [9]. In the current case, there were no signs of bowel ischemia, and therefore mesenteric vein thrombosis was ruled out as a cause of the obstruction. Furthermore, mesenteric lymphadenitis has been observed as an atypical presentation of COVID-19 in adults and it might play a role in the onset of small bowel obstruction [10].

Stimulation of angiotensin-converting enzyme (ACE)2 receptors is extensively described in COVID-19 pathology. Gastrointestinal symptoms including nausea, vomiting, ileus and transaminitis are devoted to stimulating ACE2 receptors in the gastrointestinal tract [11]. A paralytic ileus following ACE2 receptor stimulation and thereby cytokine storm seems less likely in the current case since there was no severe inflammatory or septic state, imaging presented a clear jejunal closed loop and perioperatively indentation of the jejunum was observed [12].

Beardsley et al. studied 62 patients with small bowel obstruction without prior abdominal surgery. In these patients, the most common cause of small bowel obstruction was an adhesion. These adhesions in “the virgin abdomen” were attributed to post-infectious abdominal status, including tuberculosis, typhlitis and dysentery [13]. Furthermore, malignancies were the second most common cause in these

patients. No definite cause could be found after diagnostic laparotomy in 6.1% of the cases [13].

In the current case, an adhesion between omentum and retroperitoneum was probably the cause of the jejunal obstruction, although a spontaneous bowel torsion cannot be definitely excluded. Since the current patient showed diverticulosis of the colon and sigmoid, previous diverticulitis could have led to formation of the adhesion. Potentially, there also is a role for abdominal post-COVID-19 manifestations similar to the post-infectious abdominal status as described above. Furthermore, long-term inactivity and prolonged prone position during ICU admittance cannot be ruled out as a cause of obstruction since conclusive literature on these subjects is lacking. Similar to sigmoid volvulus, small bowel closed loops might arise in bedridden patients. Chen et al. presented a comparable case of a bedridden patient that developed a closed loop obstruction without prior surgery during ICU admittance [14].

2. Conclusion

Our report demonstrates a patient with a jejunal closed loop obstruction without prior abdominal surgery after 89 days of ICU admittance due to COVID-19 infection. We conclude that in patients with small bowel obstruction and especially closed-loop obstruction, there should be a low threshold for a diagnostic laparoscopy to release adhesions or straighten out a torsion. Also, further research in long-term inactivity, prone position and COVID-19 as possible causes of closed loop obstruction is needed.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

This is acknowledged at the end of the text.

Ethical approval

This research did not require ethical approval for the publication of case report due to the nature of the manuscript.

This is acknowledged at the end of the text.

Consent

Consent was obtained and this is acknowledged as requested throughout the manuscript.

Author contribution

JPM: concept, data collection, writing, clinical care of patient, final version, submission.

MCT: concept, writing, clinical care of patient.

MH: writing, clinical care of patient, final revision.

FCB: concept, writing, clinical care of patient, submission.

Registration of research studies

1.Name of the registry: n/a

2.Unique identifying number or registration ID: n/a

3.Hyperlink to your specific registration (must be publicly accessible and will be checked): n/a

Guarantor

Mr. Jorn P. Meekel in agreement with all co-authors.

Declaration of competing interest

The authors do not have any conflicts of interest.

This is disclosed at the end of the text.

References

- [1] S.R. Rami Reddy, M.S. Cappell, A systematic review of the clinical presentation, diagnosis, and treatment of small bowel obstruction, *Curr. Gastroenterol. Rep.* 19 (2017) 28.
- [2] I. Millet, A. Ruyter, C. Alili, et al., Adhesive small-bowel obstruction: value of CT in identifying findings associated with the effectiveness of nonsurgical treatment, *Radiology* 273 (2014) 425–432.
- [3] E.J. Balthazar, W. George, Lecture Holmes, CT of small-bowel obstruction, *AJR Am. J. Roentgenol.* 162 (1994) 255–261.
- [4] B. Mizrahi, S. Shilo, H. Rossman, et al., Longitudinal symptom dynamics of COVID-19 infection, *Nat. Commun.* 11 (2020) 6208.
- [5] R.A. Agha, T. Franchi, C. Sohrabi, et al., The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230.
- [6] T. Loftus, F. Moore, E. VanZant, et al., A protocol for the management of adhesive small bowel obstruction, *J Trauma Acute Care Surg* 78 (2015) 13–21.
- [7] M. Jeppesen, M.-B. Tolstrup, I. Gögenur, Chronic pain, quality of life, and functional impairment after surgery due to small bowel obstruction, *World J. Surg.* 40 (2016) 2091–2097.
- [8] J.H.Q. Pang, J.H. Tang, B. Eugene-Fan, C.L. Lee, J.K. Low, A peculiar case of small bowel stricture in a coronavirus disease 2019 patient with congenital adhesion band and superior mesenteric vein thrombosis, *Ann. Vasc. Surg.* 70 (2021) 286–289.
- [9] P. Keshavarz, F. Rafiee, H. Kavandi, S. Goudarzi, F. Heidari, A. Gholamrezanezhad, Ischemic gastrointestinal complications of COVID-19: a systematic review on imaging presentation, *Clin. Imag.* 73 (2021) 86–95.
- [10] H. Iftikhar, M. Najam, M.U. Rehman, Mesenteric lymphadenitis due to COVID-19 in an adult, *Cureus* (2021), <https://doi.org/10.7759/cureus.15897> published online June 24.
- [11] M. El Moheb, L. Naar, M.A. Christensen, et al., Gastrointestinal complications in critically ill patients with and without COVID-19, *J. Am. Med. Assoc.* 324 (2020) 1899–1901.
- [12] P. Holleb, P. Patel, P. Saxena, J. Beniwal, J. Zuberi, Acute abdomen in a 54-year-old COVID-19 patient: a case report, *J. Surg. Case Rep.* (2021) 2021, <https://doi.org/10.1093/jscr/rjab198>.
- [13] C. Beardsley, R. Furtado, C. Mosse, et al., Small bowel obstruction in the virgin abdomen: the need for a mandatory laparotomy explored, *Am. J. Surg.* 208 (2014) 243–248.
- [14] S.-H. Chen, M.-J. Chen, Y.-C. Chang, W.-H. Chang, S.-C. Shih, C.-W. Chang, Adhesional small-bowel obstruction in the absence of previous abdominal operations, *Int. J. Gerontol.* 4 (2010) 202–204.