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Case report

Acute mesenteric ischemia in a COVID-19 patient from Nepal: A case report and review of literature

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ABSTRACT

Introduction: The incidence of acute mesenteric ischemia (AMI) among critically ill COVID-19 patients has been reported ranging from 3.8 to 4 %.
Presentation of case: A 57-year-old female presented with acute abdomen for last three days and tested positive for COVID-19. Abdominal X-ray showed prominent dilated small bowel loops with multiple air fluid levels, and absence of a completely visible colon. She underwent emergency laparotomy where blackish gangrenous bowel loops were seen and resected.
Discussion: CECT scan in over half of the AMI patients may show patent mesenteric vessels. However, such patency of mesenteric vessels should not rule out the possibility of AMI in cases of COVID-19 with prominent GI signs and symptoms, especially those admitted in ICU.
Conclusion: AMI is a life-threatening complication that may occur in COVID-19 patients. It should be suspected in COVID-19 patients complaining of severe abdominal pain in addition to pulmonary symptoms.

1. Introduction

The ongoing coronavirus disease-2019 (COVID-19) pandemic has entered its third year with over 599 million cumulative cases as of August 2022 [1]. COVID-19 is caused by Severe Acute Respiratory Syndrome-Corona Virus-2 (SARS-CoV-2), presenting as asymptomatic infection in one end and severe acute respiratory distress syndrome (ARDS) in the other end of the spectrum. Although, COVID-19 mostly affects the respiratory system, extrapulmonary manifestations are also common [2]. Myocardial dysfunction with arrhythmia, acute coronary syndrome, thrombotic conditions, acute kidney injury, gastrointestinal symptoms, hepatitis, neurological complications as well as ocular and dermatologic complaints have already been reported [2].

COVID-19 is known to induce a hypercoagulable state leading to both micro- and macrovascular thrombosis, affecting both the venous and arterial system [3,4]. However, arterial occlusion of the mesentery in the context of COVID-19 has only been reported by few articles. Acute mesenteric ischemia (AMI) has been defined as a sudden onset of small intestinal hypoperfusion due to occlusive or nonocclusive obstruction of the arterial blood supply or venous outflow. The incidence of AMI in critically ill COVID-19 patients has been reported ranging from 3.8 to 4 % [5,6]. The overall mortality in COVID-19 patients with gastrointestinal (GI) ischemia is 38 % [7].

Here we present a case of AMI in a COVID-19 patient. To our knowledge, this is the first case reported from Nepal.

2. Method

We report this case in line with the updated consensus-based surgical case report (SCARE) guidelines [8].

3. Presentation of case

A 57-year-old female presented to the emergency department with a complaint of acute abdominal pain for three days. The pain was acute in onset, crampy, non-radiating, and increasing in severity, which used to be aggravated after ingestion of food and accompanied with palpitation and vomiting with no known resolving factors. She had three episodes of vomiting during the last two days. The patient had not passed stool or flatus since the last two days prior to hospitalization. The patient had no past medical history of diabetes, hypertension, hyperlipidemia, or prior thrombotic events. However, she was a chronic smoker and on

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Table 1
Table showing changes in laboratory parameters during laparotomy.

S. no.	Parameters	Normal range	During laparotomy
1.	WBC count ($\times 10^9$ cells/L)	3.5–9.5	13
2.	Neutrophil (%)	50–70	80
3.	Lymphocyte (%)	20–40	15
4.	Hemoglobin (g/dL)	12–16	13.3
5.	Platelet count ($\times 10^9$ cells/L)	125–350	229
6.	Hematocrit (%)	36–48	–
7.	Total bilirubin (mg/dL)	0.3–1.2	2.2
8.	Direct bilirubin (mg/dL)	<0.2	0.9
9.	AST (U/L)	5–45	10
10.	ALT (U/L)	5–40	15
11.	Albumin (g/L)	3.5–5.5	3.9
12.	Amylase (U/L)	0–140	216
13.	Lipase (U/L)	0–60	58
14.	Blood sodium level (mEq/L)	135–145	138
15.	Blood potassium level (mEq/L)	3.6–5.2	4.4
16.	Blood calcium level (mg/dL)	8.5–10.5	6.9
17.	Blood urea nitrogen (mg/dL)	8–20	54
18.	Creatinine (mg/dL)	0.5–1.2	0.6
19.	FDP D-dimer (μg/mL)	<0.5	0.8

medication for Chronic Obstructive Pulmonary Disease for the past ten years.

On her arrival to the emergency department, her pulse rate was 130 beats per minute, regular; oxygen saturation 85 % on room air; blood pressure 95/70 mm Hg, body temperature 38.7 °C, and respiratory rate (RR) 22 breaths/min. The baseline electrocardiography showed tachycardia with sinus rhythm. Screening for COVID-19 was done using a rapid antigen test kit and was found to be positive. It was followed by a reverse transcription-polymerase chain reaction (RT-PCR) test, which was positive as well. On her physical examination, her abdomen was distended with diffuse tenderness. There was diffuse guarding and rigidity all over the abdomen. Bowel sounds were absent. Digital rectal examination revealed a normal sphincter tone with a collapsed rectum and absent fecal stain on the gloved finger.

She was immediately administered crystalloids and supplemental oxygen at 4 L/min. Nasogastric tube decompression and Foley catheterization were done. Her laboratory parameters showed leukocytosis with raised amylase. Liver function test revealed total bilirubin 2.20 mg/dL, conjugated bilirubin 0.9 mg/dL and alkaline phosphatase 674 U/L (Table 1). Her arterial blood gas (ABG) analysis showed metabolic acidosis with raised lactate level.

On radiological examination, supine abdominal X-ray showed prominent dilated small bowel loops and the absence of a completely visible colon while erect abdominal X-ray showed multiple air fluid levels in the small bowel loops, pointing towards small bowel obstruction (Fig. 1).

Ultrasonography of the abdomen and pelvis was unremarkable with minimal free fluid in the pelvis. Urgent Contrast Enhanced Computed Tomography (CECT) scan was performed which confirmed collection of fluid in the right iliac fossa (RIF), pelvis and along the anterior surface of the liver. It was however unremarkable and no specific findings were documented supportive of mesenteric ischemia. Despite aggressive fluid management, analgesics and intravenous antibiotics, the condition of the patient did not improve. Hence, the patient underwent emergency laparotomy. Intraoperatively, greenish fluid and gangrenous small bowel starting 20 cm distal to the duodenojejunal flexure up to 15 cm proximal from the ileocolic junction was seen (Fig. 2). Tissue decay with blackish discoloration of the intestine was found which is suggestive of AMI. Resection of the gangrenous segment of the bowel with double barrel loop ileostomy was performed.

The patient was then shifted to the COVID surgical intensive care unit (ICU) without extubating. She received Meropenem IV 1 g and Vancomycin IV 500 mg twice daily along with low molecular weight Heparin 60 mg twice daily the following day.

She was started on total parenteral nutrition (TPN) from a central line the following day. The histopathological report showed small bowel necrosis with microthrombi in the lamina propria and the submucosa with glandular necrosis (Fig. 3).

On sixth postoperative day, the patient developed COVID pneumonia and was reintubated in COVID-ICU. Her condition slowly worsened as she developed sepsis and Acute Kidney Injury. She expired on 14th postoperative day due to severe sepsis and multi-organ dysfunction syndrome in ICU. The timeline of events and interventions are summarized in Fig. 4.

4. Discussion

Although COVID-19 is notorious as a respiratory disease, GI-related complaints may occur in up to 38 % of infected patients, while in 74 %–86 % of the critically ill, complications like transaminitis, feeding intolerance, cholecystitis, pancreatitis, colonic pseudo-obstruction and

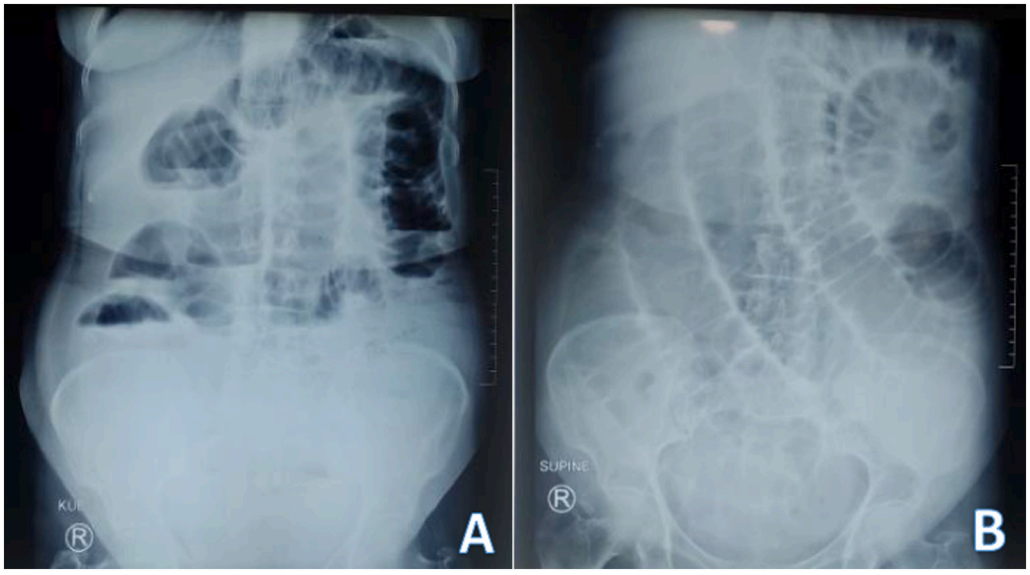

Fig. 1. Plain abdominal X-ray erect (A) and supine (B) view.
A. Multiple air fluid levels visible in the small bowel loops; B. X-ray showing prominent dilated small bowel loops.

Fig. 2. Gangrenous bowel segments (white arrows) seen intraoperatively.

mesenteric ischemia may occur [9,10]. A meta-analysis cromprising more than 18000 patients who tested positive for COVID-19 from around the world showed diarrhea as the most common GI symptom (11.5 %), followed by nausea/vomiting (6.3 %) and abdominal pain (2.3 %) [10].

AMI is the sudden onset of small intestinal hypoperfusion, presenting as an acute abdominal pain, that requires an immediate surgical intervention. The exact pathophysiology of bowel ischemia in critically ill patients with COVID-19 remains uncertain. Gross arterial and venous thrombosis, microvascular thrombosis and even non-occlusive mesenteric ischemia have been suspected responsible for fatal bowel wall necrosis [7]. Additionally, ICU admissions, high doses of vasopressors, hemodynamic instability, metabolic derangements, positive pressure ventilation, and viral enteritis should also be considered as contributory factors for bowel wall ischemia in COVID-19 patients [5,7].

Pathogenesis of thrombotic events in the context of COVID-19 includes endothelial inflammation, thrombin formation, complement activation and initiation of the immune response [11–13]. However, in a systematic review radiologically detectable arterial/venous thrombosis was not identified in more than half of patients with ischemic bowel [7]. Such patients develop mesenteric ischemia despite patent and well-perfusing proximal and mesenteric vessels on CT [5,6,14]. Likewise, CECT of our patient showed patent mesenteric vessels suggestive of non-occlusive mesenteric ischemia. Nevertheless, CECT should be considered in any cases of COVID-19 with prominent GI signs and symptoms, especially those admitted in ICU, as it can be helpful in detecting associated vascular findings and identifying those patients who may benefit from percutaneous endovascular thrombectomy [15].

The most common finding in COVID-19 associated coagulopathy is an increase in D-dimer levels. D-dimer, a degradation product of fibrin, formed during the activation of coagulation system, has the potential to detect thrombosis in any part of the venous system. Up to 46.4 % of all COVID-19 patients reported abnormally elevated D-dimer level with higher prevalence among the critically ill patients (60 %) than the non-severe cases (43 %) [16]. Various studies have reported different cutoff scores of D-dimer correlating with poor outcomes [17–19]. Zhang et al. examined 343 cases and showed that D-dimer levels of over 2.0 μg/mL could predict mortality with a sensitivity of 92.3 % and a specificity of 83.3 % [17]. Likewise, study by Rostami et al. [19] showed a 3 to 4-fold rise in D-dimer and fibrinogen concentrations in the early stages of COVID-19 disease linked to poor prognosis. Nevertheless, anticoagulant use was associated with 50 % reduction of in-hospital mortality risk, as shown by a meta-analysis by Parisi et al. [20]. Therefore, D-dimer and fibrinogen levels should be monitored, and all hospitalized patients should undergo thromboembolism prophylaxis with an increase in therapeutic anticoagulation in certain clinical situations [3].

5. Conclusion

AMI is a life-threatening complication which should be suspected in COVID-19 patients complaining of severe abdominal pain in addition to pulmonary symptoms. Even in such cases CECT scan may show patent mesenteric vessels. Early diagnosis and prompt treatment is crucial for patient survival.

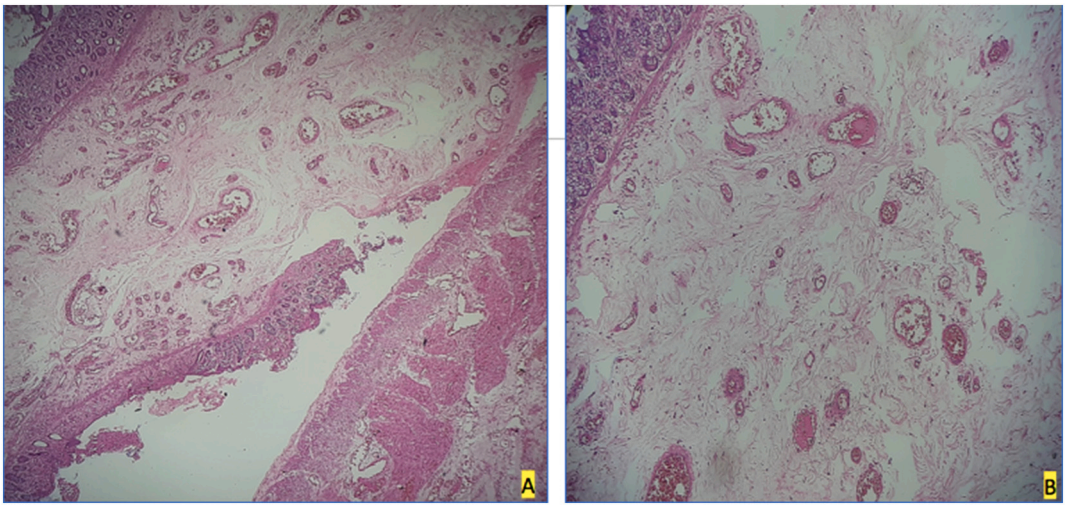

Fig. 3. A: (4× magnification) shows mucosal denudation with decreased crypts in the lamina propria. Submucosa appears edematous with dense acute inflammatory cells. B: (40× magnification) shows hyalinized blood vessels with microthrombi formation.

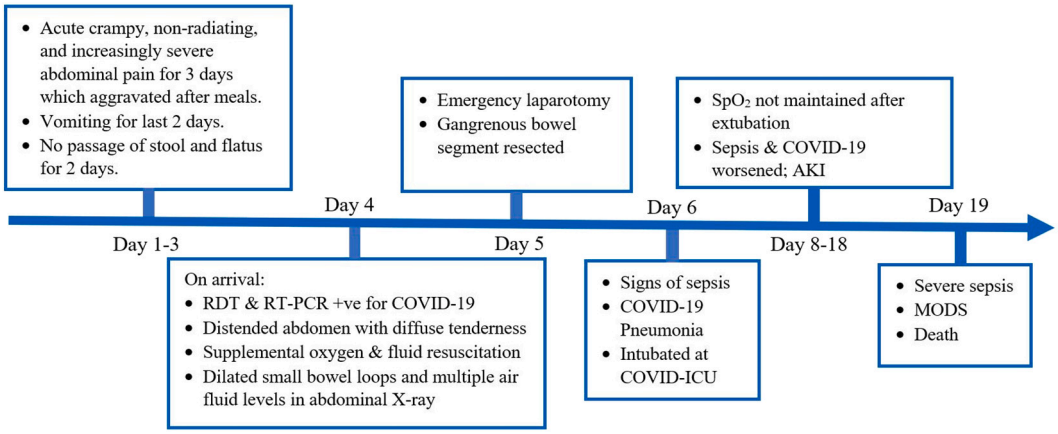

Fig. 4. Timeline of events and interventions (RDT: rapid diagnostic test; RT-PCR: reverse transcriptase polymerase chain reaction; ICU: intensive care unit; AKI: acute kidney injury; MODS: multi-organ dysfunction syndrome).

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.

Provenance and peer review

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Ethical approval

The case report is exempt from ethical approval in our institution.

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CRediT authorship contribution statement

Sunil Basukala (SB) = Conceptualization, Supervision
Ayush Tamang (AT), Shriya Sharma (SS), Ujwal Bhusal (UB), Samundra Gurung (SG) = Writing - original draft
SB, SG, AT, SS, UB = Writing - review & editing.

All the authors read and approved the final manuscript.

Declaration of competing interest

All authors declare that they have no conflict of interest.

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