



Case report

Acute mesenteric arterial thrombosis in severe SARS-Co-2 patient: A case report and literature review

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ABSTRACT

Introduction: CoV-2 infection generates a pro-inflammatory state, which conditions the formation of thrombi that can affect any system. Multi-organ dysfunction is a cause of death, mesenteric ischemia in COVID 2019 patients reported is 1.9–4%.

Description of the case: We present the case of a 73-year-old male patient who started with severe SARS-CoV-2 and arterial-type intestinal ischemia, necrosis of 3 m of the small intestine, based on SCARE 2020 guide.

Discussion: Complications secondary to thrombosis are as follows; myocardial infarction 1.1%, ischemic cerebral events, 2.5–3.7%, microvascular thrombosis including mesenteric ischemia in less than 1% of cases. In patients with mesenteric ischemia the reported postoperative mortality is 23.8% of patients especially during the first 30 days.

Conclusion: Intestinal thrombosis in patients with SARS-CoV-2 increases mortality.

1. Introduction

The coronavirus infection (COVID 2019) originating in Wuhan, China in December 2019 has made an impressive impact globally, an unprecedented pandemic. A large number of systemic disorders have been reported, mainly severe acute respiratory syndrome (SARS-CoV-2), as well as thrombotic events that worsen the prognosis. Reported venous thrombosis is approximately 25% to 50%, with a reported mortality of 40% [1–3].

Coagulation dysfunction is one of the major causes of death in patients with severe COVID 19, finding positive criteria (International Society of Thrombosis and Haemostasis) of disseminated vascular coagulation in 71% of patients who died [4].

Thrombotic events have occurred less frequently in sites such as the brain, lower extremities, and mesenteric vessels. Prothrombotic events have been related to the S-type membrane protein of the virus, which binds with the angiotensin-converting enzyme 2, this enzyme is found

mainly in the oral mucosa, lung, liver, endothelium and intestine [5].

The pathophysiological result is the reduction of the degradation of angiotensin II, stimulating the production of IL-6. Angiotensin II induces the expression of tissue factor and plasminogen activator type 1 inhibitor, causing a state of hypercoagulability. At the intestinal level, a direct involvement by the virus has been observed, it is theorized that there is an activation of the lecithin pathway (C5b-9, C4d and MASP2), producing endothelial damage [1,5].

The abdominal manifestations present in a range of 3 to 39%. Mesenteric ischemia in patients with COVID 2019 reported is 1.9–4%, activation of the lecithin pathway and direct endothelial damage cause arterial thrombosis leading to a state of ischemia. Venous events have been seen to be more frequent than arterial events [6].

We present the case of a patient with severe acute respiratory syndrome due to COVID-19 who presented segmental mesenteric ischemia, we based our report on the SCARE 2020 guidelines [7].

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Fig. 1. Dilated intestinal loops, intestinal inter-loop edema, intestinal pneumatosis.



Fig. 2. Surgical specimen for histopathological study.

2. Case description

This is a 73-year-old male patient, with a relevant history: smoking 20 cigarettes a day, occasional alcoholism to drunkenness. Recently diagnosed diabetes mellitus and hypertension, allergy to paracetamol. No family history of hypertension or diabetes mellitus, no known genetic history, no previous surgeries. He begins with moderate to severe respiratory distress, fever and general malaise of 7 days of evolution, he is taken to a hospital, where a rapid test is performed with a positive result for SARS CoV-2 (IgM +, IgG +), they begin management with oxygen and steroids, at that time the patient was not given anticoagulation.

On days 7 of hospital stay, she presented severe abdominal pain, nausea and fecal emesis, fever of 39.5 °C and peritoneal irritation, an abdominal X-ray was performed in a standing position where distention of intestinal loops, inter-loop edema, intestinal pneumatosis is observed (Fig. 1) reason for being referred to a third-level center.

A patient is received in poor general condition with data on a frank acute abdomen, with radiographic data already commented, admission

tests hemoglobin 15 g/dl, leukocytes 17 thousand/cm³, platelets 120 thousand/cm³, procalciton of 26 ng/ml, D-dimer >5000 ng/ml. With high suspicion of intestinal ischemia, the authors, as a surgical team, decided to take the patient to explore laparotomy, explain to the patient and his relatives the risks and benefits of the procedure, the patient accepts and signs the consent of information from the surgery.

During the surgery, we resect a 3-meter segment of small intestine (terminal jejunum and proximal ileon), perform end to end anastomosis leaving a 1.5 m segment of small intestine, purulent collection is drained in the pelvis, placement of drains, ending the procedure. After surgery we initiate management with antibiotics, analgesic and enoxaparin (60 mg/0.6 ml) a dose every 24 h. The patient goes to intensive therapy with mechanical ventilation, after 5 days he presents atrial fibrillation which is treated with amiodarone.

On day 10 postoperatively, he presented slight leakage of intestinal fluid due to the closure of the midline, it was decided to manage an intestinal fistula with conservative treatment and parenteral nutrition, closing this at 3 weeks. Five days after the intervention, the pathology report reports data on ischemia and necrosis of the intestinal mucosa in a 3-meters segment of the small intestine (Fig. 2). The patient presented significant deterioration in lung function, subsequently multi-organ failure, dying 30 days after the procedure. The relatives were informed of the severity of the painting, conforming to the medical care provided.

3. Discussion

In February 2020, the International Committee on Taxonomy of Viruses made official the name of the new coronavirus SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2), which is the cause of the COVID 19 epidemic, whose mortality rate is approximately 5.44% [4].

Coronavirus 2 is a virus wrapped in a simple layer of beta RNA. The main manifestations of COVID-19 are fever, cough, myalgia, dyspnea, chest pain, headache, diarrhea, nausea, emesis, however later manifestations related to thrombotic events have been reported [8], the patient initially presented data of the syndrome respiratory reason for which he went to the emergency department.

Most of the deaths related to COVID-19 were patients older than 60 years with added conditions such as high blood pressure, coronary heart disease, diabetes. Patients infected with COVID-19 with concomitant pathologies have a higher risk of coagulation dysfunction [4]. As in the case of our patient.

The respiratory system is the most affected by SARS-CoV-2, it binds to the angiotensin-converting enzyme 2 in pneumocytes, 5–10% of infected patients end up in intensive therapy. Patients who are admitted to intensive care have a higher risk of pulmonary embolism, deep vein thrombosis, arterial thrombosis. The risk of thrombosis is presented in a range of 15 to 85%. In different series, elevated D-dimer levels are reported, as well as slight thrombocytopenia, prolonged prothrombin time, increased fibrinogen levels [9,10].

A state of thrombo-inflammation has been proposed that causes a cytosine storm that results in an increase in IL-1, IL-6, IL-7, TNF, increasing the coagulation mechanisms causing thrombosis of small and large vessels. SARS CoV-2 has been seen to activate ACE2 receptors in many organs such as the intestine causing endothelial damage and thrombosis resulting in an ischemic process. VCAM-1, ICAM-1 activation as well as E-selectin, tissue factor and plasminogen activator inhibitor 1 have been seen, blocking fibrinolysis [9–11].

The severity-related coagulation parameters are: Activated Partial Thromboplastin Time, Prothrombin Time, fibrin degradation products, D-dimer and platelet count. In COVID-19, the D-dimer is elevated in 36% of cases (greater than 0.9 mg/L). A higher D-dimer is found in critical patients compared to moderate cases (2.4 versus 0.5 mg/dl), this finding is inversely correlated with survival [12]. In our case, the patient presented a DD greater than 5000 ng/ml.

Table 1

Case reports of COVID-19 patients with intestinal thrombosis.

Case report	Gender	Age (years)	Ischemia; venous/arterial	Affected segment	Treatment	Re-operation	Post-surgical
Rodríguez-Nakamura et al. [1]	Male	45	Arterial	Ileum	Anastomosis	No	Live
	Female	42	Arterial	Jejunum	Anastomosis	No	Die
Cheung S [2]	Male	55	Arterial	Jejunum	Anastomosis	No	Live
Sing B et al. [8]	Female	82	Arterial	Colon ascendete/sigmoides	Anastomosis	No	Live
Calcagno E et al. [13]	Male	36	Venous	Ileum	Anastomosis	No	Live
Amarayathi et al. [16]	Male	45	Venous/arterial	Jejunum	Thrombectomy	Yes	Live
Ignat M et al. [17]	Female	28	Venous	Jejunum	Anastomosis	No	Live
	Male	56	Venous	Proximal Jejunum	Anastomosis	No	It is unknown
	Male	67	Venous	Terminal ileum	Steroids	No	Live
Nuestro paciente	Male	73	Arterial	Jejunum/ileum	Anastomosis	Yes	Die

Complications secondary to thrombosis are as follows; myocardial infarction 1.1%, ischemic cerebral events, 2.5–3.7%, microvascular thrombosis including mesenteric ischemia in less than 1% of cases. The most frequent abdominal manifestations are anorexia, nausea, emesis, diarrhea, pain, distention and hemorrhage. Patients may present with acute mesenteric ischemia or present as a late complication during hospitalization with an average of 7 days [3,5]. As with our patient, he initially presented a respiratory painting in conjunction with his base diseases at 7 days, has acute abdomen clinics, secondary arterial-type intestinal ischemia.

Radiological manifestations include intestinal inflammation, air-fluid levels, thickening of the intestinal wall, pneumatosis, pneumoperitoneum, ischemia and intussusception [13,14], these clinical data were presented by our patient, who developed an acute abdomen, which is why it was decided to intervene in an emergency.

In a retrospective study of 92 patients with severe COVID-19 admitted to the intensive care unit, 48% had ileus, 4% intestinal ischemia, 2% Ogilvie syndrome [6]. In a study of 878 patients, 5.1% abdominal complications were reported severe, which were bleeding 1.1%, acute pancreatitis 0.1%, acute cholecystitis 0.2%, intestinal obstruction 0.1%, Ogilvie syndrome 0.2%, mesenteric ischemia 0.2% [15].

The reported postoperative mortality is 23.8% of patients especially during the first 30 days, 18.9% in elective surgery, 25.6% in emergency surgery, 16.3% in minor surgery and 26.9% in major surgery, these values increase in patients with significant lung deterioration [1]. Like our patient's case, who died 30 days after surgery.

In Table 1 we collect the case reports which comment on whether the patients had arterial or venous thrombosis, the segment of intestine affected, as well as the patients who needed a new intervention.

A fundamental part of treatment is heparin prophylaxis, which has shown an improvement in prognosis in patients with a sepsis-induced coagulopathy index >4 with a D-dimer >0.3 µg/mL. The dose of enoxaprine that has shown benefit is 40 mg (40 mg/0.4 ml) per day if the patient does not have kidney failure, in cases of kidney failure the recommended dose is 30 mg per day. Patients with previous illnesses, it is important to continue with anticoagulant treatment, especially of the oral type, for 3 months [9,17], unfortunately the patient dies 30 days after the first surgical event.

At the moment two varieties of treatment have been reported, one the intestinal resection of the infarcted segment and the percutaneous mechanical thrombectomy with inconclusive results to date, the lack of studies with a large number of patients, the case of an 83-year-old patient is reported. Who was successfully embolized, however, after a short time, he died of respiratory complications, similar to those that occurred with our patient [18].

4. Conclusions

The patient presents risk factors for presenting a picture of mesenteric ischemia, however before the diagnosis of SARS CoV-2 did not present data of acute abdomen, we consider that the infection by CoV-2

was the trigger to develop an arterial-type mesenteric ischemia, which is a complication reported in the literature that corresponds to 1%, it is important to diagnose this complication in a timely manner, which is a surgical emergency that endangers the life of the patient.

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Guarantor

Montserrat del Carmen Valencia Romero.

Registration of research studies

Not applicable.

CRedit authorship contribution statement

Montserrat del Carmen Valencia Romero. Idea of publication, patient treatment, concept and design, data collection, drafting, revision and approval of final manuscript.

Adrián Morales Cárdenas. Concept and design, data collection, drafting, revision and approval of final manuscript.

Alberto Briseño Fuentes. Patient treatment, data collection, drafting.

Adrián Alberto Salinas Barragán. Data collection, drafting.

Daniel Bladimir Serrano Gómez. Data collection, drafting.

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Declaration of competing interest

Nothing to declare.

References

- [1] R.M. Rodriguez-Nakamura, M. González, A.R. Martínez, Acute mesenteric thrombosis in two patients with COVID-12. two cases report and literature review, *Int. J. Surg. Case Rep.* 76 (2020) 409–414.
- [2] S. Cheung, J.C. Quiwa, A. Pillai, et al., Superior mesenteric artery thrombosis and acute intestinal ischemia as a consequence of COVID-19 infection, *Am. J. Case Rep.* 21 (2020), e925753.
- [3] M.Y. Abou-Ismael, A. Diamond, Kapoor, The hypercoagulable state in COVID-19: incidence, pathophysiology, and management, *Thromb. Res.* 194 (2020) 101–115.
- [4] J.-C. Song, G. Wang, W. Zhang, Y. Zhang, W.-Q. Li, Z. Zhou, et al., Chinese expert consensus on diagnosis and treatment of coagulation dysfunction in COVID-19, *Mil. Med. Res.* 7 (1) (2020) 19.
- [5] J. Avila, B. Long, D. Holladay, M. Gottlieb, Thrombotic complications of COVID 19, *Am. J. Emerg. Med.* 39 (2021) 213–218.
- [6] M.E. Moheb, L. Naar, M.A. Christensen, et al., Gastrointestinal complications in critically ill patients with and without COVID-19, *JAMA* 324 (18) (2020) 1899–1901.
- [7] for the SCARE Group, Riaz A. Agha, Thomas Franchi, Catrin Sohrabi, Ginimol Mathew, Ahmed Kerwan, The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230.
- [8] B Singh A Mechineni P Kaur , et al. Acute intestinal ischemia in a patient with COVID-19 infection. *Korean J. Gastroenterol.* Vol. 76 No. 3, 164-166.
- [9] A. Ribes, F. Vardon-Bounes, V. Mémier, et al., Thromboembolic events and Covid-19, *Adv. Biol. Regul.* 77 (2020), 100735.
- [10] T. Quinaglia, M. Shabani, I. Breder, H.A. Silber, J.A.C. Lima, A.C. Sposito, Coronavirus disease-19: the multi-level, multi-faceted vasculopathy, *Atherosclerosis* 322 (2021) 39–50.
- [11] T. Quinaglia, M. Shabani, I. Brder, et al., Coronavirus disease-19: the multi-level, multi-faceted vasculopathy, *Atherosclerosis* 322 (2021) 39–50.
- [12] T. Hadid, Z. Kafri, A. Al-Katib, Coagulation and anticoagulation in COVID-19, *Blood Rev.* 47 (100761) (2021), 100761.
- [13] E. Calcagno, O. Sogunro, P. Nepal, et al., COVID-19 induced mesenteric venous infarction, *Radiol. Case Rep.* 16 (2021) 1999–2002.
- [14] P. Keshavarz, F. Rafiee, H. Kavandi, et al., Ischemic gastrointestinal complications of COVID-19: a systematic review on imaging presentation, *Clin. Imaging* 73 (2021) 86–95.
- [15] E. Qayed, A.R. Deshpande, J. Elmunzer, Low incidence of severe gastrointestinal complications in COVID-19 patients admitted to the intensive care unit: a large, multicenter study, *Gastroenterology* 160 (2021) 1403–1405.
- [16] U. Amaravathi, N. Balamurugan, V.M. Pillai, S.M. Ayyan, Superior mesenteric arterial and venous thrombosis in COVID-19, *J. Emerg. Med.* 60 (5) (2021) e103–e107.
- [17] M. Ignat, G. Philouze, L. Aussenac-Belle, V. Faucher, Small bowel ischemia and SARS-CoV-2 infection: an underdiagnosed distinct clinical entity, *Surgery* 168 (2020), 14e16.
- [18] E. Dinoto, F. Ferlito, M.A. La Marca, et al., Staged acute mesenteric and peripheral ischemia treatment in COVID-19 patient: case report, *Int. J. Surg. Case Rep.* 84 (2021), 106105.