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Case Series

Superior Mesentraic Artery Thrombosis - Single Unit Experience During the COVID- 19 Pandemic

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Introduction

The Corona Virus Disease 2019 (COVID-19) pandemic caused by novel coronavirus primarily causing infection of lower respiratory tract since December 2019 has been leading cause of mortality and morbidity. With this unpredicted health emergency the number of ischemia related health events has also seen sudden rise, be it cardiovascular disease, stroke, acute limb ischemia and acute thrombo-embolic arterial and venous insult to the gastrointestinal system [1,2]. Acute thrombo-embolic occlusion of the Superior Mesenteric Artery (SMA) is uncommon condition with high mortality rates. High Mortality rate can be attributed to low preoperative diagnostic accuracy and limited timely therapeutic options [3]. The mode of diagnosis has shifted from autopsy to laparotomy and multidetector computer tomography in last couple of decades. Nonocclusive mesenteric ischemia (NOMI) leading to transmural intestinal infraction is a condition with extremely high mortality. Despite the considerable advances in the diagnosis and treatment, cause of mesenteric ischemic by enlarge remains elusive. This case series is aimed to provide valuable insight into to presentation ad outcome during COVID.

Keywords: COVID-19; Superior Mesenteric Artery; Mesenteric ischemic

1. Methodology

Data of all the patients who were diagnosed with superior mesenteric artery occlusion was collected from retrospectively maintained computes based from 1st March 2020 to 1st March 2021. Data of 10 patients was analyzed with variable including demographics, laboratory blood tests including coagulation panels, medical and surgical history, imaging findings, intraoperative findings, histopathology and postoperatively follow-up period. Patient with mesenteric venous thrombosis were excluded.

2. Case Presentation

This clinical case series describes 10 cases of super mesenteric artery occlusion. The epidemiological and clinical characteristics are mentioned in table 1 and postoperative outcome is mentioned in table 2.

Patient	Age/Gender	Presenting symptoms	Imaging findings	Primary intervention performed	Intraoperative findings
Case 1	63/M	Pain abdomen, obstipation, nausea and vomiting	Thrombus present in SMA 6.5 cm from the origin	EL+ resection gangrenous small and large bowl + jejunostomy + Caecum as DMF	1000 ml of foul smelling fluid, small bowl 30 cm from Duodenojejunal (DJ) flexure to colon till hepatic flexure gangrenous
Case 2	54/F	Pain abdomen, obstipation, malena, fever, nausea and vomiting	Thrombus-embolic occlusion in SMA 7 cm from the origin, long segment ischemic changes in distal jejunal and proximal ileal loops.	EL+ resection gangrenous small and large bowl + end jejunostomy + ileum as DMF	500 ml of foul smelling fluid, previous anastomotic site seen 30cm from DJ, extensive gangrenous patches seen from anastomotic site till 70 cm proximal to Ileocecal Junction (ICJ) with necrosis of mesentery.
Case 3	52/M	Pain abdomen, obstipation, malena, fever, nausea and vomiting	Thrombus present in SMA 5 cm from the origin	EL + PL + diversion loop colostomy + laprostoma	Gross fecal contamination, entire small and large bowl distended, edematous and congested, loaded with fecal matter. Thickened and viable mesentery.
Case 4	50/M	Pain abdomen, nausea vomiting, abdominal distension	Possibility of mesenteric ischemia cannot be ruled out	EL+PL+ resection of small bowl+ end jejunostomy + ileum as DMF	diffuse fecal contamination, gangrenous patches starting 100 cm from DJ till 10 cm from ICJ

Case 5	50/F	Pain abdomen, abdominal distension, obstipation, nausea and vomiting	Intra-Aortic thrombus occluding SMA at origin	EL+ Resection of gangrenous bowl+ end ileostomy+ ileum as DMF	500 ml of turbid fluid, 70 cm from DJ normal , distal jejunum, ileum, caecum and ascending colon gangrenous, omentum partly gangrenous
Case 6	38/M	Pain abdomen, abdominal distension, obstipation, malena, nausea and vomiting	Thrombus in SMA extending from origin for approximately length of 3.5 cm	EL+ Resection of gangrenous small bowl+ end jejunostomy+ ileum as DMF	300 ml pus in peritoneal cavity, 20 cm distal to DJ to 20 cm proximal to terminal ileum gangrenous
Case 7	40/M	Pain abdomen, nausea, vomiting, obstipation	Not performed	EL+ resection of small bowl+ double barrel stoma ileostomy+ feeding jejunostomy	200 ml foul smelling fluid, gangrenous bowl 70 cm distal to DJ upto 90 cm proximal to ICJ
Case 8	50/M	Pain in abdomen, obstipation, nausea and vomiting	SMA not visualized	EL + closure	No free fluid, SMA pulse not palpable, liver dusky, gangrenous bowl 5 cm distal to DJ flexure to 7 cm proximal to ileocecal junction.
Case 9	53/M	Pain in abdomen, obstipation, nausea and vomiting	Occlusion at origin of SMA	Resection of gangrenous bowel and duodeno-colic anastomosis	gangrenous bowel extending from 5 cm distal to DJ till proximal 1/3 of transverse colon
Case 10	42/F	Pain in abdomen, obstipation, abdominal distension	Reduced caliber of SMA 5.5 mm from origin.	EL+ Resection of gangrenous bowl + proximal jejunostomy + ileum as DMF	Patchy gangrenous bowl 20 cm from DJ to 45 cm proximal to ICJ with omental thickening

*Exploratory Laparotomy-EL, Distal Mucus Fistula-DMF, Ileocecal Junction-ICJ, Duodenojejunal Junction-DJ

Table 1: Postoperative outcomes of the patients.

Patients	No of reoperations performed	Outcome on Post Operative Day (POD)	In hospital Morbidity	COVID positive by RT-PCR
Case 1	0	Expired, POD 0	Septic shock	no
Case 2	3	Discharged, POD 28	sepsis, bed sore, stoma site abscess, short bowl syndrome, laprostoma, intrabdominal leak	no
Case 3	1	Expired, POD 8	Septic shock	no
Case 4	1	Expired, POD 23	Stoma necrosis, laprostoma, sepsis, short bowl syndrome, dyselectrolytemia, dehydration	
Case 5	2	Discharged, POD 73	Short bowl syndrome, sepsis, TPN induced liver injury, surgical site infection, burst abdomen, infected mesh laprostoma, stoma retraction, stoma gangrene, dehydration	yes
Case 6	0	Discharged, POD 49	Sepsis, dehydration, dyselectrolytemia, high output fistula, short bowl syndrome.	no
Case 7	0	Expired, POD 1	Septic shock	no
Case 8	0	Expired, POD 0	Septic shock	no
Case 9	0	Expired, POD 20	Short bowl syndrome, septic shock, dehydration, dyselectrolytemia,	no
Case 10	0	Discharged, POD 70	Laprostoma, short bowel syndrome,	yes

* Reverse Transcription-polymerase chain Reaction- RTPCR

Table 2: Postoperative outcomes of the patients.

2. Discussion

The overall estimated incidence through autopsy verified NOMI with transmural infraction is 2.0/ 100000 persons per year as compared to acute thromboembolic occlusion of the SMA (8.6/100000 person per year) and mesenteric venous thrombosis (1.8/100000 person per year) and increases exponentially with increasing age [4]. SARS-CoV-2 pandemic apart from affecting the pulmonary system and causing respiratory complications also has extra pulmonary manifestation. Abnormal coagulation occurs in many patients with COVID-19 population predispose both to arterial and venous thromboembolic complications [5,6]. In study conducted in New York City area by Yana et al. out of 12,630 patients being hospitalized 49 patients were diagnosed with acute arterial ischemia and 2 patients had SMA thrombosis with bowl ischemia [7]. Our hospital has also encountered unique cases for instance isolated stomach gangrene in a COVID-19 positive patient [8]. So far there have been only 7 cases of COVID-19 related SMA thrombosis reported [9]. The exact pathological mechanism causing the complication of acute mesenteric ischemia and thrombosis in COVID-19 is not known at present. There are few proposed mechanism in isolation or in varying combination which could account for the basis of the complications. Firstly, a coagulation disorder induced by systemic inflammatory state, endothelial activation, hypoxia and immobilization, with preliminary pathological

evidence showing bowl necrosis with small vessel thrombosis involving submucosal arterioles, thereby pointing to an in-situ thrombosis of small mesenteric vessels rather than an embolic event. Second, elevated levels of Von Willebrand Factor and expression of angiotensin converting enzyme 2 on the endothelium and enterocytes of small bowl, the target receptor for SARS-CoV-2, may result tropism and direct bowl damage. Lastly, hemodynamic compromise which is associated with COVID-19 pneumonia may lead to NOMI. In this study 9 out of 10 patients had radiologically confirmed thrombo-embolic occlusion of SMA [10]. Therefore the exaggeration of thrombosis of preexisting large and medium sized diseased vessel by COVID-19 is another possibility of causing occlusion. Gastrointestinal symptoms in patients with COVID-19 at diagnosis is not uncommon with nausea, vomiting, diarrhea and loss of appetite being the most common symptoms [11]. COVID-19 also have higher rates of abdominal pain as clinical presentation and abnormal liver function test. Most of our patients presented with obstipation and malena also. Comorbidities like ischemic heart disease, heart failure, atrial fibrillation, stroke, diabetes mellitus, anemia, renal insufficiency, previous vascular surgery and patients on diuretics, digitalis and beta blockers have poor prognosis in general in patients with SMA thrombosis [12]. However none of the patients had any known comorbidities or was on any chronic medication. High resolution Ultrasound examination of abdomen in the early phase may help in identification of SMA occlusion and bowl spasm but in the intermediate phase, ultrasound is not useful because of excess gas in the bowl loops. In later phase it may reveal bowl wall thinning, fluid filled lumen, extra luminal fluid and decreased or absent peristalsis [13]. Computer Tomography (CT) angiography is the best imaging diagnostic modality and has sensitivity and specificity of 89.4 % and 99.5 % respectively [14]. In the patients mentioned above none of them had collaterals suggestive of chronic ischemia or peripheral arterial disease which correlated clinically. There has been a sudden surge in the number of cases in our hospital in current pandemic mostly due to referral bias which and most of them are RT-PCR negative which is in contradiction to our assumption. Though only 2 patient were COVID positive in RT-PCR but several factors are well-known to contribute inconsistency in result of RT-PCR of nasal or throat swab [15]. Treatment for SMA thrombosis is majorly surgical resection of the necrotic bowl, restoration of blood flow to ischemic intestine and supportive measures with hemodynamic support in later stage of presentation [16]. Endovascular intervention has high success rates but was not applicable in the patients mentioned above as they had frank perforation, poor hemodynamic state of the patients and thrombus was not amenable for endovascular treatment [17]. Septic shock with multiorgan failure as reported by other studies was the cause of mortality in the patients and 2 out of 4 patients discharged also expired within 3 months after discharge with cause unknown [18]. The patients tested positive in our series stayed positive for months on repeated testing and didn't develop any severe pulmonary complication pertaining to COVID per se. Prognosis was also largely driven by the overall physiological condition of the patient at presentation.

3. Conclusion

This series is likely under-presentation of the true incidence of acute SMA thrombo-embolic occlusion in patients with COVID-19, as both asymptomatic cases and moribund patients were likely never diagnosed and influenced by referral bias, withholding elective

admission and more emergency admissions in the hospital. In current paradigm shift of understanding the patients with COVID-19 little is known about the acute thromboembolic events. Condition presenting with varied manifestation from asymptomatic to nonsalvagable state and optimal management is not clearly defined with varied postoperative course. Suspicion of COVID-19 in patient with suspected diagnosis of acute SMA throb-embolism and vice versa should be considered.

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