

## Outcome of Acute Mesenteric Ischemia in Patients with COVID 19 Infection Our Experience at Royal Medical Services

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## Abstract

## Original Research Article

**Objectives:** To present our experience and outcome in the management of acute mesenteric ischemia (AMI) as a thromboembolic complication of COVID 19 infection at king hussein medical center/ Royal Medical Services.

**Methods:** A retrospective single center study conducted on patients with active COVID 19 infection who presented with AMI between the period of March 2020 and December 2021. **Results:** 23 patients have presented to our vascular surgery department with AMI, mean age was 69 years old. 12 patient were males and 11 patients were females. 6 patients had abdominal pain with no peritonitis while 15 patients had physical signs of peritonitis. Two patients presented with sepsis and hemodynamic instability. 8 patients were managed conservatively with mortality rate reaching up to 50% among them. 15 patients had exploratory laparotomy, 5 of them found to have total dead bowel and 10 patients were managed with superior mesenteric artery thromboembolectomy leading to a mortality rate as low as 10% among them. Including total number of patients, 10 has died while 13 survived successfully with the mortality rate reaching up to 43.4% all over. **Conclusion:** Early recognition and prompt management with subsequent revascularization has improved the survival rate of COVID 19 patients presenting with AMI.

**Keywords:** Mesenteric ischemia, COVID 19, Thromboembolic, complications.

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## INTRODUCTION

COVID 19 infection is considered a global world wide pandemic that resulted in millions of deaths worldwide, and it has affected all aspects of our life [1]. Acute respiratory syndrome corona virus-2 (SARSCOV-2) primarily affects the respiratory system resulting in severe respiratory tract infection (pneumonia) among many COVID 19 patients [1, 2]. However, Thromboembolic complications has been reported increasingly during the corona virus pandemic, including acute mesenteric ischemia (AMI) which is a challenging and life threatening condition that is accompanied by high rates of mortality and morbidity [1, 2].

The aim of the study is to present our experience and outcome in the management of AMI as a thromboembolic complication of COVID 19 infection at king hussein medical center / Royal medical Services.

## METHODS AND MATERIALS

We are conducting a retrospective analytical study at king hussein medical center in Amman/Jordan, in our Vascular surgery and General surgery Departments during the period of March 2020 and December 2021. During the study period, Twenty three patients with active COVID 19 infection, presented to our emergency department with a picture of AMI. Acute mesenteric ischemia in these patients was diagnosed based on clinical presentation, laboratory investigations and CT angiogram of abdomen and pelvis on admission. Patients data were collected from our patients records and electronic health record data base as well as surgical operation reports. Patients data were analyzed including demographic (age, gender) and co-morbidities (Hypertension, Diabetes, congestive heart failure, ischemic heart disease and others) as well as smoking history and time of presentation during the COVID 19 active infection. The type of interventions and treatment offered for these patients were reviewed

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and the clinical outcome along with the 30 day mortality outcome were analyzed. Patients were diagnosed with active COVID 19 infection using PCR test which was done previously or during the patient initial presentation.

According to patient stability criteria based on level of consciousness, vital signs (temperature, blood pressure, pulse rate, respiratory rate) and oxygen saturation. These patients were divided into three groups, for which intervention plan varied as well as outcomes. Group one which included patients who presented with acute mesenteric ischemia along with symptoms of acute abdomen including signs of peritonitis on examination, with a stable general condition and stable COVID 19 symptoms. These patients had exploratory laparotomy and treated

accordingly. The second group of patients had abdominal pain but no signs of peritonitis and treated conservatively on anticoagulation. The third group of patients had acute mesenteric ischemia with signs and symptoms of peritonitis but unstable general condition and presented with sepsis and shock and deemed unstable for any intervention.

## RESULTS

Twenty three patients were included in our study, with a mean age was 69 years old (45-84 years). 12 patients (52.1%) were males and 11 patients (47.9%) were females. Mean day at presentation during COVID 19 infection was 4.6 ranging (2-10 days). The patient's clinical and pathological characteristics and variables were shown in table (1).

**Table 1: Demographic, clinical and pathological variables of patients presenting with acute mesenteric ischemia**

Variables / Demographics	Total number of patients
GENDER	Total 23 Patients
MALE	12 patients (52.1%)
FEMALE	11 patients (47.9%)
AGE ABOVE 75	6 patients (40%)
DIABETES	7 patients (30.7%)
HYPERTENSION	16 patients (69.5%)
ISCHEMIC HEART DISEASE	12 patients (52.2%)
PERIPHERAL VASCULAR DISEASE	3 patients (13%)
CONGESTIVE HEART FAILURE	4 patients (17.4%)
CURRENT SMOKING	8 patients (34.8%)

Six patients presented with Abdominal pain and were hemodynamically stable with no physical signs of peritonitis. 15 patients presented with abdominal pain and were hemodynamically stable and positive signs of peritonitis on examination, while 2 patients presented with severe sepsis and hemodynamic instability as shown in table (2).

Among the patients who presented with acute mesenteric ischemia, 8 patients (34.8%) were managed conservatively with anticoagulation alone. Four of them successfully survived and 4 patients (50%) died due to deterioration in their COVID 19 PNEUMONIA status and generalized sepsis with multiorgan dysfunction. 15

patients (62.5%) proceeded to Diagnostic laparotomy, as their stable general hemodynamic status permitted. During diagnostic laparotomy, 5 patients found to have total dead bowel and procedure was terminated and abdomen closed with high mortality result reaching up to 100%. However, 6 patients (40%) had SMA embolectomy with segmental small bowel resection while 4 patients (17.4%) had SMA embolectomy alone with preservation of bowel with second look laparotomy with 48 hours. Among the 10 patients (66.6%) who had vascular intervention done, only one of them died due to deterioration of COVID 19 INFECTION and the remaining patients successfully survived as shown in table (2).

**Table 2: Clinical presentation, treatment modalities and outcome**

Clinical presentation	Number of patients	Survived	Died (30 day mortality)
Abdominal pain, hemodynamically stable and no peritonitis	6 patients	4 patients	2 patients
Abdominal pain, hemodynamically stable and positive signs of peritonitis	15 patients	9 patients	6 patients
Severe sepsis and hemodynamically unstable	2 patients	Non survived	2 patients
<b>Treatment modality</b>			
Conservatively with anticoagulation alone	8 patients	4 patients	4 patients
Diagnostic laparotomy alone	5 patients	Non survived	5 patients
Diagnostic laparotomy with SMA embolectomy and segmental small bowel resection	6 patients	5 patients	1 patient
Diagnostic laparotomy with SMA embolectomy alone	4 patients	4 patients	Non died

Clinical presentation	Number of patients	Survived	Died (30 day mortality)
<b>Outcomes (30 day mortality)</b>			
Died	10 patients		
Survived	13 patients		

However, among all patients, 10 has died while 13 survived successfully with the mortality rate reaching up to 43.4%. Among those who died, 7 were females and the remaining 3 were males and 6 of them were above the age of 75.

### Statistical Analysis

Statistical analysis was performed using SPSS 21 software (SPSS software [IBM Corp. 2011. IBM

SPSS Statistics for Windows, Version 21.0. Armonk, NY, USA: IBM Corp]). To investigate if there an association between age, gender and mortality after considering the comorbidities as a covariate factors, logistic binary regression results showed that neither patient's age nor gender had a statistical significant predication for mesenteric ischemia deaths after controlling the covariates as shown in table (3).

**Table 3**

Explanatory variables	B	S.E	Wald test	p-value	odds ratio
Gender	2.053	1.718	1.429	0.232	7.792
Age	0.046	.141	0.108	0.743	1.047
DM	2.688	1.730	2.415	0.120	14.709
HTN	1.844	2.001	0.849	0.357	6.323
IHD	1.790	2.531	0.500	0.480	5.986
HF	1.512	1.718	0.774	0.379	4.535
PVD	0.184	1.894	.009	0.922	1.202
Smoking	1.638	1.722	.905	0.341	5.147

## DISCUSSION

(COVID-19) infection is a global health pandemic that has affected millions of people around the world. It has mainly targeted the respiratory system with a wide range of respiratory manifestations and complications [1, 2]. Thromboembolic complications, in association with severe COVID 19 pneumonic infection, has been recognized more frequently with acute mesenteric ischemia being one of the most devastating, accompanied by high morbidity with mortality rates reaching up to 60% to 80% among these patients [1-3].

Acute Mesenteric ischemia is a life threatening surgical emergency resulting from abrupt occlusion of mesenteric vessels caused by atherosclerotic disease, arterial thromboembolism and dissection. In addition, mesenteric venous thrombosis is considered a common cause of venous mesenteric ischemia that might lead to advanced bowel necrosis [4, 5]. It has been estimated that 1% of patients with acute abdomen presented with mesenteric ischemia with the incidence increased exponentially with increasing age [6].

In patients with COVID 19 infection, hypercoagulability has been recognized as a major pathological mechanism for the development of AMI that is caused by systemic inflammatory process leading usually to mesenteric venous thrombosis [7]. Other pathological mechanisms has been reported including elevated levels of Von Willebrand Factor, Endothelial dysfunction resulting from SARS-CoV-2 targeting

angiotensin converting enzyme 2 expressed on vascular endothelium as well as hemodynamic compromise and shock status in patients with severe COVID-19 pneumonia [7, 8]. This has led to the suggestion that thrombotic rather than embolic mechanism is considered the main pathological mechanism of Acute mesenteric ischemia in COVID 19 patients. This suggestion has been studied by Vartanoglu Aktokmakyan *et al.*, in an observational study which was conducted on 60 patients with 6 patients had COVID 19 infection. They have emphasised on the role of hypercoagulability in the development of acute mesenteric ischemia in such patients [9].

The typical presentation in patients with acute mesenteric ischemia is severe abdominal pain that is out of proportion of physical signs along with bowel emptying, nausea, vomiting and Diarrhea that might progress into peritonitis and bowel perforation [1, 2, 4, 5]. In a study performed by Etem Alhan *et al.*, in 2012 on 107 patients with acute mesenteric ischemia, peritonitis was demonstrated in 89.7% of patients and 22.4% of patients presented with shock status [4].

Patients with COVID 19 infection presented with symptoms that mimic the gastrointestinal symptoms of acute mesenteric ischemia. The devastating effect and lethal complications of the COVID 19 infection on the patient's general condition further complicates the management of acute mesenteric ischemia in those patients with active COVID 19 pneumonic infection [10, 11].

In our study, 65.2% (15) of patients presented with signs of peritonitis on physical examination along with abdominal pain, while 8.7% (2) of patients presented with generalized instability and shock along with severe sepsis and that was associated with high mortality rate among them, with the possible reasons to such a high mortality rate has been attributed to delays in diagnosis and the long time of presentation since the start of COVID 19 infection . They have presented after 8 days since COVID 19 infection started.

In general, patients with suspected bowel necrosis demonstrated by clinical signs of peritonitis and generalized sepsis along with laboratory and radiological signs that suggest advanced mesenteric ischemia should be treated by exploratory laparotomy if they are hemodynamically stable to sustain the surgical intervention [1, 2, 4, 5]. Frankly dead bowel should be resected according to the damage control guidelines. In the event of viable bowel segments with no evidence of perforation, revascularization should be attempted in the form of SMA embolectomy with thromboembolic acute mesenteric ischemia [4-6]. However, in patients presenting with acute on top of chronic atherosclerotic mesenteric ischemia, options of revascularization include endovascular angioplasty and stenting in hybrid suits versus open surgical mesenteric bypass [4-6].

In our data , among the 15 patients who have underwent Diagnostic laparotomy, 10 patients (66.6%) had open superior mesenteric artery thromboembolectomy, with 6 patients (40%) had accompanying small segment of necrotic small bowel resection. Only one patient died among this group due to deterioration of his COVID 19 infection. In comparison to the group of patients who were treated conservatively with anticoagulation alone, in which 4 patients out of 8 (50%) has died due to severe sepsis and deterioration in COVID 19 infection. This has emphasised on the benefit of early revascularization in such patients who present with acute mesenteric ischemia who were deemed fit and stable to proceed for surgical intervention.

Due to the high risk of thromboembolic complications accompanied by COVID 19 infection , the current guidelines worldwide recently advised to start patients with moderate to severe COVID 19 infection low molecular weight heparin (LMWH) prophylaxis, and many studies has demonstrated role of LMWH prophylaxis in the prevention of acute mesenteric ischemia in such group of patients[12, 13].

## CONCLUSION

Thromboembolic complications of COVID 19 infection has been reported increasingly, with acute mesenteric ischemia considered the most lethal and devastating. Early recognition and prompt management with subsequent revascularization has improved the

survival rate and minimized the devastating effect of these complications in such group of patients.

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