



## OUR SURGICAL EXPERIENCE IN ACUTE MESENTERIC ISCHEMIA- VARIOUS PATHOPHYSIOLOGICAL TYPES – A CASE SERIES

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### ABSTRACT

**BACKGROUND:** Mesenteric ischemia is a frequently lethal condition resulting from critically reduced perfusion to the gastrointestinal tract. It accounts for 1-2% of hospital admissions for abdominal pain.

Mortality due to mesenteric ischemia ranges from 24% to 96% with an average of 69%.

**AIM:** The aim of this case series is to outline the clinical presentation and challenges in diagnosis of acute mesenteric ischemia and emphasize the importance of early diagnosis and intervention in reducing the mortality and morbidity. This article presents a series of 4 cases of the 3 major types of acute mesenteric ischemia – 2 cases of Acute Mesenteric Arterial Thrombosis(AMAT), one case of Acute Mesenteric Arterial Embolism(AMAE) and one case of Mesenteric Venous Thrombosis(MVT).

**MATERIALS AND METHODS:** A total number of 4 patients who had undergone emergency laparotomy for acute mesenteric ischemia during the month of December 2020 in the Department of General Surgery, Government Kilpauk Medical College were studied. All 4 cases have been analysed during this study period of one month and followed up until discharge from the hospital.

**RESULTS:** This case series consisted of 4 cases. Out of 4 cases, 3 were cases of Superior Mesenteric Arterial Occlusion due to thrombus and emboli and 1 was a case of Superior Mesenteric Vein Occlusion by thrombus. All 4 were male patients. All 4 patients presented with sudden onset of abdominal pain with or without vomiting. Abdominal distension, constipation and clinical features suggestive of bowel gangrene was not seen in all cases. Out of 4 cases, 2 cases were diagnosed early and taken up for immediate surgery and had a better outcome postoperatively with shorter hospital stay. Definitive diagnosis could not be made at time of admission for one case and was taken up for surgery late after the general condition of the patient deteriorated and extensive gangrene of the small bowel was seen during surgery. One case succumbed to septic shock after surgery following delayed presentation. This case series attempts to highlight that the key to successful management in acute mesenteric ischemia is a high index of suspicion leading to early diagnosis, aggressive resuscitation and early mesenteric revascularization.

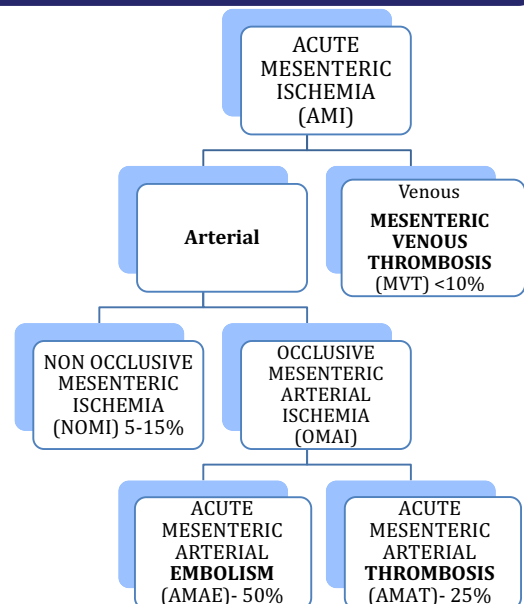
**CONCLUSION:** Despite the remarkable advances in vascular surgical technique, vascular imaging, percutaneous intervention and surgical critical care, mesenteric ischemia remains a complex and often disheartening disease. Acute mesenteric ischemia is a life threatening vascular emergency that requires a high degree of clinical suspicion and early intervention to avoid a poor outcome. As Acute Mesenteric Ischemia often affects elderly patients, we have to consider the possibility of acute mesenteric ischemia in all elderly patients presenting with abdominal pain that is out of proportion to the findings on physical examination.

**KEYWORDS :** Acute Mesenteric Ischemia, Thrombosis, Embolism, septic shock

### INTRODUCTION:

Acute mesenteric ischemia(AMI) is a condition characterized by inadequate blood flow through the mesenteric vessels, resulting in ischemia and eventual gangrene of the bowel wall. Although relatively rare, it is a potentially life threatening complication. AMI can be classified as either arterial or venous. Based on pathophysiology, AMI can be broadly classified into 4 clinical entities: Non Occlusive Mesenteric Ischemia(NOMI), Acute Mesenteric Arterial Thrombosis(AMAT), Acute Mesenteric Arterial Embolism(AMAE) and Mesenteric Venous Thrombosis(MVT).

Despite major advances in diagnostic tools and intervention over the years, mortality and morbidity due to mesenteric ischemia still remains high due to low index of clinical suspicion, delayed presentation to the hospital, advanced age of the patient and associated comorbidities. This case series presents 4 cases of Acute Mesenteric Ischemia which have been classified based on the pathophysiological mechanism of production- 2 cases of Acute Mesenteric Arterial Thrombosis(AMAT), one case of Acute Mesenteric Arterial Embolism(AMAE) and one case of Mesenteric Venous Thrombosis(MVT).

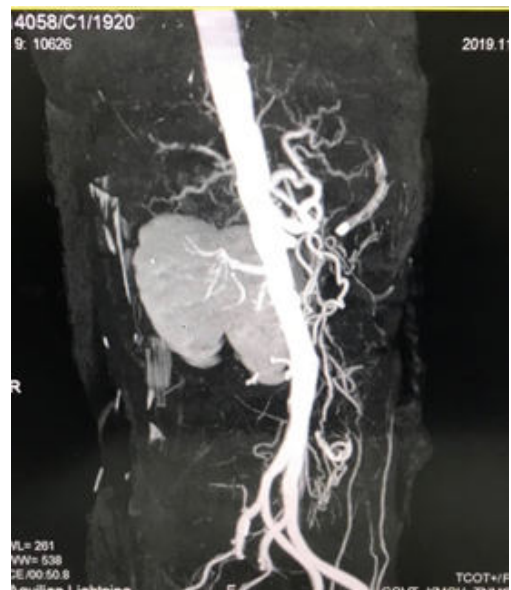


**CASE SERIES:****CASE 1: ACUTE MESENTERIC ARTERIAL EMBOLISM (AMAE):**

A 55 year old male patient presented to the emergency department with acute onset of abdominal pain and multiple episodes of vomiting for 1 day. Patient had history of Atrial Fibrillation for which he was not on regular treatment. There were no other comorbid illness or previous surgeries. On examination, general condition was fair with tachycardia (Pulse rate- 110/min). Abdomen was soft with tenderness over the epigastrium and periumbilical region. There was no guarding or rigidity and bowel sounds were present. Per rectal examination was normal. Blood investigations revealed increased total count of 14,500/cu mm and elevated renal parameters – urea-55mg% and creatinine-1.6mg%. Plain x-ray of chest and abdomen was found to be normal. Ultrasound abdomen was done and found to be normal. Plain CT of abdomen was done and showed contracted right kidney measuring 4.27 cm with perinephric fat stranding and no evidence of free fluid. Contrast study was deferred due to elevated renal parameters. Patient was initially resuscitated with intravenous fluids and put on nil per oral and treated with intravenous antibiotics for 3 days, on day 3, patient condition deteriorated with history of obstipation and decrease in abdominal pain. He developed tachycardia and hypotension with guarding in the LIF and periumbilical region with absent bowel sounds. On per rectal examination, black liquid stools was present. Hence we suspected gangrene of bowel and proceeded with emergency laparotomy. Intraoperatively, small bowel was found to be gangrenous involving distal jejunum and entire ileum upto the ileocaecal junction. Proximal jejunum was found to be spared. Viability of ascending colon was doubtful. Gangrenous segment of small bowel was resected upto ileocaecal junction and proximal jejunostomy with distal transverse loop colostomy was done. Intraoperatively, patient developed Atrial Fibrillation and was put on Amiodarone infusion. Postoperatively, patient was started on Heparin injection, Amiodarone and cardiac drugs. Both jejunostomy and mucous fistula functioned well. Patient was started on oral feeds along with TPN. Postoperatively CT angiogram was done which showed thrombus filling the Superior Mesenteric Artery (SMA) about 2.7cm from its origin and extending for a length of 3.4cm and right renal artery was not visualized, suggestive of Embolic Occlusion of SMA and Right Renal Artery. Patient was discharged on 20<sup>th</sup> post operative day with oral anticoagulants and cardiac drugs for atrial fibrillation and is on follow up.

**CASE 2: ACUTE MESENTERIC ARTERIAL THROMBOSIS (AMAT)**

A 60 year old male patient presented to the casualty with complaints of intermittent dull aching lower abdominal pain for 3 days and multiple episodes of vomiting for one day. Patient was a chronic smoker. There was no significant comorbid illness and no history of previous surgeries. His general condition was fair and general examination was found to be normal. On examination of abdomen, there was tenderness in the RIF and hypogastrium with localized guarding. Bowel sounds were absent and per rectal examination was normal. Blood investigations were normal except for elevated total count of 19,500/cu mm. Plain x-ray of chest and abdomen and ultrasound of the abdomen was found to be normal. CT abdomen showed ill defined collection in the RIF measuring 3.4\*1.9\*6.4cm and no evidence of free fluid. Patient was initially resuscitated with intravenous fluids and antibiotics, put on nil per oral and vital signs and abdominal girth were monitored and then taken up for emergency laparotomy. On laparotomy, small bowel was found to be gangrenous starting from 5cm distal to DJ flexure to 15cm proximal to the ileocaecal junction. Gangrenous segment of small bowel was resected and proximal jejunostomy with distal ileal mucous fistula was done. Patient was started on oral diet on POD-3 and put on Injection Heparin and TPN. Postoperatively, CT angiogram was done which showed complete thrombotic occlusion of SMA from its origin for a length of 12.5cm. Patient condition improved postoperatively and he was discharged on POD-8 with oral anticoagulants and is on follow up.





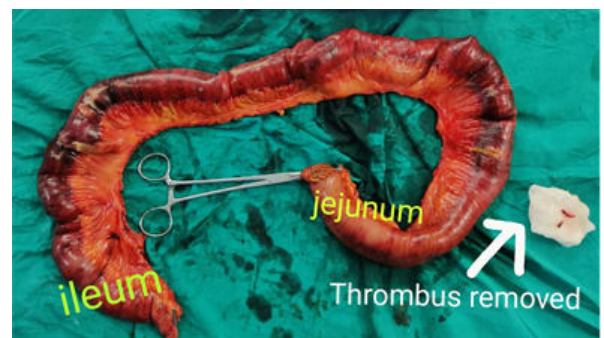
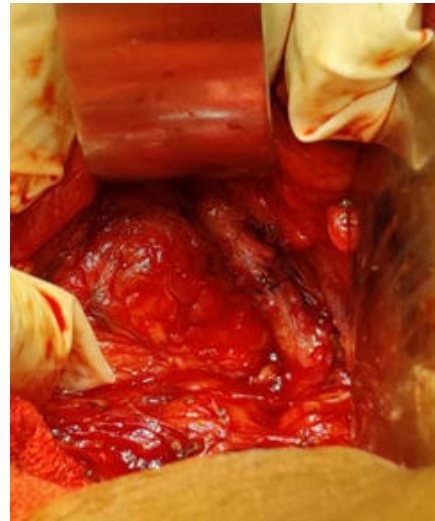
**CASE 3: MESENTERIC VENOUS THROMBOSIS (MVT)**

A 63 year old male patient presented to the emergency department with acute onset of abdominal pain for 2 days and multiple episodes of vomiting and loose stools for 2 days along with melena. He had no comorbid illness or previous surgeries. Patient was a chronic smoker and alcoholic. On examination, patient was drowsy and responding only to painful stimuli. There was tachycardia (pulse -108/min) and hypotension (BP-90/60mm/Hg). Abdomen was distended with diffuse guarding and rigidity. There was black fecal staining on per rectal examination. Blood investigations revealed leukocytosis (total count- 15,900/cu mm) and elevated renal parameters (urea- 156mg% and creatinine- 1.8mg%). Bedside ultrasound of abdomen was done and showed minimal ascites with sluggish peristalsis of bowel loops with maximum diameter of 3.5cm. Patient was immediately started on dual inotropes and put on mechanical ventilation in view of poor GCS and taken up for emergency laparotomy after resuscitation. Intraoperatively, there was 100ml of haemorrhagic toxic fluid with edematous small bowel loops. Small bowel was found to be gangrenous starting from 15cm distal to the DJ flexure to 7cm proximal to ileocaecal junction. There was active bleeding from the root of mesentery. Bleeders were identified and ligated. Gangrenous segment of small bowel resected and proximal jejunostomy and distal ileal mucous fistula was done. Postoperatively inotropic support and mechanical ventilation was continued. Patient was started on injection heparin and resuscitated with blood and blood products. Patient was weaned off from inotropes and mechanical ventilation by POD-3 and oral diet and TPN was started. CT angiogram was done postoperatively showing acute thrombosis of Portal vein causing 80% luminal narrowing and thrombus causing complete occlusion of Superior Mesenteric Vein. General condition of the patient did not improve postoperatively and he succumbed to septic shock on POD-9.

**CASE 4: ACUTE MESENTERIC ARTERIAL THROMBOSIS (AMAT)**

A 68 year old male presented to the casualty with complaints of abdominal pain and constipation for 4 days and abdominal distension for 2 days. There was history of diabetes mellitus and Coronary Artery Disease (CAD) for which he was on regular treatment. On examination, general condition was fair with tachycardia (pulse- 112/min) and tachypnea. Abdomen was found to be distended with diffuse guarding and absent bowel sounds. Blood investigations were found to be normal. Ultrasound abdomen showed minimal free fluid in

the abdomen. Plain Xray of the abdomen showed dilated small bowel loops with multiple air fluid levels. CECT of the abdomen showed dilated ileal loops with maximum diameter of 3.3cm with intramural air pockets (pneumatosis intestinalis) and non enhancing filling defect in the SMA for a length of 3.7cm about 6cm from its origin (Acute SMA thrombosis). Emergency laparotomy was done and gangrenous small bowel was seen extending about 100cm from DJ flexure to about 40 cm proximal to the ileocaecal junction. Resection of gangrenous segment was done with proximal jejunostomy and distal ileal mucous fistula. SMA arteriotomy with thrombectomy was done. Patient was started on injection heparin postoperatively. Postoperative period was uneventful. Patient was started on oral diet and TPN on POD-2 and was discharged with oral anticoagulants and cardiac drugs on POD-12.



	CASE 1	CASE 2	CASE 3	CASE 4
AGE/SEX	55/M	60/M	63/M	68/M
VESSEL INVOLVED/ MECHANISM	SMA	SMA	SMV and portal vein	SMA
PATHOPHYSIOLOGIC TYPE	AMAE	AMAT	MVT	AMAT
CLINICAL PRESENTATION	Abdominal pain and vomiting	Abdominal pain, vomiting	Abdominal pain, vomiting, loose stools, melena	Abdominal pain, constipation, abdominal distension

RISK FACTOR	Atrial Fibrillation	Smoking	Smoking	Diabetes Mellitus, CAD
XRAY ABDOMEN	Normal	Normal	Normal	Dilated small bowel loops with multiple air fluid levels
CT ANGIOGRAM/CECT ABDOMEN	Thrombus filling the Superior Mesenteric Artery(SMA) about 2.7cm from its origin and extending for a length of 3.4cm and right renal artery was not visualized, suggestive of Embolic Occlusion of SMA and Right Renal Artery	Complete thrombotic occlusion of SMA from its origin for a length of 12.5cm	Acute thrombosis of Portal vein causing 80% luminal narrowing and thrombus causing complete occlusion of Superior Mesenteric Vein.	Non enhancing filling defect in the SMA for a length of 3.7cm about 6cm from its origin (Acute SMA thrombosis)
SURGERY DONE	Resection of gangrenous bowel with proximal jejunostomy distal transverse loop colostomy	Resection of gangrenous segment with proximal jejunostomy and distal ileal mucous fistula	Resection of gangrenous segment with proximal jejunostomy and distal ileal mucous fistula	SMA arteriotomy and thrombectomy along with resection of gangrenous segment with proximal jejunostomy and distal ileal mucous fistula
POST OPERATIVE STAY	20 days	8 days	Patient expired on POD-9	12 days

## DISCUSSION:

The mesenteric arterial circulation comprises of 3 major aortic branches with multiple collaterals namely – the celiac axis, Superior Mesenteric Artery(SMA), Inferior Mesenteric Artery. The arterial collaterals with their anastomotic arcades often allow for compensatory intestinal blood flow when one or more of the major visceral arteries become diseased or occluded. However in acute arterial occlusion of one major artery, commonly the SMA, patients usually experience severe symptoms because the compensatory collateral circulation is inadequate. SMA is more commonly involved due to its wide angle of origin and parallel course to the aorta. Most common site of embolic occlusion is distal to the origin of middle colic artery.

Insufficient blood perfusion of the small bowel and colon may result from embolic or thrombotic occlusion of artery (AMAT, AMAE), thrombotic venous occlusion (MVT) or non occlusive processes such as vasospasm or low cardiac output (NOMI). Embolic phenomena account for approximately 50% of all clinical cases, arterial thrombus for about 25% and MVT for fewer than 10%. Damage to the affected bowel portion may range from reversible ischemia to transmural infarction with necrosis and perforation. The injury is complicated a by reactive vasospasm in the SMA region after the initial occlusion. Arterial insufficiency causes tissue hypoxia, leading to initial bowel wall spasm. This leads to gut emptying by vomiting or diarrhea. Mucosal sloughing may cause bleeding into the gastrointestinal tract. At this stage, little abdominal tenderness is present, producing the classic intense visceral pain that is out of proportion to the physical examination findings.

As ischemia persists, the mucosal barrier becomes disrupted, and bacteria, toxins and vasoactive substances are released into the systemic circulation. This can cause death from septic shock, cardiac failure or multisystem organ failure before bowel necrosis actually occurs. As hypoxic damage worsens, the bowel wall becomes edematous and cyanotic. Bowel necrosis occurs in 8-12 hours from the onset of symptoms. Transmural necrosis leads to peritoneal signs and heralds a much worse prognosis.

Among the many serum parameters that have been investigated such as serum lactate, serum amylase, serum

creatinine phsospokinase, there is no specific marker to diagnose AMI. CT abdomen is the rapid initial diagnostic test available in most centers. Definitive method of diagnosis is by CT angiography and this is the gold standard.

In this case series, out of 4 cases, atrial fibrillation was a risk factor in one case and CAD was present n one case. History of chronic smoking was present in 2 cases.

In case 1, the patient was stable at the time of presentation and definitive diagnosis could not be made at the time of initial presentation as contrast CT could not be done due to elevated renal parameters. Hence surgery was delayed and was performed only after the patient deteriorated due to ischemic necrosis of the bowel. Patient had history of Atrial Fibrillation which predisposed to embolic occlusion of SMA as well as infarction of right kidney. Intraoperatively, sparing of proximal jejunum and transverse colon was seen which is characteristic of embolic occlusion of SMA when the thrombus lodges distal to the origin of middle colic artery, which is the most common site of occlusion. Despite delayed intervention, patient improved postoperatively and was discharged after prolonged hospital stay.

In case 2, there was no risk factor apart from advanced age and smoking. Patient was taken up for surgery relatively early compared to case 1 and showed good recovery postoperatively.

In case 3, there was no risk factor other than age, smoking and alcohol. Owing to delayed presentation to the hospital in a state of shock, patient died despite resuscitation and surgery. In case 4, CAD was present as a risk factor. SMA thrombosis was identified preoperatively by CECT abdomen and intraoperatively, SMA thrombectomy was performed along with resection of the gangrenous bowel segment and jejunostomy.

Effective management is linked to early diagnosis, aggressive resuscitation, early revascularization and ongoing supportive care. During laparotomy it is important to assess the viability of bowel and identify the cause. This is followed by mesenteric revascularization by thrombectomy/ embolectomy/ bypass grafting (which is continued postoperatively by heparin injection) and resection of necrotic bowel. When extensive bowel involvement is noted, every effort must be made to

retain every centimeter of viable bowel. If determining bowel viability is difficult, a second look may be required 24-48 hours later.

Apart from early diagnosis of acute mesenteric ischemia, is it is also important to know the risk factors that predict the prognosis in order to enable aggressive resuscitation and treatment strategies to improve outcomes.

#### CONCLUSION:

Despite the remarkable advances in in vascular surgical technique, vascular imaging, percutaneous intervention and surgical critical care, mesenteric ischemia remains a complex and often disheartening disease. Acute mesenteric ischemia is a life threatening vascular emergency that requires a high degree of clinical suspicion and early intervention to avoid a poor outcome. As Acute Mesenteric Ischemia often affects elderly patients, we have to consider the possibility of acute mesenteric ischemia in all elderly patients presenting with abdominal pain that is out of proportion to the findings on physical examination

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