

Superior Mesenteric Artery Occlusion: A case report and Mini Review

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ABSTRACT Introduction: Acute mesenteric ischemia/occlusion is a life-threatening vascular emergency that requires early diagnosis and intervention to restore mesenteric blood flow and to prevent loss of life. Despite progress in our understanding about the mesenteric ischemia, diagnostic modalities, and treatment options, the mesenteric ischemia remains a diagnostic challenge. This leads to delayed implementation of treatment and thus contributes to high mortality and morbidity. **Methods:** Here, we have presented a case report of superior mesenteric artery thrombosis. It discusses the various aspects of superior mesenteric artery occlusion, the aetiology, the difficulty with diagnosis, and the best possible course of action. **Results:** The Superior Mesenteric Artery (SMA) supplies the whole of the small intestine except the superior part of the duodenum. It also supplies the caecum, ascending colon and most of the transverse colon. Acute mesenteric ischemia (AMI) is a syndrome caused by inadequate blood flow through the mesenteric vessels, resulting in ischemia and eventual gangrene of the bowel wall. **Conclusion:** The acute mesenteric ischemia (AMI) comprises four different primary clinical entities, Non-occlusive mesenteric ischemia (NOMI), and occlusive mesenteric artery ischemia (OMAI). This OMAI is further subdivided into acute mesenteric arterial embolism (AMRE) and acute mesenteric arterial thrombosis (AMRT). The AMI as the venous disease takes the form of Mesenteric venous thrombosis. (MVT). The overall prevalence of AMI is 0.1% of all hospital admissions; venous thrombosis is found in approximately 0.001% of patients who undergo exploratory laparotomy. The risk factor for AMI includes arrhythmia, heart diseases, mitral stenosis, endocarditis, recent MI, and intra-abdominal malignancies.

KEYWORDS Superior mesenteric artery occlusion, NOMI, OMAI, AMRE, AMRT, MVT, intestinal obstruction

Introduction

The Superior Mesenteric Artery (SMA) supplies the whole of the small intestine except the superior part of the duodenum. It also supplies the caecum, ascending colon and most of the transverse colon. It arises from the front of the abdominal aorta about one CM below the coeliac trunk, and it is crossed anteriorly at its origin by the splenic vein and body of pancreas. It passes downwards and forwards between the layers of mesentery until

it reaches the right iliac fossa here it anastomoses with one of its branches, viz. the ileocolic artery. It is accompanied by the superior mesenteric vein which lies towards its right side and is surrounded by the superior mesenteric plexus of veins. The important branches of this artery are an inferior pancreaticoduodenal artery, jejunal and ileal branches, ileocolic artery, right, and middle colic arteries. [1]

Acute mesenteric ischemia (AMI) is a syndrome caused by inadequate blood flow through the mesenteric vessels, resulting in ischemia and eventual gangrene of the bowel wall. Mesenteric vascular disease may be classified as acute intestinal ischemia-with or without occlusion. The superior mesenteric vessels are the visceral vessels most likely to be affected by the embolization or thrombosis. Occlusion at the origin of the SMA is almost invariably as a result of thrombosis, whereas the emboli lodge at the origin of the middle colic artery. [3]

Possible sources of the embolization of the SMA include fib-

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rillation of left atrium, a mural myocardial infarction, an atheromatous plaque from an aortic aneurysm and mitral valve vegetation associated with endocarditis. Primary thrombosis is associated with atherosclerosis and thromboangitis obliterans. Primary thrombosis of the superior mesenteric vein may occur in the association of factor V Leiden, portal hypertension, portal pyaemia, and sickle cell disease and in women taking contraceptive pills. [4] Thus, for practical purposes, AMI comprises four different primary clinical entities, Non-occlusive mesenteric ischemia (NOMI), and occlusive mesenteric artery ischemia (OMAI). This OMAI is further subdivided into acute mesenteric arterial embolism (AMRE) and acute mesenteric arterial thrombosis (AMRT). The AMI as the venous disease takes the form of Mesenteric venous thrombosis. (MVT). [5]

The overall prevalence of AMI is 0.1% of all hospital admissions. Venous thrombosis is found in approximately 0.001% of patients who undergo exploratory laparotomy. The risk factor for AMI includes arrhythmia, heart diseases, mitral stenosis, endocarditis, recent MI, and intra-abdominal malignancies. Approximately two-thirds of the patients are female. [6] [7]

Case report

A patient named X, 50 years, female, presented to the Department of surgery SBRKM Government medical college Jagdalpur. She was referred to this hospital from a very remote village, through the primary health centre. She gave the history of severe pain in the abdomen, vomiting, and constipation for two days.

On examination the general condition was poor. The blood pressure was 80 mm systolic, and pulse rate was around 110/minute. The abdominal examination revealed tympanic distension of the abdomen, and the bowel sounds were absent. Routine blood tests like CBC, blood sugar, serum creatinine, and tests for HIV and hepatitis ordered. The patient also underwent radiological examination like plane X-ray abdomen and Ultrasonography of abdomen. The plane x-ray abdomen was not showing any fluid levels and was without any positive findings. The USG abdomen revealed dilated bowel loops of intestine.

Emergency surgery was planned. The condition of the patient stabilized with adequate IV fluids, antibiotics, and analgesics. The abdomen opened through a midline incision. On opening the abdomen, almost whole of the small intestine was found gangrenous. About 50 CMs of the jejunum and 60 CMs of Ileum was spared, and not gangrenous, with good blood supply. The large intestine was viable.

It was decided to excise the small gangrenous bowel and to do end to end anastomosis of the viable loops of intestine. In the postoperative period, the patient had a smooth recovery.

Discussion

The acute mesenteric ischemia is a syndrome characterized by reduced blood flow through mesenteric vessels causing bowel ischemia and eventually gangrene. It is a rare disease entity but is potentially life-threatening. It may be arterial or venous. The arterial type may be occlusive or nonocclusive. The cause of occlusion may be embolism or thrombus from various sources. In 1930, Cokkinis remarked, "Occlusion of the mesenteric vessels is apt to be regarded as one of those conditions of which the diagnosis is impossible, the prognosis hopeless, and the treatment almost useless." [8] The SMA is a branch from Aorta, gives off the inferior pancreaticoduodenal artery, middle colic, right colic,

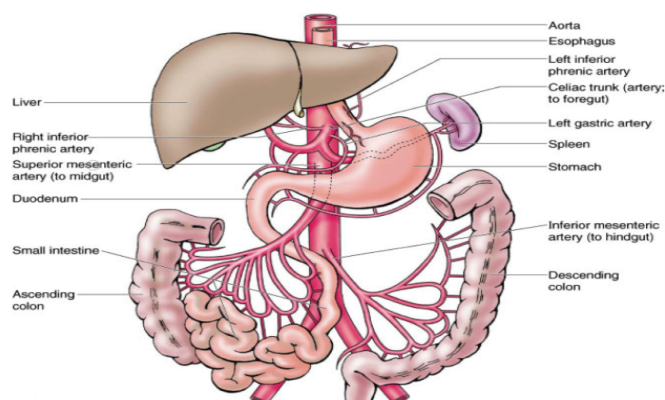


Figure 1: The anatomy of the superior mesenteric artery.

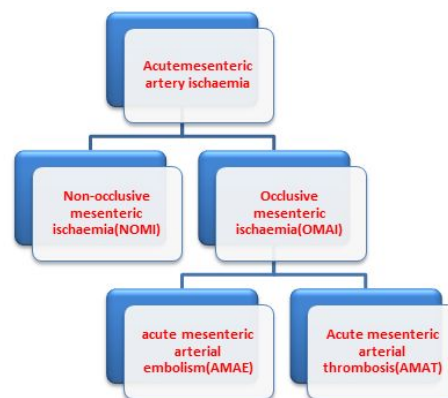


Figure 2: Acute mesenteric arterial Ischaemia.



Figure 3: Plane x-ray abdomen.



Figure 4: The excised specimen of gangrenous bowel loops.

and jejunal and ileal branches. It supplies midgut, i.e. jejunum, ileum, caecum, ascending colon and almost 2/3 of the transverse colon. The venous system, for the most part, parallels the arterial system. It is obvious that the SMA Ischaemia is devastating and once gangrene of the bowel sets in, the prognosis is grave. The clinical presentation is that of intestinal obstruction.

The pain is sudden and disproportionate to physical examination findings. It is moderate to severe, diffuse and is nonlocalised. It is constant and many times colicky. Nausea and vomiting are found in 75% of the patients. Abdominal distension occurs eventually with features of septic and hypovolemic shock. There is hypotension, tachycardia, tachypnea, and fever.

The initial presentation is confusing, and late diagnosis carries a high mortality. It is essential to have a high degree of suspicion especially in elderly patients with atrial fibrillation, MI, endocarditis, valvular diseases, sickle cell disease, etc. A diagnosis of AMI should be considered in all elderly patients with abdominal pain, especially if the pain is disproportionate to physical examination findings. Various laboratory tests may be performed, but they are unable to give a definite clue. More useful tests are plane x-ray abdomen, CT/MRI, and ultrasonography. Electrocardiography (ECG) and diagnostic peritoneal lavage (DPL) may also be considered.

Plane X-Ray Abdomen:

Plane X-Ray abdomen usually seems normal; there are no dilated bowel loops or fluid levels, so typical of the dynamic type of intestinal obstruction. Radiographic signs are nonspecific and appear when bowel infarction has already set in [9] However it may show presence or absence of perforation, pneumatosis intestinalis (i.e. submucosal gas), thumb-printing of the bowel wall, and portal vein gas as of late findings.

Angiography:

The angiography is considered a standard investigation for the diagnosis and preoperative planning in AMI. The various studies have reported the sensitivity of 74-100% and a specificity of 100% in acute arterial occlusion. [10],[11] [12] [13] The disadvantages of angiography are that it is highly invasive and unsuitable for critically ill patients. It may not be readily available and may delay surgical management. The angiographic dye is nephrotoxic. It gives a high false negative rate in patients presenting early in the course of AMI. [14] [15]

CT and CTA:

Contrast-enhanced computerized tomography (CECT) has proved very valuable for the assessment of mesenteric ischemia. Multiarray spiral scanners allow detailed examination of both small bowel and mesenteric vessels. [16] It has sensitivities of 96-100% and specificities of 89-94%. CT findings with specificity greater than 95% for AMI include SMA or SMV thrombosis, intestinal pneumatosis, portal venous gas, lack of bowel-wall enhancement, and ischemia of other organs [17] CT Angiography has a sensitivity of 71-96% and a specificity of 92-94% for AMI. It is ordered much more frequently than classic angiography. It is non-invasive and readily available.

MRI and MRA:

Magnetic resonance imaging (MRI) and MRA yield findings similar to those of CT in AMI. MRA has a sensitivity of 100%

and a specificity of 91%. It is particularly effective for evaluating MVT. In spite of its specificity, it is not ordered so commonly as CT & CTA, because of its cost and time required for the examination.

Ultrasonography:

It is less sensitive than Angiography. It cannot detect the clot beyond the proximal main vessels and also fail to diagnose NOMI. The presence of dilated loops of bowel further reduces its sensitivity and specificity. However, it may show a thrombus or reduced blood flow in the involved artery or vein. It may also show portal venous gas, biliary diseases, free peritoneal fluid, thickened bowel walls, and intramural gas. Echocardiography may confirm the source of embolization or show valvular pathology.

Treatment consideration:

Initial Resuscitation and Stabilization: The patients with SMA occlusion or ischemia are usually in a highly toxic state they need resuscitation before surgical intervention. Every effort is made to improve his cardiovascular status. Vasopressor at best is avoided since it may worsen ischemia. Intravenous fluid resuscitation is done by isotonic normal saline solution, and blood products are infused if necessary. A nasogastric tube is inserted, and also urinary bladder is catheterized to monitor urine output. The adequacy of resuscitation is determined by monitoring the central venous pressure, or a Swan-Ganz pressure monitoring. Any arrhythmia, congestive cardiac failure or myocardial infarction is treated accordingly. Oxygen is administered to maintain saturation between 96 to 99%. Broad spectrum antibiotics are started to combat peritonitis and septic shock. Appropriate analgesics are also indicated.

Regardless of the aetiology, all cases of mesenteric ischemia with signs of peritonitis and possible bowel infarction need immediate surgical intervention. [18] If the patient is presented after 24-48 hours and gangrene has already set in, so, resection of the gangrenous bowel and anastomosis of the remaining bowel is done — minimum bowel length required to be retained 1.2 meters. Otherwise patient has high mortality due to, short bowel syndrome. Development of septicemia, ARDS, DIC, and postoperative leak are common complications. In the postoperative period the blood pressure, haemoglobin level, oxygen saturation, urine output are closely monitored. Heparin may be used to reduce thrombotic events. [19]. Papaverine may be administered to reduce the vasospasm.

Antibiotics are continued to prevent any septic event. Cardiac evaluation should be done and closely monitored. In the postoperative period, paralytic ileus is expected and is appropriately managed. **The short bowel syndrome:**

It is the symptom complex after massive small bowel resection, i.e. resection more than 70%. Minimum bowel length required is 1.2 meters. Proximal jejunal resection is better tolerated than ileal resection. The ileum is more adaptive and can increase absorptive capacity more efficiently. The adaptation of massive bowel resection is better tolerated if the caecum, ileo-caecal valve, and ileum, as much as possible, are retained. Ileo-caecal resection interrupts the enterohepatic circulation of the bile salts, which in colon gets metabolized into secondary bile salts. These secondary bile salts block the absorption of water and electrolytes.

The outcome of the short bowel syndrome includes severe malabsorption, severe dehydration, gall stone formation, urinary

calculi due to increased oxalate levels, diarrhoea, water, and electrolyte imbalance, etc. [20]

Conclusion

The key to success is early diagnosis and treatment, which is most of the time not possible. A high degree of suspicion helps in the appropriate investigation and early intervention. Pain in the abdomen, out of proportion of physical findings, cardiac diseases, advanced age, sickle cell disease should arouse the doubt of Superior mesenteric ischemia/ occlusion.

Learning points

1. Late presentation invariably causes gangrene of the affected bowel.
2. The plain X-Ray abdomen may be normal. There may not be dilated bowel loops with fluid levels so typical of intestinal obstruction because this is an adynamic type of intestinal obstruction.
3. Intestinal obstruction is suspected due to the cardinal signs like pain, distension of abdomen, vomiting, and constipation.
4. Many times the exact diagnosis of vascular obstruction is reached only on opening the abdomen and not before.

Competing Interests

None

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