

Surgical Treatment of Acute on chronic Superior Mesenteric Artery Thrombosis and Acute Intestinal Ischemia

Sabah N Jaber¹, Mohammed Al-Musawi², Noufel S. Alshadood³, Osama H. Alhasani⁴

ABSTRACT

Mesenteric ischemia comes in different distinct pathologic categories which required clinicians' awareness because management varies based on pathology. The major breakthrough was with the evolution of high-resolution CT scan which can provide precise diagnosis. With the plethora of endovascular management of mesenteric ischemia, multicenter studies showed lower bowel resection rates and lower death rates in the endovascular cohort compared to open surgical cohort yet patients who show signs of peritonitis then open surgical embolectomy or thrombectomy is a good option along with the necessary bowel resection. We are presenting a case of acute on chronic mesenteric ischemia in a hospital setting lacks the necessary endovascular tools to manage the vascular element of the pathology by stenting. The indication for laparotomy was inevitable because of the established peritonitis and bowel ischemia. The arterial atherosclerosis and thrombosis were managed by open atherectomy, thrombectomy and patch angioplasty with excellent immediate and in follow-ups.

Key words: Mesenteric ischemia, atherectomy, thrombectomy, patch angioplasty.

Iraqi New Medical Journal July 2019;4(10)

INTRODUCTION

Occlusion of the mesenteric is a known cause of catastrophic intestinal ischemia or infarction.¹ Clinicians should recognize the different pathologic categories in mesenteric ischemia,^{2,3} as they differ in epidemiology, risk factors, clinical presentation, operative approach and prognosis (**figure 1**):²

1. Embolic
2. Thrombotic occlusion of the superior mesenteric artery (SMA)
3. Non-occlusive mesenteric ischemia (NOMI)
4. Mesenteric venous thrombosis (MVT).

The frequency of acute mesenteric ischemia (AMI) among patients with acute abdomen var-

ies 17.7% in emergency laparotomies to 31.0% in damage-control laparotomies in non-trauma patients.⁴⁻⁶ Acute thrombotic SMA occlusion and MVT are difficult to diagnose at first evaluation. Acute on chronic mesenteric ischemia, with an insidious clinical course, may show signs of ischemia in the duodenum on endoscopy and in the right colon.⁷ A high proportion of the often misdiagnosed patients with acute thrombotic SMA occlusion may have had longstanding preexisting symptoms of chronic mesenteric ischemia (CMI), including postprandial abdominal pain (abdominal angina), food fear, diarrhoea and weight loss. In arterial occlusive AMI (the first two categories), the current diagnostic and therapeutic strategy aims at restoring mesenteric circulation by endovascular or surgical means, before irreversible intestinal in-



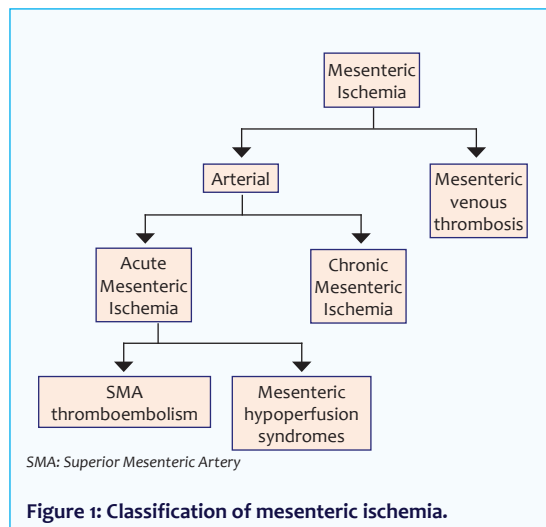
¹ MBChB, FIBMS FACS Consultant Cardiothoracic and Vascular Surgeon at Gazi Al Hariri Surgical Speciality Hospital. Baghdad, Iraq.

² MBChB, MSc, FIBMS, FRCS. Consultant Cardiothoracic Surgeon, Research Faculty, Department of Surgery, School of Medicine, University of Colorado, Colorado, USA.

³ MBChB, CABMS, MRCS. General Surgeon at Baghdad Teaching Hospital, Baghdad, Iraq.

⁴ MBChB, FIBMS. Consultant anaesthesiologist at Gazi Al-Hariri Surgical Speciality Hospital, Baghdad, Iraq.

Corresponding Author: Sabah N Jaber, Ghazi Al Hariri Teaching Hospital. Baghdad, Iraq.



jury develops. When transmural bowel necrosis has already occurred, intestinal revascularization reduces the extent of damage and facilitates healing of bowel anastomoses.⁸ In SMA thrombosis, occlusion most frequently affects the orifice (93.5%) and initial segment of the great vessel, In embolism it occurs before or at the level of the middle colic artery (in 57.9%).⁹ Most of the reported cases of acute SMA occlusion in literature were adults with advanced arteriosclerosis or embolization in the setting of chronic atrial fibrillation¹⁰ or in the setting of pro thrombotic conditions like antiphospholipid syndrome or vasculitis.^{11, 12} Venous thromboembolism and arterial ischemic events are the main deleterious diseases associated with the use of combined hormonal contraceptives (CHC). Even though their composition has been substantially improved, the vascular risk persists with the most recent CHCs use.¹³ The body of research documents the small magnitude of the problem of arterial thrombotic events in women using combined oestrogen-progestin hormonal contraceptives.¹⁴ In the era of minimal invasive surgery the endovascular therapy has become an important alternative, especially in patients with acute thrombotic superior mesenteric artery (SMA) occlusion, where the occlusive lesion can be recanalized either antegradely from the femoral or brachial artery,¹⁵ or retrogradely from an exposed SMA after laparotomy, and stented.^{2, 16} Aspiration embolectomy, thrombolysis¹⁷ and open surgical embolectomy, followed by on-table angiography, are the treatment options for embolic SMA occlusion.^{18, 19} All cases of mesenteric ischemia with signs of peritonitis

or possible bowel infarction, regardless of etiology, generally warrant immediate surgical intervention for the resection of ischemic or necrotic intestines.²⁰ Definitive treatment options include the following:

- Acute mesenteric arterial embolism (AMAE) - Papaverine infusion, surgical embolectomy, and intra-arterial thrombolysis.
- Acute mesenteric arterial thrombosis (AMAT) - Papaverine infusion and arterial reconstruction, either through aortosuperior mesenteric arterial bypass grafting or through reimplantation of the superior mesenteric artery (SMA) into the aorta.²¹

The uniqueness of this case is that is in the middle of the spectrum between acute AMI due to embolization, and Chronic MI due to atherosclerosis. Moreover, it shows the feasibility and success of doing endarterectomy and angioplasty in such cases

CASE PRESENTATION

We are presenting a case of 40 years female with no history of diabetes mellitus, no hypertension or smoking. She presented with 6 months history of progressive abdominal pain especially with feeding and loss around 10 kilograms (Kg) of her weight. All her lab tests were normal (PCV, lipid profile, ANA, homocysteine in urine). Her ECG and echocardiogram were normal. The relation of the pain to feeding was the smoking gun which leads us to the suspicion of intestinal ischemia. She started to have exacerbation of her abdominal pain made her seek medical consultation for her condition. Abdominal examination showed diffuse tenderness (signs of peritonitis). Computerized tomography with contrast (CTA) was requested ([figure 2](#)) which showed clearly the ostial and proximal occlusion of SMA. This patient then scheduled for surgery and underwent surgery by open upper midline laparotomy and exploration of SMA artery after releases of small intestine adhesion. About 1.5 meter of small intestine found unhealthy which was resected and submucosal single layer absorbable suture anastomosis was done. SMA artery opened longitudinally found filled with organized thrombus for which endarterectomy was done with balloon dilatation of ostial narrowing. On top of the organized thrombus there was a soft friable thrombus which ob-

Figure 2:
CTA showing the
ostial and
proximal
SMA occlusion

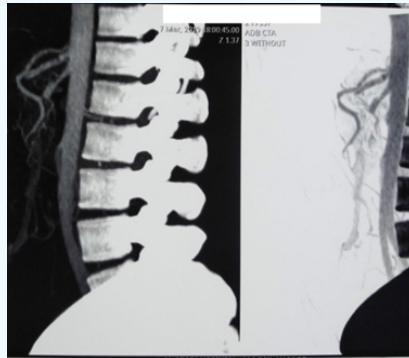


Figure 4:
Patch angio-
plasty SMA

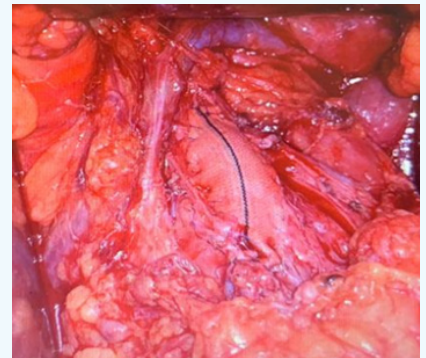


Figure 3:
Open
thrombecto-
my of SMA

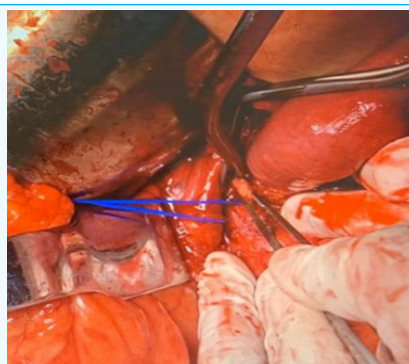


Figure 5:
The retrieved
organized
thrombus
from the
SMA

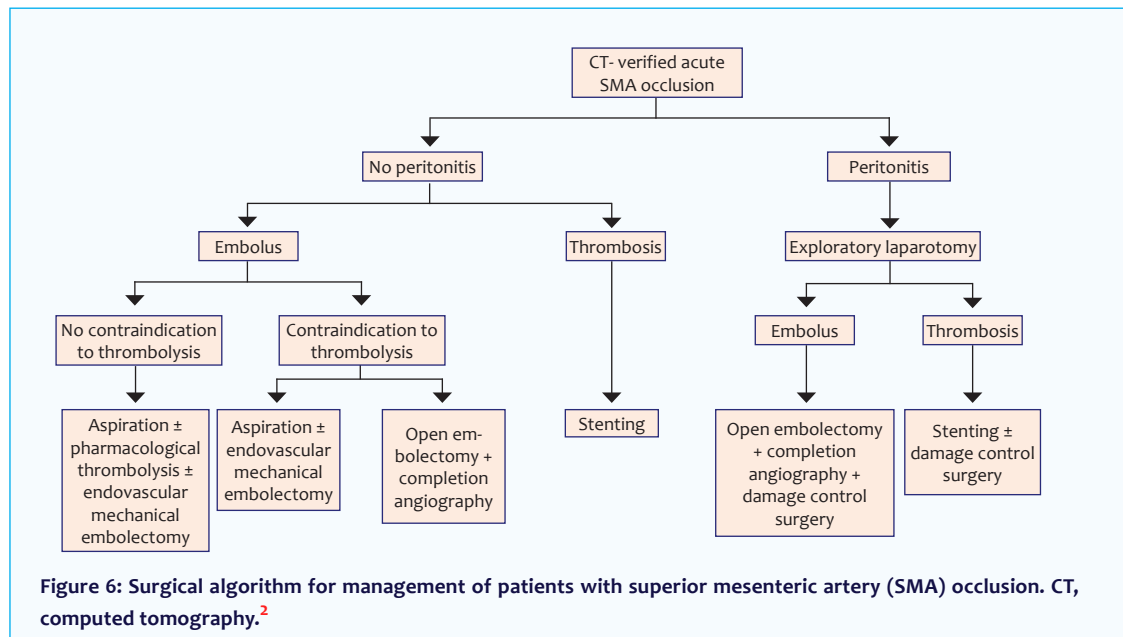


viously caused the acute exacerbation of the case. Dacron patch was used for the angioplasty. On postoperative day 3 the patient started liquid diet and she had recurrence of symptoms during feeding. She was kept on intramuscular Heparin 5000 international unit every 6 hours for 3 days. Patient was discharged home in postoperative day 5 on dual antiplatelet aspirin and Clopidogril. Retrospectively when we reviewed her any associated risk factors the only positive thing in her past medical history which can suggest pro thrombotic was the use of hormonal contraceptives. We couldn't establish causality or association between the hormonal contraceptive and the AMI but we used the benefit of doubt and we suggested to the patient to stop using the hormonal contraceptive and try using other non-hormonal modalities.

DISCUSSION

Thrombotic mesenteric artery occlusion requires high index of suspicion to reach a quick diagnosis in young patients with low risk factors. Adding to that the lack of any plasma marker which is sufficiently enough to make accurate diagnosis makes it even harder.²² Yet the major breakthrough was with the evolution of high-

resolution CT.^{23, 24} With the plethora of endovascular management of mesenteric ischemia, multicenter studies showed lower bowel resection rates and lower death rates in the endovascular cohort compared to pen surgical cohort,²⁵ yet no randomized clinical trials exist, making it difficult to compare outcomes.² And literature suggests that when patient shows signs of peritonitis the open surgical embolectomy or thrombectomy is a good option along with the necessary bowel resection^{2, 26} as seen in the surgical algorithm for management of patients with acute superior mesenteric artery (SMA) occlusion (figure 6).² In our case, combining the clinical findings of peritonitis and the CTA findings and lack of necessary endovascular skills in managing mesenteric ischemia, then open thrombectomy, patch angioplasty and resection of the ischemic bowel was the favoured approach. Using antiplatelet post AMI is advocate in the literature as a pharmacologic secondary prevention against future thrombosis specially with the use of synthetic patch.²⁷ Literature search did not show using endarterectomy and patch angioplasty in management such cases specially in this time where the endovascular approach is the standard of care in such cases.



CONCLUSION

Open surgical thrombectomy and patch angioplasty in the setting of established bowel ischemia offers excellent outcome in that subset of patients.

REFERENCES

1. Dahshan A, Donovan K. Isolated superior mesenteric artery thrombosis: a rare cause for recurrent abdominal pain in a child. *Journal of clinical gastroenterology*. 2002;34(5):554-6.
2. Acosta S, Bjorck M. Modern treatment of acute mesenteric ischaemia. *The British journal of surgery*. 2014;101(1):e100-8.
3. Acosta S. Mesenteric ischemia. *Current opinion in critical care*. 2015;21(2):171-8.
4. Sanna A, Adani GL, Anania G, Donini A. The role of laparoscopy in patients with suspected peritonitis: experience of a single institution. *Journal of laparoendoscopic & advanced surgical techniques Part A*. 2003;13(1):17-9.
5. Rozycki GS, Tremblay L, Feliciano DV, Joseph R, DeDelva P, Salomone JP, et al. Three hundred consecutive emergent celiotomies in general surgery patients: influence of advanced diagnostic imaging techniques and procedures on diagnosis. *Annals of surgery*. 2002;235(5):681-8; discussion 8-9.
6. Khan A, Hsee L, Mathur S, Civil I. Damage-control laparotomy in nontrauma patients: review of indications and outcomes. *The journal of trauma and acute care surgery*. 2013;75(3):365-8.
7. Bjornsson S, Resch T, Acosta S. Symptomatic mesenteric atherosclerotic disease-lessons learned from the diagnostic workup. *Journal of gastrointestinal surgery*. 2013;17(5):973-80.
8. Kärkkäinen JM, Acosta S. Acute mesenteric ischemia (Part II) – Vascular and endovascular surgical approaches. *Best Practice & Research Clinical Gastroenterology*. 2017;31(1):27-38.
9. Baeshko AA, Klumuk SA, Iushkevich VA. Acute disorders of mes-

enteric circulations: the etiology, risk factors and incidence of lesions. *Angiologiya i sosudistaya khirurgiya = Angiology and vascular surgery*. 2004;10(4):99-113.

10. Altman KA. Superior mesenteric artery occlusion. A review and case report. *The American journal of gastroenterology*. 1971;55(2):152-7.
11. England RJA, Woodcock B, Zeiderman MR. Superior mesenteric artery thrombosis in a patient with the antiphospholipid syndrome. *European Journal of Vascular and Endovascular Surgery*. 1995;10(3):372-3.
12. Hamilton ME. Superior mesenteric artery thrombosis associated with antiphospholipid syndrome. *The Western journal of medicine*. 1991;155(2):174-6.
13. Plu-Bureau G, Sabbagh E, Hugon-Rodin J. [Hormonal contraception and vascular risk: CNGOF Contraception Guidelines]. *Gynecologie, obstetrique, fertilité & senologie*. 2018;46(12):823-33.
14. Petitti DB. Hormonal Contraceptives and Arterial Thrombosis — Not Risk-free but Safe Enough. *N Engl J Med* 2012; 366(24):2316-2318. DOI: 10.1056/NEJMe1204769
15. Zhang Z, Chen X, Zhu R. Percutaneous Mechanical Thrombectomy Treatment of Acute Superior Mesenteric Artery Embolism. *EJVES short reports*. 2017;34:17-20.
16. Do N, Wisniewski P, Sarmiento J, Vo T, Aka PK, Hsu JH, et al. Retrograde superior mesenteric artery stenting for acute mesenteric arterial thrombosis. *Vascular and endovascular surgery*. 2010;44(6):468-71.
17. Okamura S, Fujiwara H, Sonoyama T, Ochiai T, Ikoma H, Kubota T, et al. Management of Acute Superior Mesenteric Artery Occlusion by Thrombolytic Therapy. *Case reports in gastroenterology*. 2009;3(3):300-5.
18. Miura Y, Araki T, Terashima M, Tsuboi J, Saito Y, Kanamaru K, et al. Mechanical Recanalization for Acute Embolic Occlusion at the Origin of the Superior Mesenteric Artery. *Vascular and endovascular surgery*. 2017;51(2):91-4.
19. Kuhelj D, Kavcic P, Popovic P. Percutaneous mechanical thrombectomy of superior mesenteric artery embolism. *Radiology and oncology*. 2013;47(3):239-43.

20. Acosta S, Ogren M, Sternby NH, Bergqvist D, Bjorck M. Mesenteric venous thrombosis with transmural intestinal infarction: a population-based study. *J Vasc Surg*. 2005;41(1):59-63.
21. Tambyraja AL. Management of acute mesenteric ischaemia: recommended strategy is misleading. *BMJ* (Clinical research ed). 2003;327(7411):396-.
22. Acosta S, Nilsson T. Current status on plasma biomarkers for acute mesenteric ischemia. *Journal of thrombosis and thrombolysis*. 2012;33(4):355-61.
23. Karkkainen JM, Saari P, Kettunen HP, Lehtimäki TT, Vanninen R, Paaanen H, et al. Interpretation of Abdominal CT Findings in Patients Who Develop Acute on Chronic Mesenteric Ischemia. *Journal of gastrointestinal surgery*. 2016;20(4):791-802.
24. Menke J. Diagnostic accuracy of multidetector CT in acute mesenteric ischemia: systematic review and meta-analysis. *Radiology*. 2010;256(1):93-101.
25. Acosta S, Ogren M, Sternby NH, Bergqvist D, Bjorck M. Clinical implications for the management of acute thromboembolic occlusion of the superior mesenteric artery: autopsy findings in 213 patients. *Annals of surgery*. 2005;241(3):516-22.
26. Yun WS, Lee KK, Cho J, Kim HK, Huh S. Treatment outcome in patients with acute superior mesenteric artery embolism. *Annals of vascular surgery*. 2013;27(5):613-20.
27. Gottsater A. Pharmacological secondary prevention in patients with mesenteric artery atherosclerosis and arterial embolism. *Best practice & research Clinical gastroenterology*. 2017;31(1):105-9.

Abbreviation list: Acute mesenteric ischemia (AMI), Acute mesenteric arterial embolism (AMAE), Acute mesenteric arterial thrombosis (AMAT), Anti Nuclear Antibody (ANA), Chronic mesenteric ischemia (CMI), Combined hormonal contraceptives (CHC), Computerized tomography (CTA), Electrocardiography (ECG), Kilogram (Kg), Mesenteric venous thrombosis (MVT), Non-occlusive mesenteric ischemia (NOMI), Packed Cell Volume (PCV), Superior mesenteric artery (SMA)

Conflict of interest: Authors have nothing to declare.

Funding: Authors received no funds to complete this case presentation a part from self funding.