

Management of acute mesenteric ischemia in Assiut University Hospital: a clinical audit

Mohamed A.A. Sayed, Farouk A. Murad, Mostafa A. Hamad, Ahmed Taha

Department of Surgery, Faculty of Medicine, Assiut University, Assiut, Egypt

Correspondence to Mohammed A.A. Sayed, MSc, Department of Surgery, Assiut University Hospital, Assiut, 71515, Egypt.

Tel: +20 106 757 5588; fax: +20882354130; e-mail: mohamed1234ali1991@gmail.com

Received: 26 November 2020

Revised: 11 December 2020

Accepted: 14 December 2020

Published: 18 May 2021

The Egyptian Journal of Surgery 2021, 40:342–346

Introduction

and aim Acute mesenteric ischemia (AMI) is a life-threatening condition. This is an audit for the management of a cohort of patients with AMI, which was then compared with the World Society of Emergency Surgery recommendations.

Patients and methods

This is a prospective clinical audit, conducted at General Surgery Department, Assiut University Hospital, Egypt, during the period from December 2017 to September 2018. The audit was designed to match the recommendations of the World Society of Emergency Surgery.

Results

A total of 135 patients presented with suspicion of AMI to the emergency unit of the General Surgery Department by either clinical, laboratory, or radiological findings. Only 30 (22%) patients had final diagnosis of AMI and were audited. Median age was 55 years (interquartile range, 40–66). There were 22 (73.3%) males and eight (26.7%) females. Hypertension was the most prevalent risk factor ($n=10$, 33.3%). Etiology was arterial embolism in 13 (43.3%), arterial thrombosis in four (13.3%), venous thrombosis in 11 (36.6%), and was not identified in two patients. Management was surgical in 17 (56.6%), interventional radiology in two (6.7%), and noninterventional in 11 (36.6%) patients. Percentages of adherence to World Society of Emergency Surgery guidelines were as follows: 40% for recommendation 1, 60% for 2, 100% for 3, 100% for 8a, 43% for 8b, 100% for 9, 100% for 10, 0% for 11, 100% for 12, and 67% for 14.

Conclusion

This audit showed some discrepancies between our practices and World Society of Emergency Surgery recommendations. We advocate implementing changes in our practices and reauditing.

Keywords:

acute mesenteric ischemia, computed tomography angiography, laparotomy, mesenteric vascular occlusion

Egyptian J Surgery 40:342–346
© 2021 The Egyptian Journal of Surgery
1110-1121

Introduction

Acute mesenteric ischemia (AMI) is defined as a group of diseases characterized by an interruption of the blood supply to varying portions of the intestine, leading to ischemia and secondary inflammatory changes, with classically abdominal pain as one of the early symptoms [1,2]. If untreated, this process will eventually be life-threatening by intestinal necrosis and perforation. McKinsey and Gewertz [3] estimated the incidence to be 0.09–0.2% of all acute surgical admissions in emergency departments. Care is always required in managing these patients, as the entity is relatively an uncommon cause of abdominal pain. The condition if not properly treated results in mortality in the range of 50% [4].

The use of computed tomography (CT) angiography to establish the diagnosis as early as possible, timely surgical intervention by resection of necrotic intestine or stoma formation, use of damage control

techniques when appropriate, and the proper use of endovascular approaches represent the mainstay of modern lines of management [5]. In addition, there is a role for noninterventional management in selected cases such as in patients with mesenteric venous thrombosis and no signs of peritonitis, where the early use of heparin has been associated with improved survival [6].

In an effort to standardize the care of those group of patients, World Society of Emergency Surgery has published recent guidelines for the management of AMI, which summarizes the minimum international standard of care required for the management of those patient [7].

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

This is an audit for the management of a cohort of patients with AMI, which was then compared with the World Society of Emergency Surgery recommendations.

Patients and methods

This study was a prospective clinical audit that was conducted at General Surgery Department, Assiut University Hospital, a large tertiary care hospital in Upper Egypt, during the period from December 2017 to September 2018. The audit and the publication of its results were approved by the ethical committee of the Faculty of Medicine of Assiut University. The audit and the publication of its results were approved by the ethical committee of the Faculty of Medicine of Assiut University. All patients were consented to be included in this audit.

Table 1 Recommendation of the World Society of Emergency Surgery for the management of acute mesenteric ischemia

Recommendation	Level of evidence
1 Severe abdominal pain out of proportion to physical examination findings should be assumed to be AMI until disproven	1B
2 Clinical scenario differentiates AMI as mesenteric arterial emboli, mesenteric arterial thrombosis, nonmesenteric ischemia, or mesenteric venous thrombosis	1B
5 CT angiography should be performed as soon as possible for any patient with suspicion for AMI	1A
7 When the diagnosis of AMI is made, fluid resuscitation should commence immediately to enhance visceral perfusion. Electrolyte abnormalities should be corrected, and nasogastric decompression initiated	1B
8 Broad-spectrum antibiotics should be administered immediately. Unless contraindicated, patients should be anticoagulated with intravenous unfractionated heparin	1B
9 Prompt laparotomy should be done for patients with overt peritonitis	1A
10 Endovascular revascularization procedures may have role with partial arterial occlusion	1C
11 Damage control surgery is an important adjunct for patients who require intestinal resection due to the necessity to reassess bowel viability and in patients with refractory sepsis. Planned relaparotomy is an essential part of AMI management	1B
12 Mesenteric venous thrombosis can often be successfully treated with a continuous infusion of unfractionated heparin	1B
14 The finding of massive gut necrosis requires careful assessment of the patients underlying co-morbidities and advanced directives in order to judge whether comfort carries the best treatment	1C

World Society of Emergency Surgery recommendations [7]. AMI, acute mesenteric ischemia; CT, computed tomography.

The audit was specifically designed to match the recommendations of the World Society of Emergency Surgery, which outlines the management of AMI [7]. World Society of Emergency Surgery recommendations are presented in Table 1, along with the level of the recommendation approved by the society. The audit included all patients presented to the emergency unit of the General Surgery Department with abdomen pain, in whom AMI was suspected by either clinical, laboratory, or radiological findings. All patients with the final diagnosis of AMI either by CT abdomen or surgery were further followed up. Patients with nonocclusive mesenteric ischemia were not possible to be included in this audit owing to different mode of presentation. Patients with any different diagnosis were excluded.

Recommendation 1 was audited by checking the percentage of patients who proved at final diagnosis to be AMI, although were not diagnosed initially as AMI, despite presenting with severe abdominal pain out of proportion to physical examination. Recommendation 2 was audited by checking the percentage of patients who were correctly diagnosed as either embolic, arterial thrombotic, nonocclusive mesenteric ischemia, or venous thrombosis at initial presentation after history and examination only. Recommendations 3, 4, 6, and 13 were not audited. Recommendation 3 states that conventional plain radiograph films have limited diagnostic value in evaluating AMI, although signs of intestinal perforation may be seen. Recommendation 4 states that there are no laboratory studies that are sufficiently accurate to identify the presence or absence of ischemic or necrotic bowel, although elevated lactate and D-dimer may assist. Hence, it was not possible to be audited. Recommendations 6 and 13 were not audited, as they are concerned with nonocclusive mesenteric ischemia, which was not included in this audit. The rest of the recommendations were audited appropriately.

All included patients were followed up till their discharge from the hospital. All clinical, laboratory, radiological, interventional radiological procedures, operative, postoperative data, and clinical outcomes were recorded.

Statistical analysis

Statistical analysis was undertaken using IBM SPSS statistics, version 19.0 (IBM Corp., Armonk, New York, USA). Baseline characteristics were presented with number (and percentages) or medians (and interquartile range).

Table 2 Clinical characteristics and identified in the audit cohort

	Total [n (%)]	Survivors [n (%)]	Nonsurvivors [n (%)]
Risk factor			
Hypertension	10 (33.3)	6 (60)	4 (40)
Diabetes	6 (20)	4 (66.6)	2 (33.3)
Cardiac diseases	7 (23.3)	4 (57.1)	3 (42.9)
Hyperlipidemia	7 (23.3)	3 (24.9)	4 (57.1)
Smoking	16 (53.3)	6 (37.5)	10 (62.5)
Type of mesenteric vessel affected			
Arterial embolism	13 (43.3)	5 (38.5)	8 (61.5)
Arterial thrombosis	4 (13.3)	2 (50)	2 (50)
Venous thrombosis	11 (36.6)	9 (81.8)	2 (18.2)
Unidentified	2 (6.6)	1 (50)	1 (50)
Type of intervention			
Noninterventional	11 (36.6)	9 (81.8)	2 (18.2)
Interventional radiology	2 (6.6)	1 (50)	1 (50)
Surgical management	17 (56.6)	7 (41.2)	10 (58.8)
Surgical management			
Open and close	2 (6.6)	1 (50)	1 (50)
Resection and anastomosis	4 (13.3)	1 (25)	3 (75)
Resection and stoma formation	11 (36.6)	5 (45.5)	6 (54.5)

Results

During the audit period, 135 patients presented with suspicion of AMI to the emergency unit of the General Surgery Department by either clinical, laboratory, or radiological findings and were audited against recommendations of the World Society of Emergency Surgery. Only 30 (22%) patients had final diagnosis of AMI and were audited against the recommendations 1, 2, 3, 5, 7, 8, 9, 10, 11, 12, and 14 of the same guidelines.

Table 2 summarizes the risk factors and the characteristics of the patients included in the audit. Median age was 55 years (interquartile range, 40–66). There were 22 (73.3%) males and eight (26.7%) females. Two patients presented with peritonitis and had surgical intervention without performing CT angiography. The rest of the cohort had CT angiography, which showed that the mesenteric vessel affected was arterial embolism in 13 (43.3%), arterial thrombosis in four (13.3%), 11 (36.6%) were venous thrombosis, and in two (6.6%), the exact pathology could not be identified.

All 11 (36.6%) patients with venous thrombosis had received noninterventional management in the form of anticoagulation (heparin). Two patients with arterial thrombosis received interventional management in the form of thrombo-embolectomy. The rest of the cohort received surgical intervention. Upon laparotomy, two patients had questionable viability of small bowel, and one of them had been closed hoping for improvement, and the other one had

resection and stoma. The rest of the patients had obvious ischemia; four (13.3%) patients were managed by resection and anastomosis, and 11 (36.6%) were managed by resection and stoma. Overall hospital mortality in the cohort was 18 (60%) patients.

Table 3 describes the number and percentage at meeting each recommendation. Regarding recommendation 1, six (40%) of the 15 patients whose final diagnosis was AMI and presented with severe abdominal pain disproportional to physical examination were unfortunately not diagnosed initially as AMI. For recommendation 2, 18 patients were correctly diagnosed as either any of the four etiologies on presentation. As for recommendation 5, all of our patients had CT angiography except three patients who were presented with sign of intestinal perforation and had laparotomy without angiography. All patients in this audit were managed as recommendation 7. All patients received broad-spectrum antibiotic on presentation as per recommendation 8, but only 11 (36.6%) patients perceived anticoagulation. All patients with overt peritonitis (15) had immediately laparotomy. Only two patients were possible to have endovascular revascularization, and both of them had received this intervention. In this cohort, three patients had questionable bowel viability during laparotomy, but unfortunately damage control surgery was not adopted in the department and was not offered to the patients. Approximately 11 patients had mesenteric venous thrombosis and were successfully treated with a continuous infusion of unfractionated

Table 3 Number and percentage of patients meeting recommendations of World Society of Emergency Surgery guidelines

Recommendation number	Audit question	Percentage at meeting the recommendation [n/N (%)]
1	Patients were not diagnosed initially as AMI despite presenting by severe abdominal pain out of proportion to physical examination	4/15 (40)
2	Correct diagnoses at initial presentation	18/30 (60)
5	CT angiography performed	27/27 (100)
7	a: Resuscitation	30/30 (100)
	b: Electrolytes correction	30/30 (100)
	c: Nasogastric decompression	30/30 (100)
8	a: Antibiotic usage	30/30 (100)
	b:Anticoagulation	13/30 (43)
9	Patients with overt peritonitis	17/17 (100)
10	Endovascular revascularization	2/2 (100)
11	Damage control surgery	0/3
12	Heparin for mesenteric venous occlusion	13/13 (100)
14	Passive action at laparotomy	4/6 (67)

AMI, acute mesenteric ischemia; CT, computed tomography.

heparin as per recommendation 12. Six patients had massive gut necrosis; four of them had no further action and were closed immediately as per recommendation 14.

Discussion

The World Society of Emergency Surgery had recently published detailed recommendations for the management of AMI [7]. In this article, we present the results of an audit done in our hospital to compare our management against the World Society of Emergency Surgery recommendations. To our knowledge, no similar audits are published so far.

The results of our audit show that the practice in our hospital, which is the largest emergency hospital in Upper Egypt, is not too far from the recommendations of the World Society of Emergency Surgery, especially in the preoperative assessment and management. The audit shows that many patients with AMI who were presenting with severe abdominal pain out of proportion to physical examination were missed at initial assessment, which is one of the society recommendations. This can be partially attributed to the fact that the emergency department receives overwhelming number of patients and most of them present with vague abdominal pain, which turns out to be of nonspecific etiology. This finding was also reported by Cervellin *et al.* [8].

The audit shows that the preoperative anticoagulation is not widely practiced in our hospital. Initiating anticoagulation before fully confirming the diagnosis will be counterintuitive to most young doctors practicing in the emergency department. Similar note was reported by Kea *et al.* [9] in their study on

patients discharged from emergency department with suspicion of atrial fibrillation.

Regarding surgical management, the audit shows wide differences between our practice and the recommendations of the society, except that the damage control surgery is not practiced in our hospital. Damage control laparotomy, which was accepted for more than 30 years ago, is an important option in management patients with AMI [10]. Damage control is a modality that is more valuable in the treatment of critically patients with AMI. The plan of the damage control laparotomy must be made as early as possible guided by the response to resuscitation and recovery of the intestine. Old age is not a contraindication to damage control surgery, as accepted outcomes have been founded in the elderly [11].

This audit showed that there is room for improvement in the management of AMI. To be able to apply the recent guidelines, the concept of multidisciplinary surgical management has to be implemented [12]. All departments involved in the management and care of the patients have to be included, such as diagnostic (CT angiography) and interventional radiology and ICU, and early use of anticoagulant. Better assessment of the patients in the emergency department, suspicion for AMI and CT angiography, and early administration of anticoagulation have to be implemented. The concept of damage control or second-look operation which is one of the tools that can be lifesaving in selected cases was not applied to these patients, and our audit implemented compared with World Society of Emergency Surgery.

Conclusion

This audit gives us insights to the discrepancies between our practices and what is recommended internationally. Based on our results, we advocate some changes in our practices to match the international recommendations and advice to reaudit after implementing these changes. We recommend performing similar audits at emergency departments of large hospitals.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- 1 Jagielski M, Piłkowski J, Jackowski M. Challenges encountered during the treatment of acute mesenteric ischemia. *Gastroenterol Res Pract* 2020; 2020:5316849.
- 2 Carver TW, Vora RS, Taneja A. Mesenteric ischemia. *Crit Care Clin* 2016; 32:155–171.
- 3 McKinsey JF, Gewertz BL. Acute mesenteric ischemia. *Surg Clin North Am* 1997; 77:307–318.
- 4 Natesan S, Lee J, Volkamer H, Thoureen T. Evidence-based medicine approach to abdominal pain. *Emerg Med Clin North Am* 2016; 34:165–190.
- 5 Kanasaki S, Furukawa A, Fumoto K, Hamanaka Y, Ota S, Hirose T, *et al.* Acute mesenteric ischemia: multidetector CT findings and endovascular management. *Radiographics* 2018; 38:945–961.
- 6 Acosta S. Surgical management of peritonitis secondary to acute superior mesenteric artery occlusion. *World J Gastroenterol* 2014; 20:9936–9941.
- 7 Bala M, Kashuk J, Moore EE, Kluger Y, Biffl W, Gomes CA, *et al.* Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery. *World J Emerg Surg* 2017; 12:38.
- 8 Cervellin G, Mora R, Ticinesi A, *et al.* Epidemiology and outcomes of acute abdominal pain in a large urban Emergency Department: retrospective analysis of 5, 340 cases. *Ann Transl Med* 2016; 4:362.
- 9 Kea B, Waites BT, Lin A, *et al.* Practice gap in atrial fibrillation oral anticoagulation prescribing at emergency department home discharge. *West J Emerg Med* 2020; 21:924–934.
- 10 Godat L, Kobayashi L, Costantini T, Coimbra R, *et al.* Abdominal damage control surgery and reconstruction: world society of emergency surgery position paper. *World J Emerg Surg* 2013; 8:53.
- 11 Weber DG, Bendinelli C, Balogh ZJ. Damage control surgery for abdominal emergencies. *Br J Surg* 2014; 101:109–118.
- 12 Mastoraki A, Mastoraki S, Tziava E, Touloumi S, Krinos N, Danias N, *et al.* Mesenteric ischemia: Pathogenesis and challenging diagnostic and therapeutic modalities. *World J Gastrointest Pathophysiol.* 2016; 7:125–130.