



ORIGINAL RESEARCH PAPER

General Surgery

FACTORS AFFECTING OUTCOME OF MESENTERIC VASCULAR ISCHEMIA IN A TERTIARY CARE CENTRE

KEY WORDS: mesenteric ischemia, bowel resection, Covid 19, coagulopathy, shock, intestinal obstruction

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ABSTRACT

Introduction: Acute mesenteric ischemia (AMI) is a catastrophic abdominal vascular emergency with a mortality of over 50% despite more than 50 years of advances in the treatment. Diagnosis is challenging due to paucity of specific signs and symptoms, non-specific laboratory and radiological findings.. **Aims And Objectives:** To study the incidence of mortality and factors affecting it in patients of mesenteric vascular ischemia. Mortality with respect to various parameters such as demographic, clinical, laboratory, radiological, interoperative findings and complications is analysed. **Methodology:** Prospective observational study, done including 41 operated cases of mesenteric vascular ischemia. **Results:** Mean age of presentation was 53.36 years. Mortality was slightly higher (88%) in the patients above 60 years with no sex preponderance. Out of 41 patients 14 were smokers and 5 had positive COVID 19 history. Patients presenting with shock had a mortality rate of 94.4% which was significantly high. Dyslipidaemia was noted in 24.4% patients but had no significant association with respect to mortality. 22(91.6 %) out of 24 patients who had deranged coagulation profile were lost to disease. Patients who underwent a resection of more than 100 cm of bowel had a significant mortality rate of 90.9 %. various findings on USG, Xray, CECT were also studied. Similarly, operative procedure such as anastomosis or stoma with post op infections were also evaluated but none showed any specific survival benefits. **Conclusion:** Delayed presentation of the patients, patients presenting in shock, hyper coagulability and more than 100 cm of bowel resection signifies adverse prognosis. Based on this study we emphasise on having a high suspicion for early diagnosis, prompt investigations especially CT Scan, definitive management where ever possible. Timely follow-up to intervene in the chronic phase of disease which precedes in almost 20-30% of the patients is also crucial.

INTRODUCTION:

“Occlusion of the mesenteric vessels is apt to be regarded as one of those condition of which the diagnosis is impossible, the prognosis hopeless and the treatment almost useless.” [1]This quote by A J COKKINIS even after nearly a century remains partly true.

Acute mesenteric ischemia (AMI) is a catastrophic abdominal vascular emergency with a daunting mortality of over 50% despite more than 50 years of advances in the treatment. The incidence of AMI is estimated at 12.9/100,000 person-years. It carries a high risk of extensive intestinal infarction, complicated by short bowel syndrome (SBS) and permanent intestinal failure requiring long-term total parenteral nutrition (TPN) and/or intestinal transplantation. [2]

Often these patients pose a diagnostic challenge due to paucity of specific signs and symptoms, non-specific laboratory and radiological findings.

In the COVID-19 pandemic era in addition to common respiratory symptoms, there has been an exponential increase in the patients of acute mesenteric ischemia, especially those with severe disease course, attributed to the hyper coagulability associated. This brings our mind back to the devastating illness.

High mortality rate and recent advancement in radiology and intervention prompted us to undertake this study to identify the associated risk factors of mortality relevant in our centre and review the recent outcome in these patients.

Aims And Objectives:

To study the incidence of mortality and factors affecting it in

patients of mesenteric vascular ischemia. Factors studied include demographic (age, sex), clinical (smoking, COVID 19, shock), laboratory (lipid profile, coagulopathy, D-dimer), radiological (CECT), intraoperative (length of bowel resection, anastomosis, stoma) parameters and complications (wound infection, reoperation).

MATERIAL AND METHODS:

After ethical sanction a prospective observational study was conducted on 41 patients diagnosed with mesenteric vascular ischemia intraoperatively or post operatively.

Inclusion criteria: All the cases of mesenteric vascular ischemia being operated till December 2022 and diagnosed preoperatively or intraoperatively.

Exclusion criteria: 1) Patients with bowel gangrene due to causes other than vascular events like arterial thrombosis, embolisms, non-occlusive spasm, or venous thrombosis. 2) Patients with bowel gangrene due to traumatic mesenteric tear. 3) Patients with bowel gangrene due to iatrogenic injury to mesenteric vessels. 4) Patients with Chronic mesenteric vascular ischemia

Baseline screening process and recording: A detailed history of patients, thorough Clinical Examination, Blood investigations - Routine hemogram, LFT, KFT, D-dimer, Lipid Profile, Coagulation Profile and Radiological investigations - (Chest x-ray PA view, X-ray abdomen erect, USG abdomen and pelvis, CECT Abdomen and Pelvis) was done. Patients were monitored closely during their hospital stay for morbidity and mortality.

Statistical analysis method: All Data was collected in paper-

based case report forms and was then entered in Microsoft excel 2013 format and analyzed. Frequency tables and measures of central tendency (mean) and measures of dispersion (Standard deviation) were obtained by using the software IBM SPSS version 20.

OBSERVATION & RESULTS:

The analysis done for 41 patients of operated mesenteric vascular ischemia . Factors affecting mortality were studied and they were as follows

Table no.1: Association of demographic parameters with mortality.

Parameter		Frequency	Mortality	P value
Age Group	<60	24	17	0.34
	>60	17	15	
Gender	Male	33	25	0.85
	Female	8	7	

Table no.1 Majority of the patients (58.5%) were less than 60 years of age . Mortality was slightly higher(88%) in more than 60 years age group. Age and gender both had no significant association with mortality.

Table no.2: Corelation of clinical factors with mortality.

Parameter		Frequency	Mortality	P value
Smoking	Present	14	12	0.665
	Absent	27	20	
COVID 19	Positive	5	4	>0.9
	Negative	36	28	
Shock	Present	18	17	0.05
	Absent	23	15	

Table no. 2 Majority of the patients were non-smokers whereas 34.1% had smoking history associated. Smoking was associated with slightly increase in mortality (85.7% vs 74%) which was **statistically insignificant**. History of covid 19 infection was associated in only 5 out of 41. 19.80% mortality rate was observed in covid 19 positive groups whereas 77.7% in covid 19 negative .The difference was **statistically not significant**. Shock at the time of presentation were seen in 43.9 percent (n=18) of the patients. Mortality among the patients presenting in shock was 94.4 % which was **significantly higher** than those not in shock

Table no.3: Correlation of laboratory investigations with mortality.

parameter		frequency	mortality	P value
Lipid Profile	Normal	31	24	0.245
	Deranged	10	8	
Coagulation Profile	Normal	17	10	0.03
	Deranged	24	22	
D-Dimer	Normal	19	13	0.31
	Raised	22	19	

Table no.3 Dyslipidaemia was noted in only 24.4 percent of the patients , which was not found to be significantly associated mortality. Coagulopathy was found to be significantly associated with mortality while raised D-dimer was not.

Table No.4 Distribution of X ray findings in the study population and association with mortality

X ray findings	Frequency (n=41)	Mortality n(%)	P value
Normal	11	7(63.6)	1.823
Perforation	6	6(100)	1.977
Obstruction	9	8(88.9)	0.791
Ileus	15	11(73.3)	0.58

Table no.4 None of the x ray findings were found to have any statistically significant association with mortality.

Table No.5 CECT (A+P) findings and its association with mortality.

CECT (A+P)	Frequency	Mortality	P value
Arterial thrombosis	10	8	0.81
Embolism	5	4	0.87
Venous thrombosis	2	2	> 0.9
Ischemia	10	8	0.81

Table no.5 Arterial thrombosis as well as features of visceral ischemia was seen in 58.8 % patients on CECT abdomen ,followed by Embolism which was seen in 29.4 percent and, Super mesenteric vein thrombosis in only 2. CECT findings were found to have no correlation with the mortality.

Table no.6: Corelation of Intraoperative parameter with the Mortality.

Parameter		Frequency	Mortality	P value
Bowel involvement	Small bowel	24	17	0.34
	Small and large	17	15	
Length of bowel resection	<100	16	9	0.013
	>100	22	20	
Intervention	Primary anastomosis	18	13	0.64
	Ostomy	20	16	

Table no.6 Involvement of bowel segment and mortality is **not found statistically significant** . Majority of the patients i.e. 20 out of 22 (90.9%),who had a Resection of more than 100 cm of the bowel length couldn't survive and was **found a significant factor** in mortality on statistical analysis . Mortality was observed in 72.2% of the patients who had primary anastomoses whereas 80 % in those who had stoma formation post resection.

Table No. 7 Association of complications with the Mortality

Parameter		Frequency	Mortality	P value
Wound infection	Present	6	3	0.21
	Absent	35	29	
Reoperation	Needed	3	2	0.65
	Not needed	38	30	

Table no.7 shows that Post operative wound infection was observed in 14.6 % of the patients ,out of those 3(50%) could not survive. **No association could be established statistically between wound infection and increased mortality** . Re-operation was performed in 3 patients -out of which 2 couldn't survive (66.6%) .

DISCUSSION:

The mortality in the present study was 78%(n=32) which is on the higher end of the spectrum of various studies with mortality ranging from 24% to 83%.

Age is an important factor determining mortality. Similar findings were seen in Gupta et al and Yang et al [7] , but not found in present study due to smaller sample size.

Mean age was nearly a decade higher in most of the Western literature, as in the studies of Crawford et al, Yildirim et al, which can be attributed to the better longevity and better medical facilities in these countries. [5,6]

Male preponderance was seen in present study and similarly in Moiz et al and Dhamnaskar et al. [3,17] ; Whereas female predominance was observed by Yildirim et al, Park et al and Gupta et al [6,7,9]. None of the studies showed any association of mortality with any gender.

Cigarettes smoking is a known risk factor of vascular diseases. In Park et al and Dhaval et al.[9,19] AMI was associated with tobacco smoking. Smoking couldn't be established with the mortality of AMI patients in the present study.

As the study was done in the COVID 19 pandemic era, the significance of its association in the present study was foremost. 5 patients (12.5%) in the present study were having severe COVID19 disease out of which 4 did not survive during admission, out of these 4, one patient presented with perforation peritonitis with need of massive resection of > 100 cm of bowel. However, this high mortality was not found associated independently with the COVID 19 infection. Because of the in general high mortality of acute mesenteric ischemia (78%) and small sample size.

The similar studies of Serban et al and Kraft et al also showed a high mortality in COVID 19 patients having acute mesenteric ischemia but failed to establish any statistically significant association between the two [13,14]. Contrast to the above a relatively lower mortality rate was observed in the studies of Hwabejire et al (33%).[8]

Late presentation and presentation in shock contains a dreadful outcome in acute abdomen. Shock at the time of presentation was present in 43.9 percent of the patients with 94.4% mortality. Gupta et al, and Dhamnaskar et al had similar association. [7,17]

24.4% of the patients were found to have hyperlipidaemia. A similar frequency of hyperlipidaemia is observed in Park et al and Nuzzo et al whereas Veenstra et al showed double frequency (53%). However, it's association with mortality could not be established.

In the present study 43.9% of the subjects with raised prothrombin time and INR, had significant association with mortality. Crawford et al had similar results whereas Carlos et al could not demonstrate any such association. [5]

D dimer was found raised in 23 patients out of which 65% did not survive, but the association was not significant. Resembling the same findings were Yang et al and Serban et al studies. [4,12] Kulu et al demonstrated significant correlation with mortality. [13]

Even though Xray is the first investigation for AMI, it does not provide significant information

CECT was performed in the patients in whom operative decision was in dilemma and patient was clinically stable. CECT was performed in 17 patients out of which 13 patients had arterial occlusion (6-SMA , 1-celiac artery, 1-IMA and 5-distal SMA) and 2 patients had SMV thrombosis.

Ischemic features were observed in 7 patients in CECT out of which 4 had pneumatosis intestinalis. Although the findings in CECT in our study was not found to be significantly associated with the mortality due to less no of CECT performed. It demonstrated a very high specificity for diagnosing the disease which was in accordance with the study of Menke et al . Moschetta et al showed arterial thrombosis to have mortality of 88% whereas 11% in venous thrombosis and also demonstrated that hyper density of bowel wall and focal thickening is a good outcome predictor whereas dilated loop, pneumatosis intestinalis, pneumoperitoneum are predictors of poor outcome.[15,16]

Patients with both small and large bowel involvement had slightly more mortality (88.2%) than those having only small bowel involvement (70.8%) but this difference was not found statistically significant. Large bowel involvement has a well-known association with the high mortality as shown in the studies of Yang et al, Crawford et al [4,5]

Amongst 38 patients who underwent resection in primary surgery ,16 patients had <100 cm of bowel resection (56.3% mortality, n=9) and 22 patients had >100 cm length of bowel resection (90.9% mortality, n=20), and the difference is found

significant statistically(p=0.013). Similar association was also seen in studies of Dhamnaskar et al (p<0.05). Long segment bowel gangrene carries higher risk of developing sepsis and DIC and reduced functional bowel which might contribute to the grave prognosis.[17]

After gangrenous bowel resection either primary ostomy or anastomoses was performed. Both were found to have similar frequency and mortality in the present study. Neither of them was found significantly associated with increased mortality. Likewise in other similar studies. [4]

Surgical site infection in the present study was seen in 14.6% patients. Being type 3 (contaminated) the rate of infection was relatively lower when compared to the results in the study of Garibaldi et al ,which showed a 28% of wound infection rate.[20]

Surgical site infection in the current study was observed to be higher in those managed by primary stoma formation when compared with primary anastomosis but the significance could not be established due to small sample size. Similar observation was seen in the study of Yang et al [5] whereas Rocco et al demonstrated significantly more surgical site infections in the patients with stoma.[21]

When we studied the need for re-exploration, in the present study it was seen in 3 patients, 2 had blackening of stoma and 1 patient had anastomotic leak , this might be due to no revascularisation procedure performed in any of the subject. mortality (66.6%) of the re operated patients were much higher in the present study when compared to in general mortality post re-laparotomy as in Abebe et al (14.7%). [18]

Limitations Of The Study: As the sample size was small, the results of the present study could not be generalised and it requires a more detailed study with a larger sample size. Gold standard investigation, CT angiography could not be performed in any of the subjects also definitive management such a revascularisation was not done in the present study due to deficiency of the resources.

CONCLUSION:

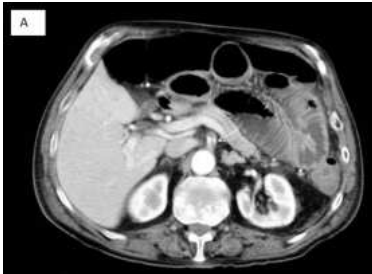
From the present study we can conclude that it is more common in males above 50 years and has a very high mortality rate, CT scan of the abdomen having high specificity is the investigation of choice, whereas x-ray and USG abdomen should be used as primary investigation to rule out other causes of an acute abdomen. Patients presenting in shock, hyper coagulability and more than 100 cm of bowel resection signifies adverse prognosis. Based on these findings we emphasise on having a high suspicion for early diagnosis, prompt investigations especially CT Scan, definitive management where ever possible and timely follow-up to intervene in the chronic phase of disease. Thus, Acute mesenteric ischemia a potentially fatal vascular emergency, has a devastating outcome in terms of mortality and morbidity. In spite of the immense growth in the understanding ,investigations and management of the disease over years ,the mortality remains as high even in the tertiary care centres.

Picture Gallery:





1(A) Picture showing sagittal (A) and axial section (B) CT scan image with superior mesenteric vein thrombosis (arrow).
1(C) intraoperative picture of the same patient showing ischemic changes of segment of ileum.

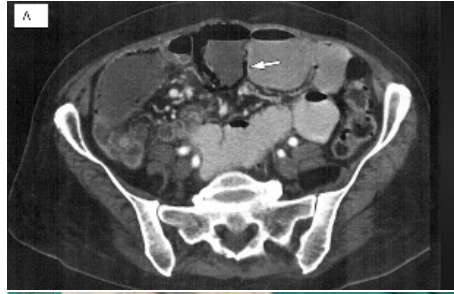


2(A) picture showing axial view CECT abdomen with proximal superior mesenteric artery thrombosis at the origin (arrow).
2(B) picture showing resected gangrenous bowel including distal jejunum, ileum, IC junction and proximal ascending colon.



3(A) picture showing axial view CECT with distal SMA artery thrombosis.

3(B) intraoperative picture showing patchy gangrenous changes of distal jejunum and ileum



4(A) axial view CECT abdomen showing pneumatosis intestinalis in a patient of gangrenous bowel
4(B) Picture showing massive gangrenous bowel in the same patient

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