FACTORS PREDICTING MORTALITY IN ACUTE MESENTERIC ISCHEMIA: A PROSPECTIVE OBSERVATIONAL STUDY

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Introduction

Acute mesenteric ischemia (AMI) - 1:1000 acute hospital admissions

3rd most common pathology of acute abdomen after bleeding and perforation

Arterial: Embolic/Thrombotic/ Vasospastic | Venous Thrombosis | Non occlusive Mesenteric Ischemia

Clinical presentation: non-specific, severe symptoms, paucity of signs

Dx ??



High mortality 30% to 85% , more complications, sparse literature to guide treatment in Indian setup (majority reviews, case reports, retrospective series) in AMI

Hence, it was important to identify prognostic indicators of mortality in AMI

Objectives

- To evaluate the factors predicting mortality in AMI
- To estimate the incidence of mortality in AMI
- To co-relate radiological findings with intra-operative decisions made
- To assess quality of life on post-operative day 60 using SF36 questionnaire

Methodology

Prospective Observational Study

IEC permission taken

Inclusion criteria: CT diagnosed ischemic bowel
Exclusion criteria: <18y, pregnant patients

Adequate resuscitation done as per protocol; necessary surgeries performed

Informed consent was obtained

Data analysis by descriptive and multivariate analysis (SPSS 16.0)

Study Variables

Demographics
- Age
- Sex
- Addictions
- Comorbidities

Physical exam
- BMI
- Time to presentation
- Tachycardia
- Respiratory rate
- Hypotension (needing inotropes)

Lab values
- Leukocytosis
- Hemoglobin
- Metabolic acidosis (Bicarb)
- Hypoxia (PaO2)
- Creatinine
- Albumin
- Lactate

Operative findings
- Procedure: Primary anastomosis or ostomy
- Length of gangrenous bowel: <90cm or >90cm
- Length of remnant small bowel: <100cm or >100cm from DJ
- Ileocecal junction: resection or spared
- Perforation of the dead bowel
- Amount of contamination: <1000ml or >1000ml
- Need for second look surgery
- Complications
- Postop need of mechanical ventilation: <2days or > 2 days

Radiological findings
- Involved vessels
- Occlusive/non occlusive
- Bowel wall thickening/thinning
- Decreased bowel wall enhancement
- Pneumatosis intestinalis
- Pneumoperitoneum
- Portal venous gas
- Bowel loop dilation

Results

Demographics (n=44)

Patient demographics Total Patients	44
Male	31 (70.5%)
Age, years	61 (50-68)
BMI, kg/m²	22.03 (18.6-27.4)
Comorbidities [a]	
Diabetes Mellitus	19 (43.2%)
Hypertension	14 (31.8%)
COPD	4 (9.1%)
Ischemic Heart Disease	5 (11.4%)
Peripheral Vascular Disease	4 (9.1 %)
Charlson's Comorbidity Index (CCI)	2 (2-4)
Previous Surgical History	4 (9.1 %)
Time to Presentation	
< 24 hours after onset of pain	31 (70.5 %)

Values are listed as either number (percentage), mean (±Standard Deviation) or median (interquartile range)
BMI, Body Mass Index; COPD, Chronic Obstructive Pulmonary Disease

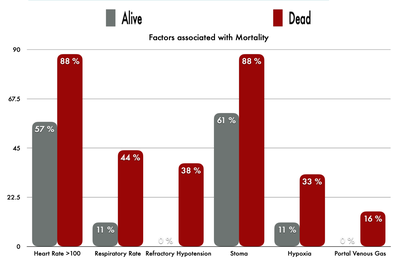
Patient vitals Total Patients	44
Heart Rate, >100 beats per minute	31 (70.5%)
Respiratory Rate, <26 /minute	28 (63.6%)
Systolic Blood Pressure, <90 mmHg	17 (38.6 %)
Refractory Hypotension	7 (15.9 %)

Values are listed as either number (percentage), mean (±Standard Deviation) or median (interquartile range)

Lab values	
Total Leucocyte count, > 11000/cc	38 (86.4 %)
Hemoglobin, <8 mg/dL	15 (34.1 %)
Metabolic Acidosis, mmol/L HCO3-<18	22 (50 %)
Hypoxia, <60 mmHg PaO2	9 (20.5 %)
Creatinine, <2 mg/dL	35 (79.5%)
Serum Albumin, <3 g/dL	31 (70.5 %)
Serum Lactate, >2 mmol/L	21 (47.7%)

Peri-Operative details Total Patients	44
Procedure Done	
Stoma	32 (72.7%)
Resection And Anastomosis	12 (27.2%)
Length of Bowel Gangrene, >90 cm	27 (61.4%)
Remnant Bowel Length	
<100 cm	10 (22.7%)
>100 cm	34 (77.3%)
Ileocecal Valve Resected	6 (13.6 %)
Ischemic Perforation	
Yes	5 (11.4 %)
No	39 (86.4 %)
Peritoneal Contamination	
<1 L	16 (36.4 %)
>1 L	28 (63.6 %)
Re-Exploration needed	11 (25 %)
Invasive Mechanical Ventilation	
>2 days	13 (29.5 %)
<2 days	31 (70.5 %)

Values are listed as either number (percentage), mean (±Standard Deviation) or median (interquartile range)



Outcomes Total Patients	44
Length of Hospital Stay, days	22 (9-42)
Clavien-Dindo Classification	
1	5 (11.4%)
2	8 (18.2%)
3A	2 (4.5%)
3B	5 (11.4%)
4A	6 (13.6%)
Mortality	18 (40.9%)
SF 36	
Physical Score	15%
Role Limitation	0%
Energy	25%
Emotional Well Being	48%
Social Well Being	12.5%
Pain	45%
General Well Being	20%
Lost To Follow Up	9 (19%)

Values are listed as either number (percentage), or median (interquartile range).

Radiological details Total Patients	44
Vessel Involved	
Coeliac Artery	0
Superior Mesenteric Artery	39 (88.6 %)
Inferior Mesenteric Artery	1 (2.3 %)
Venous	4 (9.1 %)
Mechanism of Mesenteric Ischemia	
Occlusive	43 (97.7%)
Non-Occlusive	1 (2.3%)
Bowel Thickening	
Yes	17 (38.6 %)
No	15 (34.1 %)
Bowel Enhancement	
Yes	11 (25 %)
No	33 (75 %)
Pneumatosis Intestinalis	
Yes	5 (11.4 %)
No	39 (88.6 %)
Pneumoperitoneum	
Yes	5 (11.4 %)
No	39 (88.6 %)
Portal Venous Gas	
Yes	3 (6.8 %)
No	41 (93.2 %)
Bowel Dilatation	
Yes	20 (45.5 %)
No	24 (54.5 %)

Values are listed as either number (percentage), mean (±Standard Deviation) or median (interquartile range)

Statistical Analysis	No Mortality n=26	Mortality N=18	P Value	Odds Ratio (95% CI)
Sex, Male	18	13	0.831	1.15 (0.3-4.3)
Age	-	-	0.01	1.09 (1.02-1.16)
CCI	-	-	0.019	1.68 (1.08-2.61)
Previous Surgery	4	0	-	-
Time to Presentation >24hrs	7	6	0.647	1.3 (0.36-5.02)
Heart Rate >100 bpm	15	16	0.020	9.6 (1.08-85.16)
Resp Rate >26/min	3	8	0.012	6.66 (1.40-31.7)
Hypotension	8	9	0.326	1.87 (0.53-6.61)
Refractory Hypotension	0	7	0.001	-
Stoma	16	16	0.045	5.0 (0.94-26.53)
Gangrenous Bowel >90cm	13	14	0.063	3.5 (0.90-13.51)
Remnant Bowel <100cm	4	6	0.162	2.75 (0.64-11.6)
Ileocolic Resection	3	3	0.626	1.53 (0.27-8.62)
Perforation	4	1	0.312	0.34 (0.03-3.16)
Contamination >1 L	15	13	0.325	1.90 (0.52-6.94)
Intubation For >2 Days	6	7	0.258	2.12 (0.56-7.90)
Leukocytosis	23	15	0.626	0.65 (0.11-3.66)
Hemoglobin <8 mg/dL	12	3	0.042	0.233(0.05-1.00)
Acidosis	14	8	0.759	0.81 (0.22-2.99)
Hypoxia	3	6	0.047	4.66 (0.95-22.9)
Creatinine > 2 mg/dL	5	4	0.274	1.2 (0.27-5.26)
Hypoalbuminemia	16	15	0.119	3.12 (0.71-13.5)
Hyperglycemia	13	6	0.272	0.5 (0.14-1.73)
Lactic Acidosis	14	7	0.477	0.62 (0.17-2.29)
Occlusive AMI	25	18	0.400	1.72 (1.33-2.21)
Pneumatosis Intestinalis	2	3	0.356	2.4 (0.35-16.07)
Portal Venous Gas	0	3	0.031	-
Bowel Dilatation	15	5	0.05	0.28 (0.07-1.02)

Summary of Results

- 40.9% mortality in this cohort
- Leukocytosis was the most common lab abnormality in 86% patients
- 61% patients had >90cm gangrenous bowel
- 25% patients needed re-exploration
- SMA was the most common vessel involved (89%)
- Surviving patients had a physical functioning of 15%, 100% role limitation and 20% of general health compared to their healthy state
- All 7 patients, who needed inotropic support, died

Discussion

- Aging has a higher risk of mortality due to increased atherosclerosis, greater comorbidities, poor nutritional and performance status. With each year increase in age, the odds of mortality increased by 1.09
- Portal venous gas was present in 3 cases all of which died, hence is a significant predictor of mortality (p value <0.05)
- Pneumatosis intestinalis was seen in 5 patients. In contrast to other studies, we did not find it to be a significant predictor of mortality
- Patients who had an ostomy: 5 times more likely to die than patients with resection anastomosis (RA)
- 32 patients had an ostomy and only 12 patients underwent RA. None of the operative decisions had a significant impact on mortality in this study
  - Out of these 12 patients, 7 patients had a leak which required re-exploration
  - Out of 32 patients with ostomy, 4 patients had gangrene of the proximal stoma needing additional resection

Limitations

- No revascularization procedure open or endovascular, such as a SMA embolectomy or stenting due to unavailability of vascular surgeons in the emergent settings
- Technology not readily available for temporary abdominal closure

Conclusion

- Acute mesenteric ischemia is a geriatric abdominal emergency with high morbidity and mortality
- For risk stratification of patients with acute mesenteric ischemia, following were significant predictors of poor prognosis
  - aging
  - presence of comorbidities (CCI more than 2)
  - unstable hemodynamics on admission and refractory hypotension
  - hypoxia on blood gas analysis
  - presence of portal venous gas on imaging
  - creation of an ostomy

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