

embolectomy in 3 (12 %) and thrombectomy in one (4 %). Primary anastomosis was done in 17 out of the 25 patients (64 %). At operation, the mucosa had appropriate perfusion in 13 patients (52 %), poor perfusion in 10 (40 %) and suspicious in 2 (8 %). Five patients were returned to the operating room for a second-look laparotomy.

The average length of hospital stay was 19.3 ± 3.7 days.

Post-operative course:

The mortality rate within 30 days postoperatively was 60 % (15/25) (Fig. 1). Ten patients developed renal failure, 8 developed respiratory failure and 3 developed disseminated intravascular coagulation (DIC). The factors associated with early death were acidosis and high serum amylase activity. Patients who died differed from survivors only with respect to time of presentation and intervention. Among patients underlying early operation within 12 hours of presentation (n=8), there was 3 deaths (37.4 %), in comparison to 12 deaths (12/17, 70 %) recorded in patients with delayed presentation & operation (> 24 hours) (P = 0.02). According to the aetiology of arterial ischaemia, mortality rate was lower in arterial embolism than in thrombosis but without statistically significant difference (58 %; 10/17 versus 62.5 %, 5/8 respectively; P > 0.5).

3 patients (12 %) developed short bowel syndrome. Survival rate was 36 % at 6 months and 32 % at one year (Fig. 2).

Patients with mesenteric venous occlusion:

Patients with mesenteric venous thrombosis were on average age of 43 ± 2.2 years old (range 31-63 years). Five patients (71.4 %) were younger than 50 years. The male/female ratio was 2.5 (5/2). All patients initially presented with abdominal pain of insidious onset associated with nausea in 85.8 % (6/7), vomiting in 57.1 % (4/7), diarrhea in 28.5 % (2/7), haematemesis in 14.2 % (1/7) and haematochezia in 14.2 % (1/7). On average, patients had symptoms for 15 ± 6 days before admission. Two patients were admitted within 12 hours of the onset of symptoms. At presentation, 5 patients had minimal abdominal findings, whereas two had signs of acute peritonitis. Time to laparotomy ranged from 3 hours to 5 days (average 1.5 ± 0.6 days), with 2 patients undergoing emergency surgery because of signs of peritonitis. The primary cause of delay in surgery was initially to establish the diagnosis. Urinary output was less than 30 cc per hour in 2 patients (28.5 %). Electrocardiography showed AF rhythm in one (14.2 %) and myocardial infarction in another one (14.2 %).

Associated conditions and risk factors:

Associated medical conditions are shown in table (1). One patient (14.2 %) had a history of cardiac disease and one had atrial fibrillation. With respect to risk factors, smoking was observed in 4 patients (57.1 %), hypertension in one (14.2 %), peptic ulcer disease in 2 (28.5 %) and hepatomegaly in 3 (42.8 %) (see Table 2).

A hypercoagulable profile was obtained only in two patients, one had polycythaemia vera and another had protein C deficiency. The cause of mesenteric venous thrombosis in the remaining 5 patients was thought to be idiopathic.

Diagnostic tests and laboratory findings:

All patients with mesenteric venous thrombosis had a moderate leucocytosis on average of $15.6 \pm 2.7 \times 10^3$ cells per cubic millimeter, an elevated serum lactate level, and evidence of intravascular depletion with admission haematocrite value on average of 40.6 ± 2.7 (see Table 3). Plain abdominal X-rays were performed in all patients, with non specific findings ranging from scarcity of bowel gas to partial small bowel obstruction (Fig. 3). Non specific features were also obtained by abdominal ultrasonography. An upper gastrointestinal series performed in one patient showed rigid small loops with edematous bowel wall. CT scan of the abdomen was performed in 2 patients, which showed thrombus within the superior mesenteric vein (SMV) and dilated, fixed thick-walled small bowel loops (Fig. 4). Other diagnostic studies such as angiography and duplex ultrasound were not performed in this series.

Operative findings and surgical procedures:

All 7 patients had surgical infarction of the small bowel (Fig. 5). No patient was found to have frank perforation and peritonitis. The infarcted segment had an average length of 4.7 ± 0.8 feet (range 1-12 feet).

The mesentery was thickened with oedema and diffuse petechiae. Multiple thrombi were seen in the mesenteric veins. Good arterial pulsations, and varying amounts of haemorrhagic ascites were noted in all patients. The infarcted segment of bowel was resected with generous margins, and primary anastomosis was performed in all patients (100 %). Anticoagulant therapy was started immediately postoperatively with conversion to oral warfarin at appropriate time. No patient underwent a second look laparotomy. The average length of hospital stay was 13.9 ± 2.3 days.

Postoperative course:

The mortality rate within 30 days postoperatively was 14.2 % (1/7) (Fig. 1). This patient was explored 3 days after admission and developed an anastomotic leak at the fifth postoperative day. The cause of death was hepatorenal failure.

One patient developed short-gut syndrome secondary to extensive bowel resection. Treatment with antispasmodic and elemental diet resulted in relief of symptoms. Survival rate at one year was 85.8 % (Fig. 2).

Table 1: Coexistent conditions in patients with thrombotic mesenteric ischaemia

Condition	Arterial Occlusion		Venous Occlusion	
	No	%	No	%
Cardiac disease	19/25	76 % ⁺	1/7	14.2 %
Myocardial infarction	4/25	16 %	1/7	14.2 %
Atrial fibrillation	15/25	60 % [*]	1/7	14.2 %
Congestive heart failure	9/25	36 % [#]	0/7	0
Chronic mesenteric ischaemia	3/25	12 %	0/7	0
cerebrovascular	2/25	8 %	0/7	0

⁺ P = 0.004 arterial versus venous thrombosis
[#] P = 0.0001 arterial versus venous thrombosis

^{*} P = 0.03 arterial versus venous thrombosis

Table 2: Risk factors in patients with thrombotic mesenteric ischaemia

Condition	Arterial Occlusion		Venous Occlusion	
	No	%	No	%
Hypertension	14/25	56 % ⁺	1/7	14.2 %
Smoking	10/25	40 % [*]	4/7	57.1 %
Chronic Obstructive Lung Disease	7/25	28 %	0/7	0
Diabetes Mellitus	5/25	20 %	0/7	0
Peptic ulcer disease	5/25	20 %	2/7	28.5 %
Hepatomegaly	1/25	4 % [#]	3/7	42.8 %

+ P = 0.04 arterial versus venous occlusion
P = 0.01 arterial versus venous occlusion.

* P = 0.19 arterial versus venous occlusion

Table 3: Vital signs and laboratory study results at the time of diagnosis

Condition	Arterial Occlusion	Venous Occlusion
	N = 25	N = 7
Mean BP (mmHg)	92 ± 4	102.8 ± 13.2
Pulse / minute	108 ± 6	98 ± 5
Respiratory rate / minute	22 ± 2	20 ± 1
WBCs $C \times 10^3 / ml$	23.2 ± 1.8 ⁺	15.6 ± 2.7
Haematocrite value (%)	36.2 ± 1.7	40.6 ± 2.7
CO ₂ (mg/dL)	23.7 ± 1.3	22.1 ± 0.8
BUN (mg/dL)	36.4 ± 4 [*]	19.1 ± 3.5
Creatinine (mg/dL)	2.1 ± 0.4	1.3 ± 0.3
pH	7.4 ± 0.03	7.38 ± 0.03
Lactate (mg/dL)	5.3 ± 1.3	3.7 ± 1.6

BP: Blood Pressure WBC: White Blood Cell Count BUN: Blood Urea Nitrogen
+ P = 0.014 Arterial versus venous occlusion * P = 0.003 Arterial versus venous occlusion

Table 4: Type of surgical intervention for patients with occlusive intestinal ischaemia

Condition	Arterial Occlusion		Venous Occlusion	
	No	%	No	%
Bowel resection	21/25	84 %	7/7	100 %
Bowel resection and revascularization	4/25	16 %	0/7	0 %

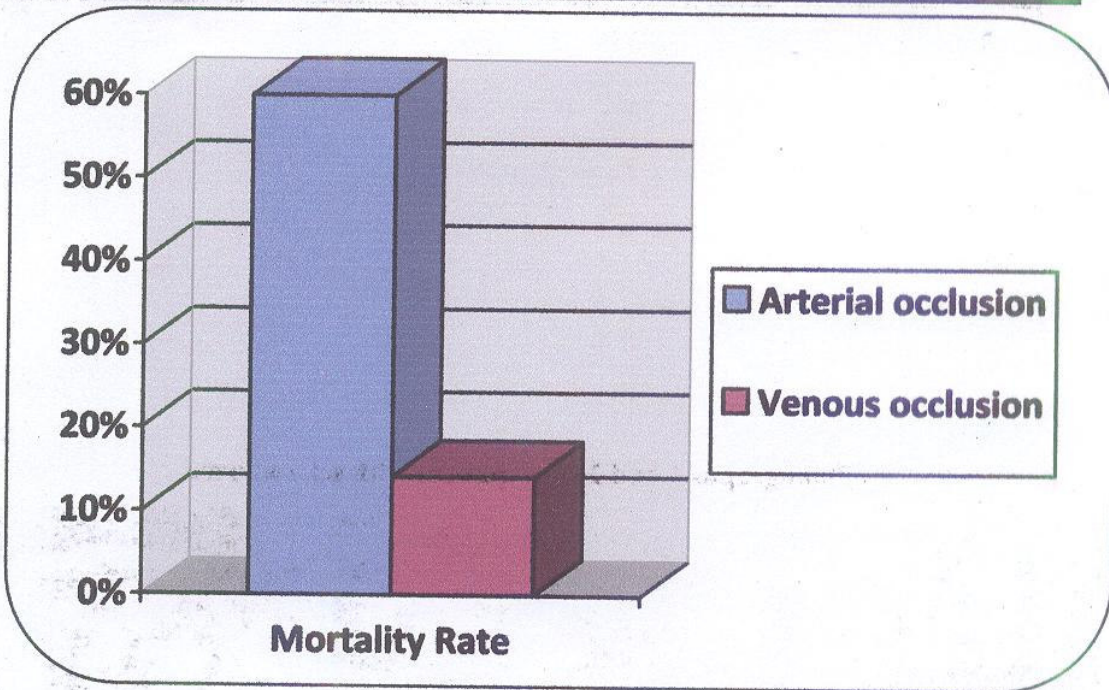


Fig. (1) shows mortality rates in both groups of patients with occlusive intestinal ischaemia. It was lower in venous than arterial occlusion ($P = 0.03$).

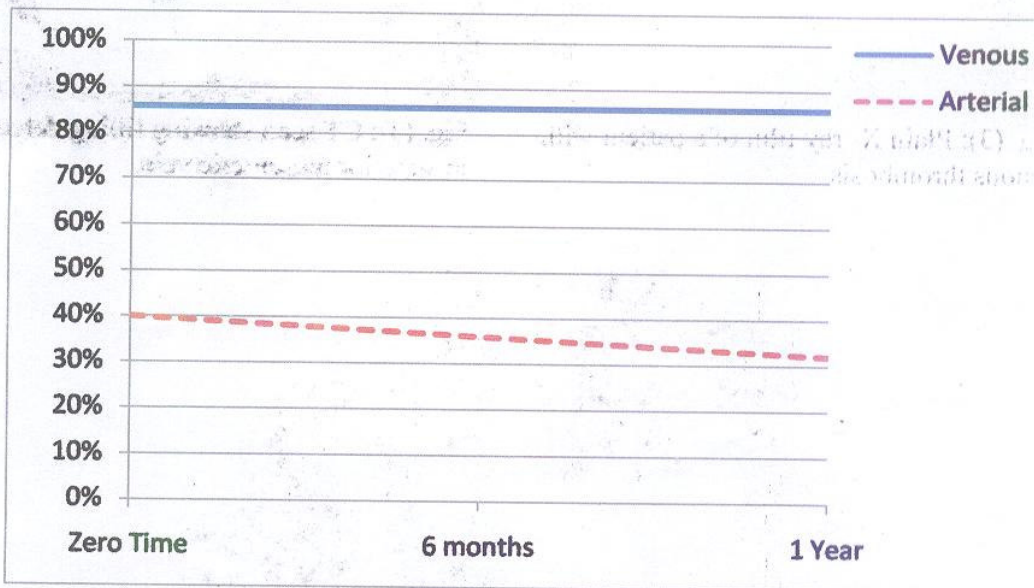


Fig. (2) shows survival rates in both groups in patients with mesenteric vascular occlusion. It was better in venous than arterial occlusion ($P = 0.01$).