Management of mesenteric vascular occlusion

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ABSTRACT

Introduction: The aim of this study was to evaluate our recent clinical management of mesenteric vascular occlusion (MVO) at Al-Ain Hospital, United Arab Emirates.

Methods: A retrospective study was performed including all patients who were diagnosed to have MVO from December 2001 to May 2005. The records were studied with regard to clinical features, risk factors, diagnosis, treatment, and outcome.

Results: Of the 14 patients studied, seven patients experienced mesenteric venous thrombosis (MVT), five patients mesenteric arterial occlusion (MAO), and two patients were found to have both MVT and MAO. The main risk factor for MAO was ischaemic heart disease with atrial fibrillation in four patients (80 percent). No predisposing factors were identified in three patients with MVT (primary MVT 43 percent). Contrast-enhanced computed tomography was performed in all patients and was diagnostic in 12 (86 percent) patients. Seven patients (50 percent) underwent surgery. One patient died on the ninth postoperative day (overall mortality rate 7 percent). Seven patients (50 percent) were successfully managed conservatively, five of them had only MVT, one had combined MVT and MAO, and one had only MAO.

Conclusion: Early diagnosis and prompt initiation of anticoagulation therapy, with operative intervention when indicated, are essential for a favourable outcome.

Keywords: computed tomography, mesenteric vascular occlusion, mesenteric venous thrombosis

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INTRODUCTION

Acute mesenteric vascular occlusion (MVO) is uncommon and remains a difficult diagnostic challenge with high rates of morbidity and mortality. The severity of ischaemic injury depends on mesenteric blood flow and is influenced by the number of occluded blood vessels, the development of a collateral circulation, the extent of bowel involved, and duration of ischaemia. The mucosa and submucosa are the most metabolically active parts of the intestine and receive approximately 70% of the total mesenteric blood flow. Intestinal ischaemia secondary to disruption of mesenteric blood flow occurs in a transmural fashion that progresses from mucosa to serosa.[1] In the early stages of the disease, the mucosa sloughs, causing bleeding into the gastrointestinal lumen and also producing the classical clinical picture of intense visceral pain disproportionate to the mild tenderness, which is often the only abnormality on physical examination of the abdomen. When ischaemia persists, the mucosal barrier becomes disrupted with the release of bacteria and toxins into the systemic circulation. The gradual onset of necrosis leads to bowel perforation

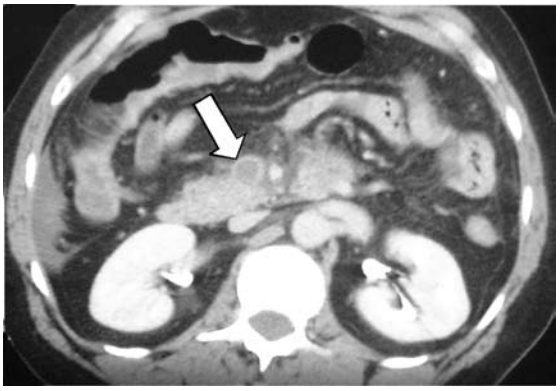

Fig. 1 CT angiogram shows superior mesenteric vein thrombosis (arrow) in a 50-year-old man.

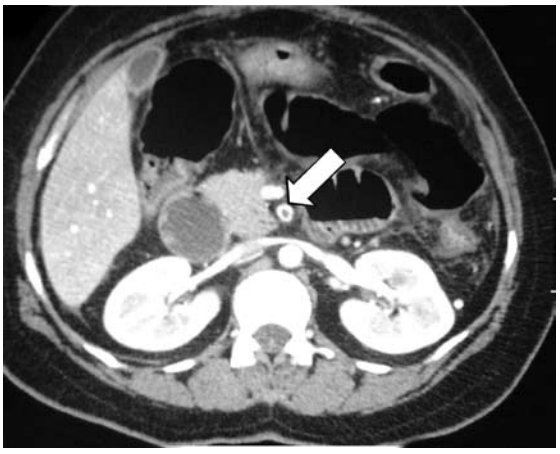

Fig. 2 CT angiogram shows superior mesenteric artery thrombosis (arrow) in a 40-year-old woman.

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causing peritonitis, septicaemia, and multiple organ failure, all of which are life threatening.[2]

MVO can be due to superior mesenteric vein thrombosis (MVT) or superior mesenteric artery occlusion (MAO), which may be due to thrombosis or embolism.[1] Superior mesenteric artery thrombosis usually occurs at the origin of the vessel from the aorta, resulting in extensive bowel involvement. Embolic events usually occur more peripherally in the mesentery and cause less extensive bowel ischaemia.

MVT is classified as either primary or secondary. When an aetiological factor is found, the patient is said to have secondary MVT.[3] Recent progress in computed tomography (CT) and magnetic resonance (MR) imaging have made it possible to diagnose MVO early in the course of the disease. Prompt diagnosis, resuscitation, and aggressive treatment are essential to lower the risks of morbidity and mortality. Herein, we review our recent experience with the management of MVO.

METHODS

All patients, who were admitted to Al-Ain Hospital and diagnosed with MVO between December 2001 and May 2005, were studied. The diagnosis of MVO was based on CT results or laparotomy findings. Physical examination, predisposing factors, and laboratory investigations were reviewed. Treatment and outcomes were analysed.

RESULTS

14 patients (ten men and four women), having a median (range) age of 40 (20–75) years, were studied. Seven patients were found to have MVT, five patients with MAO, and two with both MVT and MAO. All patients complained of abdominal pain and eight complained of vomiting. On presentation, the median pulse rate (range) was 99 (86–155) beats per minute. Four patients had fever. All patients had abdominal tenderness. Intestinal sounds were audible in ten patients and rebound tenderness was positive in three patients (Table I). MVT patients had significantly longer duration of symptoms, compared with pure MAO patients (median [range] duration: 144 [48–336] hours vs. 24 [12–144] hours, $p < 0.05$, Mann-Whitney test).

Predisposing factors for MAO were ischaemic heart disease and atrial fibrillation in four patients, hypertension in two patients, and diabetes mellitus in two patients. Two patients developed MVT postoperatively; one had undergone splenectomy and was diagnosed on the sixth postoperative day and the other was diagnosed ten days following appendectomy. Primary MVT occurred in three patients with no identifiable predisposing factors (Table II). Leucocytosis (more than $11{,}000 \times 10^9$) was present in 11 patients. Arterial blood gas analysis was performed in only four patients and showed acidosis only in one patient, this patient died. Abdominal radiographs were taken for ten patients; appearances were normal in five and dilated bowel loops were evident in the other five patients. Ultrasonography was carried out in eight patients, but was not diagnostic, showing appendicular mass in one patient, portal vein thrombosis in one patient, free fluid in two patients, and thickened bowel mucosa in one patient.

All 14 patients had a CT (16 slice) with intravenous contrast administration, and this proved diagnostic in 12 patients. Seven patients had MVT, three patients had MAO, and two patients had combined MVT and MAO. Two patients with MAO were diagnosed during laparotomy. Other CT findings included thrombosis of the portal vein in two patients and splenic vein thrombosis in one patient with splenic infarction, pancreatitis in one patient, appendicular mass in two patients, thrombosis of the external iliac artery and femoral artery in one patient, free intraperitoneal fluid in five patients, and thickened bowel mucosa in five patients. The diagnosis was suspected prior to the CT scan or laparotomy in only four patients. This was similar between MVT and solely MAO patients ($p = 0.52$, Mann-Whitney test). The median

Table I. Clinical presentation of the patients with mesenteric vascular occlusion.

Clinical manifestation	No. (%)
Abdominal pain	14 (100)
Vomiting	8 (57)
Distension	5 (36)
Haematemesis	1 (7)
Bleeding per rectum	1 (7)
Abdominal tenderness	14 (100)
Rebound tenderness	3 (21)
Audible intestinal sounds	10 (71)
Fever	4 (29)

Table II. Predisposing factors to mesenteric vascular occlusion.

Type of occlusion and predisposing factors	No. of patients
Superior MVT (n = 7)	
Unknown (primary)	3
Postoperative	2
Pancreatitis and DVT	1
Appendicular mass	1
Superior MAO (n = 5)*	
Ischaemic heart disease/atrial fibrillation	4
Diabetes mellitus	2
Both MAO and MVT (n = 2)	
Hypertension	1
Appendicular mass	1

MVT: mesenteric vein thrombosis; MAO: mesenteric artery occlusion

* One patient presented with both conditions

(range) time taken before diagnosis after admission was 24 (2–144) hours. Following admission, the diagnosis was made within 24 hours in ten patients, within 48 hours in one patient, and more than 72 hours in three patients.

Laparotomy was carried out in seven patients and revealed small intestinal gangrene in all (four patients with MAO, two patients with MVT, and one patient with combined MVT and MAO). Resection and anastomosis were performed in six patients, one of whom also underwent right hemicolectomy. One patient had a resection of gangrenous small intestine with a jejunostomy fashioned. One patient had an embolectomy and a second-look operation was done in two patients. The median (range) time to commencement of anticoagulant administration to all the patients was 2 (1–6) days. 12 patients were treated initially with low molecular weight heparin and two patients with heparin infusion, and all of them were treated later on with warfarin. Antibiotic therapy was given to 13 patients and the median (range) time to commencement was one (1–2) day. Only one patient died, and he was a 75-year-old man who underwent embolectomy, resection, and small bowel anastomosis for MAO. The median duration (range) of hospital stay was 20 (3–204) days. Two male patients had both MVT and MAO simultaneously. One presented with appendicular mass and complained of abdominal pain for one week prior to diagnosis and was managed conservatively. The other patient was known to have hypertension and presented with features suggestive of intestinal obstruction. Symptoms had been present for ten days, and resection of gangrenous small intestine was performed.

DISCUSSION

The diagnosis and management of MVO is challenging.[4] Various types of MVO have somewhat different predisposing factors, clinical features, and prognosis. In our series, MVT accounted for 50% of cases, MAO 36%, and combined MAO and MVT 14%. In other reports MVT accounted for 5%–15% of cases of mesenteric ischaemia.[5,6] The increasing incidence of MVT may reflect improvements in the diagnosis following the development of new imaging technology, such as multidetection CT scan with angiography. It is noteworthy that our population is young in age, with young labourers constituting 50% of the population. MVO occurs more frequently in male patients; the male to female ratio was 5:2. MVT occurs in a relatively younger age group. The median age range was 36 years and 44 years for MVT and MAO, respectively.

The onset of symptoms in MVT is more insidious. In our study, the median duration of symptoms was six days in MVT, but it was only one day in MAO. Early diagnosis of MVO, depending on the clinical features and laboratory studies, is often difficult. The diagnosis of MVO was suspected only in four patients (29%) and was the provisional diagnosis in only one patient (7%). In our series, the median time range to reach to the correct diagnosis following admission was 24 hours. Laboratory studies were not helpful for this purpose; acidosis is usually observed late in the course of the disease and is significantly associated with early death.[7]

Abdominal radiograph findings are usually non-specific. Dilated small bowel loops with air fluid levels were found in 50% of the patients. Although ultrasonography was not diagnostic, it was helpful in some patients, especially for the recognition of free intraperitoneal fluid. CT angiography is the procedure of choice for suspected MVO. Intravenous contrast agent should be used when performing CT for an appendicular mass and postoperative abdominal pain.[8] It has a sensitivity of more than 90% in MVT and approximately 60% in MAO.[5,6] CT with intravenous contrast administration was performed in all our patients. It was diagnostic for all cases of MVT, but it was diagnostic for only three (60%) patients with MAO, two of whom were diagnosed at laparotomy. Retrospectively, when the CT image reconstructions of these two patients were reviewed, they did indeed show thromboembolic signs in superior mesenteric vessels. It is essential that the radiologist be informed about the clinical presentation and the possible differential diagnosis so that reconstruction of mesenteric vessels can be viewed when vascular occlusion is suspected. MR imaging and magnetic resonance angiography (MRA) have a sensitivity of 100% and specificity of 91%. However, imaging is expensive and takes more time than CT.[9]

The majority of our patients who had laparotomy (6/7, 86%), had gangrenous bowels at surgery. In one patient, the diagnosis was not made at the first laparotomy, possibly because ischaemia was only mucosal at that time. The patient developed intestinal fistula and a second laparotomy 20 days later revealed gangrenous bowels. A review of the CT showed a missed MAO. Laparotomy is indicated for most patients with superior MAO.[10,11] One of our patients with recent extensive myocardial infarction, and who developed MAO, was managed conservatively with heparin infusion. The patient improved and he underwent repeat CT angiography which showed lysis of the thrombus.

The treatment of MVT involves anticoagulation alone or in combination with surgery.[12] Five of our patients with MVT (71%) were successfully managed conservatively with low molecular weight heparin. This is similar to other recent studies of conservative managements for MVT.[13] Two of our patients (29%) with MVT required resection of gangrenous small intestine. Laparotomy is mandatory for patients with MVT whenever the clinical features suggest peritonitis and/or bowel infarction. Only one of our patients died (mortality rate 7%). This patient was a 75-year-old

man who presented with peritonitis. Embolectomy with resection and anastomosis were carried out, but the patient died nine days following the operation. The mortality rate of MVT in other studies varies widely from 20% to 80%.[2] None of our patients with MVT died. This may reflect the value of early diagnosis, resuscitation with the early use of anticoagulation therapy, and operative intervention when indicated. Two of our patients had occlusion of both superior mesenteric vein and artery at the same time. Both patients had a long duration of symptoms resembling the cases of MVT. We postulate that MVT occurred primarily, followed by MAO, which aggravated the condition.

In summary, MVO produces a spectrum of clinical presentations, the most common of which is the acute onset of abdominal pain disproportionate to the physical findings. MVT occurs in a younger age group, and if diagnosed early, it may be successfully managed conservatively with anticoagulation therapy. MAO occurs in a relatively older age group than MVT, and usually requires surgery. Occasionally both arterial and venous mesenteric occlusion may be found simultaneously. New imaging techniques have increased the likelihood of early diagnosis of all forms of MVO. Knowledge of the predisposing factors, the clinical presentation, and the use of modern imaging technology have led to improvement in diagnosis and outcome, with appropriate therapeutic options for such patients.

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