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Vasc Endovascular Surg 2005; 39; 473

DOI: 10.1177/153857440503900603

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Deciphering Mesenteric Venous Thrombosis: Imaging and Treatment

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The principal cause of a high mortality rate in mesenteric vein thrombosis (MVT) is a delay in diagnosis. Recent data indicate that the mortality rate is decreasing owing to earlier diagnosis and anticoagulation. The authors examined the treatment profile of MVT to see how the increased use of imaging and early anticoagulation has impacted this process. They retrospectively analyzed the treatment paradigm with acute MVT at one institution over a 10-year period. Twenty-three patients were identified. Data were analyzed using chi-squares and Student's *t* tests. Twenty-three patients (11 men and 12 women with an average age of 51.74 ± 14.8 years) were identified with acute MVT between the years of 1993 and 2003. Five patients had splenic vein thrombosis, 17 had superior mesenteric vein thrombosis, 1 had inferior mesenteric vein thrombosis, and 12 had portal vein thrombosis. Nine patients had combination mesenteric vein segment thrombosis. Thrombolytics were utilized in a total of 6 patients. Four of the 6 patients in whom lytics were utilized had combined mesenteric vein thrombosis; however, these 4 patients did not require surgical intervention. There was no significant difference in length of hospital stay between patients taking lytics versus patients treated with traditional anticoagulation with heparin ($p = 0.291$). A hypercoagulable state was identified in 66.7% of the patients. Four patients required surgical intervention. The overall mortality rate was 8.7% (2 of 23). The use of thrombolytics was associated with a significant mortality ($p = 0.04$). The use of antibiotics made no difference in mortality ($p = 0.235$), nor did antibiotic use influence length of hospitalization ($p = 0.192$). MVT is relatively rare, and often the delay in diagnosis increases the mortality rate. In the majority of cases prompt anticoagulation will preserve bowel viability and decrease mortality and morbidity rates. The majority of patients do not need surgery. There is a marked increase in mortality rate when these patients progress to surgical intervention. An increased awareness and early diagnosis has led to decreased morbidity and mortality rates.

Vasc Endovasc Surg 39:473–479, 2005

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Introduction

In 1935 Warren and Eberhard described 2 patients with mesenteric vein thrombosis (MVT) and reviewed 73 other cases and literature on MVT.¹⁻³ They found that exploration and resection of gangrenous or ischemic intestine was the most effective treatment and reported a 34%

mortality rate. The principal cause for the high mortality rate then, and still today, is the delay in diagnosing this insidious process. It is often misdiagnosed as gastroenteritis, small bowel obstruction, or inflammatory bowel disease.

Nearly 70 years after Warren and Eberhard's paper, the mortality rate has drifted downward, owing to earlier diagnosis with imaging and the use of anticoagulation. Advances in imaging now allow diagnosis before laparotomy. Recent literature quotes mortality rates of 29–39% for surgical treatment and 13–19% for “nonoperative” management.⁴ Early heparin infusion is integral to moving into this lower mortality stratum. Heparin use began the transition toward nonoperative management in the 1950s, but there have only been scattered case reports detailing use of thrombolytics, the other major form of nonoperative treatment.^{5,6}

We performed a retrospective review of this institution's 10-year experience with acute MVT. We were interested in the changing trends in dealing with this process as well as elucidating the role of thrombolytics. In addition, we hoped to identify variables that may increase the mortality rate.

Methods

A computerized search of the medical records for patients with the diagnosis of acute MVT was performed for the years 1993–2003, using the key words “mesenteric vein thrombosis.” Patients with mesenteric arterial thrombosis as a cause of ischemia were excluded. MVT was defined as the presence of an acute thrombus in the portal vein, splenic vein, inferior mesenteric vein, or superior mesenteric vein as indicated by imaging study or pathology. Data on demographics, clinical presentation, diagnostic evaluation, management, and outcome were obtained. Imaging and pathology reports were also reviewed. Analysis included Student's *t* tests and chi-squares. SPSS (SPSS Corporation, Chicago, IL) statistical software was used to perform the analysis.

Results

Twenty-three patients (11 men and 12 women with an average age of 51.74 ± 14.8) were identified with acute MVT between the years 1993

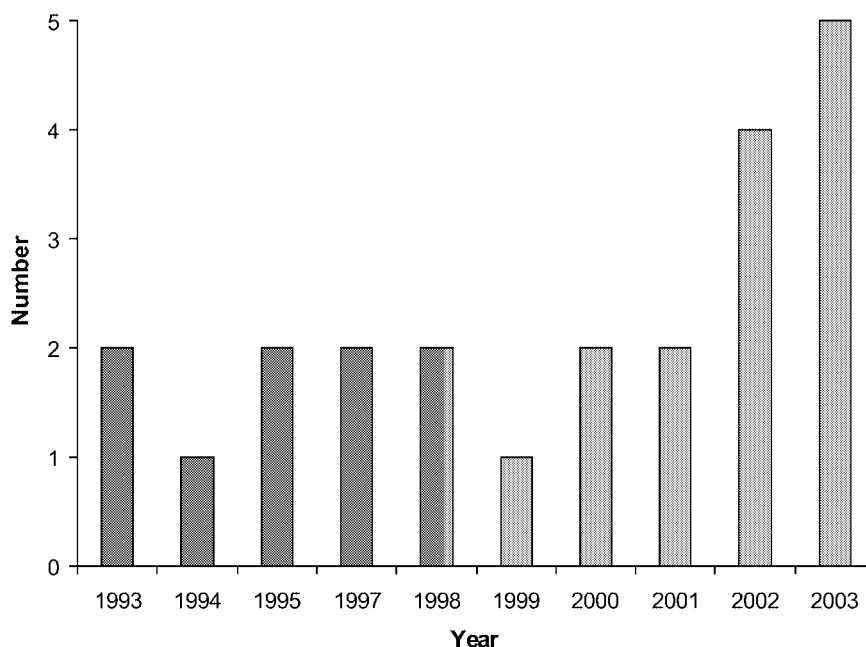


Figure 1. Mesenteric vein thrombosis by year.

and 2003 (Figure 1). Five patients had splenic vein thrombosis, 17 had superior MVT, 1 had inferior MVT, and 12 had portal vein thrombosis. Nine patients had combination mesenteric vein segment thrombosis. The mortality rate was 8.7% (2 of 23). The 2 patients who died had isolated superior MVT. These 2 patients had initially been treated with thrombolytics and failed and thus required surgical intervention because of worsening abdominal exam results and multisystem organ failure. The mortality rate for the thrombolytic group was 33%.

Patients with multiple segment MVT were not significantly associated with increased mortality ($p = 0.235$). There was also no significant difference in length of hospitalization between these patients (6.67 days) and patients with only single-segment thrombosis (17.5 days) ($p = 0.177$). Thrombolytics were utilized in a total of 6 patients. Four of these 6 patients had combined MVT; however, 4 of these patients did not require surgical intervention. There was no significant difference in length of hospital stay between patients receiving lytic therapy (25 days) and patients not treated with lytic therapy (9.12 days) ($p = 0.291$). There was also no significant differ-

ence in length of hospitalization between patients who received lytics or heparin alone and those who received them as a combination ($p = 0.299$). A hypercoagulable state was identified in 69.6% of the patients. Several patients had multiple hypercoagulable states. The most common hypercoagulable states were protein C or S deficiency (26%), history of malignancy (26%), and use of clot-inducing medications including tamoxifen and estrogen (26%) (Figure 2). Four patients required surgical intervention. The average length of intestine resected was 127 centimeters (Figure 3). The 2 patients who died failed nonoperative management with thrombolytics and required surgical exploration. Surgical exploration was significantly associated with mortality ($p = 0.001$), as was the use of thrombolytics ($p = 0.04$). The use of antibiotics made no difference in mortality ($p = 0.235$), nor did antibiotic use influence length of hospitalization ($p = 0.192$).

Computed tomography (CT) scan, ultrasound, angiography and magnetic resonance imaging (MRI) were utilized as imaging modalities in 95.7%, 4.3%, 13%, and 13% of the patients, respectively. CT scan was the most widely utilized imaging method, identifying MVT in 21

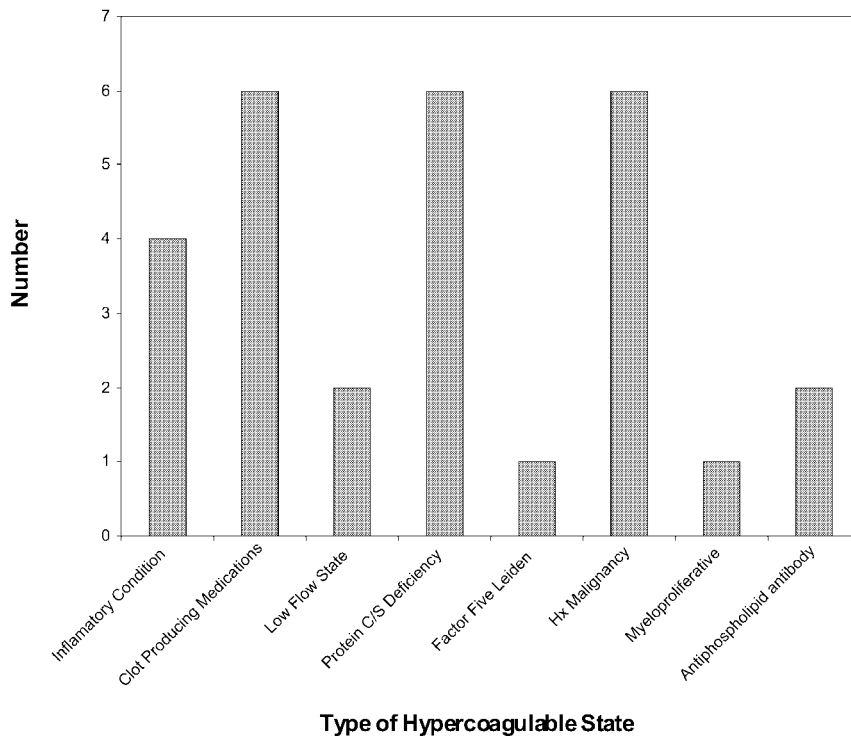


Figure 2. Hypercoagulable state.



Figure 3. Surgical intervention.

of 22 patients. Changes on CT, which are suggestive of MVT, include the presence of a thrombus, edematous changes of bowel or mesentery, collateralization with enlarged spleen, and ascites. Angiography and MR were both 100% successful at identifying thrombus. Ultrasound was the least reliable, requiring validation with CT. In some cases more than one imaging method was used.

Discussion

MVT is relatively rare and the practicing surgeon can expect to see only a handful of these cases in a career. MVT accounts for 1.5% to 6.2% of acute mesenteric ischemia.⁴ The most common presentation of these patients will be vague abdominal pain, nausea, and vomiting. The onset of MVT may be precipitated by a viral illness. The delay in diagnosis is the primary factor that increases mortality when surgical exploration is required by progression of symptoms. In the majority of cases prompt anticoagulation will preserve bowel viability and decrease mortality and morbidity rates.

Diagnosis by history alone is difficult and is aided by both an index of suspicion and imaging. Ultrasound is a fairly limited test. It is operator dependent and oftentimes limited by bowel gas or body habitus. Logistically, ultrasound may not

be available during “nonbusiness” hours. CT is a good initial diagnostic test that is widely available and has a greater sensitivity than ultrasound. Changes on CT suggestive of MVT include the presence of a thrombus, edematous changes of bowel or mesentery, collateralization with enlarged spleen, and ascites. CT was performed in 95.7% of the patients, which was an increase compared to the 38% of Rhee et al² in their review of acute MVT from 1972 to 1993 (Figure



Figure 4. SMV thrombosis adjacent to patent SMA.

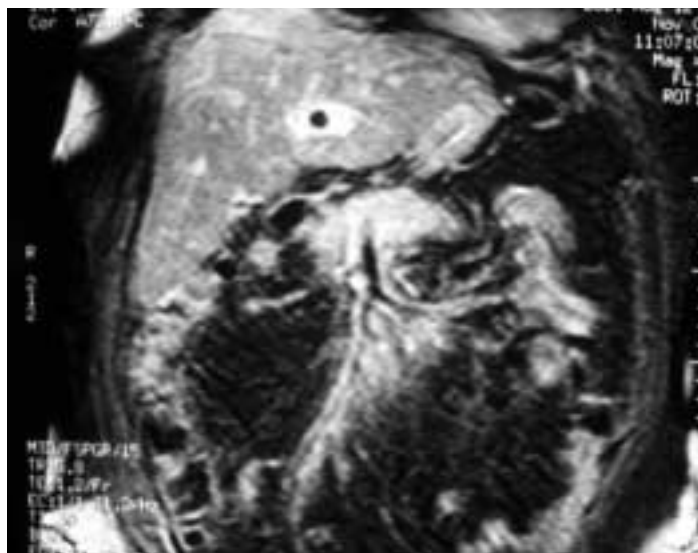


Figure 5. MRA of patient with occlusion of all named mesenteric veins. This patient had chronic abdominal pain for 3 months prior to presentation.

4). Another form of imaging, magnetic resonance angiography (MRA), is a nice adjunct. There is no contrast load and it is optimal when surgical clips or other artifacts obscure the field of interest (Figure 5). Finally, angiography is the most invasive of the mentioned imaging techniques and in the past has been the gold standard. The diagnosis of MVT is based on a mesenteric filling defect or slow or absent mesenteric venous filling.² Angiography may be useful therapeutically if lytic treatment is utilized (Figure 6). Fibrinolytic agents may be infused systemically, directly into the superior mesenteric artery, or transhepatically into the mesenteric portal system. Overall, CT scans are generally preferred for their noninvasive methods to MRA and angiography as well as their improved accuracy and availability over ultrasounds.

Heparin use began the transition toward non-operative management in the 1950s. Abdu et al¹ have written one of the largest clinical reviews conducted on MVT.¹ They reviewed clinical experiences recorded in the literature from 1911 to 1984, which included a total of 372 cases. Abdu and colleagues quoted a modest increase in survival from 65% to 77% with resection and the addition of anticoagulation once heparin use began. They concluded that anticoagulation should be continued indefinitely in the vast majority, as it will decrease recurrence from 30–40% to 3–5%.¹

Management of these patients fundamentally begins with fluid resuscitation. Hypercoagulable profiles should be drawn before administration of heparin if possible. In this study, 66% of MVT was due to some hypercoagulable state. One third of the patients did not have a hypercoagulable state identified. Many thrombophilic states may not have been recognized in the early years of this study. As recurrence is high, a hypercoagulable profile should be drawn not only for diagnosis in the patient, but perhaps more importantly, to identify patients who may have family members at risk. Consideration on preventive anticoagulation could be given to these individuals.

Operative intervention is required in the presence of peritonitis or worsening clinical status. Liberal use of second-look operation is imperative if bowel viability is of concern (Figure 7). Complications of surgical management include short bowel syndrome, wound infection, sepsis, and gastrointestinal bleeding. Approximately 14% of patients who undergo resection will have repeat MVT within 6 weeks.^{1,2,5}

There are no randomized controlled trials of thrombolytics versus conventional anticoagulation in the literature. The role of lytic therapy has not been clearly defined, but it seems reasonable to attempt lytics in patients who are hemodynamically stable, have no evidence of bowel infarction on imaging, and no peritoneal signs. There should also be a clear diagnosis of thrombosis. The best use of lytics centers around early use in patients with an acute clot burden. Certainly thrombolytics themselves are not without their own unique set of deleterious effects, principally bleeding as a result of attempted canalization or bleeding from increased fibrinolytic activity. This was evidenced by 2 patients in this study whose therapy was effective but who suffered an increase in morbidity owing to the development of groin hematoma and hemothorax, respectively. There is also the theoretical complication of clot emboli.

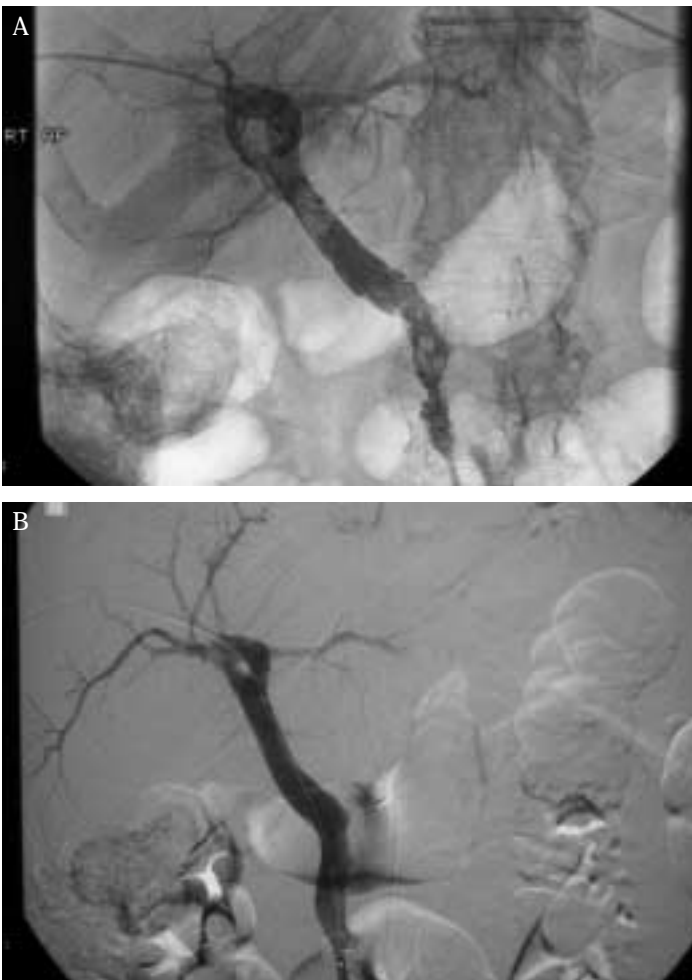


Figure 6. A. Multiple filling defects of portal vein and SMV prior to reteplase infusion. B. Thirty-two hours after reteplase.

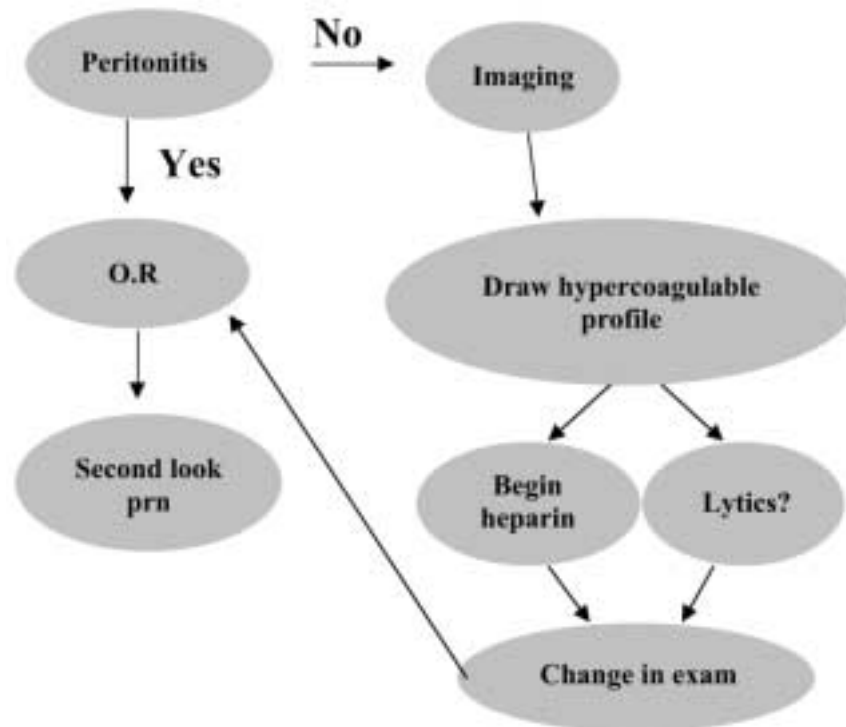


Figure 7. Management paradigm.

The experience gained from these data suggests that if lytics are used, they should be used early in the hospital course—within 24 hours. In this study the use of thrombolytics was associated with a significant mortality, owing quite possibly to the delay in intervention. Two patients treated with thrombolytics after 24 hours of their initial presentation to this hospital had a 100% mortality rate. Harward et al³ noted that 50% of patients have pain for 5 to 30 days before seeking medical attention, and 27% have had pain for more than 1 month.

There was no association between the presence of multiple vein thromboses and increased mortality rate as compared to single vein thrombosis ($p = 0.235$), which suggests that it is the rate of the thrombosis that contributes to the lethality. Nor did combined vein thrombosis have a significant effect on increased length of stay ($p = 0.177$). Portomesenteric venous thrombectomy was not utilized in any of these patients. Thrombectomy of the mesenteric system is limited to the larger named vessels. Portomesenteric venous thrombectomy can help decrease a large clot burden, but otherwise is nontherapeutic for the venous arcades and vasa recta, which when occluded, continues to prevent venous return.

The principal limitation of this study is the small sample size. Nonetheless, a few conclusions can be drawn. There is little doubt that early heparinization decreases morbidity and mortality rates. The amount of clot burden did not appear to have a deleterious effect on outcome; a likely reason for this is that it is not the amount of clot that is present, but rather the rate of the thrombosis. This is further supported by data from Rhee et al,² who noted that if patients had abdominal symptoms for more than 4 weeks, the chance of complications related to MVT decreased significantly. That is, none of these patients progressed to infarction.² Differentiating patients who have acute from a chronic thrombus is important. These appear to behave as 2 separate entities. Chronic thrombus has a much more indolent course, owing probably to the formation of collaterals. We propose that thrombolytics have a limited to no role in patients in whom chronic thrombus is suspected. Although there were 2 deaths in the thrombolytic arm of this study, these deaths occurred in patients in whom fibrinolytic administration was delayed more than 24 hours after admission. The role of thrombolytic therapy centers around being an adjunct to heparin. It is a poor rescue medication in patients

with a spiraling clinical course. A high index of suspicion and clinical awareness of MVT will increase survival and decrease the potential need for bowel resection. Prompt imaging, anticoagulation, and the judicious use of thrombolytics will afford the patient the best outcome.

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