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Case Report

Superior mesenteric vein thrombosis and osteoporotic vertebral fractures ☆,☆☆

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ARTICLE INFO

Article history:

Received 15 November 2022

Revised 6 December 2022

Accepted 10 December 2022

Keywords:

Superior mesenteric vein
thrombosis
Osteoporotic vertebral fractures
Spinal deformity
Elderly people
Contrast medium-enhanced
computed tomography

ABSTRACT

Superior mesenteric vein (SMV) thrombosis is relatively rare disease with unspecific symptoms. Thrombus formation within the SMV eventually leads to congestive intestinal necrosis. In most cases, the lack of specific symptoms makes early diagnosis difficult. Therefore, it is important to suspect the disease and actively investigate it, given a causative factor. Here, we report a case of SMV thrombosis with a novel predisposing factor, compression of SMV by deformed spine, found on contrast medium-enhanced computed tomography. Treatment with intravenous heparin followed by oral anticoagulants resulted in favorable outcome. This is the first picture showing the novel mechanism of SMV thrombus formation relating to spinal deformity. Treating osteoporosis before spinal deformity could prevent SMV thrombosis with such a mechanism.

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Introduction

Superior mesenteric vein (SMV) thrombosis is relatively rare disease with unspecific symptoms. Thrombus formation within the SMV eventually leads to congestive intestinal necrosis. Early diagnosis is often difficult due to nonspecific symptoms such as nausea and diarrhea, and most cases are identified either at laparotomy or at autopsy [1]. Acute throm-

bosis often presents with abdominal pain, whereas chronic disease manifests as an incidental finding on computed tomography (CT) [2]. Contrast medium-enhanced CT could diagnose more than 90% of cases of SMV thrombosis [2]. In addition to dilatation of mesenteric veins and translucency due to thrombus, edema, thickness of the intestinal wall, and decreased contrast enhancement are its findings, which suggest intestinal ischemia [3,4]. Here, we report a case of SMV thrombosis with a novel predisposing factor found incidentally on

☆ Funding: No specific funding was received from any bodies in the public, commercial or not-for-profit sectors to carry out the work described in this article.

☆☆ Competing Interests: All authors declare no conflicts of interest.

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<https://doi.org/10.1016/j.radcr.2022.12.026>

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contrast medium-enhanced CT. The location of the thrombus in the SMV suggests that the cause is the compression by the deformed spine.

Case report

An 89-year-old Japanese woman was admitted to our hospital for persistent fever for a week during COVID-19 pandemic in Japan. She had been vaccinated against SARS-CoV-2 twice and had not infected with SARS-CoV-2 before. Serum C-reactive protein level was elevated to 68 mg/L. Because of positive anti-neutrophil cytoplasmic antibody against myeloperoxidase (36.7 IU/ml) and interstitial pneumonia, diagnosis of microscopic polyangiitis was made according to the 2022 ACR/EULAR classification criteria for microscopic polyangiitis [5] and 20 mg of prednisolone was employed with good response.

Contrast medium-enhanced CT on admission incidentally revealed a giant thrombus measuring 17 mm × 45 mm in the SMV (Figs. 1A and 2). It was presumably responsible for high D-dimer levels (9.3 µg/mL), as no venous thrombosis was noted elsewhere. She had a characteristic posture (Fig. 1B) with multiple vertebral compression fractures, and had subsequent prominent kyphosis in the thoracic spine and exaggeration of lumbar lordosis to compensate it. The SMV was physically sandwiched between the abdominal wall and the protruding part of the deformed spine, suggesting that the vessel was partially obstructed at this point, leading to initiation of thrombus formation.

Our patient was treated with intravenous heparin followed by oral anticoagulants with favorable outcome. Effective prevention and treatment of osteoporosis in the elderly is of

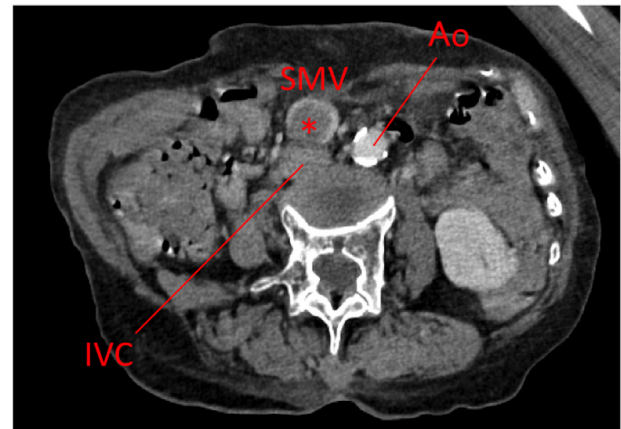


Fig. 2 – Contrast-enhanced axial computed tomography image, showing giant SMV thrombus. The asterisk indicates the thrombus. “SMV,” “IVC,” and “Ao” represent superior mesenteric vein, inferior vena cava, and aorta, respectively.

our concern so as not to cause spinal deformities and their sequelae.

Discussion

To our knowledge, this is the first report describing a novel mechanism of SMV thrombus formation relating to spinal deformity. Causes of SMV thrombus formation include (1) pro-thrombotic states such as neoplasms, antiphospholipid anti-

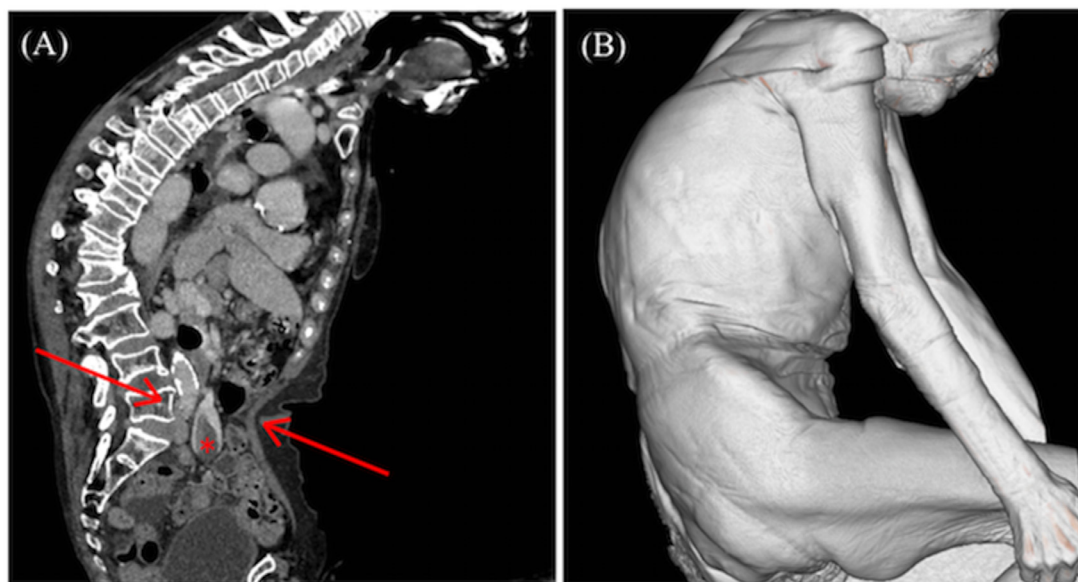


Fig. 1 – SMV thrombosis in the elderly with kyphosis. (A) Contrast-enhanced sagittal computed tomography image, showing giant SMV thrombus. The asterisk indicates the thrombus in the SMV. The arrows indicate that the SMV was physically sandwiched between the abdominal wall and the protruding part of the deformed spine. (B) Reconstructed 3D image of the patient's appearance, showing kyphosis.

bodies, antithrombin III deficiency, protein C deficiency, protein S deficiency, pregnancy, (2) hematologic disorders such as polycythemia vera, essential thrombocythemia, paroxysmal nocturnal hemoglobinuria, (3) inflammatory diseases such as pancreatitis, peritonitis, diverticulitis, inflammatory bowel disease, (4) postoperative state such as abdominal operations, splenectomy, and (5) cirrhosis and hypertension and so on [1]. In our case, each thrombogenic factor is as follows. She was not with prothrombotic states such as coagulation disorders and malignancy. Blood tests showed that anti-phospholipid antibody was negative and that protein C, protein S, and antithrombin III were normal. She did not have hematological disorder. She had never had abdominal surgery. Her liver function was normal and no splenomegaly suggesting portal hypertension was noted. As she obviously had an inflammatory disease, microscopic polyangiitis, it might have promoted systemic thrombus formation. However, no obvious thrombi were observed other than SMV. Considering these findings, it is suggested that the main local causative factor of SMV thrombosis was that the SMV was physically sandwiched between the abdominal wall and the deformed spine, resulting in congestion.

The most important point is whether osteoporotic kyphosis and SMV thrombosis had a causal relationship or not. It is known that compression of SMV by scarring after abdominal surgery, a similar condition, can cause SMV thrombosis [1]. Therefore, it is supposed that pressure due to spinal column deformation can also be a cause. Precise proof is difficult, even if the timing and location of the 2 events were the same. We believe that the causality will be proved by accumulation of similar cases.

Although the duration of kyphosis before the onset of SMV thrombosis is unknown, it is natural to suppose the onset of kyphosis preceded that of the thrombosis by years, because she had had turtle back for a long time and because she had no back pain at admission. However, the presence of some new additional compression fractures, which might have triggered SMV thrombosis, could not be ruled out.

The increase in osteoporosis with the aging of the population leads to an increase in subsequent multiple vertebral fractures and spinal deformity, which can cause pressure on abdominal organs inducing various disorders. One

of them, SMV thrombosis, is difficult to diagnose early, because it presents no specific symptoms. Therefore, it is important to suspect and diagnose it before developing intestinal ischemia, especially in elderly people with both conspicuous deformity of the vertebral column and with either elevated D-dimer levels or hypercoagulable state such as autoimmunity, malignancy, or infection [1] including coronavirus disease 2019 (COVID-19) [6]. It is important to treat osteoporosis before spinal deformity to prevent SMV thrombosis by this mechanism.

Patient consent

Informed consent was obtained from the patient for publication of this report and accompanying images.

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