

Heterotopic ossification with femoral vein compression mimicking deep vein thrombosis

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ABSTRACT

Heterotopic ossification (HO) in patients with spinal cord injury could lead to local tissue swelling and sometimes mimic the clinical presentation of deep vein thrombosis. Recognition and effective management is critical. We report the case of a bedridden patient with spinal cord injury presenting with diffuse right lower limb swelling caused by external venous compression from HO. The patient underwent surgery and local radiation therapy. Postoperative venography disclosed a marked improvement in the blood flow, and symptoms were alleviated. We discuss the role of venography in the diagnosis and treatment of venous compression in the setting of HO. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:479-82.)

Keywords: Heterotopic ossification; Myositis ossificans; Vein compression; Deep vein thrombosis

Heterotopic ossification (HO) is the formation of lamellar bone at locations where bone normally does not exist. It is a complication of a central nervous system disorder (brain trauma, encephalitis, spinal cord injury [SCI]), hip surgery, multiple injuries and burns, and typically presents as local tissue swelling.^{1,2} The incidence of HO in patients with SCI was previously reported approximately as 1% to 78%.^{3,4}

However, HO near the hip or upper femur could also cause diffuse lower limb swelling in case of external venous compression, similar to symptoms of deep vein thrombosis (DVT).^{1,2}

We report the case of a patient with SCI presenting with diffuse right lower limb swelling caused by external venous compression from HO, mimicking DVT. We also discuss its management as well as the role of venography. Written consent has been signed by the patient, confirming his agreement to publication of the case details and images.

CASE REPORT

A 33-year-old man presented with progressive right leg swelling for 2 months. Six months earlier, he sustained a traumatic C6/7

cervical SCI during an accident. Although he underwent C6/7 posterior laminectomy and anterior microdiscectomy with fusion, C5 tetraplegia and paresthesia remained (American Spinal Injury Association Impairment Scale A), and he had been bedridden since. Four months after the accident, his right thigh and leg were swollen, warm, and erythematous. The maximum venous outflow to the segmental venous capacitance was low although the D-dimer level (344 ng/mL; normal range, 0-500 ng/mL) was normal. The ultrasound (US) examination revealed that the femoral vein was compressible and there were no thrombus formations in the femoral and popliteal veins. Suspecting DVT, an oral anticoagulant was prescribed but the symptoms did not improve significantly. Therefore, he was admitted for further evaluation 2 months after the onset of symptoms.

After admission, a radiograph of the right lower limb showed bone tissue formation outside the skeleton (Fig 1). A computed tomography (CT) scan revealed focal ossified lesions around the right ilium and proximal femur, associated with anterior soft tissue swelling and femoral vein compression (Fig 2). Thus, he was diagnosed as having right femoral vein compression caused by HO around the right hip and upper femur.

We performed the first venography in the catheterization room on the day 3 of admission, which showed venous stenosis and compromised venous flow without thrombus formation. Further treatment was discussed with orthopedic surgeons and a radiation oncologist. On day 5, the patient underwent surgery for removal of the ossified tissue, for fear of prolonged vein compression, lower limb swelling, and possible further thrombus formation. After the surgery, the swelling did not improve immediately, and we were not sure whether the swelling was because of a postoperative hematoma, tissue inflammation, or persistent stenosis from venous fibrosis.

A second venography on day 10 disclosed remaining venous stenosis with limited flow (Fig 3, A). We attempted a balloon angioplasty without significant response, which might indicate persistent venous compression or possible fibrosis. Local radiation therapy was done on days 15 and 16 (5 Gy for each day). We performed the third time venogram on day 17, which

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Fig 1. Radiograph of the right lower limb showing bone tissue formation outside the right proximal femur.

showed much better blood flow in the femoral vein with mild residual stenosis (Fig 3, B) and no further vascular intervention was executed. The swelling in his right lower limb improved gradually several days later. The patient also had no recurrent symptoms after 1 year at the last follow-up.

DISCUSSION

Lower limb swelling in bedridden patients with SCI has different etiologies, such as DVT, cellulitis, and HO.^{1,2} HO occurs frequently in the first 2 to 3 weeks after SCI and occurs below the level of paralysis, predominantly in the hip and less commonly in the knee and distal femur.^{5,6} Moreover, HO might mimic DVT. Therefore, prompt diagnosis and effective treatment is crucial for such patients. Generally, in patients with HO, limb swelling is mostly localized or near articular areas because of interstitial inflammation or edema of the soft tissue, whereas the most common symptom of DVT is edema of the entire leg.⁷⁻⁹

In our patient, the initial symptoms were diffuse lower limb swelling on the right side and low maximum venous outflow to the segmental venous capacitance. Although no obvious thrombus formation was observed on US examination, a higher level of thrombus formation or stenosis in the iliac vein or common femoral vein could not be ruled out. Therefore, an anticoagulant was



Fig 2. A computed tomography (CT) scan revealed that focal ossification along the tissue located around the proximal right femur associated with surrounding soft tissue swelling and right femoral vein compression (white arrow).

given first because prompt management was important to prevent possible complications from pulmonary embolism. However, his symptoms persisted, and a CT scan of the right lower limb disclosed HO with femoral vein compression.

US examination is a good investigative modality for diagnosis of HO,⁸ but HO was not diagnosed initially in this patient, although it did exist after we reviewed the image again. This was related to that the initial US examination only being focused on the compressibility of the vessel and whether a thrombus was present. In contrast, CT venography is useful for a specific diagnosis in such patients with lower limb swelling for differentiating between DVT at the level of the inferior vena cava or iliac vein, HO, cellulitis, and fractures.¹⁰ The CT scan can elucidate the extent of the HO and its relationship with the joint and surrounding neurovascular structures.^{5,6}

Currently, the management of HO mainly includes bisphosphonates, nonsteroidal anti-inflammatory drugs, and radiation therapy.^{5,6} Most patients with HO have a relatively benign course without severe complications.⁴ In contrast, surgery with general anesthesia in patients with an SCI has extremely high risk because it is associated with complications, such as bleeding because of abundant blood supply and a high recurrence rate of HO. Our patient showed prolonged leg swelling; therefore, we chose surgical intervention, followed by local radiation therapy to prevent

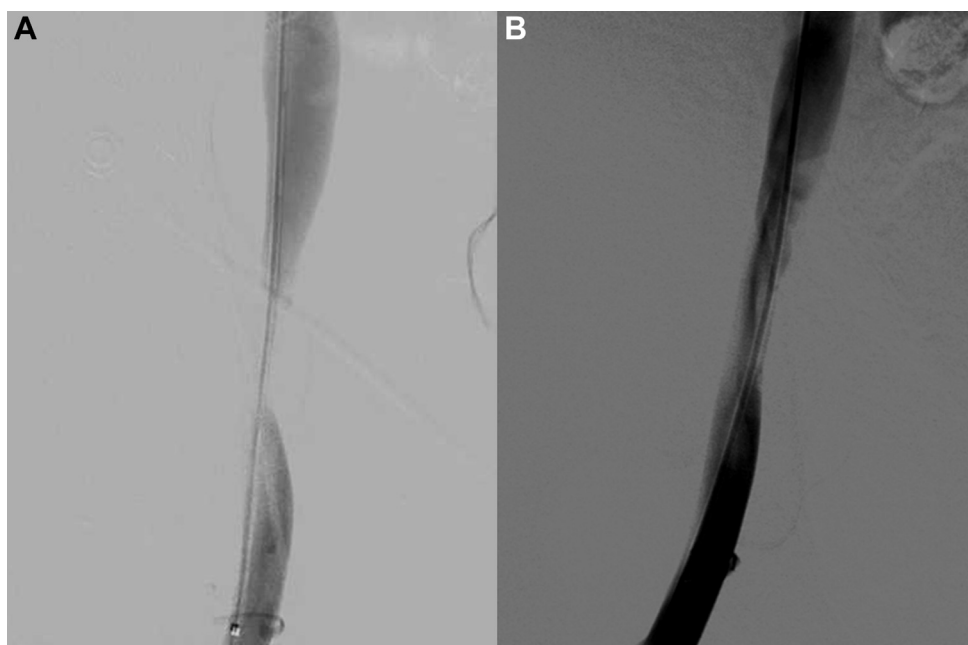


Fig 3. **A,** Venography disclosed venous stenosis with limited blood flow. **B,** Venography after the surgery and radiation therapy showed that right femoral venous flow improved markedly with no sign of stenosis.

compartment syndrome and further thrombus formation. His symptoms improved significantly after the intervention.

We performed venography before and after the surgery and radiation therapy, which has not been reported previously.^{1,2,11} The first venogram showed right femoral vein stenosis because of external compression. During the second venography, we performed a balloon angioplasty because the symptoms did not improve immediately after the surgery. However, the effect of balloon angioplasty was limited, which might suggest venous fibrosis or persistent external compression from a postoperative hematoma or local tissue inflammation. Therefore, stent placement was considered, although it was not suitable for that position (from the common femoral vein to superficial vein). After radiation therapy, a third venogram revealed a dramatic improvement in the patient's venous flow with minimal residual venous stenosis, which was thought to be associated with the resolution of postoperative inflammation or hematoma. The stent was not deployed. Venography in the catheterization room is a good modality and can be done as a screen or serially to monitor such patients. In addition, further intervention like angioplasty or stent placement could be done when needed. Intravascular US examination might be an adjunctive tool, although it was not used for our patient because of health insurance concerns and because we thought it would not affect the treatment in this patient.

In summary, in bedridden patients with SCI presenting with a swollen leg and possible DVT, venous compression by HO of the hip or femur should be considered. US

examination and CT venography are traditional excellent image modalities for diagnosis. Venography in the catheterization room could prove to be a useful tool for post-treatment evaluation; further intervention could also be performed if required.

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