

# Spinal Epidural Hematoma After Attempted Catheter Thrombectomy of a Large Iliofemoral Deep Venous Thrombosis: A Case Report

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## ABSTRACT

The authors report the case of an 82-year-old woman with a spinal epidural hematoma following attempted catheter-directed thrombolysis of a large femoral-popliteal deep venous thrombosis. The patient rapidly developed acute motor and sensory paralysis below the level of T7 within hours of the thrombectomy procedure. Computed tomography imaging revealed that the catheter had perforated the wall of the right inferior vena cava and magnetic resonance imaging subsequently demonstrated an extensive T1-S1 dorsal epidural hematoma with compression of the thoracic spinal cord, conus medullaris, and cauda equina. Given the extent of cord infarction and the risks of extensive thoracolumbar laminectomy, decompression was not performed. The incidence, diagnosis, and management of anticoagulation-associated spinal epidural hematoma as well as the indications for catheter-directed thrombolysis of acute deep venous thrombosis are reviewed.

**KEYWORDS:** epidural hematoma, spinal epidural hematoma, spinal cord injury, DVT, PE, thrombectomy, thrombolytic

## INTRODUCTION

Spinal epidural hematoma (SEH) is rare but has been reported as a sequela of thrombolytic therapy.<sup>1,2</sup> It is usually localized, most commonly occurring in the T12-L1 region and producing neurological symptoms 12–24 hours following the typical initial presentation of severe focal back pain.<sup>1,2</sup> Up to one-third of SEH is associated with anticoagulant therapy,<sup>2,3,4,5</sup> which is commonly used to treat a variety of conditions including atrial fibrillation, deep venous thromboembolism (DVT), and pulmonary embolism. Catheter-directed thrombolysis (CDT), which involves percutaneous placement of a venous catheter in the vicinity of the thrombus for the local delivery of thrombolytic agents, is a treatment modality primarily indicated for the acute management of life-threatening proximal iliofemoral DVT.<sup>6</sup> Compared to intravenous anticoagulation alone, CDT contributes to better complete thrombolysis and prevention of venous obstruction but does not significantly reduce

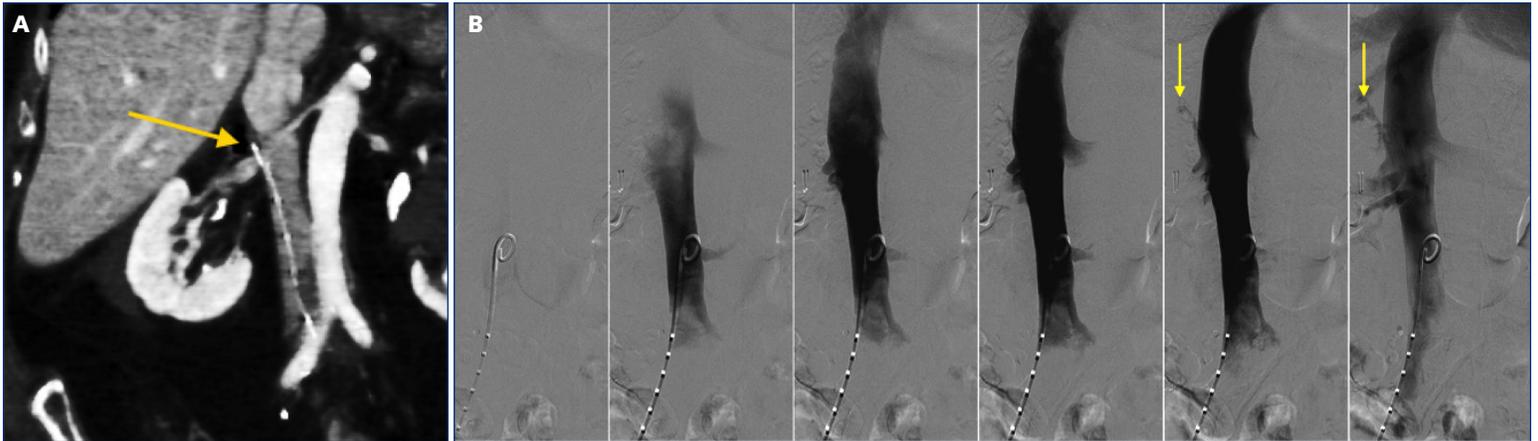
mortality or risk of recurrent DVT; furthermore, CDT has also been associated with significantly higher risk of major bleeding.<sup>6</sup> In this report, we review the case of an 82-year-old female who suffered a large SEH after CDT.

## CASE REPORT

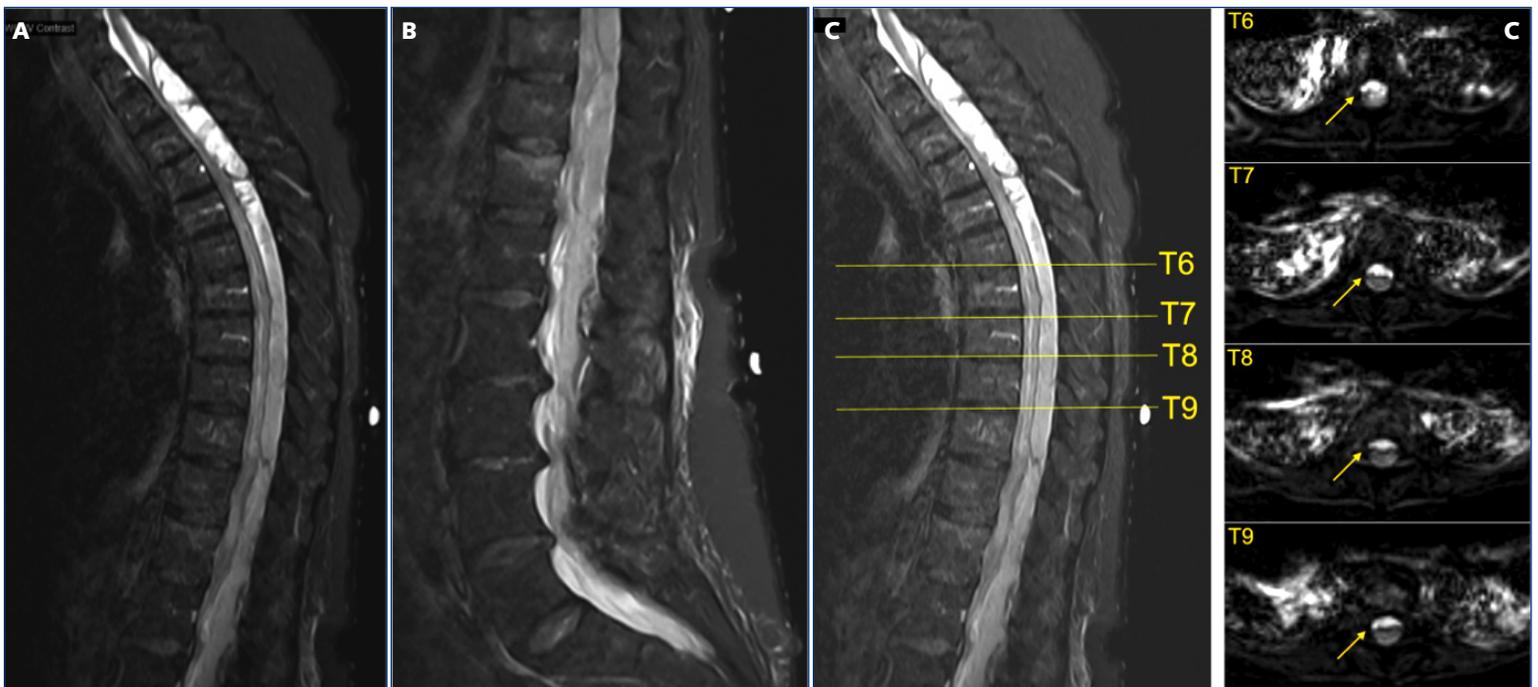
An 82-year-old female with prior history of multiple intracranial meningiomas treated with stereotactic radiosurgery presented to an outside hospital with a 3-day history of left lower extremity (LLE) swelling and was found on ultrasound to have an acute occlusive left deep venous thrombus (DVT) from the common femoral vein to the popliteal vein. Her laboratory evaluation was notable for a mild creatinine elevation and troponin I elevation (0.153 ng/mL). She was started on a continuous heparin infusion and intravenous fluids. Three days later, she developed acute midthoracic back pain without associated neurological symptoms. Two days later, given the patient's improved but incompletely resolved LLE pain and swelling, she underwent attempted ultrasound-augmented catheter-directed (CDT) tissue plasminogen activator (tPA) thrombolysis with the EKOS EndoWave Infusion Catheter System (EKOS Corporation, Bothell, WA). Immediately following the procedure, she quickly developed bilateral lower extremity paraplegia. tPA was held. Duplex ultrasounds of the lower extremities were unremarkable. CT imaging of the brain, abdomen, and pelvis was negative for intracranial hemorrhage, stroke, and retroperitoneal hemorrhage; however, new foci of air in the right retroperitoneal space adjacent to the IVC were noted. tPA was then restarted and the patient transferred to our center. Examination at that time was notable for complete loss of motor and sensory function below the T10 level, consistent with an American Spinal Injury Association (ASIA) Grade A spinal cord injury.

Repeat CT imaging of the abdomen and pelvis demonstrated perforation of the IVC wall by the catheter at the level of the right renal vein; in retrospect, these findings are consistent with the identification of right-sided retroperitoneal air on the previous CT scan (**Figure 1**). The patient was urgently taken to interventional radiology for removal of the EKOS catheter and IVC filter placement. Subsequent spine MRI revealed a dorsal epidural hematoma extending from T1-S1 with compression of the thoracic spinal cord, conus

**Figure 1.** Abdominal imaging demonstrating perforation of the right renal vein by EKOS catheter. **(A)** Coronal CT showing catheter tip (yellow arrow) extending beyond the wall of the right renal vein. **(B)** Venogram following EKOS catheter removal. Sequential frames showing leakage (yellow arrows) of contrast into the retroperitoneal space above the junction of the right renal vein and inferior vena cava.



**Figure 2.** MRI imaging of patient's spinal epidural hematoma. Midsagittal T2 STIR images of **(A)** thoracic spine and **(B)** lumbar spine, demonstrating hematoma extending from T1-S1 with marked compression of the thoracic cord. **(C)** Transverse axial images of the thoracic spine demonstrating T2-hyperintense signal of the ventral horn (yellow arrows), suggesting acute ischemic infarction in the vascular distribution of the anterior spinal artery.



medullaris, and cauda equina with acute ischemic infarction in the vascular distribution of the anterior spinal artery (**Figure 2**). Given the risks of surgical intervention and limited potential benefits of surgery, the patient and family declined decompressive surgery. The patient was ultimately discharged to rehabilitation – at that time, she was still plegic in her bilateral lower extremities. She has since passed away.

## DISCUSSION

Outcomes of SEH are variable.<sup>2</sup> Of the cases reported in the literature, SEH is usually localized, most commonly occurring in the T12-L1 region and not producing neurological symptoms until 12–24 hours following the typical initial presentation of severe focal back pain.<sup>2,3</sup> In one case, a patient with a left leg DVT was treated with catheter-directed urokinase thrombolysis and a venous stent and several hours after the procedure developed severe lower back pain followed by bilateral lower extremity paraplegia, which

resolved after evacuation of a T11-L2 spinal epidural hematoma revealed by MRI.<sup>7</sup> In another case, a 43-year-old male patient receiving tPA and heparin for treatment of acute myocardial infarction developed a C6-T5 SEH 18 hours after administration, and did not regain neurological function after decompression.<sup>8</sup>

In this case, the patient's complaint of acute onset back pain could have indicated an SEH,<sup>1,2</sup> however, other causes of sudden-onset atraumatic back pain, including osteoporotic or pathologic compression fracture or spinal epidural abscess, were also on the differential. Although the patient was neurologically intact, severe atraumatic back pain in the context of therapeutic anticoagulation should have prompted urgent evaluation with MRI. Epidural hematoma was likely inappropriately ruled out by the primary team on the basis of CT imaging, which is insensitive for SEH, alone. Given the patient's midthoracic back pain after 4 days of heparin, it is also possible that a minor heparin-associated spinal epidural hematoma was catastrophically amplified by the release of retroperitoneal tPA, which may have entered into spinal veins or radicular arteries.

Low-molecular-weight heparin remains the mainstay of both immediate and long-term anticoagulation for venous thromboembolic disease in the setting of malignancy.<sup>7</sup> Although renal impairment is a contraindication to initiation of enoxaparin, this patient's mild acute kidney injury on presentation (GFR 47 mL/min) should not have necessitated the use of unfractionated heparin. Furthermore, guidelines from the American College of Chest Physicians do not recommend the routine use of CDT, which has been associated with increased bleeding risk without mortality benefit, in the management of DVT. Currently, the strongest relative indication for CDT is for patients with acute (<14 days from onset) ileo-femoral DVT with impending venous gangrene, good functional status, and no contraindications to thrombolytic therapy. As previously noted, this patient's DVT did not extend to the iliac vein. Furthermore, as per the most recent CHEST guidelines, the patient's advanced age and female gender have both been associated with increased risk of hemorrhagic complication after thrombolysis and are considered relative contraindications to thrombolytic therapy.

In our opinion, the patient and her family reasonably declined surgical treatment. Although extrapolated in this case, data from the traumatic spinal cord injury literature suggest a greater than 60% 1-year mortality for geriatric patients (age > 70) with ASIA A spinal cord injury.<sup>9</sup>

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