Case report

Lower extremity hemorrhage in patients with spinal cord injury receiving enoxaparin therapy

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Low-molecular-weight heparin is commonly favored over unfractionated heparin because of its predictable pharmacokinetic and pharmacodynamic properties. However, full-dose enoxaparin can cause major soft tissue bleeding that may lead to compartment syndrome and even limb amputation. In patients with spinal cord injury, range of motion exercises should be carefully performed if on full-dose enoxaparin. This vulnerable patient population is particularly susceptible to aggressive stretching, which could lead to bleeding, and compartment syndrome. Providers should also monitor weight fluctuations in patients receiving full-dose enoxaparin. Changes in weight without proper dose adjustment can cause over or under treatment. Attention to both these issues can improve patient care.

Keywords: Enoxaparin, Hematoma, Spinal cord injury, Tetraplegia

Enoxaparin is a low-molecular-weight heparin commonly used for prophylaxis and treatment of thromboembolism. Low-molecular-weight heparin is favored over unfractionated heparin because it exhibits a more stable and predictable response.¹ Weight-adjusted low-molecular-weight heparin can be used for full anticoagulation without monitoring.² However, there can be side effects. Hemorrhage is common and bleeding can occur in internal organs. Other common complications include minor soft tissue problems such as bruising, oozing from wounds, and prolonged leakage from drainage sites.³ Soft tissue bleeding in the lower extremities has also been noted to occur in spinal cord injured patients, but has typically been deemed minor.⁴

To our knowledge, these are the first reported cases of significant lower extremity hemorrhage in patients with spinal cord injury (SCI) on treatment-dose enoxaparin therapy caused by aggressive range of motion exercises. One required surgical intervention, while the others developed anemia, requiring transfer from rehabilitation to an acute setting and transfusion.

Case descriptions

Case 1

A 45-year-old man receiving chronic warfarin for atrial fibrillation developed lower body weakness, loss of sensation, and urinary retention. He was later admitted to a hospital, where he was observed to have a spinal subdural hematoma. Warfarin was discontinued and the hematoma was evacuated. He developed bilateral calf-level deep vein thrombosis, so an inferior vena cava filter was placed, and 40 mg of enoxaparin was administered daily. He was transferred to a rehabilitation facility 3 weeks after admission, where he received daily physical therapy and stretching. Two weeks later, the patient was observed to have edema of the left lower extremity. He was transferred back to the acute setting, where venous imaging revealed extensive deep vein thrombosis, and he was started on a heparin infusion. He required left lower extremity fasciotomy for compartment syndrome the following day. Computed tomographic angiography showed thrombus extending from the popliteal vein to the filter. Full-dose enoxaparin was begun.

The patient returned to the rehabilitation facility 3 weeks after fasciotomy. A month later, a precipitous decline in hemoglobin occurred, and the patient

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returned to acute care where computed tomography revealed bilateral large gluteal hematomas. The weight-based enoxaparin was changed back to a prophylactic dose, and the patient returned to the rehabilitation setting, where he had an uneventful course.

Case 2

A 65-year-old man sustained a fall and developed tetraplegia. He was found to have a cervical SCI. His acute course included deep vein thrombosis and pulmonary embolus. He was anticoagulated with full-dose enoxaparin.

He was transferred to a rehabilitation facility a month later for physical therapy and daily stretching. Full-dose enoxaparin was continued. After a week, he was found to have a right thigh hematoma requiring return to acute care for incision and drainage. He returned to rehabilitation, and enoxaparin was continued, but a left thigh hematoma developed, again requiring return to acute care for incision and drainage. He returned to acute care but a right calf hematoma occurred, requiring return to acute care for incision and drainage once more. A balance between anticoagulation and risk of further bleeding needed to be established and the patient was continued with enoxaparin at a dose of 40 mg. The patient did well on this dose and the subsequent course was uneventful.

Case 3

A 39-year-old man with a history of hypercoagulability due to Factor V Leiden mutation developed loss of function and sensation in his legs and became unable to walk 3 months after a motor vehicle crash. He was subsequently diagnosed with spinal osteomyelitis and suspected spinal cord ischemia. This was treated with debridement of his spine and spinal decompression.

One month later, he was transferred to rehabilitation for daily physical therapy and stretching. Full-dose enoxaparin was administered because of his hypercoagulability. He later developed sudden worsening of anemia, and returned to acute care where he was found to have two large buttock hematomas. Management included transfusion of red blood cells, discontinuation of full-dose enoxaparin, and placement of an inferior vena cava filter. He then returned to the rehabilitation setting.

Discussion

Several factors could have contributed to soft tissue hemorrhage in these three cases. All three patients were undergoing daily stretching to help maintain

range of motion in their legs. While necessary after a SCI, stretching exercises can occasionally cause harm to muscle and other soft tissue.⁵ Possible explanations for overstretching include inability of the insensate patient to give feedback to the provider performing the stretching exercises, or inability to perform protective contractions during exercises. It has been demonstrated that the torque applied in stretches for this subset of patients can go as much as six times beyond those tolerated by sensate patients.⁶ Overstretching likely contributed to the lower extremity bleeding in these cases as all three patients developed loss of sensation and function of their lower extremities.

Weight loss contributed to the calf hematoma in Case 1. Treatment dose of enoxaparin is determined by weight. In 1 month, the patient lost 40 pounds (14% total body weight) without a corresponding change in his enoxaparin dose. This patient was overanticoagulated due to lack of attention to his rapid weight loss.

There are several treatments available for simple soft tissue hematomas. Ice and compression can be helpful. Anemia may require transfusion. If anticoagulation is occurring at the time of hematoma, this can be discontinued, held, or reversed, as felt appropriate. Protamine sulfate can partially reverse the effects of enoxaparin.⁷ Hematomas complicated by compartment syndrome are emergencies, and may require surgical intervention.

Conclusion

Soft tissue bleeding can be a serious side effect of full-dose enoxaparin in patients with SCI. Care should be taken when performing stretching exercises on patients with SCI, as lack of sensation may increase risk of overstretching during range of motion exercises. If left untreated, a hematoma complicated by compartment syndrome could lead to amputation. Weight should also be carefully monitored in a person receiving full-dose enoxaparin.

Disclaimer statements

Contributors VY is the primary author of the manuscript, while CF edited and made corrections/recommendations to the manuscript.

Conflict of interest None.

Ethics approval Ethical approval was not required, however patient consent was obtained from all patients nonetheless.

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