Case report

Bilateral upper-extremity deep vein thrombosis following central cord syndrome

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Deep vein thrombosis (DVT) is a common complication following spinal cord injury (SCI). Although DVT of the upper extremity is much less common than DVT of the lower extremities, the risk of pulmonary embolism following upper-extremity DVT should not be disregarded.

Method: Case report.

Findings: A bilateral upper-extremity DVT developed in a 51-year-old woman with SCI (central cord syndrome) being followed in our rehabilitation clinic. Medical treatment resulted in improvement in the clinical status of the patient as well as the regression in the thrombus.

Conclusion: In patients with SCI, DVT should be kept in mind in the presence of pain and edema in the upper extremities, and prophylactic DVT treatment should be considered.

Keywords: Central cord syndrome, Deep vein thrombosis, Spinal cord trauma

Introduction

Central cord syndrome is characterized by the cervical medulla spinalis injury related to cervical spine trauma or degenerative process. Motor impairment of the upper than that of the lower extremities is the prominent clinical finding. Varying degrees of sensory loss is possible while the sacral segments remain intact and the patient retains sacral sensation. Eighty-five percent of deep vein thromboses (DVTs) originate in the lower extremity and pelvic veins, 5–6% occur in the upper extremity. The incidence of DVT in spinal cord injury (SCI) ranges from 12 to 100% depending on the diagnostic method used.

Case report

A 51-year-old woman with SCI-central cord syndrome was followed in our outpatient clinic for ongoing rehabilitation for tetraparesis. Medical background included past history of type 2 diabetes mellitus. For injuries sustained in a traffic accident, she underwent stabilization and laminectomy surgeries with two subsequent surgical operations 7 days apart, for the treatment of C6–C7

fracture dislocation, laminar fracture at C5, and arcus fracture at C6.

Clinical course

Examination after the first operation revealed that the muscle power on the right upper extremity was 3/5, on the left upper extremity was 2/5, and on the lower extremity was 4/5 bilaterally. According to American Spinal Injury Association (ASIA) classification, her injury was categorized as ASIA D incomplete SCI. Sensory examination revealed no deficits. Other findings on physical examination were bilateral upper-extremity edema with a difference in diameter of 3 cm between upper extremities. An upper-extremity venous catheter was located on the left side for administration of fluids. There was no difference in diameter of lower extremities. The patient was sent to the radiology department with the provisional diagnosis of upper-extremity DVT. Consequent Doppler ultrasonography (USG) imaging revealed a 12×9 mm intraluminal thrombus in the middle part of the left subclavian vein and a short-course thrombus in the antecubital region of the right cephalic vein (Figs. 1 and 2). Low-molecular-weight heparin (LMWH) prophylaxis could not be

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Figure 1 Gray scale USG of subclavian vein showing thrombus in lumen.

Figure 2 Gray scale USG of cephalic vein showing thrombus in lumen.

initiated during her hospitalization in the neurosurgery department because a second operation was planned in a week.

Upon diagnosis of DVT, bilateral upper-extremity elevation, and mechanical compression, 1 mg/kg enoxaparin were recommended subcutaneously every 12 hours by the cardiovascular consult. Control Doppler USG imaging performed during the course of the treatment revealed recanalization of the flow and regression in the thrombus in both extremities.

Discussion

Increase in thrombotic risk in patients with acute SCI necessitates prophylaxis for upper-extremity DVT.¹ Venous occlusion in upper extremities is a quite rare disorder accounting for ~4% of all DVTs.² Upper-extremity DVT may be asymptomatic in some patients; one-third of patients develop pulmonary embolus.

However, recurrence and mortality appear to be infrequent in the clinical course of upper-extremity DVT-dependent pulmonary embolism.³

Upper-extremity DVT is rarer mainly due to lesser exposure to gravity, fewer venous valves, higher levels of plasminogen activator production, and higher fibrinolytic activity.⁴ Involvement of the left subclavian vein and right cephalic vein in this case seems to be in accordance with the statement that upper-extremity thrombosis mostly involve brachial, cephalic, axillary, and subclavian veins.⁵

Upper-extremity DVTs are classified as primary and secondary based on the etiology. Primary upper-extremity DVTs are fairly infrequent clinical entities (1/100,000 per year) that comprise two different groups, namely Paget-Schroetter syndrome and idiopathic upper-extremity DVT.⁶

Secondary causes of DVT are more commonly encountered. The criteria for the secondary thrombosis are defined according to Virchow's triad including: (i) hypercoagulability, malignancy, infection, protein C and protein S deficiency, and polycythemia; (ii) intimal damage, catheter use, intravenous drug abuse, and traumatic injury; and (iii) stasis and obstruction, tumoral, anatomic abnormalities, and heart failure.²

Idiopathic upper-extremity DVT cases have been associated with occult cancers. Findings from a past study revealed development of a malignancy (mostly lung cancer or lymphoma) within the first year in one-fourth of these patients.^{7,8}

Catheter-related thrombosis is also included in the primary etiology.^{2,9,10} In the past studies conducted in patients with acute SCI, thrombotic tendency has been linked to decreased fibrinolytic activity, increased activity of factor VIII, and platelet dysfunction. Immobility, muscle paralysis, external pressure secondary to long-term bed confinement, venous stasis due to flaccid and dilated blood vessels, spasticity, central catheter use leading to endovascular trauma are among the additional individual-based risk factors in acute SCI.¹¹

Disease-related factors underlying comorbid thrombosis in this patient were immobilization due to SCI and the use of central catheter vein. Gene mutations and acquired factors are the risk factors for primary upper-extremity DVT, while protein C, protein S and antithrombin deficiencies, hyperhomocysteinemia, and prothrombin gene mutations are the risk factors defined to date. There is considerable debate on the investigation of risk factors in these patients and risk factor evaluation has been recommended only in the patients with family history for DVT, unexplained recurrent miscarriages, and past history of DVT. Activated

protein C resistance is the most commonly encountered inherited coagulation disorder and followed by the presence of anticardiolipin antibodies.^{3,12} The first 10 days of catheter use following SCI has been reported to be the period associated with the highest risk of DVT development.¹³

Of the currently used diagnostic imaging methods, colored Doppler USG has a sensitivity and specificity of 100 and 93%, respectively. For this reason, colored Doppler USG was the preferential diagnostic method in this patient.

Clinical guidelines recommend different anticoagulant prophylaxis regimens in the prevention of DVT based on the presence of complete or incomplete type of SCI.¹⁴ Prophylaxis must be initiated within the first 72 hours and include compression bands, pneumatic compression devices, LMWH, or unfractionated heparin if not contraindicated. Inferior vena cava filters are preferred in patients with contraindications to prophylactic anticoagulant therapy or high-level complete cervical SCI.¹⁵ In patients with motor incomplete injury, low-dose unfractionated heparin (5000 U every 12 hours) has been recommended.¹⁶

When upper-extremity DVT was diagnosed, LMWH treatment was started in this patient. Since evaluation revealed use of catheter to be responsible, the upper-extremity catheter was removed.

Albeit unable to provide the complete lysis of the thrombus, based on their benefit for maintaining blood flow through the collateral veins and preventing thrombus progression, anticoagulant therapy has been the mainstay of treatment in patients with DVT.¹⁷

In patients with upper-extremity DVT, aggressive treatment with combined therapy of intravenous unfractionated heparin and oral warfarin or LMWH must be administered unless anticoagulant therapy is contraindicated. Elevation of the extremity may have a role in decreasing edema. Empirical approach should include bed rest until the initiation of therapeutic anticoagulant agent.^{18,19}

Rehabilitation committees recommend safe and early mobilization after DVT. The rationale behind anticoagulant use is to limit progression of the thrombus, to prevent emboli development, and to enable efficacy of natural thrombolytic mechanisms. In this regard, treatment is initiated with standard heparin or LMWH and then switched to oral warfarin treatment. The most appropriate candidates for thrombolytic treatment are young patients with primary upper-extremity DVT, patients with symptomatic superior vena cava syndrome, and patients with secondary upper-extremity DVT who have to use the central venous catheter.

Pulmonary embolus, post-thrombotic syndrome, superior vena cava syndrome, obstruction in thoracic channel, and brachial plexopathy are among the complications likely to develop in association with upper-extremity DVT. Prevention and treatment of upper-extremity DVT gain importance due to associated complications. Given that it is considered the most cost-effective approach, particular attention must be paid for the prevention of DVT.

Conclusion

DVT is a life-threatening serious complication in patients with SCI. While thrombus development is much more commonly observed in the lower extremity than the upper extremity, given that the upper-extremity muscle power deficit is more prominent, the risk of upper-extremity thrombus development should be kept in mind in patients with central cord syndrome. Owing to associated increase in the risk of thrombosis combined with immobilization, careful attention must also be paid in use of catheters in these patients, and the extremity with the least muscle power deficit should be chosen for insertion.

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