Upper Extremity Deep Vein Thrombosis in a Collegiate Baseball Player

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Upper extremity deep vein thrombosis (UEDVT), which involves the subclavian, axillary or brachial vein, accounts for 4-10 % of all venous thromboses. Thrombosis is the formation of a stationary blood clot along the wall of a blood vessel, which frequently causes vascular obstruction, and which can involve multiple blood vessels. Primary UEDVT includes idiopathic thrombosis (i.e., no clinically apparent risk factors) and thrombosis associated with thoracic outlet syndrome or Paget-Schroetter syndrome (i.e., effort-induced thrombosis).[1]

Key Points

- Upper extremity deep vein thrombosis (UEDVT) involves the subclavian, axillary or brachial vein.
- Many surgeons advocate early decompression of the thoracic outlet through resection of the first rib or clavicle.
- Proper diagnoses and early treatment of UEDVT is essential.

The main complications of UEDVT are pulmonary emboli (30 %), post-thrombotic syndrome (PTS), and death. PTS occurs in 7–44 % of patients. Mortality ranges from 15–50 %.[2-4] Inaccurate or delayed diagnosis can lead to loss of limb and mortality. The incidence of UEDVT is low (i.e., approximately 2/100,000 persons per year), but it is the most common vascular condition among athletes.[5-7]

Thoracic outlet syndrome (TOS) relates to various forms of compression of the thoracic outlet, which is located between the base of the neck and the axilla. Compression of the thoracic outlet can affect the brachial plexus, blood vessels, or both. Approximately 3–10 % of TOS cases affect the vasculature. The thoracic outlet veins can be compressed by the clavicle and the first rib.[8] Approximately 60 % of patients with primary UEDVT have TOS.[9] Treatment consists of either anticoagulation therapy alone or in combination with surgical resection of the first rib.[8,10]

Paget-Schroetter syndrome is a specific manifestation of TOS, which is also referred to as effort-induced thrombosis. The condition affects young, healthy persons who engage in strenuous activity that involves the arm during sports participation.[11-15] Repeated compression of the vessels between the clavicle and first rib induces microtrauma, which activates the coagulation process.[5] The mechanism of UEDVT development is widely believed to involve repetitive, strenuous upper extremity activities.[5,7] The condition can lead to complications if not recognized and properly treated.

Symptoms of UEDVT are nonspecific, range in severity, and may depend on upper extremity positioning. Symptoms commonly include swelling, pain, ecchymosis, and discoloration of the arm.

Standard treatment of UEDVT consists of anticoagulation therapy and limb elevation to facilitate thrombus resolution and to prevent further thrombus formation.[16] Determination of whether or not the patient has

an anatomic anomaly is essential to identify patients who will benefit from surgical decompression of the thoracic outlet. If venous compression by an anatomic structure is identified, many surgeons advocate early decompression of the thoracic outlet through resection of the first rib or clavicle. Others recommend a conservative approach after thrombolysis.[17]

Case Report

A 22-year-old male collegiate baseball player (shortstop position) presented a gradual onset of severe swelling, discomfort, and discoloration of his right arm. He reported feelings of weakness and fatigue on the practice field, which negatively affected his throwing performance. He reported persistent tingling and numbness from the mid-bicep area to the fingertips, which gradually developed over a weekend of baseball activity.

The patient had played competitive baseball since 7 years of age. He reported having had a right shoulder arthroscopic labrum repair performed 2 years earlier, from which he had completely recovered. He also reported a family history of thrombo-phlebitis.

His exercise regimen included daily weight lifting and baseball practice. He denied having experienced any injury during weight lifting or baseball activities. He exhibited full range of motion of the right shoulder, but his right upper arm, forearm, and hand were observed to be swollen and discolored (Figure 1). Palpation elicited tenderness in the axilla and on the medial aspect of the upper arm. Radial and ulnar pulses at the wrist were graded as 2 + . Due to the severity of the swelling, a medical consultation was recommended.

The patient was evaluated by the team physician on the same day that the symptoms were first reported to an athletic trainer. The team physician ordered venous Doppler imaging of the right upper extremity, which demonstrated the presence of thrombi in the brachial, axillary, and subclavian veins. The patient was subsequently admitted to the hospital for further evaluation and treatment. Inpatient treatment consisted of anticoagulation therapy with low molecular weight heparin and Coumadin. He was released from the hospital after 3 days, with continuation of oral anticoagulation therapy. He then was evaluated by a vascular surgeon, who recommended anticoagulation therapy for 6 weeks, shoulder rehabilitation, and then thoracic outlet surgery. Shoulder rehabilitation consisted of range of motion exercises, joint mobilization, rotator cuff and scapular muscle strengthening exercises, and therapeutic modalities (i.e., moist heat, ice). After 6 weeks, the patient underwent thoracic outlet surgery, which involved resection of the first rib and a partial scalenectomy (i.e., scalene muscle release).

A conservative rehabilitation program was initiated at two weeks postsurgery, which included range of motion exercises (i.e., passive, active-assisted), rotator cuff and scapular muscle isometric strengthening, and therapeutic modalities (i.e., heat, ice). At 6 weeks postsurgery, the patient demonstrated full shoulder range of motion, and cardiovascular training (i.e., stationary

Figure 1 The involved arm with ecchymosis and swelling.

cycle) and low-weight, high-repetition weight lifting exercises were initiated. At 2 months postsurgery, the patient demonstrated normal rotator cuff and scapular muscle strength, and he was permitted to initiate a progressive 3-week throwing program. The interval throwing program was initiated with throwing 2 sets of 25 throws at 45 ft (on level ground), which was progressed gradually to throwing distances of 60, 90, 120, 150, and 180 ft. Before and after each throwing session, the patient's shoulder was manually stretched, and cryotherapy was administered after the throwing sessions. The patient did not experience any complications, and was permitted to return to unrestricted baseball activities at 3 months postsurgery. No further symptoms associated with UEDVT were reported after the patient's return to full activity. His surgical management did not result in any decrease in his functional abilities (i.e., no loss of strength or throwing velocity).

Discussion

Early diagnosis of UEDVT is critical, but vague symptoms can make it difficult to recognize. Development of the condition is believed to be associated with repetitive, strenuous upper extremity activities,[1] such as throwing and weight lifting. A number of differential diagnoses should be considered when a patient presents sudden onset of pain, warmth, ecchymosis, and diffuse swelling of the arm, which includes shoulder rotator cuff tendinitis, thoracic outlet syndrome, torn biceps tendon, biceps tendonitis, and UEDVT. Although UEDVT rarely affects athletes, delayed treatment could prove to be fatal.

Conclusion

The reported case demonstrates that athletes can develop UEDVT, which is an uncommon condition with potentially catastrophic consequences. Early recognition of the signs and symptoms of UEDVT is critical to ensure rapid initiation of proper treatment. ▮

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