Upper Extremity Deep Vein Thrombosis in a College Football Player

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UPPER EXTREMITY deep vein thrombosis (UEDVT) is a rare condition among athletes. Initially reported in the late 1800s as primary axillary-subclavian thrombosis, the incidence rate of UEDVT is approximately 2 per 100,000 persons per year. UEDVT may be due to trauma, intravenous drug use, improper catheter placement, or may be effort-related. Anatomical anomaly of the costoclavicular region, such as cervical ribs and/or anomalous muscular insertions, are often associated with UEDVT. Athletic victims of UEDVT are typically involved in sports that require forceful overhead motions, such as baseball pitchers, weight lifters, and tennis players.

Diagnosis, management, and treatment of UEDVT is controversial. UEDVT is rare, but is responsible for 3-6% of all pulmonary emboli and 1-2% of all fatalities from pulmonary emboli. The purpose of this report is to present a case of UEDVT, highlighting the clinical presentation, evaluation, management, and current medical opinions about this condition.

Background

A 21-year-old African-American male intercollegiate football player (height, 182.5 cm; weight, 92 kg) reported to the athletic training facility after an off-season weight lifting session. He was a junior tight end with no history of upper extremity pathology. His chief complaints at the time of the initial evaluation by the head football athletic trainer were swelling, moderate pain in the left (nondominant) upper extremity, and a tingling sensation in the left hand and digits. He denied acute onset of the symptoms. He reported that he had completed a “normal” workout of usual intensity and duration, during which the swelling and pain gradually increased. The exercises he had performed were bench press, military press, power cleans, latissimus dorsi pull downs, and seated rows. The athlete denied previous use of any ergogenic aid or other substance.

Evaluation

Observation revealed a significant and obvious increase in left upper extremity girth compared to the uninvolved extremity. The athletic trainer began the evaluation with an assessment of the neurovascular status of the arm and hand that included bilateral blood pressure measurements, as well as bilateral palpation of distal pulses at the brachial and radial arteries. The athlete’s pulse was 84 bpm at the time of the initial evaluation. Sensation was tested bilaterally with sharp-dull discrimination over dermatomes C5-T1. Pulses and sensations were equal bilaterally, and blood pressure values were symmetrical at 130/80 mm/Hg. Elevated surface temperature of the proximal left upper extremity as compared to that of the uninvolved extremity was noted. There were no palpable auxiliary lymph nodes, and the athlete’s tympanic temperature was measured at 36.6°C. Girth differences between extremities were 3.7 cm and 2.8 cm at the deltoid tuberosity and radial head, respectively. These landmarks were used for subsequent serial measurements because of ease of palpation for consistent measurement location. Evaluation of the cervical spine and upper quarter was performed to rule out musculoskeletal involvement.
All special tests for structural or neurovascular pathology of the cervical spine were unremarkable. At the shoulder, the upper quarter visual screen and joint stability, thoracic outlet, and manual muscle tests were all normal. Interestingly, the athlete reported a mild increase in hand paresthesia during C7 manual muscle testing of the triceps brachii.

**Treatment**

The athletic trainer was concerned about the possible existence of vascular occlusion due to thrombosis. The athlete was referred to the team physician for immediate evaluation. The differential diagnoses included phlebitis and/or deep vein thrombosis. The physician ordered radiographic images of the upper extremity and cervical spine to rule out the existence of a structural anomaly or traumatic lesion that may have produced the upper extremity edema. Blood tests were ordered to rule out hypercoagulability. All radiographic images and blood tests were normal.

The day following the initial evaluation, the athlete was examined by a thoracic surgeon. An enhanced computed tomography (CT) scan of the chest and upper extremity revealed an occlusion of the left subclavian vein without an extrinsic mass. Immediately, the anticoagulant heparin was intravenously administered to decrease the potential for expansion of the thrombus. A daily oral dose of warfarin anticoagulant for three months was prescribed.

The physician ordered complete discontinuation of activity for three months. The athlete was advised that he could gradually return to noncontact conditioning after a satisfactory reevaluation and normal upper extremity images. During this three-month interval, upper extremity circumference measures were obtained at approximately the same time each day by the athletic trainer to monitor improvement or worsening of the athlete’s condition.

During months 3-6, a daily dose of 500 mg of aspirin was prescribed to augment the anticoagulation properties of the blood. At the sixth month, a repeat CT scan revealed complete dissolution of the thrombus. The athlete was cleared for return to full activity and began his summer conditioning and weight lifting routine at that time. The athlete has since returned to his sport and completed his senior season without recurrence of any symptoms.

**Discussion**

During the past several decades, the reported incidence of UEDVT has risen from less than 1,000 cases per year, to approximately 50,000 cases per year. This dramatic increase in incidence has been speculated to have an association with increased use of central line catheters. The rate of mortality has been found to be higher in UEDVT patients than those with lower extremity deep vein thrombosis. Death from pulmonary embolus is reported to occur in 36% of cases. UEDVT is responsible for 1-2% of all fatal pulmonary embolism cases. Most experts agree that UEDVT is “a serious thrombotic disorder that fully resembles the corresponding disease of the lower extremity.”

Although rare, the potential consequences of UEDVT make knowledge of its clinical presentation essential. The literature indicates that strenuous effort commonly precedes manifestation of UEDVT symptoms. Strenuous upper body exertion is often required by many sports. In two-thirds of UEDVT cases, symptoms develop in the right upper extremity. A large proportion of the population is right-extremity dominant, but other contributing factors may include the fact that the angle of the right subclavian-jugular venous anastomosis is much sharper on the right side, and the right side is the most common placement site for vascular catheters.

For as many as half of patients with UEDVT, swelling and warmth are the chief complaints and primary indicators that the condition exists. Other common symptoms of UEDVT are pain and/or functional impairment of the upper extremity. However, only 23-50% of patients experience any symptoms, thus experiencing a “silent” onset. “Clinical examination findings are highly nonspecific, and diagnostic tests are required to confirm the diagnosis.”

Typically, diagnostic confirmation of UEDVT is made by contrast venography, CT scan, Doppler ultrasonography, duplex ultrasound scanning, impedance plethysmography, or radionuclide venography. Venography is the most accurate, but it is usually painful, expensive, and can be associated with a reaction to the radionuclide. Early referral is crucial in the management of UEDVT. Accurate and early diagnosis decreases the likelihood of progressive expansion of the UEDVT and its complications.
After confirmation of the existence of UEDVT, conservative management includes anticoagulants, rest, heat, elevation, compression garment, surgical thrombolysis, and in some cases, implantation of an inferior vena cava filter to trap emboli. Aggressive treatment is usually implemented for young patients with effort-induced UEDVT. Conservative management without anticoagulant drug therapy results in clot resolution in less than 30% of cases. Management with anticoagulation drug therapy results in clot dissolution for approximately 50% of cases, and a much lower rate of complications. Initially, the patient is given an intravenous bolus of heparin, followed with oral administration of warafin anticoagulant. This medication is typically prescribed for three months. During this period, the athlete must be protected from potential injury to avoid the risk of hemorrhagic sequelae secondary to the anticoagulant medication.

**Summary**

Because of the relatively rare occurrence of UEDVT, the literature contains conflicting recommendations for its management. UEDVT is life threatening and presents signs and symptoms that are similar to those of lower extremity deep vein thrombosis. Spontaneous onset occurs in a small percentage of all UEDVT cases (Table 1). This condition can be fatal if it is not recognized and treated rapidly, and it presents risk for long-term morbidity from postphlebitic complications. If presented with such as case of UEDVT, the athletic trainer must immediately recognize its symptoms, orchestrate a rapid referral to a physician for medical management, educate the athlete about the nature of the condition, and coordinate follow-up evaluations by the physician prior to return to play.

**Table 1. Underlying Factors in Patients With Upper Extremity DVT**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number of Patients (%)</th>
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<tbody>
<tr>
<td>Central venous catheter</td>
<td>65 (72)</td>
</tr>
<tr>
<td>Infection</td>
<td>25 (28)</td>
</tr>
<tr>
<td>Extrathoracic malignancy</td>
<td>20 (22)</td>
</tr>
<tr>
<td>Thoracic malignancy</td>
<td>19 (21)</td>
</tr>
<tr>
<td>Recent surgery</td>
<td>19 (21)</td>
</tr>
<tr>
<td>Renal failure</td>
<td>19 (21)</td>
</tr>
<tr>
<td>Prior lower-extremity DVT</td>
<td>16 (18)</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>9 (10)</td>
</tr>
<tr>
<td>Multiple trauma</td>
<td>8 (9)</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>7 (8)</td>
</tr>
<tr>
<td>Stroke</td>
<td>6 (7)</td>
</tr>
<tr>
<td>Permanent pacemaker</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Spontaneous (effort induced)</td>
<td>3 (3)</td>
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*Adapted from Marinella et al.*

**References**


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