Effort thrombosis, also known as primary axillosubclavian thrombosis or Paget-Schroetter syndrome, consists of primary thrombosis of the axillary and/or subclavian vein. It should be distinguished from the far more common secondary axillosubclavian thrombosis that is due to central venous catheters. It is relatively uncommon, accounting for 1 to 9% of upper extremity thromboses. Nonetheless, because of its often dramatic onset in young patients, it has received considerable attention in the radiological and surgical literature. The typical patient is a young male who experiences acute onset of painful arm swelling after strenuous exercise (Tretola, 1995).

Primary axillosubclavian venous thrombosis occurs because of the anatomic location of these veins. The axillary vein is subject to compression between the pectoralis minor muscle and the rib cage posteriorly; the subclavian vein may be compressed as it passes between the clavicle and the subclavius muscle anteriorly and the first rib and scalenus anticus muscle posteriorly (Tretola, 1995).

When the syndrome occurs in a full-blown fashion, there is often an acute onset of diffuse swelling of the arm with distension of the superficial veins accompanied by a variable degree of cyanosis. This bluish discoloration of the extremity is characteristic of the syndrome. The patient may complain of heaviness of the affected arm, and physical examination reveals an increase in size of the extremity involved. If effort thrombosis is suspected, upper limb edema should be monitored with circumferential measurements of the upper extremity, as well as observing for cyanosis and venous distension. Upper extremity strength should be assessed, as weakness may result with long-standing conditions.

Venous occlusion is often confirmed with an exercise test in which the patient performs a workout in a fashion that usually produces the symptoms and is examined immediately after this exercise bout. Occasionally, the symptoms can be exacerbated by bringing the arms into hyperabduction or into the exaggerated military position with the shoulders pulled back and depressed. Investigation should include evaluation of the bony structures by chest x-ray and A-P view of the cervical spine. The venogram is the diagnostic “gold standard” technique, although CT, MRI, or other diagnostic techniques such as Doppler ultrasonography may be used as indicated (Reid, 1992).

The differential diagnosis should include drug abuse, sarcoidosis, infection, hypercoagulability including oral contraceptive use, metastatic tumor, or medical causes of poor
circulation including heart disease, polycythemia, dehydration, or the nephrotic syndrome.

It is important to differentiate between venous and arterial occlusion. Patients with venous thrombosis usually have symptoms (venous distension, swelling, diffuse aching in limb) aggravated by activity. Arterial occlusion is accompanied by a more dramatic presentation of a cold, pale, pulseless extremity. There may be a feeling of decreased strength, and there may be tingling and sensory changes in the hand. In the young and fit athlete, the risk of pulmonary embolus is probably relatively low. Nevertheless, because of the potential risk of a fatal pulmonary embolus, aggressive medical therapy is indicated (Reid, 1992).

**Case Study**

A 19-year-old right-handed football quarterback presented after football practice with complaints of significant swelling in his right chest, arm, and hand. There was no known mechanism of injury. He said his hands and fingers had been “puffy” for approximately 2 weeks preceding this episode; however, the swelling increased significantly during football practice that day.

The athlete was not in pain but he did complain of “heaviness” in the arm. There was no prior history of injury to the right shoulder or arm. Swelling and venous distention were noted in the right chest, arm, and hand. There was a slight cyanotic discoloration to the right upper extremity with a delayed capillary refill test. Adson’s maneuver was positive, as was the hyperabduction test. Upper extremity manual muscle testing was within normal limits. The athlete had no neurological signs or symptoms at the time of presentation. Upper extremity deep tendon reflexes were equal and symmetrical.

In regard to possible precipitating factors, the athlete had significantly increased his throwing with the transition from high school to college football practice. Furthermore, he had increased his in-season weightlifting activities from two to four times a week beginning approximately 2 weeks prior to this episode. The athlete was evaluated by the primary-care team physician and the orthopedic consultant, who, concerned about a possible axillary vein thrombosis, referred the athlete to a vascular surgeon.

**Evaluation, Diagnosis, and Treatment**

A vascular surgeon was consulted and a venous Doppler of the right upper extremity was performed which showed normal flow with the extremity at rest but decreased flow in subclavian vessels with the arm in abduction. An MRI demonstrated a narrowed thoracic inlet on the right. The athlete was diagnosed with thoracic outlet syndrome, removed from all athletic activity, and placed on a regimen of rest, medication (aspirin therapy), and structured rehabilitation which consisted of postural exercises, cervical flexibility with emphasis on anterior and medial scalenes, pectoralis minor flexibility, and therapeutic modalities.

Two weeks after the initial presentation, his rehabilitation was advanced to include upper trapezius strengthening and light rotator cuff progressive resistance exercises (PRE). One month after the episode, the athlete’s symptoms had fully resolved and he was cleared by physicians to begin a gradual return to functional activity. At this time he began an interval football throwing program.

After lightly tossing a football 10 to 15 yds approximately 20 times, he developed extensive swelling and venous distension in his right chest, arm, and hand with cyanosis. He was taken to the emergency room, where a venous Doppler and subsequent venogram (Figure 1) revealed a clot completely obstructing the right subclavian vein. The athlete was...