
Selected Topics: Sports Medicine

DEEP VENOUS THROMBOEMBOLISM IN A TRIATHLETE

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□ **Abstract—Background:** Demanding athletic events can contribute multiple risk factors to the development of deep venous thrombosis (DVT) in athletes. **Objectives:** To discuss risk factors for the development of DVT in athletes participating in athletic events. **Case Report:** We present the case of a young female athlete who had a DVT, complicated by pulmonary embolism, after participating in a half-Ironman triathlon. **Conclusion:** Our patient developed a DVT complicated by pulmonary embolism as a result of many factors relating to participation in a triathlon. Demanding athletic events can contribute different risk factors to the development of DVT in athletes. The diagnosis of DVT should be considered in any athlete presenting with leg pain, especially after a strenuous athletic event. © 2010 Elsevier Inc.

□ **Keywords—**triathlon; marathon; deep venous thrombosis; pulmonary embolism; athlete

INTRODUCTION

Deep venous thrombosis (DVT) is a common diagnosis made in the emergency department (ED). The incidence has been estimated to range anywhere from 40 to 80 cases per 100,000 people annually, and all cases of venous thromboembolism, including pulmonary embolism, affect 1 in 1000 people per year (1). The true incidence of DVT is unknown secondary to inaccuracies of clinical diagnoses as well as the occurrence of many occult thromboses that resolve spontaneously.

DVT is a diagnosis that should be considered in young, healthy athletes with symptoms, especially after demanding athletic events, despite the fact that it has rarely been reported (2–4).

CASE REPORT

A 33-year-old female triathlete with no past medical history presented to the ED complaining of 3 weeks of progressively worsening left lower extremity swelling and pain. She finished a half-Ironman triathlon 3 weeks prior. The morning after the race she drove a car about 5 h, stopping twice to walk. Her symptoms began shortly after the car ride. She also noted progressively worsening dyspnea on exertion and lightheadedness, all of which started after the leg symptoms. She was seen by a general practitioner 1 week after her symptoms began and was given a short course of corticosteroids for presumed lung inflammation. She did note mild improvement but, due to concerns regarding persistent leg pain, she obtained a referral to an orthopedist. On follow-up with the orthopedist 1 week later (after 2 weeks of symptoms), she was given a course of celecoxib (Celebrex; Pfizer Inc., New York, NY) and physical therapy. Her symptoms continued to worsen and prompted her to come to the ED. The patient had no significant medical history, including no prior DVT or malignancy. Her current medications included celecoxib and oral contraceptives. She denied smoking and illicit drug use. There was no family history of hypercoagulopathies.

On physical examination, her vital signs were stable and she had an oxygen saturation of 100% on room air. She had a regular heart rate and rhythm and no murmurs, rubs, or gallops were appreciated. The lungs were clear to auscultation bilaterally. The left lower extremity was noted to be diffusely erythematous, warm, swollen, and tender to palpation to just above the knee. Pulses were equal in bilateral lower extremities. The rest of the physical examination was unremarkable.

An evaluation for suspected DVT with possible pulmonary embolism was initiated. An electrocardiogram was normal, with a sinus rhythm of 62 beats/min with no signs of right heart strain. Complete blood count, electrolytes, and coagulation studies were unremarkable. A bedside venous duplex ultrasound was done by the vascular surgery technician and was significant for an occlusive DVT in the superficial femoral vein through the popliteal vein, with a non-occlusive DVT in the common femoral vein of the left lower extremity. A computed tomography scan of the chest with contrast was significant for extensive bilateral central pulmonary emboli. She was admitted to the medical service and started on low-molecular-weight heparin and warfarin. She remained in stable condition throughout her hospital stay and the lower extremity swelling improved. She was later discharged on warfarin, and an outpatient hypercoagulability workup was negative.

DISCUSSION

Diagnosing deep venous thromboses and their sequelae are an integral part of emergency medicine. Venous thromboembolism occurs in about 1 in 1000 people per year, and 1–5% of those afflicted will die from complications, mainly pulmonary embolism (5). The diagnosis might have eluded the two physicians the patient visited previously because she was a young, healthy patient with few apparent risk factors. Her pain easily could have been attributed to musculoskeletal pain in light of the recently completed vigorous competition. The significance of her lower extremity swelling may not have been appreciated initially. In addition, elite athletes may not exhibit tachycardia from a pulmonary embolism secondary to their propensity to be bradycardic at baseline.

Virchow's triad of venous stasis, endothelial injury, and hypercoagulability can help to identify general risk factors for venous thrombosis. Endurance athletes are exposed to many of these factors during prolonged strenuous exercise, particularly a triathlon. Endurance competitions such as triathlons and marathons often expose patients to the risk factors of trauma, including repetitive microtrauma and increased endothelial injury, increasing the risk of thrombosis (6). Dehydration during these

events can also lead to hemoconcentration. The relationship of hemoconcentration to thrombotic events is undetermined, but in combination with other factors, it may contribute to an increased risk of DVT in athletes. In many cases, including our patient, these effects are compounded by immobilization after exertion and frequent long distance travel to and from the actual competition (7).

Violent effort or prolonged, strenuous exercise causing a DVT is rare but well described in the literature, particularly for the upper extremity. Effort thrombosis of upper extremity vasculature results from microtrauma to the axillo-subclavian vein leading to activation of the coagulation cascade and subsequent DVT formation. This condition is also known as Paget-Schroetter syndrome (6). Similar mechanisms have been reported in case reports concerning the lower extremity (2–4). An additional factor that may contribute to DVT formation is muscle hypertrophy, leading to compression of venous structures, leading to stasis. Use of hormonal therapy, as in our patient, adds a fourfold increase in risk (6). The role of corticosteroids in the development of DVTs is still somewhat controversial (8–10).

Elite athletes often rest after an event and can be relatively immobilized. The effect of this relative immobilization after competition is compounded by having to travel long distances to competitions, as our patient did. Some studies have shown that the risk of DVT is the same for any prolonged length of travel > 4 h, whether by air, car, bus, or train (7). However, our patient did stop multiple times to walk and stretch, which should have been protective given the relatively short length of time of each driving segment (11,12).

CONCLUSION

Deep venous thrombosis can occur in young, healthy athletes presenting with lower extremity pain or swelling after strenuous exertion. This population, especially endurance athletes, is often exposed to multiple different factors leading to venous stasis and endothelial injury, thus increasing their risk for thrombosis. Many may go undiagnosed secondary to expectations of pain and swelling after endurance events. More research needs to be done to determine the incidence of deep venous thrombosis in athletes after demanding events like triathlons.

REFERENCES

1. Silverstein MD, Heit JA, Mohr DN, Petterson TM, O'Fallon WM, Melton LJ 3rd. Trends in the incidence of deep vein thrombosis and pulmonary embolism: a 25-year population-based study. *Arch Intern Med* 1998;158:585–93.

2. Cauley K, Wright P. Iliac vein compression and pulmonary embolism in a long distance runner: computed tomography and magnetic resonance imaging—a case report. *Angiology* 2005;56:87–91.
3. Harvey JS. Effort thrombosis in the lower extremity of a runner. *Am J Sports Med* 1978;6:400–2.
4. Echlin PS, Upshur RE, McKeag DB, Jayatilake HP. Traumatic deep vein thrombosis in a soccer player: a case study. *Thromb J* 2004;2:8.
5. Kline JA, Runyon MS. Pulmonary embolism and deep venous thrombosis. In: Marx J, Hockberger R, Walls R, eds. *Rosen's emergency medicine: concepts and clinical practice*, 6th edn. Philadelphia, PA: Mosby; 2006:1368–82.
6. Meyering C, Howard T. Hypercoagulability in athletes. *Curr Sports Med Rep* 2004;3:77–83.
7. Cannegieter SC, Doggen CJ, van Houwelingen HC, Rosendaal FR. Travel-related venous thrombosis: results from a large population-based case control study (MEGA study). *PLoS Med* 2006;3:e307.
8. Huerta C, Johansson S, Wallander MA, Garcia Rodriguez LA. Risk factors and short-term mortality of venous thromboembolism diagnosed in the primary care setting in the United Kingdom. *Arch Intern Med* 2007;167:935–43.
9. Russell MW, Taylor DC, Cummins G, Huse DM. Use of managed care claims data in the risk assessment of venous thromboembolism in outpatients. *Am J Manag Care* 2002;8(1 Suppl): S3–9.
10. Høgevoid HE, Hoiseth A, Reikeras O. Effect of high-dose corticosteroids on the incidence of deep vein thrombosis after total hip replacement. *Arch Orthop Trauma Surg* 1991;111:29–31.
11. Chee YL, Watson HG. Air travel and thrombosis. *Br J Haematol* 2005;130:671–80.
12. Geerts WH, Pineo GF, Heit JA, et al. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. *Chest* 2004;126(3 Suppl):338S–400S.