

When Computers Can Kill—Two Unusual Cases of “E-Thrombosis”

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Abstract

Deep vein thrombosis (DVT) is a common and potentially fatal vascular event when it leads to pulmonary embolism. Occurring as part of the broader phenomenon of Venous Thromboembolism (VTE), DVT classically arises when Virchow’s triad of hypercoagulability, changes in blood flow (e.g. stasis) and endothelial dysfunction, is fulfilled. Although such immobilisation is most often seen in bedbound patients and travellers on long distance flights, there is increasing evidence that prolonged periods of work or leisure related to using computers while seated at work desks, is an independent risk factor. In this report, we present two cases of “e-thrombosis” from prolonged sitting while using a computer.

Keywords

Deep Vein Thrombosis, Seated Immobilisation, Venous Stasis, Prolonged Sitting, Computers

1. Introduction

Deep vein thrombosis (DVT) is a common and potentially fatal vascular event [1] when it leads to pulmonary embolism. Occurring as part of the broader phenomenon of Venous Thromboembolism (VTE), DVT classically arises when Virchow’s triad [2] of hypercoagulability, changes in blood flow (e.g. stasis) and endothelial dysfunction, is fulfilled. Although such immobilisation is most often seen in bedbound patients [3] and travellers on long distance flights [4], there is increasing evidence that prolonged periods of work or leisure related to using computers while seated at work desks, is an independent risk factor [5]. In this report, we present two cases of “e-thrombosis” from prolonged sitting while using a computer.

2. Case Report 1

A 50-year-old software professional of Indian descent presented to the Emergency Department with progressively worsening pain and swelling in the whole of his left lower limb over 2 days. He had a medical history of hypertension and was taking atenolol 25 mg once a day. He denied any trauma to the left lower extremity. On closer exploration of his history, particularly looking for risk factors for DVT, the patient shared some interesting details—he had recently worked on his computer on average for 12 hours each day to meet work related deadlines. He would take three to four breaks of about 30 min during the 12 hours. Of further importance was his stretching routine when seated—although he recognised the need to stretch regularly, he was only able to exercise his right leg. His left leg was kept flexed at the knee at all times as there was a stack of boxes stored under his desk that limited his ability to extend or stretch his left leg.

On examination, he was afebrile, his heart rate was 64 beats/min, blood pressure was 139/86 mmHg, and oxygen saturation was 99% on room air. There was no rash on the affected limb. The left lower limb was noted to be swollen and the left calf girth was 40 cm, compared to his right calf girth of 36 cm (both measured 10 cm below the tibial tubercle). There was no tenderness on palpation but he experienced a persistent aching sensation. There was presence of Grade I pitting edema up to mid shin. Veins were noted to be more prominent on the left leg but not clinically varicose. The arterial pulses were well felt and there was no neurological deficit. The cardiorespiratory examination was unremarkable.

As there was clinical suspicion for DVT, blood samples for D Dimer levels were obtained, and was reported to be 463 ug/L (cutoff < 130 ug/ml to exclude VTE in a low pretest probability scenario). The patient's pre-tests probability score (Well's Criteria) was 2, indicating intermediate risk. A bedside ultrasound three point compressibility test was performed, and lack of venous compressibility was noted in the popliteal and adductor canal regions. Subsequently urgent outpatient ultrasound duplex imaging was arranged which was reported as acute thrombosis in the common femoral vein above its sapheno-femoral junction with some flow noted. The popliteal vein above the mid-knee showed acute thrombosis with some flow noted as well. The left common iliac and external iliac veins were also thrombosed.

Electrocardiogram showed a normal sinus rhythm with a rate of 66 beats per minute. There was evidence of left ventricular hypertrophy, presumed to be related to pre-existing hypertension. Chest x-ray was unremarkable.

The patient was hospitalized and started on low molecular weight heparin and simultaneous oral warfarin. Thrombophilia work up was eventually negative. A follow up appointment with the haematologist was also arranged.

3. Case Report 2

An 18-year-old female student of Chinese descent, with a past history of hyper-

thyroidism, presented to the Emergency Department with sudden onset of pain and swelling of the left lower limb that developed over one day. There was no prior trauma, and the pain was centralised around the calf.

There was no preceding long haul flights or nor any accompanying diaphoresis, chest pain or shortness of breath. She had however, spent long hours seated at her desk using her computer prior to onset of the lower limb pain.

On examination, she was afebrile, pulse rate was 120 beats/min and BP was 122/57 mmHg. There was uniform swelling throughout the entire left lower limb. Investigations performed included a urine pregnancy test which was negative, urinalysis which was normal, and blood tests for renal function, thyroid function and full blood count. As DVT was suspected clinically, D-Dimer Quantitation was ordered, which returned at a value of 2.94 mg/L (upper limit 0.50 mg/L), Thyroid function test revealed presence of thyrotoxicosis secondary to relapse of Graves' Disease. Thrombophilia work up was negative.

A Duplex Ultrasound scan of the left lower limb showed acute thrombosis in the left common iliac, external iliac, common femoral and long saphenous veins.

The patient was admitted for further management including commencement of low molecular weight heparin and oral warfarin. Carbimazole was prescribed for her hyperthyroidism and she was discharged with close follow up planned by the haematologist, and endocrinologist.

4. Discussion

Prolonged seated immobilisation as a prominent risk factor for VTE was first described by Simpson in 1941 [1] following the observation that fatal pulmonary embolism (PE) occurred in those who sat for prolonged periods in chairs in air raid shelters during World War 2. Immobilisation in bed bound patients [3] and in long distance travellers [6] (thus giving rise to the term Economy Class Syndrome) [4] has been demonstrated to be a clear risk factor for VTE. Studies such as LONFLIT [7] have suggested that prolonged sitting for periods longer than 8 hours add to the risk of DVT, and Hitos *et al.* in 2007 [8] demonstrated that leg exercise regimens enhanced popliteal venous flow during immobility of seated subjects, reinforcing the importance of regular leg movement to prevent venous stasis (one of the most readily addressed components of Virchow's Triad). Electrical foot stimulation has also been shown to ameliorate risk [9].

As we have progressed through the decades and proposed interventions to reduce morbidity and mortality associated with risk factors for DVT, since the turn of the century, seated immobility related thromboembolism [10] has become more commonly associated with use of computer for work, or leisure, giving rise to the phenomenon of "e-thrombosis", first described by R Beasley *et al.* in 2003 [5]. To demonstrate the seriousness of this condition, a case controlled study by Healy *et al.* in 2010 suggested that being seated at work and on the computer at home for at least 10 hours in a 24-hour period, and for at least two hours at a time without getting up, was associated with a 2.8 times increased risk

of VTE [11]. Over the years, a variant of “e-thrombosis” termed “gamer’s thrombosis” has also emerged as a cause for concern amongst most young gamers, following a case in 2004 where a young person who played video games continuously for 80 hours eventually died from PE [12].

The cases described above are of interest due to the following reasons.

1) Prolonged sitting should be regarded as a significant risk by virtue of immobilisation. West *et al.* [13] have established that the risk of VTE increases with both the total duration spent sitting (10% per hour longer) and individual periods of sitting without getting up (20% for every hour longer). The first case above, who was able to provide precise accounts of time spent seated, sat for 12 hours in total, comprising 3 to 4 hours of continuous sitting at a time. This gave him an approximately 200% higher chance of developing DVT. The immobilisation component in Wells Criteria [14] should factor in this new development to make it relevant to the modern clinician.

2) The first case above also developed DVT in the left leg which was completely immobilised with the knee bent (as opposed to the right leg which was intermittently stretched and extended). Hypotheses for his development of DVT include additional effects of kinking in vessels, and this may have implications for patients with contractured lower limbs [15] for whom DVT risk may be increased, but regular screening may be limited by their access to care.

3) The second case presents with an interesting association with thyrotoxicosis. Concomitant thyroid disorders associated with unprovoked DVT has been described in the literature [16] [17], but in the second patient above there was additional risk of prolonged sitting while working on her computer. It may be useful to actively consider DVT development in patients with thyroid disorders and who may be predisposed to prolonged periods of sitting.

With the advent of the Internet, and increasing usage of computers in our society [18] [19] “e-thrombosis” presents with significant implications for health-care systems, software and related industries, labour organizations, schools and insurance companies. A sedentary lifestyle is an established hazard from the metabolic and cardiovascular standpoint. Additionally, with increased risk of developing DVT, prolonged computer use can now be literally said to be potentially fatal endeavour. Until a time when apps are developed to forcibly limit extended periods of seated immobility and encourage computer users to get up and stretch, the responsibility of public education, early detection and its risks lie in the hands of astute clinicians.

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