

Fatal pulmonary embolism following ankle fracture in a 23-year-old man

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Abstract

Patients with lower extremity injuries are at increased risk of venous thromboembolism. We report a case of fatal pulmonary embolism following a simple ankle fracture in a 23-year-old man. The diagnosis was confirmed *post-mortem*. The incidence of such complications and the importance of deep venous prophylaxis in such cases are discussed.

Introduction

In many countries, most stable ankle fractures are treated conservatively in a below-knee plaster cast. It has been suggested that this method of immobilization may increase the risk of deep-vein thrombosis (DVT) because of inactivation of the ankle pump.¹ However, the real incidence of venous thromboembolism (VTE) and pulmonary embolism (PE) in patients with ankle fracture is still unknown, as the diagnosis includes various types of anatomic injuries, thus the literature reports a wide range of incidence for both VTE and PE. Fatal PE after simple fracture is considered as rare. We report a case of a 23-year-old man, with an ankle fracture who suffered a massive PE which was confirmed *post-mortem* and carry out a mini literature review upon the subject.

Case Report

A 23-year-old man (height=179 cm, weight=83 kg, body mass index=25) was transported to Emergency Department (ED) within half hour after the onset of severe shortness of breath chest pain, discomfort and agitation. Past medical history included a conservative treatment for minimal displaced lateral malleolus fracture (Weber type B) 20 days before, which had been stabilized by a

below-knee plaster of Paris cast. Medical regimen included only oral analgesics. Surgical and family history was non-contributory. He had no known drug allergies, no history of smoking, drug or alcohol abuse and no medical co-morbidities. On arrival, his Glasgow Coma Scale was E4/V5/M6, but 5 min later he collapsed in the ED. Immediate ventilation with 100% O₂ was initiated, intubation was carried out and resuscitation according to Advance Life Support guidelines initiated. First recorder electrocardiography was asystoly and arterial blood gases revealed severe metabolic and respiratory acidosis (pH 6.57; PaCO₂ 153.6 mmHg; PaO₂ 17 mmHg; HCO₃ 13.6 mEq/L; basis excess -25.8; Na⁺ 143.6 mEq/L; K⁺ 5.38 mEq/L; anion gap 34.1; Glu 702 mg/dL). During resuscitation efforts, the patient received tenecteplase 50 mg iv due to serious clinical suspicion of pulmonary embolism. Unfortunately, resuscitation was carried out for 60 min to no avail and the patient was pronounced dead. On *post-mortem* examination massive pulmonary embolism, with both macroscopic (in both pulmonary arteries) and microscopic findings (thrombi throughout the smaller arterial vessels in both lungs), confirmed the clinical diagnosis.

Discussion and mini review of the literature

Foot and ankle trauma or lower extremity surgery may lead to a higher incidence of venous thromboembolism due to stasis, vascular injury and immobilization. In addition, there are several other predisposing risk factors that may also increase VTE incidence. They are principally classified into non-modifiable (genetic: antithrombin, protein C and protein S deficiencies, Factor V Leiden mutation, the prothrombin 20210A variant, higher D-dimer, *etc.*), modifiable (obesity consuming >1.5 servings of red and processed meat daily, homocysteine levels) and temporary (hospitalization, oral contraceptive therapy, airline travel) factors.^{1,2}

It is difficult to determine which patients require prophylaxis because little is known about the risk of DVT in patients with lower extremity injuries. Various studies report various incidences. SooHoo *et al.*³ reported PE rate of 0.34% (DVT rate not reported), Mizel *et al.*⁴ reported PE rate of 0.15% and DVT rate of 0.22%, Hanslow *et al.*⁵ higher rate of both PE (1.3%) and DVT (4%) – yet their study included trauma patients –, Lipidus *et al.*⁶ and Jorgensen *et al.*⁷ found even higher rates of DVT (17 and 28% respectively), probably because they examined asymptomatic VTE and performed venography in all patients. Moreover, the second study did not clarify the

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nature of the plaster cast (above- or below-knee) and included patients with different injuries. A fact that may also bias the incidence of DVT. In another trial, Patil *et al.*⁸ reported 5% of non-clinical DVT and zero cases of PE after assessment of 100 cases of isolated fractures of the ankle treated in a below-knee cast. Finally, in a large study of 4271 patients, Kavanagh *et al.*⁹ reported the rate of symptomatic VTE in patients with isolated ankle fractures to be relatively low with a DVT rate of 0.29%, a PE of 0.36% and a combined VTE rate of 0.54%. Numerous case reports of fatal PE are also found in the literature.^{10,11} The current recommendation from the American College of Chest Surgeons is that thromboprophylaxis is not recommended for isolated injuries below the knee.¹² Considering the low incidence of symptomatic DVT and PE found in the literature and the relatively high cost of the routine prophylaxis strategy, these recommendations appear to be appropriate. Yet, cases like those aforementioned show that this policy may be debatable. We need large scale studies to really determine if the current guidelines need modifications and to what extent.

Conclusions

Routine pharmacological prophylaxis to patients requiring prolonged immobilization

in a cast rather than the current practice of selective use of prophylaxis in high-risk patients is debatable. Cases of fatal pulmonary embolism in otherwise healthy low-risk patients prove that larger studies need to be carried out to come to a definite conclusion.

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