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Case Report

Rare imaging of a known entity: fat embolism seen on CT in lower extremity vein after trauma

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ABSTRACT

Fat embolism occurs in the vast majority of patients who have had trauma (approximately 90%). The most common occurrence is after long bone fracture. It has also been noted in cases after orthopedic surgery. Fat embolism is most often diagnosed when the clinical manifestations of fat embolism syndrome become apparent. Reported cases of fat emboli in transit are unusual. In our case, we present the rare finding of fat embolism seen on computed tomography in the lower extremity after a trauma.

Background

Fat embolism was first described by Von Bergmann [1] as a syndrome in 1873. He described it as fat globules in the circulation. Since then, numerous reports have been made of fat embolism syndrome (FES). It is often a benign entity that occurs in well-documented clinical scenarios. The classic presentation is that of a high-velocity trauma with a subsequent long bone fracture [2]. FES most commonly includes pulmonary, brain, and skin manifestations, with lung findings being the most common [3]. It is rare to diagnose the fat embolism while in transit.

Case presentation

A 51-year-old male presents to the emergency department after traumatic injury to his right leg. He does not have any past medical or surgical history. He does not take any medications. Physical examination demonstrates deformity of his right leg with significant swelling. Laboratory values were within normal range.

Imaging findings

The patient undergoes a computed tomography (CT) angiogram of his right lower extremity to exclude a vascular injury. As can be seen in the three-dimensional reconstructions (Fig. 1), he has an acute tibial and fibular fracture with valgus angulation. He does not have any vascular injuries. Figure 2 demonstrates an incidental finding in the distal superficial femoral vein. There is a layer hypodensity antidependently spanning a length of 6.8 cm. It had a mean attenuation of −105 HU, consistent with fat. The patient was therefore diagnosed

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Fig. 1 – Three-dimensional reconstruction demonstrating the tibial and fibular fracture. There was no vasculature injury. (A) Anterior view. (B) Posterior view.

with a fat embolus within the superficial femoral vein arising from the tibial or fibular bone marrow after the trauma.

Treatment and follow-up

The patient received supportive care in the intensive care unit including oxygen with continuous monitoring (did not require mechanical ventilation). The patient did not develop respiratory symptoms, and his chest x-ray at hospital day 4 was unremarkable (Fig. 3). No systemic steroids or vasopressors were needed. The patient underwent surgical repair of his lower extremity fractures. On postoperative day 2, he developed compartment syndrome in the right leg and subsequently underwent an emergent fasciotomy. His remaining hospital course was uneventful without evidence of development of FES.

Discussion

Fat embolism is a phenomenon that occurs in over 90% of cases of trauma [4]. Although often clinically silent, there is an approximate 2.5% chance of developing FES. This dramatically increases the morbidity and mortality rate of the patient. It most commonly develops on day 2 after trauma. If the patient develops pulmonary symptoms, a chest x-ray should be obtained as a screening tool.

FES is a multisystem disease most often involving the lungs (respiratory distress), brain (fat emboli with subsequent

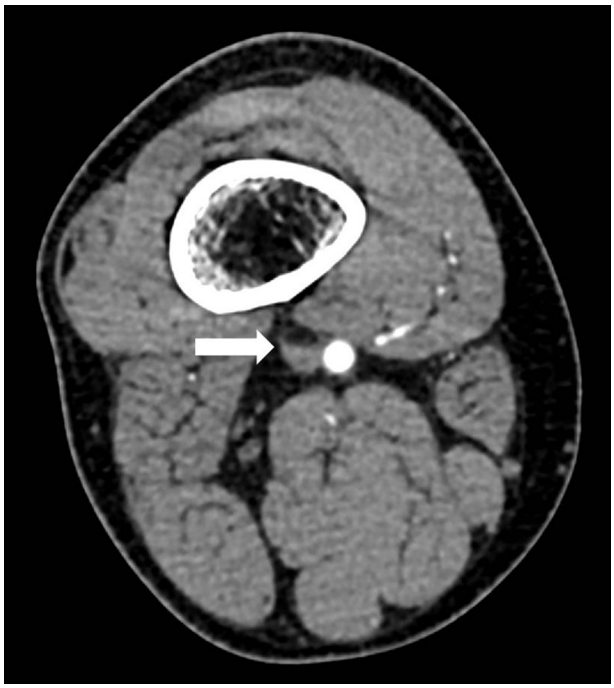

Fig. 2 – Axial image of the CT angiogram. The arrow points to a fat density layering antidependently within the distal superficial femoral vein.

edema), and skin (petechiae) [5]. There are two methods by which the fat emboli enter the systemic circulation. The first is the paradoxical mechanism, in which large fat emboli can pass through a patent foramen ovale or other anatomic shunt [6]. The second mechanism is that the fat emboli are small enough to pass from the pulmonary arterial to venous circulation (microembolism) [7].

There are two major theories regarding the pathogenesis of fat embolism. The first is the mechanical theory in which disrupted bone marrow is dislodged in the circulation [6]. The second is the biochemical theory in which free fatty acids and cytokines interact in the bloodstream to create fat emboli [8].

Treatment is often supportive with attention to the blood oxygen saturation. If FES is developed, then mechanical ventilation or corticosteroids may be required [9]. In most cases, FES resolves spontaneously.

In summary, evaluation of the veins in a posttraumatic/surgical patient is critical. Although it is very unusual to find a fat embolus in transit, it is a critical finding to relay to the clinicians. FES is a diagnosis that can be made clinically with respiratory distress, neurologic symptoms, and petechial rash. However, early diagnosis can prevent these serious manifestations as appropriate care, and monitoring can be started right away.

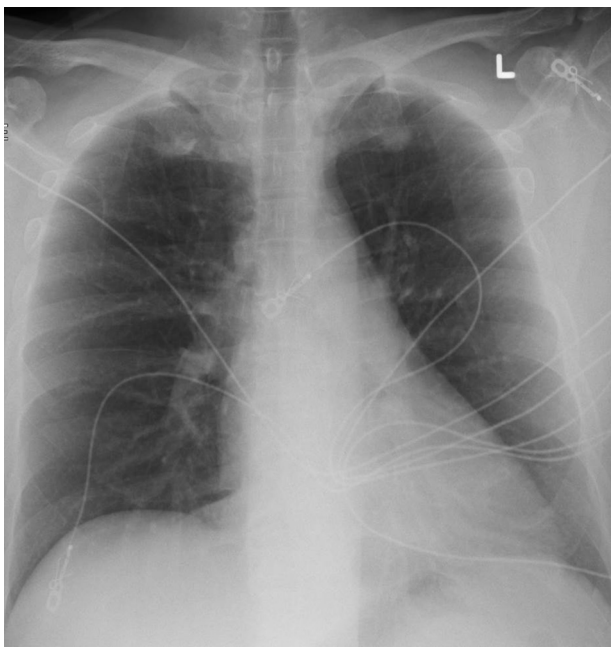

Fig. 3 – Frontal chest x-ray demonstrating no acute findings and overlying wires.

Learning points

1. In cases of trauma, special consideration should be taken to evaluate the veins.
2. If a posttraumatic or postsurgical patient develops respiratory distress, a fat embolism should be considered in the differential.

REFERENCES

[1] Von Bergmann E. Ein fall todlicher fettenbolic. Berl Klin Wochenscher 1873;10:385.
[2] Arakawa H, Kurihara Y, Nakajima Y. Pulmonary fat embolism syndrome: CT findings in six patients. J Comput Assist Tomogr 2000;24(1):24–9.
[3] Malagari K, Economopoulos N, Stoupis C, Daniil Z, Papiris S, Müller NL, et al. High-resolution CT findings in mild pulmonary fat embolism. Chest 2003;123(4):1196–201.
[4] Eriksson EA, Pellegrini DC, Vanderkolk WE, Minshall CT, Fakhry SM, Cohle SD, et al. Incidence of pulmonary fat embolism at autopsy: an undiagnosed epidemic. J Trauma 2011;71:312.
[5] Johnson MJ, Lucas GL. Fat embolism syndrome. Orthopedics 1996;19:41.
[6] Pell AC, Hughes D, Keating J, Christie J, Busuttil A, Sutherland GR, et al. Brief report: fulminating fat embolism syndrome caused by paradoxical embolism through a patent foramen ovale. N Engl J Med 1993;329:926.
[7] Sulek CA, Davies LK, Enneking FK, Gearen PA, Lobato EB. Cerebral microembolism diagnosed by transcranial Doppler during total knee arthroplasty: correlation with transesophageal echocardiography. Anesthesiology 1999;91:672.
[8] Nixon JR, Brock-Utne JG. Free fatty acid and arterial oxygen changes following major injury: a correlation between hypoxemia and increased free fatty acid levels. J Trauma 1978;18:23.
[9] Sarkar S, Mandal K, Bhattacharya P. Successful management of massive intraoperative pulmonary fat embolism with percutaneous cardiopulmonary support. Indian J Crit Care Med 2008;12:136.