

CASE REPORT

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Fracture of the tibia and fibula in a car accident with cerebral fat embolism syndrome (FES): A case report

Felipe dos Santos Souza, Rafael Alfenas de Paula, José Batista Júnior, Álvaro Moreira Rivelli, Marco Orsini, Antônio Marcos da Silva Catharino

ABSTRACT

Introduction: Fat embolism is defined by the presence of fat globules in the pulmonary circulation. The term fat embolism syndrome (FES) refers to the clinical syndrome that follows an identifiable insult that releases fat into the circulation, resulting in pulmonary and systemic symptoms.

Case Report: We report a case of a 28-year-old male, victim of a medium impact collision presenting long bone fractures (tibia and fibula) evolving with fat embolism syndrome (FES).

Conclusion: Almost all cases of FES are due to fractures of long and pelvic bones (the bone marrow contains a high fat content). However, some cases are associated with trauma in the absence of orthopedic fractures and rare cases are not related to trauma. In this sense, it is

important to present a case in a polytrauma emergency unit that requires quick and assertive attention to the patient's clinical management and stabilization, in addition to the importance of the intervention of the neurology and neurosurgery team.

Keywords: Long bone fracture, Case report, Fat embolism syndrome

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INTRODUCTION

Fat embolism syndrome (FES) is defined as the occurrence of dysfunction damage to one or more organs, suggesting a complication or atypical evolution of fat embolism [1]. It has a predominant epidemiology in young patients, with an average age of 30 years, associated with polytrauma with bone fractures (usually long bones of the lower limbs) [1, 2]. It has rarely been described as part of a sickle cell crisis with bone marrow fat necrosis and subsequent embolism. Brain manifestations of fat embolism syndrome can be highly variable and non-specific. Symptom spectra include: headache, lethargy, irritability, delirium, stupor, convulsions, or coma [2]. The diagnosis is clinical, with the changes found and classified (Gurd and Wilson) into major and minor criteria, making the sign of fat embolism syndrome when it does not present at least one major criterion and four

minor criteria. The major criteria include: (a) respiratory failure (PaO₂ <60 mmHg); (b) neurological signs disproportionate to hypoxia; (c) axillary or conjunctival petechiae, and (d) pulmonary edema. The minor criteria are: (a) fever (>38 °C), (b) tachycardia (>110 bpm), (c) retinal changes, (d) renal changes, (e) anemone, and (f) thrombocytopenia (<100,000) [3, 4].

CASE REPORT

We report a case of a 28-year-old male patient, victim of medium impact collision, presenting long bone fracture (tibia and fibula). He was admitted to the emergency room with a lucid, oriented and Glasgow 15. The patient was admitted and taken to the operating room. After 12 hours, he developed decreased level of consciousness (Glasgow 9). On physical examination: isochoric and photoreactive pupils, global hypotonia, global rot 3, and bilateral Babinski were found. His heart rate was: 88 bpm and temperature was: 37.8 °C. Laboratory report showed: HB: 11.9 g/dL, platelets: 171,000 mm³, creatinine: 2.02 mg/dL. High field magnetic resonance imaging was requested, which showed: small multifocal and non-confluent lesions presenting hypersignal in the fluid-attenuated inversion recovery (FLAIR)-weighted sequences (Figure 1) and signs of diffusion restriction (Figure 2) compromising the white matter of the frontal and parietal lobes, as well as the core-capsular regions and the thalamus. Bilaterally, characterizing the “star field” pattern (field/starry sky), therefore being a pattern of cerebral fat embolism. The patient continued to be monitored in the intensive care unit (ICU) and, however, progressed with brain deterioration and, eventually, death.

DISCUSSION

Fat embolism syndrome is clinically diagnosed, with no laboratory and neuroimaging tests that alone provide

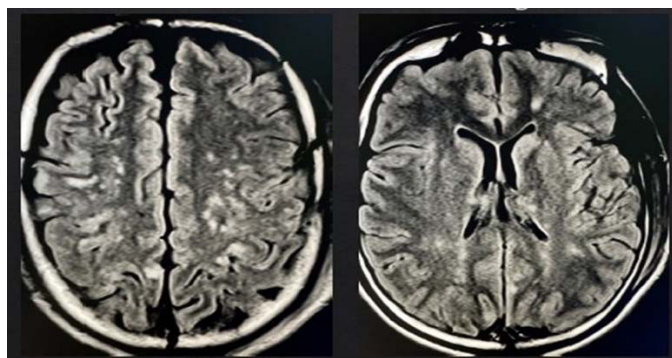


Figure 1: Magnetic resonance imaging (MRI) showing multifocal and non-confluent lesions changed hypersignal in the weighted sequence in FLAIR and diffusion restriction signs, compromising the white matter of the frontal and parietal lobes bilaterally. Source: Hospital Santa Isabel.

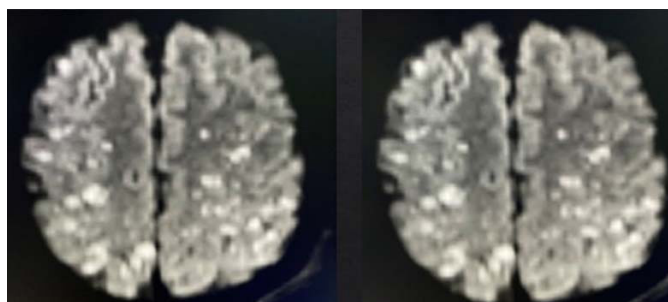


Figure 2: Magnetic resonance imaging (MRI) in diffusion (DWI) showing multifocal lesions affecting the core-capsular regions and the thalamus bilaterally, characterizing the “stellar field” pattern (field/starry sky). Source: Hospital Santa Isabel.

the diagnosis. In this sense, it is essential to investigate the different differential diagnoses: (a) Traumatic brain injury (TBI), (b) Pulmonary thromboembolism (PTE), and (c) Sepses [5, 6]. The anatomopathology of FES has important characteristics such as: petechiae in white matter with enhancement of fat globules in the capillary lumen. This is because the white substance is five times more vascularized than the gray one. Capillaries are more sparse, rectilinear, and with bilious anastomoses [7]. If a capillary is obstructed by a fatty plunger, the microterritorial local circulation is interrupted and, therefore, endothelial necrosis will occur, allowing a punctiform leakage of blood (petechiae) [7].

Fat embolism syndrome (FES) consists of the presence of fat globules in the bloodstream, generally resulting from the exposure of the yellow bone marrow in fractures of the long bones, such as the femur, tibia, and pelvis bones, polytrauma and orthopedic surgery, such as arthroplasty, knee, and hip, which can cause occlusion of small vessels [3, 8]. The presence of fatty emboli is common, being observed in 67–95% of patients who have suffered long bone fractures or major trauma [8]. Few, however, are patients with emboli capable of causing clinical manifestations and complications. FES does not install itself immediately after the trauma. There is a lucid, or latent, period of 12 to 14 hours, which was exactly witnessed according to the patient's evolution after admission to the emergency unit [9–12].

CONCLUSION

The pathogenesis of fat embolism is unknown. There are two theories: the mechanical theory in which fat emboli may be the result of fat globules entering the bloodstream through tissue (usually bone marrow or adipose tissue) that has been ruptured by trauma, and the biochemical theory in which inflammation results from the production of toxic substances intermediary with circulating fat (for example, chylomicrons, infused lipids, or fat derived from bone marrow). It is possible that both mechanisms are involved in action in many cases. Fat

embolism syndrome is more commonly associated with long bones (especially the femur) and pelvic fractures and less commonly with fractures of other bones containing marrow (for example, ribs). In this case, the polytrauma patient evolved with FES receiving a supportive measure and rapid action by the neurosurgery team, but the patient died. The description of this case allows the scientific community to manifest an emergency and efficiently operate it in a medical service that must be prepared for a fat embolism syndrome. Take away message: Fat embolism syndrome has a predominant epidemiology in young patients. It is usually associated with polytrauma and rarely been described as part of a sickle cell crisis. Medical services must be prepared for a FES.

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Author Contributions

Felipe dos Santos Souza – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Rafael Alfnas de Paula – Analysis of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

José Batista Júnior – Acquisition of data, Analysis of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Guarantor of Submission

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Conflict of Interest

Authors declare no conflict of interest.

Data Availability

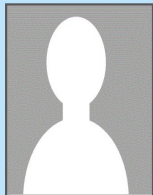
All relevant data are within the paper and its Supporting Information files.

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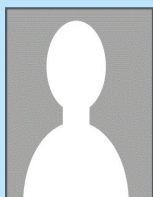
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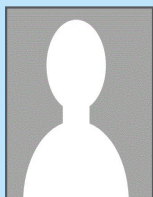
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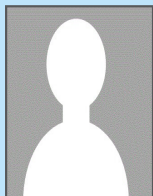
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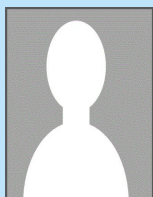
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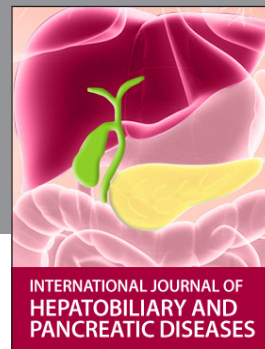
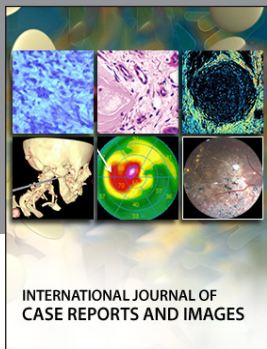
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