Case Report

Early Recognition and Successful Management of a Case of Fracture Shaft of the Femur Complicated with Fat Embolism Syndrome and Acute Respiratory Distress Syndrome

Lt Col Shalendra Singh, Surg Lt Cdr S. Ushakiran Singh, Col Deepak Dwivedi¹, Maj Kaminder Bir Kaur
Department of Anaesthesiology and Critical Care, Armed Forces Medical College, Pune, Maharashtra, India

Abstract

Fat embolism is a life-threatening complication of trauma. Early recognition and prompt treatment help in reducing morbidity. We report a case of fracture right shaft of the femur in a young adult which was being managed conservatively in the hospital ward and subsequently developed fat embolism syndrome (FES) followed by acute respiratory distress syndrome. All clinical parameters were normal except unexplainably low oxygen saturation (SpO₂) of 90%–92% without supplemental oxygen. On the 3rd day post admission, the patient suddenly developed FES and was managed in the intensive care unit (ICU) with elective mechanical ventilation, immediate bedside external fixation of the fracture, and supportive care. Prevention, early recognition by vigilant monitoring, prompt treatment, and adequate supportive care in the ICU help in reducing morbidity. All patients of trauma in the ward should be closely monitored for desaturation; probably, it might be an early sign of FES which is not revealed in literature.

Keywords: Acute respiratory distress syndrome, fat embolism syndrome, oxygen saturation

INTRODUCTION

Fat embolism syndrome (FES) is an under-reported, life-threatening physiological response of fat embolization into systemic circulation following skeletal trauma. It is a serious complication which manifests clinically by a triad of dyspnea, petechiae, and mental confusion. The true incidence is difficult to assess as many cases remain undiagnosed. Early recognition, prompt intervention, and immediate stabilization may avoid significant morbidity in these patients. Here, we present management of such a case of long bone fracture where early oxygen desaturation warned and helped us in the early detection of FES.

CASE REPORT

A 24-year-old healthy male was referred from a peripheral health center with complaints of pain, swelling, and inability to use his right lower limb, following an accidental fall while running. The clinical and X-ray examination revealed a fracture shaft of the right femur. He was initially managed conservatively (skeletal traction) in the ward and was planned for open reduction and internal fixation subsequently. His vitals were within normal limits except oxygen saturation (SpO₂) of 90%–92% without supplemental oxygen. On the 3rd day post admission, the patient suddenly developed FES and was managed in the intensive care unit (ICU) with elective mechanical ventilation, immediate bedside external fixation of the fracture, and supportive care. Prevention, early recognition by vigilant monitoring, prompt treatment, and adequate supportive care in the ICU help in reducing morbidity. All patients of trauma in the ward should be closely monitored for desaturation; probably, it might be an early sign of FES which is not revealed in literature.

Address for correspondence: Surg Lt Cdr (Dr) S. Ushakiran Singh, Department of Anaesthesiologist and Critical Care, Armed Forces Medical College, Pune - 411 040, Maharashtra, India. E-mail: ushasanasam7@gmail.com

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the next day, the patient developed acute respiratory distress syndrome and was managed with mechanical ventilation with a lung-protective strategy, sedation, and paralysis [Figure 2]. The patient was put on a close watch for seizures and urine output. On the 3rd day of ICU admission, the patient had another episode of fat embolization and it was decided to externally fix the fracture bedside to prevent further embolization. The patient developed anemia and thrombocytopenia and was managed with transfusion of three units of packed red blood cells. The fluid management was titrated with regular measurements of inferior vena cava diameter. The patient’s condition improved and he was extubated on the 5th day of ICU admission. The patient underwent closed reduction and intramedullary nailing on day 20th of admission and was discharged on the 25th day of admission.

**DISCUSSION**

FES has an incidence of 0.2%–35% with a mortality rate of 5%–15%. Common traumatic causes include fracture of long bones, burns, orthopedic procedures, and liposuction, whereas pancreatitis, lipid infusion, and diabetes mellitus are common nontraumatic causes. Fracture of long bones is the most common cause of FES. Majority of patients having fat emboli remain asymptomatic with only a small percentage progressing to FES, leading to multisystem dysfunction. FES commonly develops after 24–72 h of the injury and is diagnosed in the presence of respiratory insufficiency, petechiae, and neurological manifestations. Respiratory symptoms are the first to manifest and are seen in 75% of patients. Neurological symptoms (80%) are the most common manifestations, with petechiae rash being the least common manifestation. Heightened monitoring for the signs and symptoms associated with FES must be instituted for high-risk patients. Long-bone fractures lead to FES because of the disruption of venules in the marrow, which remain tethered by their osseous attachments, leading to entering of fat emboli into the venous system and further migration to arterial circulation. Diagnosis of FES is done using various criteria such as Gurd’s criteria, Schonfeld’s criteria, or Lindeque’s criteria. Treatment of FES is supportive; its purpose is to ensure adequate oxygenation. Mechanical ventilation is often needed if oxygenation is not adequate. Avoidance of high airway pressures and tidal volumes, use of prone positioning, and placement of a tracheostomy for anticipated prolonged ventilatory support are considered beneficial. Our patient showed desaturation of unconfirmed etiology 1 day before FES, likely mediated by leukotrienes causing hypoxic vasoconstriction affecting oxygen exchange in the lungs.

Our case report highlights the importance of constant vigilance for early detection of an unusual event of development of low SpO2 few days before occurrence of a deadly phenomenon of FES. Prevention, early recognition by close monitoring, prompt treatment, and immediate supportive care help in reducing morbidity. All patients in the ward should be closely monitored for desaturation, as it may be a useful sign in the early detection of FES which is not revealed in literature.

**Declaration of patient consent**
The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**
There are no conflicts of interest.

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