

## Fat Embolism Syndrome: A Rare Case Report

Nurul Fadiyah\*<sup>1</sup>, Khrisnanto Nugroho<sup>2</sup>, Tendi Novara<sup>3</sup>

<sup>1</sup>Faculty of Medicine University of Jendral Soedirman, Indonesia

<sup>2</sup>Departement of Orthopaedic and Traumatology, Prof. Margono Soekarjo General Hospital, Purwokerto, Indonesia

<sup>3</sup>Departement of of Anesthesiology and Intensive Therapy, Prof. Margono Soekarjo General Hospital, Purwokerto, Indonesia

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### ABSTRACT

**Background:** Fat embolism syndrome (FES) is a life-threatening complication in patients with orthopedic trauma, especially long bone fractures. The diagnosis of fat embolism is made by clinical features alone with no specific laboratory findings. FES has no specific treatment and requires supportive care, although it can be prevented by early fixation of bone fractures. Here, we report a case of FES in a patient with a right closed femoral fracture severe comminutive, which was diagnosed initially by *Gurd's criteria* and subsequently confirmed by typical appearances on *Magnetic Resonance Imaging* (MRI) of the brain. The most important for fat embolism syndrome management is divided two-fold: preventative and supportive.

**Patient:** A 43-year-old male fell from a high-rise building approximately 3 days before admission. A deformity was observed on the right thigh and the patient felt intense pain. After a few hours, the patient became weak and experienced a loss of consciousness. He was diagnosed with *Fat Embolism Syndrome* (FES) by using *Gurd's criteria*. The diagnosis was confirmed after excluding other diagnoses with similar clinical presentation.

**KEYWORDS:** Fat embolism syndrome, Fracture femur

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### ARTICLE DETAILS

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### 1. INTRODUCTION

Fat embolism syndrome (FES) is a rare complication that usually occurs in long-bone fractures. The incidence and mortality rates are unknown because of comorbid injury and other problems [1]. FES usually occurs within 24 to 72 hours after trauma or during surgical procedures in most patients; however, most patients are usually asymptomatic.

### 2. CASE PRESENTATION

A 43-year-old male suffered a deformity on his right thigh following a fall from a high-rise building approximately 3 days before admission. The patient landed on his right leg first and felt intense pain. After a 72 hours from accident, the patient became weaker and experienced a loss of consciousness. He was transferred to Margono Soekarjo General Hospital's ER with a GCS of 10 (E3V2M5), BP: 104/65 mmHg, HR: 75x/minutes, Temp: 36.6 C, RR: 22x/minutes, and a VAS score of 8.



Figure 1 : Clinical Picture of Tight Thigh

The patient was initially referred to neurosurgery due to loss of consciousness. However, the result from the CT scan of the brain showed no abnormalities that could cause loss of consciousness and Chest X-ray revealed patchy, diffuse opacity at both lungs. The patient was eventually transferred to orthopaedics for evaluation of treatment. Based on the patient's

clinical condition, there was no brain abnormalities that could have caused the patient's loss of consciousness. Examination on the patient's blood sample indicated that there were anemia and thrombocytopenia. Using *Gurd's criteria*, it was likely that the patient was suffering from a possible *Fat Embolism Syndrome* (FES).



Figure 2 : CT Scan of the brain and Chest X-ray before ORIF surgery

The patient was rushed into the OR for *Open Reduction Internal Fixation* (ORIF) surgery at the right femur. After the surgery, the patient was transferred to the *Intensive Care Unit* (ICU). On the 1<sup>st</sup> until 3<sup>rd</sup> day the patient was still on a ventilator and on

the 4<sup>th</sup> day weaning is carried out or removing the ventilator on the patient. The following table shows the progress of the patient's condition while being treated in the ICU.

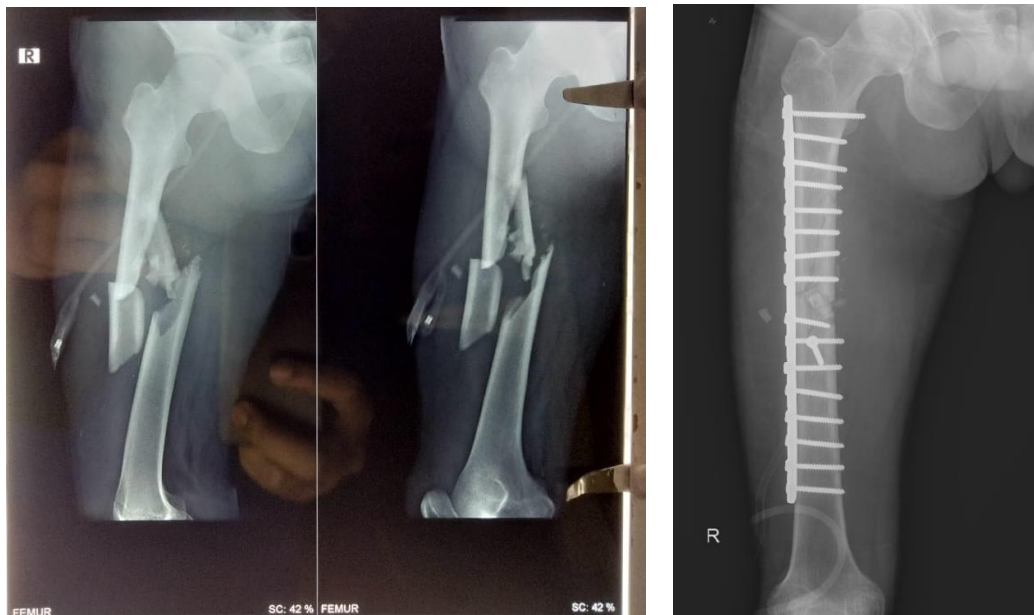
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**Table 1 : The progress of patients in the Intensive Care Unit**

Day	GCS	BP (mmHg)	HR (x/minutes)	RR (x/minutes)	T (°C)	SpO2 (%)
1	E1V1M1	116/74	63	20	36	100% Mechanical ventilator FiO2 50%
2	E2VettM5	151/89	103	22	36.9	100% Mechanical ventilator FiO2 50%
3	E3VettM5	152/82	101	21	36.9	100% Mechanical ventilator FiO2 50%
4	E3V5M6	146/80	67	25	36	96% NK 5 lpm

He was subsequently discharged from the hospital 6 days after his ORIF surgery in stable condition with a GCS of E4V5M6, BP : 125/82 mmHg, HR: 83x/minutes, RR: 20x/minutes, T: 36.6 °C and SpO2 99% room air. On 7<sup>th</sup> days after the surgery, during

the patient's first visit to the hospital he still required assistance for walking. The patient followed intensive physiotherapy to improve his ability to walk. His ability to walk continued to improve until he was finally able to walk without assistance.



**Figure 3 :Radiograph of the femur before and after ORIF surgery**

### 3. DISCUSSION

FES is a rare complication that is most commonly associated with orthopedic trauma and has the highest incidence among closed long bone fractures of the lower extremities. The clinical presentation can appear within 24 to 72 hours after trauma [2]. The femur is the most frequent, and the second is the pelvis. The risk factors include age of 10-40 years, sex (in which male has higher incidence rate), and unstable bone fractures and multiple fractures [3].

The majority of FES processes can be explained by one of two theories. First, according to mechanical theory, an injury-induced rise in intramedullary pressure pushes the marrow into the sinusoidal veins, where it releases big fat droplets into the venous system [4,5]. After being discharged, the fat will enter systemic blood arteries, obstruct lung capillaries, and move to the lungs. Second, according to the biochemical theory, the clinical signs of FES result from a pro-inflammatory state

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caused by tissue lipase's local hydrolysis of triglyceride emboli, which yields glycerol and hazardous free fatty acids [6].

The diagnosis of FES can be established if two major criteria or one major criterion of *Gurd's criteria* are met. At the very least, two of the *Gurd's* minor criteria are observed. Major criteria include petechial rash, signals in the central nervous system unrelated to trauma or other diseases, and respiratory symptoms with radiographic change. Acute thrombocytopenia, a sudden drop in hemoglobin, tachycardia (HR >120 bpm), fever (temperature >39 °C), retinal changes (presence of fat or petechiae), elevated *erythrocyte sedimentation rate* (ESR), and fat globules in sputum are minor criteria [7]. Two major criteria were observed in this patient: respiratory symptoms with patchy opacity dispersed at both lungs; two minor criteria were anemia and thrombocytopenia; and central nervous system indications unrelated to trauma or other illnesses.

The mainstay of treatment for FES is supportive care, which aims to preserve the patient's hemodynamics, oxygenation, and breathing while also doing resuscitation with fluid and blood products [8]. In the most recent experimental study, mice induced by injection of Triolein and administration of Aliskiren were used to study alterations in the renin-angiotensin pathway to prevent FES. These changes included larger blood vessels, decreased fibrosis, and lower fat content in blood vessels compared to the mice that were not injected with said treatment. Further information about the prevention and treatment of FES may be obtained from the research. It is not advised to use corticosteroids for treatment or prophylaxis in FES because there is insufficient high-quality evidence in the research. [9] Research regarding said treatment also does not indicate a lower morbidity and mortality in FES cases [10].

### 4. CONCLUSION

Gurd's criteria are used to determine the diagnosis of FES based on the patient's clinical presentation and particular test results. However, a combination of clinical criteria, laboratory results, and a brain CT scan can help identify FES early and reliably in individuals with a high index of suspicion. If the course of treatment is followed promptly and appropriately, the prognosis will be favorable.

### 5. ACKNOWLEDGEMENT

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### 6. DISCLOSURE

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