Fat Embolism Syndrome in Long Bone Fracture—Clinical Experience in a Tertiary Referral Center in Taiwan

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Background: Fat embolism syndrome (FES) is a potentially fatal complication of long bone fractures. There have been no reports of FES in long bone fractures in this decade in Taiwan. The purpose of this study was to review the FES experiences in a tertiary referral center between January 1997 and February 2008.

Methods: Between January 1997 and February 2008, 13 patients with long bone fractures with documented FES in our institution were reviewed. FES was diagnosed clinically by at least 2 major criteria or 1 major with at least 4 minor signs of Gurd's criteria.

Results: The incidences of FES, less than those reported in the literature, were 0.15% in fracture of the tibia, 0.78% in fracture of the femur and 2.4% in multiple fractures. The mortality rate of FES, similar to other available results, was about 7.7%. All cases were less than 35 years old, except for 1 70-year-old male. Fat embolism occurred within an average of 48.5 hours after long bone fracture. Eleven presented with sudden drop in hemoglobin level, dropping 4.2 g/dL on average. Nine presented with thrombocytopenia, and 10 presented with sudden drop in platelet count, dropping 140,000/dL on average. Two had cerebral sequelae without recovery at the last 48-month follow-up.

Conclusion: This 12-year interval retrospective study revealed modern epidemiologic results for FES in long bone fracture. Compared with the available literature in the recent decade, the incidence of FES in long bone fracture in our institution is less and the mortality rate is similar. [*J Chin Med Assoc* 2010;73(8):407–410]

Key Words: complication, fat embolism syndrome, femoral fracture, long bone fracture, tibial fracture

Introduction

Fat embolism syndrome (FES) is a potentially fatal complication of long bone fractures. The mortality rate of FES was 10–20% or higher in the 1960s,[1] but the rate has reduced to less than 10% on account of more aggressive pulmonary therapy.[2] Early diagnosis and appropriate supportive care can reduce the complication and mortality rates of FES.[1] To our knowledge, there were only 2 reports of FES in fracture in Taiwan, reported a decade ago and giving no information about incidence.[3,4] There have been no epidemiologic studies of FES in long bone fracture in Taiwan in this decade. As times have changed, the increased severity of motor vehicle injury and advances in supportive care may be supposed to influence the epidemiologic results of FES in long bone fracture in Taiwan. Therefore, the purpose of this study was to review the experiences of FES in a tertiary referral center in Taiwan in this decade.

Methods

All patients with long bone fracture with documented FES between January 1997 and February 2008 in our institution were reviewed. Informed consent was obtained from all patients prior to enrolment. According to Gurd's criteria,[5] FES was diagnosed clinically by at least 2 major criteria or 1 major criterion with at least 4 minor criteria and high suspicion of FES. All of these patients received reduction with reaming intramedullary nail for fracture fixation. Demographic data,

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clinical presentation, treatment course and prognosis were all reviewed for analysis.

Results

A total of 13 patients in the 12-year period were found with long bone fracture and subsequent FES. Two patients underwent chest computed tomography angiography scan, and 2 patients underwent ventilation/perfusion scan to confirm the final diagnosis. All of these patients were mainly diagnosed according to Gurd's criteria clinically. Eight of the 13 patients were male, and 5 patients were female. In our institution, all femoral shaft fractures and tibial shaft fractures are managed with reaming internal fixation. All 13 patients received reaming system internal fixation also. One patient had tibial shaft fracture only. The other 12 cases had femoral shaft fracture, including 4 with concurrent fracture of the tibial and femoral shafts; 6 had middle third femoral shaft fracture, and 6 had the fracture site over the middle to distal third junction of the femur. Five of the 13 cases had tibial shaft fracture, with all the fracture sites in the middle third. The incidence of FES was 0.15% (5/3,385) in tibial shaft fracture, 0.78% (12/1,541) in femoral shaft fracture and 2.4% (7/294) in multiple fractures during this 12-year interval. The definition of multiple fractures includes having fracture sites over more than 1 bone, excluding segmental fracture of 1 bone and single-side fracture of the tibia and fibula. Regarding the fracture side, 7 were on the right side only, 5 were on the left side only, and 1 involved both sides. As to age, all of the patients were less than 35 years old except for 1 70-year-old male (Figure 1). Fat embolism occurred within an average of 48.5 (11.73–97.5) hours after long bone fracture (Figure 2).

During the time of FES developing, 6 of 13 cases presented with clear lung field on chest X-ray but progressed within 24 hours. All cases progressed from both sides clear, to right lower lobe, to both lower lobes and then bilateral whole lung involvement. The findings of worsening on the chest X-rays of all patients were infiltration in both whole lungs, except for 1 case in both lower lungs and 1 case in the right lower lung (Figure 3).

When FES occurred, intubation with mechanical ventilator was necessary in 9 (69.2%) patients, while oxygen support via nasal cannula was enough in 2 (15.4%) patients. One patient received oxygen supplement via a simple mask and another via the biphasic airway pressure system. The average time of oxygen supportive care was about 6 days. Six patients developed

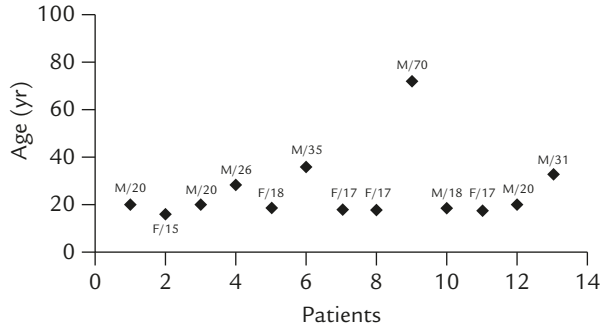

Figure 1. Age distribution of patients. All were younger than 35 years except for 1 70-year-old male. M = male; F = female.

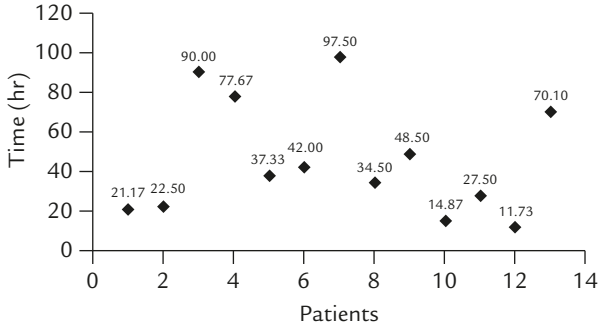

Figure 2. Time from injury to development of fat embolism syndrome (FES). Most of the patients developed FES within 48 hours after long bone fracture.

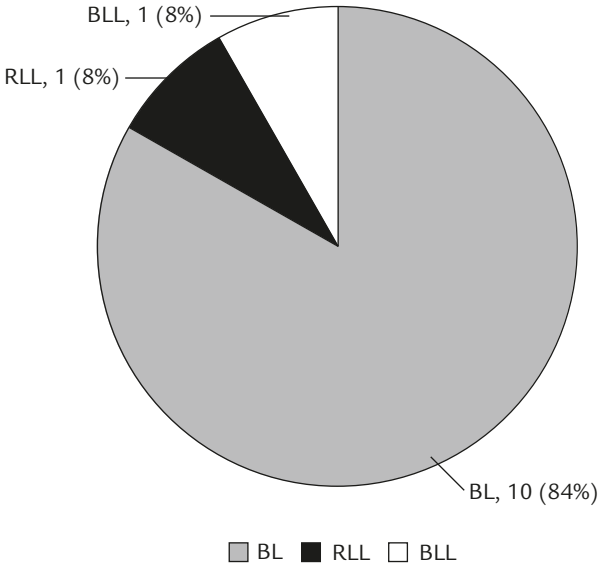

Figure 3. Area of infiltration as seen on chest X-ray. Excluding the 1 patient without any findings of infiltration, the chest X-ray findings of worsening for all patients was infiltration in both whole lungs (BL), except for 1 case in both lower lungs (BLL) and 1 case in the right lower lung (RLL).