



Original article

Fat embolism syndrome in femoral shaft fractures: does the initial treatment make a difference?☆



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ABSTRACT

Objective: To identify the risk factors correlated with the initial treatment performed.

Methods: This is a retrospective study involving a total of 272 patients diagnosed with femoral shaft fractures. Of the patients, 14% were kept at rest until the surgical treatment, 52% underwent external fixation, 10% received immediate definitive treatment, and 23% remained in skeletal traction (23%) until definitive treatment.

Results: There were six cases of fat embolism syndrome (FES), which showed that poly-trauma is the main risk factor for its development and that initial therapy was not important. **Conclusion:** Polytrauma patients have a greater chance of developing FES and there was no influence from the initial treatment.

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Síndrome da embolia gordurosa na fratura diafisária de fêmur: o tratamento provisório faz diferença?

RESUMO

Objetivo: Identificar os fatores de risco e correlacioná-los com o tratamento inicial.

Métodos: Estudo retrospectivo que envolveu 272 pacientes com diagnóstico de fratura diafisária de fêmur; 14% permaneceram em repouso até o tratamento cirúrgico, 52% foram submetidos a fixação externa, 10% fizeram o tratamento definitivo imediato e 23% permaneceram com tração esquelética até o tratamento definitivo.

Resultados: Foram seis casos de síndrome da embolia gordurosa (SEG), nos quais se evidenciou que o politrauma é o principal fator de risco para seu desenvolvimento e que o tratamento inicial instituído não o influenciou.

Palavras-chave:

Fraturas do fêmur

Fixação de fratura

Traumatismo múltiplo

Embolia gordurosa

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Conclusão: Pacientes politraumatizados apresentaram uma maior chance de desenvolver SEG e não houve influência do tratamento inicial instituído.

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Introduction

The release of fatty emboli into the bloodstream can lead to lesion and dysfunction of one or more organs, defined as fat embolism syndrome (FES), mainly due to the mobility in the focus of the fracture¹; however, despite new protocols with aggressive support and intensive therapy, it remains a concern in shaft fractures of long bones.²⁻⁴ Thus, early skeletal stabilization is suggested to prevent this syndrome.¹ However, the decision on the approach to be used depends on the patient's clinical picture and availability of resources.⁵

The present study aims at identifying the risk factors for fat embolism syndrome, and to correlate it with the initial treatment established.

Casuistry and method

This is a retrospective observational study based on data from patients' records from the Department of Orthopedics and Traumatology, seen between January 2011 and December 2015. The information collected includes epidemiological data, trauma mechanism, fracture classification according to the AO classification,⁶ treatment used, and clinical outcome regarding the presence or absence of FES.

Patients with a diagnosis of femoral shaft fracture of both genders, with a minimum age of 16 years were included, and patients with a fracture in a pathological bone were excluded.

Two groups were considered: polytraumatized and non-polytraumatized. The former group included those with multiple lesions exceeding a defined severity (ISS \geq 17).⁶

Regarding the initial treatment, they were divided into: rest (patients who were kept resting in bed with cushions), transtibial skeletal traction; external fixation for damage control, and definitive surgical treatment, either with intramedullary nail or fixation with plate and screws. No patient was definitively treated with external fixation (Table 1).

Table 1 – Distribution of patients as to initial treatment.

| Initial treatment | n | % |
|-------------------|-----|------|
| Rest | 39 | 14.3 |
| External fixation | 144 | 52.9 |
| Definitive | 27 | 9.9 |
| Skeletal traction | 62 | 22.8 |

n, number of patients.

Source: Data obtained from medical records studied. SAME, ISCMSP and HEFR.

Of the patients, 272 patients whose medical records were reviewed met the inclusion criteria. There were 43 (16%) female patients and 229 (84%) male patients. As for the age group, they were predominantly between 16 and 30 years (63%) (Table 2). FES was evidenced in six cases (2.2%).

Regarding the mechanism of trauma, there was a predominance of victims of motorcycle accidents (57%), followed by car accidents (17%), and falls (14%).

We used the AO⁶ group classification for the fractures and obtained the following distribution according to Fig. 1.

Forty-three patients were considered polytraumatized (ISS > 17) (16%), and 67 (25%) had compound fractures.

Results

Five out of 229 male patients (2.2%) developed FES, and in the group of 43 female patients we observed only one (2.3%) ($p = 0.954$).

There was a prevalence of FES in adults, mainly below 30 years (83.3%), but without statistical significance ($p = 0.302$).

Considering only the fact that the patient was polytraumatized as a variable, out of 43, five (12%) developed FES, and in the non-polytraumatized group, only one did ($p < 0.001$).

Six patients (4%) developed FES, five were polytraumatized, of the 144 cases undergoing external fixation as initial treatment.

In the group of 43 polytraumatized patients, 30 underwent external fixation, and of these five (17%) developed FES. In the remainder of the group (13 patients), four were submitted to bed rest, four had definitive treatment in the emergency room, five underwent skeletal traction, but none of these cases had FES.

Regarding the AO classification,⁶ patients with FES were distributed between 32-B2 (50%), 32-A2 (33%) and 32-A3 (17%). We did not find cases of FES among patients with fractures classified as 32-C.

Table 2 – Distribution of patients by age group.

| Age group | n | % |
|---------------|-----|------|
| 16-30 years | 172 | 63.2 |
| 31-40 years | 48 | 17.6 |
| 41-50 years | 19 | 7.0 |
| 51-60 years | 10 | 3.7 |
| Over 61 years | 23 | 8.5 |

n, number of patients.

Source: Data obtained from medical records studied. SAME, ISCMSP and HEFR.

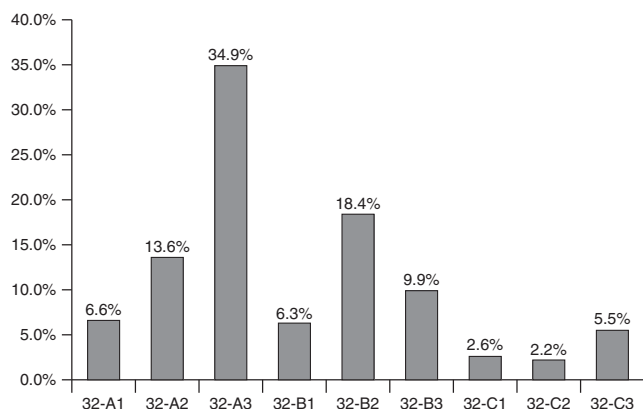


Fig. 1 – Distribution of patients by AO classification.

Source: Data from medical records studied. SAME, ISCMSP and HEFR.

Discussion

FES is related to multiple factors, such as trauma energy, patient predisposition and initial resuscitation.^{1,7} Pinney et al.⁸ described that there is a relation of FES in young adult patients, because they are able to survive high energy traumas, which favors this syndrome. Our study showed that among the six patients with FES, five were less than 30 years old, but this was also the age at which this fracture was more prevalent, with 172 patients (63%). Thus, there is a predominance of FES in the group of young adults, but without statistical significance ($p=0.302$). The same was observed for the male gender, in which femoral shaft fractures were more common (84%) and account for 83% of patients with FES.

The initial management of a patient with femoral shaft fracture depends on the clinical conditions of their hospital admission, taking into account the concepts already established in the literature of Early Total Care and Damage Control. In the patients submitted to definitive primary treatment, there was no FES, which corroborates studies by Bone et al.⁹ and Lasanianos et al.⁷ They demonstrated that the early fixation of the individual femoral shaft fracture in stable patients may be beneficial.

In the group of patients with indication of temporary fixation, Scannell et al. demonstrated that there was no difference in clinical outcomes in patients undergoing both external fixation (EF) and skeletal traction.¹⁰ In our study, there was a higher prevalence of FES in EF patients ($p < 0.02$), and no cases of FES in those undergoing skeletal traction, or bed rest. However, among the patients undergoing EF, in 144 (six with FES), 30 were polytraumatized (five with FES), which was considered the most important factor ($p=0.016$).

Regarding the classification of fractures (classification AO⁶), which takes into account the energy of the trauma, a

higher prevalence of type C fractures was expected in patients with FES because they are fractures with greater instability and greater mobility in the focus; therefore, a greater release of fat emboli is expected.^{1,6} However, in our study, type B2 fractures were the most prevalent in the FES patient group (50%), but among these 50 patients with fracture classification AO 32-B2, eight were also polytraumatized (two with FES), and 42 non-polytraumatized (one with FES). If we were to measure the relationship between embolism and polytrauma in this group of fractures, there was no statistical significance between these variables ($p=0.098$).

Conclusion

The polytraumatized patient is more likely to develop FES, and in our casuistry the initial treatment did not influence in its development.

Conflicts of interest

The authors declare no conflicts of interest.

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