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Fat Embolism Among Patients with Hip and Long Bone Fractures in Albania

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ORIGINAL PAPER

ABSTRACT

Objective: The aim of this study was to assess the incidence and the effectiveness of treatment of fat embolism in patients with hip and long bone fractures (femur and tibia) in Albania. **Methods:** 229 patients (68% men) with combined hip and long bone fractures (femur and tibia) hospitalized at the Orthopedics-Traumatology Services of the University Center "Mother Teresa" during 2004-2006 were included in the study. Patients were classified into three groups based on astrupogram data: $\text{PaO}_2 < 60\text{mmHg}$, $65\text{mmHg} < \text{PaO}_2 < 75\text{mmHg}$, and $\text{PaO}_2 > 75\text{mmHg}$. Chi square test was used to compare fracture differences between men and women and the effectiveness of combined use of metilprednisolon and anticoagulants vs. anticoagulants alone. **Results:** Poly traumas combined with femur fracture were more frequent in 2005. These combined poly traumas combined were more frequent among men than women ($P < 0.001$). Remarkably, femur fractures were more frequent among men than women (9:1). Coli femur fractures peaked in the age-group 76-85 years. In general, poly traumas were less frequent in the older age groups, with a peak between 36-55 years, being more frequent among men, but the difference was not statistically significant. Fractures of coli femur and those of tibia were more frequent in 2006, while in 2004 femur fractures were more frequent. In almost all age groups fractures of coli femur were more frequent, followed by fractures of femur and tibia. In general, poly traumas were more frequent among men than women, ranging from 6:1 for fractures of femur to 2:1 for tibia fractures. The incidence of fat embolism ranged from 4.9% to 8.9% for the period 2004-2006. Among fat embolism patients, 100% of them had tachycardia, 88.2% had petechia, 84% tachipnea, 23.5% cyanosis and blood sputum, and 41.2% obnubilation. In general, during 2004-2006 the frequency of combined use of metilprednisolon and anticoagulants has increased. **Conclusions:** Clinical diagnosis remains the most important element for the detection of fat embolism syndrome. The incidence of fat embolism was 8-9 times higher than the rates reported in literature. This finding is linked with trauma gravity in Albania. Combined use of metilprednisolon with anticoagulants seems to be more effective than use of anticoagulants alone in preventing fat embolism ($P < 0.05$) and patients using the combined therapy have experienced milder forms of disease. Therefore, the combined treatment should be preferred over the single treatment for the prevention of fat embolism.

Key words: fat embolism, prevention.

1. INTRODUCTION

Since Level & Clark defined their three levels of prevention – the primary, the secondary and the tertiary – significant focus of public health interventions has been put on primary and secondary prevention. Traditionally, public health professionals prefer to deal with those levels that are considered more closely related to the core values of public health – those that aim to keep the people healthy in first place or slower the progress of diseases in their early stage of development.

Anyway, the tertiary prevention – the prevention of diseases from becoming chronic, as well as the prevention of disability and death among sick people – deserves significant consideration. It is important not only for the affected individual's sake, but also due to the huge impli-

cation chronic diseases and disability pose in the overall burden of diseases (1).

Fat embolism (FE) is a dangerous, life threatening complication among trauma patients. It is a set of complex circulatory alterations arising as a complication of pelvis and long bone's fractures and is clinically manifested as an acute respiratory syndrome. The first cases of FE were described since the 1800-ies with the very first case reported by Zenker in 1861 and first clinical description made by Von Bergman in 1873 (2).

In addition to the long bone fractures (especially those of proximal and middle segments of femur), among causes of FE can be mentioned trauma, acute pancreatitis, liposuction, cardiac bypass, intravenous lipid intake and cell crisis syndrome. The symptoms are manifested within the first

72 hours and the classical triad includes dyspnea, mental confusion and petechia.

There is still no common agreement on the incidence of FE. Based on retrospective studies, the incidence is reported to be less than 1% (Ministry of Health, 2005 – unpublished). Anyway, current prospective studies put it as high as 11% to 29% (3). The incidence of FE is higher among persons with skeletal damage, in particular long bones' and pelvic fractures. The increase in numbers of road accidents has brought as a consequence the increased observance of this syndrome in the clinical practice.

No specific treatment exists for the disease. The management of the patients is done inside the intensive care units and involves the normalization of the altered respiratory and cardiac functions (1), in addition to the management of the primary condition (the fracture). Maintaining an adequate vascular volume and oxygen saturation are important therapeutic goals. In severe cases, the cardiopulmonary resuscitation is the starting point for the therapy.

Given the severity and the increased frequency of the condition, the prevention of FE in fractures of femur and pelvis is of paramount importance. The traditional prevention therapy consists of the use of anticoagulants. The rationale behind their use is the blocking of thrombocytes' aggregation and release of serotonin (4). There is increasing research evidence that the use of high doses of corticosteroids is also effective in preventing FE, although no final decision is made yet for the inclusion of corticosteroids in the treatment protocol for the prevention of FE (Boga P, 1997 – unpublished). Therefore, the current article aims to bring the Albania experience in the prevention of FE among the patients with fractures of long and pelvic bones.

The goal of this study is to demonstrate the effect of combined use of anticoagulants and methyl-prednisolone (MP) in preventing the occurrence of FE among patients with pelvic, femur and tibia fractures admitted in the Tirana University Hospital Center (TUHC). The conclusions of this study will assist the surgical and ICU teams in better managing FE as a life threatening condition, reducing the complications rate and improving the rehabilitation of trauma patients.

2. METHODS

The determination of FE incidence among patients with pelvic, femur and tibia fractures in the first contribution of this study, in addition to the main objective that is the comparison of effectiveness between the prevention of FE through anticoagulants alone vs. the combination of anticoagulants and MP.

For the purpose of this retrospective study, the research team reviewed the patients' charts for the three years period (2004 through 2006). The inclusion criterion was the confirmed diagnose of pelvic, femur and tibia fracture that was treated surgically in the Trauma Department of TUHC. The exclusion criteria were the pediatric age (less than 15 years) and the presence of polytrauma (including cranial fracture).

Chi square test was used to compare fracture differences between men and women and the effectiveness of combined use of metilprednisolon and anticoagulants vs. anticoagulants alone. The data were analyzed using the statistical program SPSS 14.0, Chicago, Illinois.

3. RESULTS

229 cases were included in the study. Demographic characteristics of the study population (N=229) are presented in Table 1.

Category	Number	Percentage
Gender		
Male	155	67.69%
Female	74	32.31%
Age groups		
16-25 years	36	15.72%
26-35 years	27	11.79%
36-45 years	30	13.10%
46-55 years	46	20.09%
56-65 years	29	12.66%
66-75 years	38	16.59%
>=76 years	23	10.04%
Total 229		

Table 1. Demographic characteristics of the study population

All these cases were treated with anticoagulants with the purpose of preventing the occurrence of FE. In addition, a proportion of the patients were treated with a combination of anticoagulants and MP. The treatment protocol used in the Trauma Center of the TUHC is described below:

Administration of methyl-prednisolone for the prevention of fat embolism

- Initial dose: 30mg/kg
- Administration route: i/V
- Administration time: 30'
- Frequency: every 4 to 6 hours during the initial 48 hours
- Maximal duration: 72 hours

Despite of the preventive treatment 17 patients developed and were diagnosed with FE during the course of treatment. The annual incidence of FE among the patients is presented in the Table 2.

Year	Patients	FE cases	Incidence	95% CI
2004	81	7	8.64%	(TBD)
2005	67	5	7.46%	(TBD)
2006	81	5	6.17%	(TBD)
Total	229	17	7.1%	(TBD)

Table 2. Annual incidence of fat embolism among the surgically treated fractures' cases in TUHC for the period 2004-2006

Treatment	Patients	FE cases	Incidence	95% CI
AK	138	12	8.69%	(TBD)
AK+MP	91	5	5.49%	(TBD)
Total	229	17	7.19%	(TBD)

Table 3. Incidence of Fat Embolism among treated patients based on the preventive treatment regime

The incidence of FE among the surgically treated fractures' patients was 7.1% with an annual incidence varying 6.17% to 8.86%. from the total number of patients 140 (60.6%) were treated only with anticoagulants (AK), whereas 91 (39.4%) were treated with a combination of anticoagulants and methyl-prednisolone (MP).

Following the preventive treatment, 5 patients in the "combined group" developed FE as compared to 12 patients

in the “AK group”. The results are presented in the Table 3.

The incidence of FE is higher among the group treated only with anticoagulants (8.57%) as compared to the group treated with the combined therapy (anticoagulants and methyl-prednisolone).

4. DISCUSSION

The three year incidence of FE among the surgically treated patients with a fracture of pelvis, femur or tibia (or combination of one or more) in the Trauma Center of TUHC is 7.86%. This figure represents a lower figure as reported to the incidence of FE among patients not receiving preventive treatment (literature provides figure ranging between 11% and 29%). Therefore, we can conclude that the preventive treatment of FE in Albania TUHC has had a relative success. Keeping in mind the severity of the case mix treated in the TUHC, the success of the preventive treatment can be considered as further enhanced.

The use of combined therapy (anticoagulants and methyl-prednisolone) is accompanied by both a reduced incidence of FE (5.49% vs. 8.57%, $p < 0.05$) as well as with lighter clinical manifestations of FE. Therefore, the researchers recommend that the treatment of surgical patients suffering from fractures of pelvis and long bones should include methyl-prednisolone as a form of prevention for the development of fat embolism. In addition, evidence from our study reveals that even when the combined therapy fails to prevent the

development of FE, the clinical manifestations of the diseases are lighter and the course more favorable.

5. CONCLUSION

Medical and public health professionals should pay particular attention to the new developments in the field of tertiary prevention as means to prevent diseases from becoming chronic or causes disability and death. A successful tertiary prevention intervention does not only relieve individual suffering, but also contributes directly to the reduction of burden of diseases and disability—a big challenge of the 21st century.

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