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IS EARLY TOTAL CARE TREATMENT SAFE IN BORDERLINE POLYTRAUMA PATIENTS WITH FEMORAL FRACTURE?

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ABSTRACT
EVEN TODAY THE POLYTRAUMA REMAINS A VERY CONTROVERSIAL SUBJECT DUE TO HIGH COMPLICATIONS RISK AND UNPREDICTABLE EVOLUTION OF PATIENTS. WE KNOW THAT MINUTES FOLLOWING TRAUMA, THE PATIENT IS EVOLVING TOWARD AN INTENSE AND GENERAL INFLAMMATORY RESPONSE, THAT PUTS THE PATIENT AT RISK FOR DEVELOPING GENERAL COMPLICATIONS. THE ACUTE POSTTRAUMATIC COAGULOPATHY IS ONE OF THEM WITH A HIGH MORTALITY RATE IF LEFT UNTREATED. WHEN WE HAVE A PATIENT LIKE THIS THAT ALSO ASSOCIATES FEMORAL FRACTURE AND IMPORTANT ASSOCIATED LESIONS LIKE HEAD TRAUMA, THORACIC TRAUMA, ABDOMINAL INJURY, OR PELVIC INJURY, THE RISK OF DEVELOPING GENERAL COMPLICATIONS IS EVEN HIGHER, SO A RAPID AND SAFE TREATMENT IS NEEDED. IS THESE CASES A COMPLEX MULTIDISCIPLINARY APPROACH IS NECESSARY IN ORDER TO INSURE SURVIVAL AND RECOVERY OF THE PATIENT.

KEY WORDS: POLYTRAUMA, FEMORAL FRACTURE, EARLY TOTAL CARE (ETC), DAMAGE CONTROL (DCO).

INTRODUCTION

Trauma can be considered a world pandemic, being a recurrent cause of morbidity and mortality. Globally, about almost 6 million people die because of posttraumatic injuries.

Polytrauma is caused by high energy traumatic agents with immediate vital risk. So it is important to know which of these patients are at risk for developing local and general

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complications. There are a large number of trauma scores available today, like the Abbreviated Injury Score (AIS)[6], that was first published in 1969 and revised in 1990. This trauma score tries to offer a global picture by describing lesions on every region and asses the gravity of every region. This score is grated 0 to 6, where **0** is the 0% chance of death, **1** has an 1-2% chance of death, **2** has an 8-10% chance of death, **3** has an 5-30% chance of death, **4** has a 5-50% death chance, **5** has a chance of death that can go up to 100%, and **6** is the maximum gravity with high chance of death, the lesions being incompatible with life. We must say that AIS best reflects the impact on survival and less the absolute gravity of the lesion.

Later, the Injury Severity Score (ISS) designed by Baker[7] appeared, that quantifies the lesions on regions of the body and grades then by gravity, with a maximum of 75 points.

According to Pape[8], a polytrauma patient is considered to have an ISS above 15 or an AIS above 3 in at least two body regions, and at least one of the following: Hypotension (systolic blood pressure below 90mmHg), or unconsciousness (Glasgow Coma Scale below 8) or acidosis (base excess below -6.0) or coagulopathy (INR above 1.4 or PTT above 40) or age above 70 years.

The resuscitative measures must be started as soon as possible and an appropriate surgical treatment of the femur is mandatory, because of the hypovolemic shock risk due to the high vascularization of the femur[9]. This complication can occur even more often in polytrauma patients that can have also a posttraumatic coagulopathy that can alter coagulation mechanisms[10].

The main options of treatment are either "early total care" that consists in a intramedullary nail that can be reamed or unreamed or "damage control protocol" with external fixation of the femur and later the conversion of treatment with an intramedullary nail. We traditionally know from the literature that the intramedullary nail can lead to a high risk of developing general complications like ARDS and that the external fixator has a higher risk of infection[11], but things are not that clear today.

The literature says that patients with severe chest or head trauma are at risk for developing general complications after primary femur stabilization[12], so we need different approaches depending on the patients general condition.

In the present paper we wanted to evaluate the patients and to identify the factors that can influence the evolution toward complications in polytrauma patients with femoral fracture.

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METHODS

We evaluated 81 patients treated in the Clinical Emergency Hospital Of Bucharest, Romania between 01.01.2015 and 31.12.2018. The inclusion criteria were:

- ISS above 16;
- Age of the patients above 18 years old;
- Femoral diaphysis fracture;
- Informed consent according to the hospital regulations;

The evaluation of the patients included:

- Demography and epidemiology.
- Analysis of the traumatic event that included analysis of the type of trauma, the time from trauma until the stabilization of the femur, type of femoral fracture.
- ISS score at admission.
- The presence and type of associated injury.
- Type of fixation: ETC vs. damage control.
- Need of blood transfusions.
- Development of general complications: MSOF and ARDS.
- Local complications.

RESULTS

1. The most affected patients were included in the 18 - 35 years group, and most of the were males (figure 1).

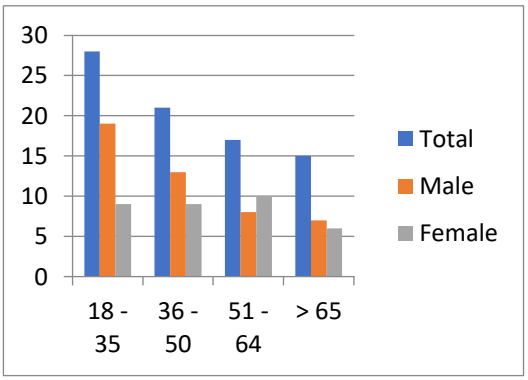

Figure 1 - Demography and epidemiology

2. Etiology of the trauma was in most cases following road traffic accidents, followed by work related injuries and falls from height (figure 2).

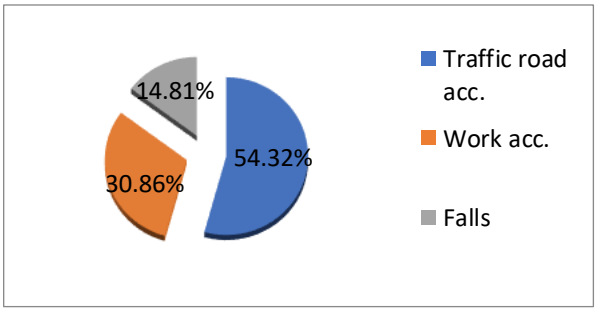

Figure 2 - Etiology of trauma.

3. Time from trauma and femur stabilization was done in most cases during the first 12 hours (figure 3).

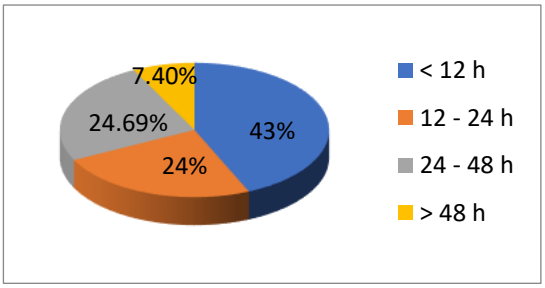

Figure 3 - Time of stabilization

4. Type of femoral fracture according to the AO classification. Most fractures were cominutive fractures.

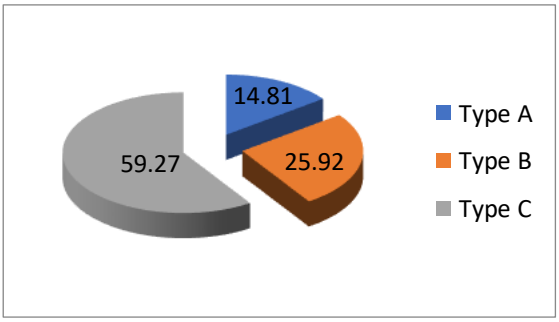

Figure 4 - (type of fracture).

5. Open fracture were found 37% of the patient (figure 5). We eliminated from the study open fractures type IIIB and IIIC due to high risk of infection in this cases external fixator being indicated.

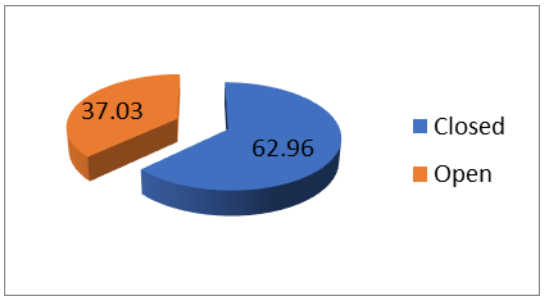

Figure 5 - Open fractures.

6. ISS score at admission. Most of the patients had an ISS above 25, that shows the gravity of the lessions.

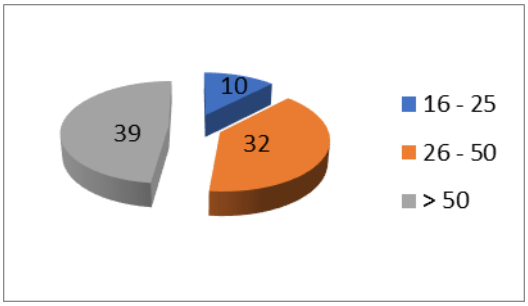

Figure 6 - ISS score.

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7. Associated injuries. Complex injuries were found in most of the patients that had femur fracture (F), head trauma (H), chest injury (C), abdominal injury (A), pelvic trauma (P) - figure 7.

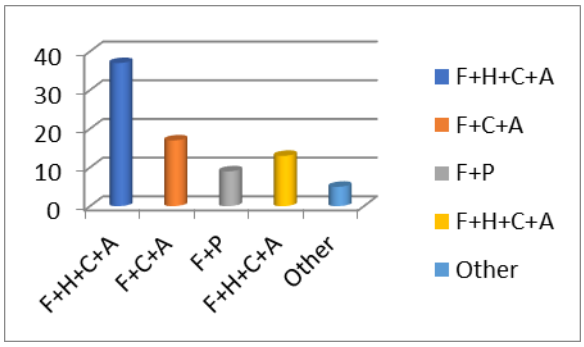

Figure 7 - Associated injuries

8. Type of fixation ETC vs. damage control. In the 16-25 ISS group, ETC was used mostly, and damage control was used in ISS above 50 group. We consider the borderline patient to be in the 25-50 ISS group, where we used either ETC or damage control depending on the patient general condition.

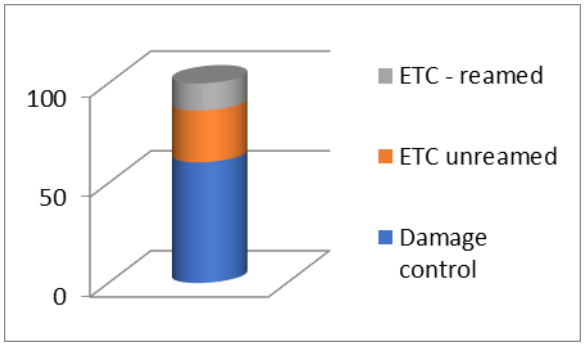

Figure 8 - Type of fixation

9. Considering the need for blood transfusions, 83% of the patients required blood transfusions. The damage control group needed the most blood transfusions, but this was the group with the most severe injuries (figure 9).

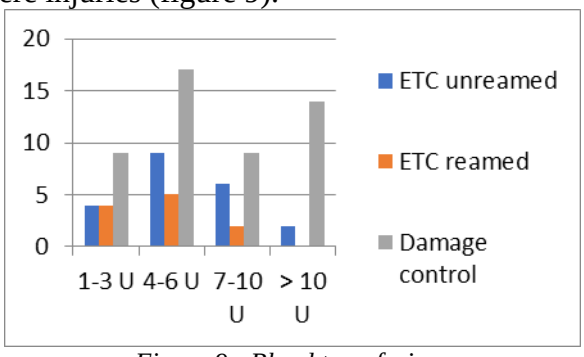

Figure 9 - Blood transfusions

10. ARDS. The overall incidence of ARDS was 11.11%, most of the patients being males. The most cases were in the damage control group, but without statistical difference between the ETC group. Five of the nine patients with ARDS had an ISS > 50, and four hand an ISS above 26, the ISS score correlated with development of ARDS (p=0.04). ARDS developed more often in groups that were operated at more than 24 hours.

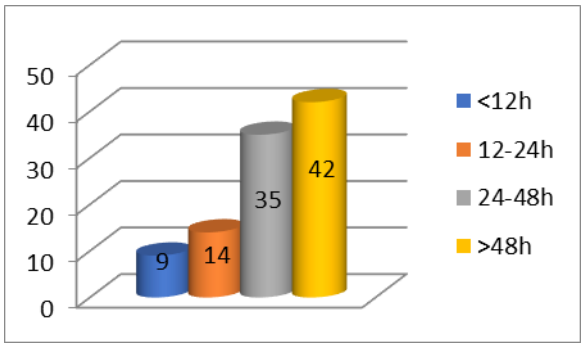

Figure 10 - ARDS

Other factor that correlates with development of ARDS were head trauma (p=0.03), chest trauma (p=0.01), and time of fixation above 24 hours (p=0.02).

11. MSOF. 18.51% was the general incidence of MSOF. The medium ISS score among the patients was 33.6. Most MSOF cases were among the damage control group, but once again these were the patients with the most severe injuries and the early total care group with reamed nails.

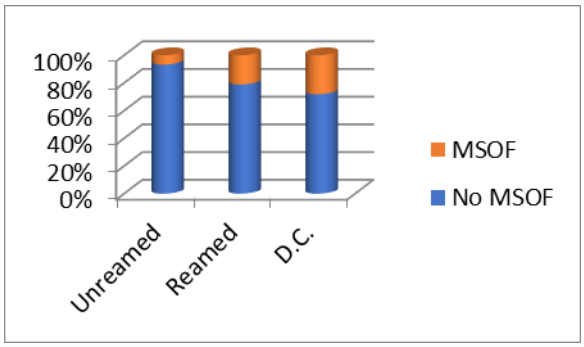

Figure 11 - MSOF

Other factor influencing MSOF were ISS score (p=0.03), head trauma (p=0.04), type of surgery (p=0.05).

12. Local complications. We had 19.75% local septic complication rate.

	Osteitis	**Pin track**	**Wound**
ETC	2		4
DCO	3	5	2

Pin tract infections were treated with local debridement and removal of pin. In the osteitis cases removal of the implants was necessary.

DISCUSSION

The polytrauma induces a systemic inflammation response. That is why we need a multidisciplinary evaluation at admission and a rapid application of resuscitative measures. In order to prevent further aggravation of the general condition, our surgical act must be rapid, must not produce an extra inflammatory response, and must not be associated with high blood loss, or prolonged operating time. Otherwise we may find ourselves in the position

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that we induced an second hit phenomenon that can raise the risk for general complications like ARDS or MSOF. We know that the stabilization of the femur is a resuscitative measure itself[13], but care must be taken in order to adapt the surgical management to the overall condition of the patient.

Patients in critical condition are at a high risk for developing general complications if they are submitted to inappropriate surgical management. For example chest trauma is a major risk for developing ARDS and care must be taken in these patients[14].

In his study, Pape[15] observed that borderline patients operated with intramedullary nail had a higher incidence of ARDS than patients operated with external fixation. Borderline patients operated with intramedullary nail had a 6 times greater risk for ARDS than patients operated with damage control principles[16].

CONCLUSION

In stable patients, with a low ISS we recommend to use ETC with unreamed nails were this is possible. It is a safe stabilization technique for this group of patients.

In patients with ISS between 26-50, we have the borderline patients, that have serious injuries, but some of them may be fit for primary stabilization, depending on their general condition and the extent of general inflammation. Care must be taken in this group of patients, damage control orthopedics may be a safer choice of treatment especially for patients with head or chest trauma.

Patients with ISS above 50, should benefit only by external fixator stabilization. These are the patients with the most severe injuries, most of them with SIRS, and any other surgical gesture can have o potently fatal outcome.

Polytrauma is a severe condition with serious possible complications. At first the treatment should be oriented on saving the patients' life, and after the general condition has improved to address the femoral fracture in a definitive way.

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