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Medical Sciences

FEMORAL FRACTURE IN POLITRAUMA PATIENT - AVOIDING THE "SECOND HIT" - CASE PRESENTATION

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ABSTRACT
TREATMENT OF FEMORAL FRACTURES IN POLYTRAUMA PATIENTS CAN BE VERY CHALLENGING FOR SPECIALISTS ALL AROUND THE WORLD, DUE TO THE LARGE NUMBER OF POSSIBLE STABILIZATION TECHNIQUES AND IMPLANTS THAT ARE AVAILABLE. HOWEVER, IN THIS CASE, WE NEED TO SEE THE BIG PICTURE AND TO ACKNOWLEDGE THE FACT THAT THE PATIENT IS IN A VERY PRECARIOUS CONDITION AND HIS SENSIBLE EQUILIBRIUM CAN BE BROKEN BY SURGERY. IN THIS CASE WE NEED TO REMOVE THE RISK OF THE SECOND HIT PHENOMENON AND TO APPLY THE DAMAGE CONTROL PROTOCOL IN ORDER TO LIMIT MORBIDITY AND MORTALITY.

KEYWORDS: FEMORAL FRACTURE, POLYTRAUMA, DAMAGE CONTROL, SECOND HIT

CASE PRESENTATION

INTRODUCTION

Femoral fractures in polytrauma patients remain a major factor of morbidity and mortality. We know that the femoral diaphysis fracture can lead to hypovolemic shock due to the high vascularization of the femur [6]. Associated with polytrauma, this complication can occur even faster due to the posttraumatic coagulopathy that most of this patients have, so a rapid and correct treatment is needed in order to limit the appearance of complications and mortality of these patients[7].

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[6] Alonso J, Geissler W, Hughes JL. External fixation of femoral fractures. Indications and limitations. Clin Orthop Relat Res. 1989;241:83-8.
[7] Ball CG. Damage control resuscitation: history, theory and technique. Canadian journal of surgery Journal canadien de chirurgie. 2014;57(1):55-60.

The treatment must be oriented at first in order to save the patient's life, to correct de deficits and to take all resuscitative measures that are needed[8] . The second hit phenomenon occurs while on a inflammatory state of the patient we perform an important surgery with associated bleeding, reaming and prolonged operating time[9] . In order to avoid this, after the patient is considered hemodynamically stable, we stabilize the femur by damage control protocol, the final stage of the treatment being done when the general condition of the patient will permit it. The advantage of this method is that the initial method of stabilization, the external fixator, can be a resuscitative measure itself, by limiting the bleeding[10] .

METHODS

We present a case that will show the challenges of treating a femoral diaphysis fracture in a polytrauma patient. The patient, 35 years old, is rushed to the Clinical Emergency Hospital following a traffic road accident, intubated, with a systemic arterial pressure of 75mmHg, and a heart rate of 120 bpm. At admission, according to the protocol, the patient is evaluated in a multidisciplinary team (general surgeon, plastic surgeon, orthopaedic surgeon, vascular surgeon and intensive care specialist). The patient is then rushed to the CT scan that shows:

- Fracture of the nasal bone, ethmoid bone and right maxillary sinus;
- Fracture of ribs and pulmonary contusion;
- Hepatic contusion with sub capsular hematoma and retroperitoneal hematoma;
- Complex pelvic fracture (bilateral pubic rami fracture, pubic symphisis disjunction and right sacroiliac dislocation (figure 1).

Above all that, the patient also has an type III A open cominutive fracture (according to Gustillo Andersen classification) of the left femoral diaphysis (figure 2).

Figure 1 - Complex pelvic fracture

Figure 2 - Femoral fracture

[8] Broos PL, Miserez MJ, Rommens PM. The monofixator in the primary stabilization of femoral shaft fractures in multiply-injured patients. Injury. 1992;23(8):525-8.

[9] Pape HC, Giannoudis PV, Grimme K, van Griensven M, Krettek C. Effects of intramedullary femoral fracture fixation: what is the impact of experimental studies in regards to the clinical knowledge? Shock (Augusta, Ga). 2002;18(4):291-300.

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The laboratory findings are:

- Hemoglobin 8.2g/dL;
- Severe leukocytosis (22.600/mm3);
- Thrombocytopenia (84.000/mm3);
- Acute base deficit (-15mEq/L);
- PaO2/FiO2 ratio = 69;
- Severe metabolic acidosis (lactate 12 mEq/L);
- ISS score of 27;

Due to the hemodynamic instability the patient is rushed intro de OR, where the resuscitative measures are continued combined with the appropriate surgical management.

- The general surgery team did a peritoneal lavaje and drainage.
- Stabilization of the pelvic ring because of the rotational and vertical instability; these kind of lesions can pose a real threat by the secondary bleeding. The stabilization was achieved with an external fixator (figure 3 and 4).
- Stabilization of the femoral diaphysis fracture, this being also an haemostatic gesture. Due to the hemodynamic instability, also an external fixator was used (figure 5).
- Surgical debridement of the wound;

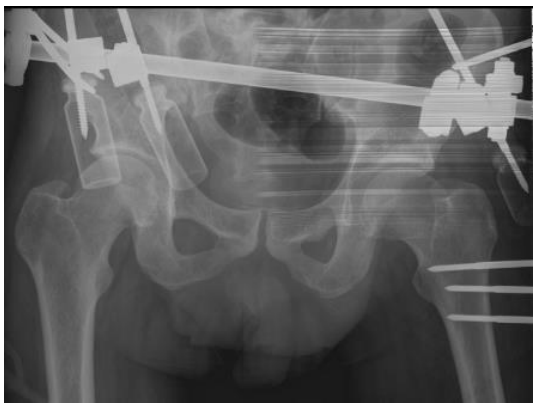

Figure 3 - Stabilization of the pelvic ring

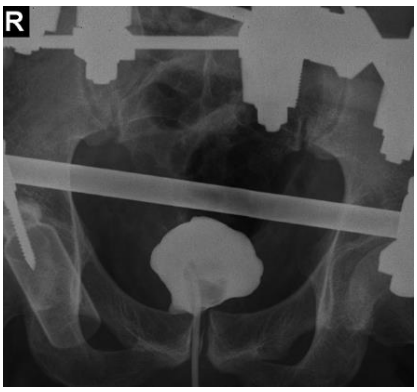

Figure 4 - Stabilization of the pelvic ring

Figure 5 - Femoral stabilization

RESULTS

Considering the soft tissue defect following wound debridement**,** VAC therapy (negative wound pressure) was used in order to facilitate granulation and to limit secondary contamination.

A numerous second look type of surgeries consisting of soft tissue debridement followed, with continuous VAC therapy until the defect was closed.

Also, the general condition of the patient improved, and slowly he started to do simple joint exercises and walk with crutches.

After 2 months, we took out the external fixator form the pelvic ring and saw that the reduction maintained, so in this case the external fixator was used as a definitive treatment (figure 6 and 7).

Figure 6 - Pelvic ring after ExFix

Figure 7 - Pelvic ring after ExFix (outlet view)

This cannot be applied for the femur, because of the big bone defect.

So, we decided, together with the plastic surgery team to perform an osteoplasty of the bone defect using a vascularized bone graft the was harvested from the peroneum, that was fixed with screws while maintaining the external fixator that was reinforced (fig. 8 and 9).

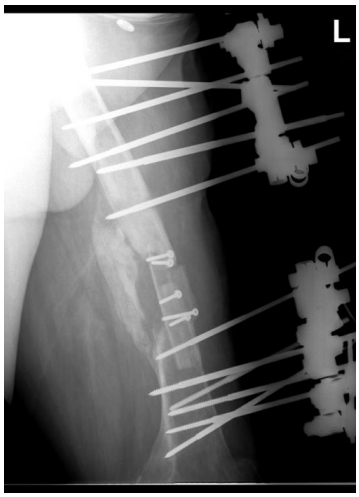

Figure 8 - AP view of the femur

Figure 9 - Lateral view of the femur

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At first the evolution was good, but after 4 weeks the monitoring skin island flap viability was compromised; this means that the transplant was not successful and now the bone graft can become a bone sequestrum with a high chance of infection.

So we decided to remove the graft and an cemented spacer with antibiotic was mounted (figure 10 and 11).

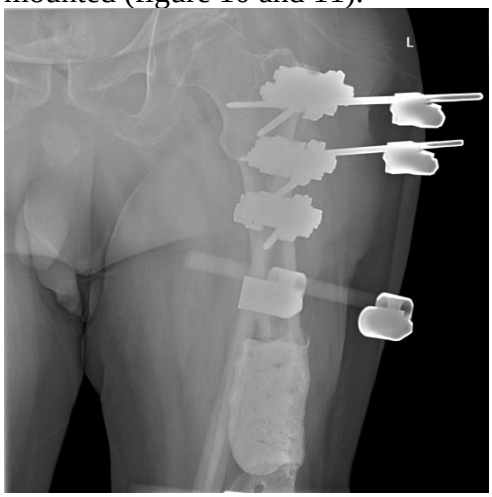

Fig. 10 - Cemented spacer AP view

Fig 11 - Cemented spacer lateral view

After the normalization of the inflammatory markers and proper wound healing, we removed the spacer and performed the final fixation using an titanium anterograde femoral nail that was locked proximal and distal and an osteoplasty using cancellous bone graft and bone substitute with an contention device for the graft (figure 12, 13, 14 and 15).

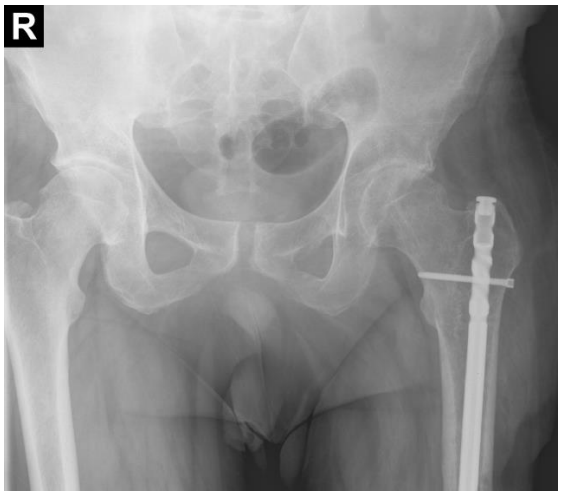

Figure 12 - AP view of the pelvis

Figure 13 - AP view distal femur

Figure 14 - Lateral view proximal femur

Figure 15 - Lateral view distal femur

CONCLUSION

The femoral fracture treatment in polytrauma remains controversial. Some authors tend to say that the stable polytrauma patient with femoral fracture may be operated following early total care principles, while borderline and unstable patients to be operated by damage control principles. However, the term stable is not very well defined, and in most cases the surgeon's experience can make the difference between life and death. So we recommend that in polytrauma patient that associate femoral fracture is safer to apply the damage control protocol, and use as primary stabilization the external fixator and convert the treatment after the general condition of the patient has improved.

In this case however the patient had an open fracture of the femur and a large bone defect, so this made things even harder. In the end we managed to find the appropriate treatment and the patient did an almost full recovery.