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A case of acute bilateral femur fracture with vascular injury

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ABSTRACT

The femoral fractures remain the great challenge for orthopedic surgeons regarding time of fixation and appropriate fixation techniques. There is a bimodal distribution of fractures occurring most frequently in young males after high-energy trauma (motor vehicle accidents) and in elderly females after falls from standing. Young patients with femoral fracture are under the great risk of multiple injuries. Hence, the great significance is optimal time of fixation. We present a case of unusual pattern of injury and fixation technique of bilateral proximal femur fracture associated with vascular injury, with very satisfied outcome.

1. Introduction

Femoral fractures are very common in the population under 25 years of age and in the population over 65^[1]. The incidence of fractures of the femur is 1/10000 patients a year. They are usually the result of high-energy trauma (traffic accidents, gunshots injuries, falls from heights) and often associated with injuries of other structures (soft tissue, neurovascular) and other systems. These injuries can therefore be life threatening and with long-term consequences.

Patients with a fracture of the femur can lose 500–1 500 mL blood, and this loss may be greater if there is an injury of the main blood vessel. Therefore, more than 50% of patients with femur fractures require blood transfusion and these patients represent the case for intensive care unit (ICU).

This paper presents a case of a patient who sustained bilateral extracapsular proximal femur fractures with unilateral lesion of femoral artery and vein by falling from the height.

2. Case report

A 50-year-old male patient sustained his injuries by falling from the roof (the height is about 6 m). He was brought by a

private car to the Resuscitation Department of Emergency Center in Belgrade, where he underwent complex examination by anesthesiologist, neurosurgeon, general surgeon and orthopedic surgeon. On examination the patient was uncommunicative, restless, covered with cold sweat and blood pressure was 110/75 mmHg with heart rate of 90/min. Then he was immediately intubated and sedated.

Clinical examination revealed the presence of deformities in the area of the proximal parts of both femurs with pathological mobility of bone fragments. Clinical examination also revealed two wounds, one in the right gluteal region, and the other on the medial side of the proximal part of the right thigh. The pulses of popliteal artery, posterior tibial artery and pedal dorsal artery were very weak, so the vascular surgeon has been called and at the first examination he has not established the presence of lesions of the major blood vessels and he indicated a new consultation in 2 h. After initial stabilisation with aggressive fluid resuscitation the patient was hospitalized on ICU.

After 2 h, exclusion of intracranial, intrathoracic and intra-abdominal bleeding, orthopedic surgeon had been called in order to clarify the great loss of blood, followed by falling in hematocrit and blood pressure. At this moment, the pulses of popliteal and posterior tibial artery were not palpable and the vascular surgeon was called again. Regarding increased blood loss and hypotension, despite transfusion of 3 L of full blood, the vascular surgeon had indicated right femoral arteriography, where the lesion of femoral artery and vein in the length of about 10 cm had been seen. The patient was taken urgently to the operating theatre. The intramedullary fixation of right proximal

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femur and open reduction and internal fixation of left proximal femur have been performed by an orthopedic surgeon (Figures 1 and 2), followed by reconstruction of right femoral artery and vein with autograft, performed by vascular surgeon.

After initial surgical treatment, the patient was returned to the ICU. According to the witnesses, the patient fell from the roof and sustained the injury with metal spike with entry wound in the right gluteal region and exit wound on the medial side of right thigh, which can explained the injury of main vascular structures.

The patient stayed at the ICU for more than 20 days because the systemic inflammatory response syndrome and sepsis had been developed. After stabilisation of his general condition he was translated to the Orthopedic Department, where the conversion to the intramedullary fixation of the right femur had been performed. One year after surgical treatment, the hardware had been removed, the patient was able to walk with crutches with full bearing on both legs. Patient had no pain, but limited range of motion in both hip joints. Vascular status is without pathological findings (Figures 3 and 4).



Figure 1. Intramedullary fixation of the right proximal femur fracture after temporary external fixation.



Figure 3. After hardware removal (18 months after injury).



Figure 2. Fixation of the left proximal femur fracture with clinical decision support system.



Figure 4. Good functional outcome despite insufficiently fixation and vascular injury.

3. Discussion

Fractures of the femur can be easily diagnosed, because there is usually an obvious deformity and pain of the fractured bone. After clinical diagnosis of the femur fracture, next step is to check the neurovascular status of the limb. The injury of blood vessels may occur directly by the initial force or secondary caused by moving of bone fragments^[2,4]. In our case, it was probably a combined primary and secondary damage of blood vessels. This is the point of this case to spare the time of diagnosis and to perform the treatment as soon as possible, *i.e.* to decrease the risk of the fatal outcome.

When there is a fracture of the femur, the incidence of the injury of vascular structures is up to 0.1%–2.0%^[3,4]. In the absence or asymmetry of pulses, every surgeon must be aware of a possible vascular lesion. Re-evaluation of the quality of the pulse needs to be done after mild stabilization of fractures by longitudinal traction. If there is a lack of pulse and the ankle-brachial index is less than 0.9, one should immediately call a vascular surgeon and ultrasound or angiography should be done.

In our case, there was the first suspicious of a vascular injury, but neither ultrasound nor angiography were performed and the waiting time was 6 h. However, the surgical procedures were performed within 8 h after admission to the emergency room. That is important in the sense of shortening of ischemic time.

Some authors thought that it is not always necessary to do angiography, because it leads to the loss of precious time, but the patient must immediately be taken to operating theatre, and angiography should be reserved for cases when the level of the lesion is not clear or when it is not clear if there is a vascular lesion^[5].

What is also important at the initial examination of the patient with a fracture of the femur are anterior-posterior x-ray and profile images of pelvis, femur and knee, because injuries of ipsilateral femoral neck and knee are very common. According to some studies injured femoral neck in patients with femur fractures initially remained undiagnosed in more than 30% of patients and the incidence ranged between 2% and 9%^[6].

Artery injuries are rare in closed fractures with incidence of 0.3%^[7]. In our case, a violation of femoral artery and vein had been caused by the specific mechanism of injury, so in this case we speak of open fractures.

Regarding the type of injury, the patient's general condition and the fact that in this case, an operative stabilization of fractures and surgery on blood vessels were required, pelvic femoral external fixation had been done.

The patient was treated within 8 h from the time of injury at orthopedic side, which is according to the recommendations in the international literature, where several studies demonstrated that mortality in patients with injury severity scorer greater than 18 is less if the stabilization was done in the first 24 h, and also lower incidence of pulmonary complications (acute respiratory distress syndrome, fat embolism and pneumonia) and the shorter hospital stay^[8].

It is very common that the simultaneous work of orthopedic and vascular surgeon is required. There are conflicting opinions on the priority of these two types of surgical procedures. Some studies have shown that it is better to do the stabilization of the fracture^[9], while other studies first favor the treatment of vascular lesions^[10]. Benefits of stabilizing of the fractures are the possibility of maintaining the length of the graft and

smooth the surgical treatment of blood vessels, because it eliminates the potential danger of secondary damage caused by bone fragments, but there is a danger of prolonged ischemia. First, we decided to do pelvic femoral external stabilization of the fracture, which did not require much time and so we ensured the vascular surgeons can easily do interposition of venous graft. External fixation is a suitable method for associating injuries due to the small and fast application of soft tissue damage^[11,12].

Pelvic femoral external fixation is unable to preserve the anatomical relationships, it can be achieved only by rigid fixation, but we decided for this type of stabilization in order to bring the patient in the condition when the vascular surgeons can freely do a reconstruction of artery and vein. Further, it came to the migration of external fixation, probably due to pronounced degree of comminution of the proximal femur^[13], and we did the conversion to intramedullary fixation. All the time we had very poor patient compliance, probably due to alcohol withdrawal, but a year and a half after the injury, we are very satisfied with the results of treatment because the patient has no pain and walks with a cane (a few hours during the day even without a cane).

We are particularly happy with the result of treatment according to the results of some studies which showed that very often patients must undergo limb amputation due to initial unrecognized lesions of vascular structures^[14].

Conflict of interest statement

The authors report no conflict of interest.

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