

Pelvic ring fractures in polytrauma patient – a perpetual challenge – four case presentation

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ABSTRACT

In this paper we present a series of four cases of multiple trauma patients that associated pelvic ring fractures. The objective was to show the complexity of this pathology, the therapeutical efforts needed to treat such patients and the very different end results such case may have. Polytrauma is still a serious public health issue because of the increased mortality and morbidity in the young population, which leads to a significant socio-economic impact.

Keywords: polytrauma, pelvic fractures

INTRODUCTION

Pelvic fractures are relatively uncommon with a reported incidence of only 2–8% of all fractures, but in multiple trauma patients, the frequency can rise up to more than 25% [1]. Haemorrhage makes pelvic fractures the most serious skeletal injury resulting in substantial mortality that ranges from 5% to 50% in the literature and is dependent not only on the type of pelvic ring fracture, but also on the severity of associated injuries involving the abdomen, chest, and central nervous system [2].

Although consensus has not yet been achieved regarding the definition of polytrauma, this term usually refers to severely injured patients. The most frequently used definition is related to the Injury Severity Score (ISS), and the wide used definition of polytrauma refers to an ISS >16, with at least one life threatening injury.

MATERIAL AND METHOD

This is a series of four case presentation of polytrauma patients that associated pelvic ring fractures.

CASE PRESENTATIONS

Case 1

A 36 years female patient admitted after a road traffic accident with complex rotationally unstable pelvic fracture (Tile type B1 “open-book” fracture). At the time of admission in the Emergency Department the patient was aware, cooperative, blood pressure 137/75 mmHg and heart rate of 92 bpm and presenting multiple wounds to the upper limbs and also with immobilization in the pelvic binder.

The pelvis CT scan shows fracture of the left iliac wing, left sacral wing with small detached bony

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fragments, right iliac wing fracture and moderate dislocation of the sacro-iliac joints, displaced fractures of the ilio and ischiopubic rami bilaterally, fractures of the transverse processes of the L2, L3, L4 and L5 vertebrae.

The patient was admitted in the Operating room and a pelvic external fixator was applied to reduce and stabilize the pelvic ring injury. The post-surgery evolution of the patient was uneventful with a favorable evolution of hemoglobin, leucocytes and INR values (Figure 1) and a decrease of the creatine kinase level from 504 U/l at admission to 27 U/l at 13 days after surgery when she developed intense dyspnea and loss of consciousness. After a full cardiological exam and a thoracic Computer Tomographic examination that shows a filling deficit in the bilateral pulmonary arteries, the diagnosis of pulmonary embolism is confirmed.

After this event the patient is transferred to the Intensive Care Unit where specific supportive and anticoagulant (unfractionated heparin) treatment is established.

The evolution of the patient is favorable, the thoracic CT scan done 7 days after the pulmonary embolism shows reduction of filling defects in the pulmonary arteries and partial re-permeabilization of the lobar arteries. The transthoracic echocardiography performed at the same interval shows undistended right ventricle, hypertrophy of interventricular septum, preserved left ventricular ejection fraction (55%) and no pulmonary hypertension.

The patient evolved favorable onward and was discharged 6 weeks after removal of the pelvic external fixator.

Case 2

A 19 years old football player who suffered a road traffic accident was transported at the Emer-

gency Department as a polytrauma case (ISS 50) with severe cranial trauma, traumatic shock, left occipital wound, upper airway obstruction, chest trauma with suffocating pneumothorax and subcutaneous emphysema, abdominal trauma, right clavicle fracture, and pelvic trauma. He also presented an undisplaced type Denis zone 2 left sacral fracture, bilateral ischiopubic and left iliopubic rami. An emergency CT scan was done with the following conclusion: infracentimetric concussion of the left frontal lobe, fracture of the horizontal left mandibular ramus, fracture of the left occipital condyle bilateral clavicle and sternal manubrium fractures, left ribs fractures, pneumomediastinum, bilateral pneumothorax, bilateral pulmonary contusion, upper pole splenic and left renal contusion, left diaphragm rupture with thoracic migration of the stomach and spleen.

After the CT scan the patient is immediately transported to the operating room for emergency laparotomy, phrenoraphy and bilateral pleurostomy. After surgery the patient is admitted in the Intensive Care Unit where he is mechanically ventilated, and has vasopressor support (Noradrenaline 0.7-0.8 $\mu\text{g}/\text{kg}/\text{min}$). In the following days the general condition remains extremely serious and is continuously treated by a multidisciplinary team of doctors (intensive care, general surgery, thoracic surgery, orthopedic surgeon, oro-maxillofacial surgeon and neurosurgeon).

Eight days after admission the patient develops high fever (40°C), with a positive hemoculture and the antibiotic treatment is modified according to the antibiogram results. After this episode the general condition of the patient is relatively stable with fever regression, a decrease of the rhabdomyolysis syndrome (Figure 2), the sedation treatment is reduced and then stopped to evaluate the neurological status but in 72 hours no improvement is detected. The pupils remain intermediary, equal and

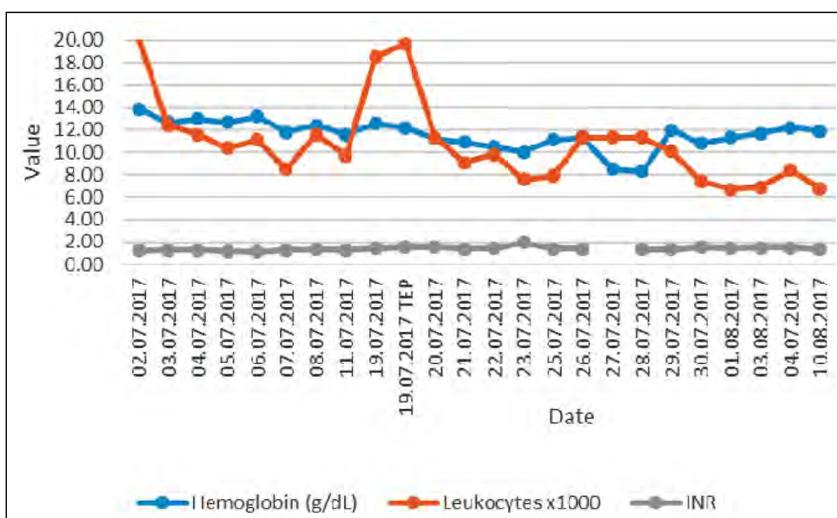


FIGURE 1. Post-surgery parameters of the patient

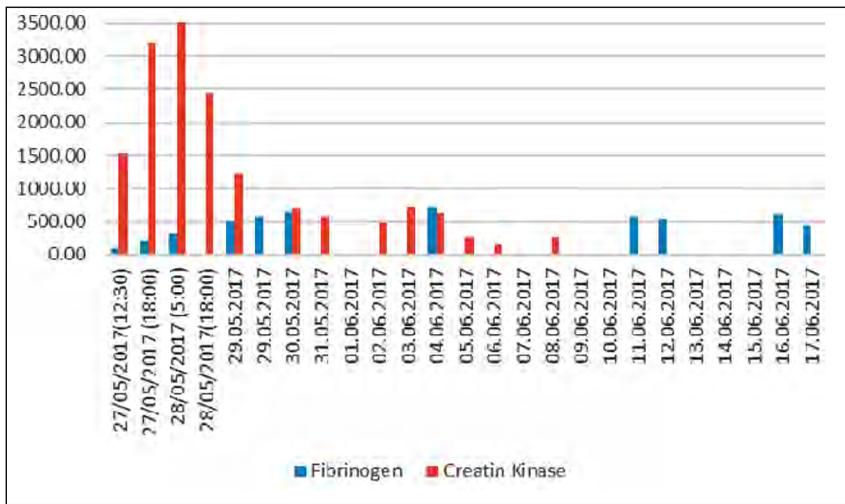


FIGURE 2. Patient's fibrinogen and creatine kinase evolution

reactive, involuntary movement is detected, but the patient does not respond to commands. Seventeen days after admission a tracheostomy is done under general anesthesia and at one month he is transferred at the neurosurgery intensive care unit being mechanically ventilated trough the tracheostomy cannula, he spontaneously opens his eyes, moves all limbs but does not respond to commands.

Six weeks after the accident, the patient can spontaneously breathe trough the tracheostomy cannula and becomes responsive to simple commands and his medical condition (clinically and paraclinically – Figure 3) is slowly improving and so, at ten weeks after admission, he can be transferred to a recovery clinic where he undergoes an intensive recovery program and returns to a fairly normal life (some neurological deficit remains), but never returns to sport.

Case 3

A 18 years old male patient motorcycle accident victim was admitted to the Intensive Care Unit with

the following diagnosis: polytrauma (ISS 50), Glasgow Coma Scale (GCS – 3), fixed mydriasis, subdural hematoma, subarachnoid haemorrhage, cerebral contusion, cerebellar hematoma, cerebral and cerebellar oedema, multiple skull fractures involving the cranial bones, base of the skull and sinuses, thoracic trauma with pulmonary contusion and right scapula comminuted fracture, abdominal trauma with liver contusion, retroperitoneal and sub peritoneal hematoma, comminuted, displaced fracture of the left acetabulum extended to the iliac wing, comminuted left femur fracture, open left patella fracture, open dislocation of the left knee, open both bones left forearm fracture, traumatic and haemorrhagic shock, coagulation deficit.

After volemic replacement the patient is transferred urgently to the Operating Room, where closed reduction of the knee dislocation and provisional osteosynthesis with spanning external fixator for the knee and left femur fracture is performed.

The next day the patient presents fulminant rhabdomyolysis syndrome and after orthopedic

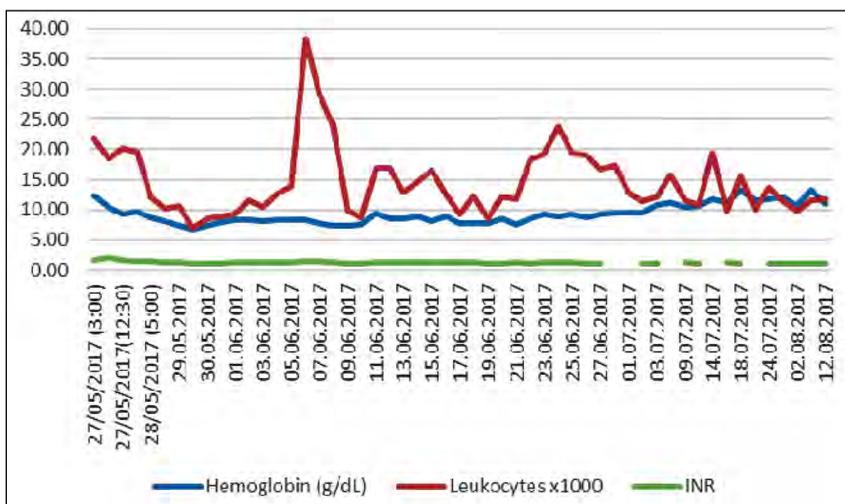


FIGURE 3. The patient's test results six weeks after the accident

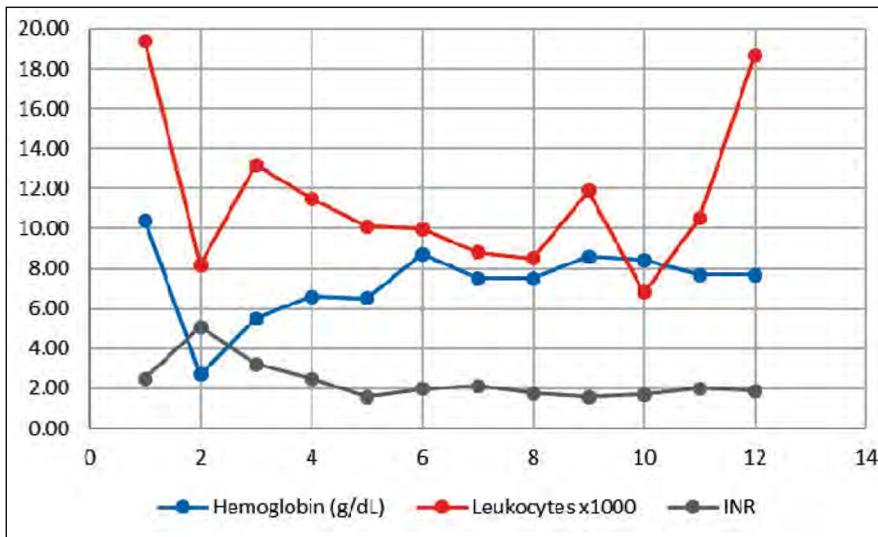


FIGURE 4. Paraclinical parameters of the patient

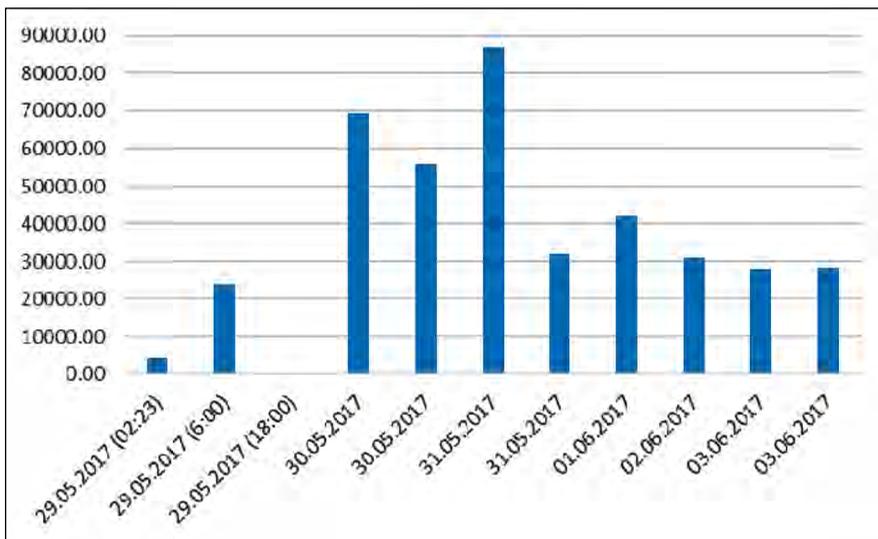


FIGURE 5. Creatine kinase evolution

evaluation emergent leg and thigh decompression fasciotomy is performed with massive postoperative bleeding due to coagulopathy followed by important arterial pressure fluctuations.

Paraclinical parameters showed anemia, thrombocytopenia with coagulation deficit despite massive blood and derived products transfusion, rhabdomyolysis syndrome, nitrogen retention syndrome, hepatic cytolysis syndrome, dyselectrolythemia, elevated pancreatic enzymes (Figures 4 and 5).

Two days after admission, the patient is neurologically evaluated and electroencephalogram (EEG) is performed. The neurological evaluation shows complete quadriplegia, absence of brainstem reflexes, mydriatic, areactive pupils and the EEG is isoelectric. After orthopedic reevaluation - because of areactive and partially necrotic muscular tissue - emergency amputation of the left thigh is proposed, but the patients family refused.

The general condition of the patient remains extremely serious and on the 4th day of hospitalization, cardiac arrest occurs through asystole, which does not respond to resuscitation maneuvers and death is declared.

Case 4

A 36 years old polytrauma patient (ISS 50) from a road traffic accident is transferred from another hospital. At the time of the admission he presented cerebral trauma with cerebral edema and blood in the 4th cerebral ventricle, multiple fractures of the facial bones (maxillary sinus walls, temporal, zygomatic, pterygoid process etc.), left pneumothorax, fractured ribs (four on the left side and three on the right) hepatic rupture (6th and 7th segments and the capsule), right acetabulum fracture (anterior and posterior columns), left iliopectic and ischiopubic rami.

The patient is intubated and mechanically ventilated with extremely serious general condition and

is admitted into the Intensive Care Unit where myocardial contusion is excluded after echocardiography. In the first five days after admission the general condition remains serious but undergoes a progressive improvement and so in the 5th day from the accident the patient is extubated and able to spontaneously breathe. Two days later he presents dyspnoea, oxygen desaturation and increased respiratory labor so the patient is intubated and mechanically ventilated. The patient's condition remains critical with severe respiratory dysfunction and atrial fibrillation that is converted with drugs to sinus rhythm.

The pelvic CT scan done in the 25th day shows minimally displaced acetabular fracture and slightly displaced rami fractures with incipient callus formation so was decided that the orthopedic lesions should be treated conservatively. The patients general condition is getting better and paraclinical values return to normal (Figures 6 and 7).

The echocardiography done five weeks after hospitalization shows tricuspid valve with slight regurgitation, left ventricle with slight hypokinesis, 50% ejection fraction and hypoechogenic pericardial space, elements signifying myocardial contusion. At the same interval, the patient was transferred to a rehabilitation facility.

DISCUSSIONS

Pelvic ring fracture is by far the most serious orthopedic component in an polytrauma patient generating the most complications, morbidity and mortality.

The rising incidence of road traffic accidents is an important public health problem. In particular, blunt chest injury and pelvic fractures are associated with increased morbidity and mortality [3]. The chest wall and soft tissues are the most commonly affected sites by blunt trauma. The site of fracture

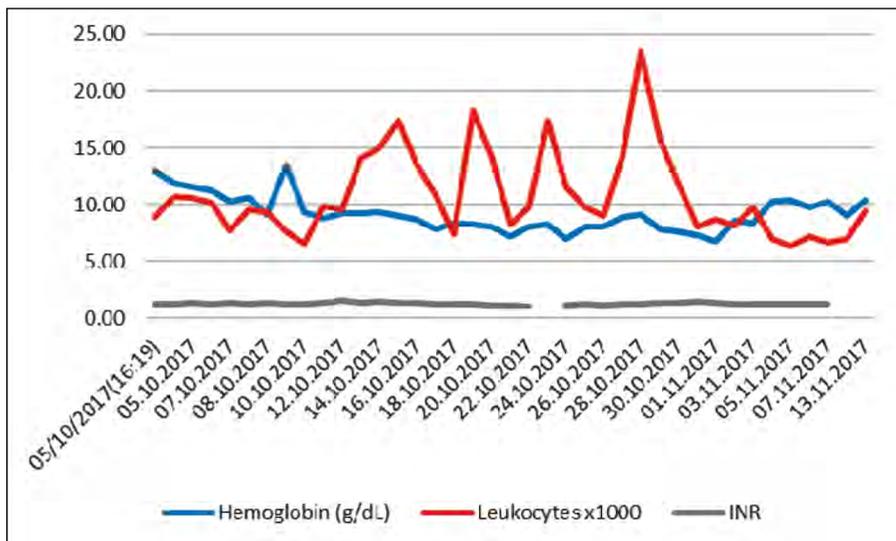


FIGURE 6. Paraclinical parameters of the patient

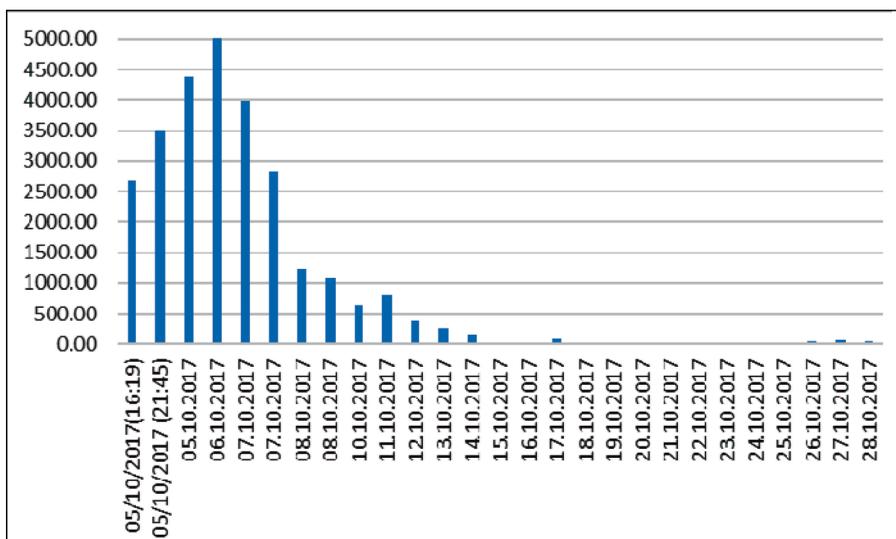


FIGURE 7. Creatine kinase evolution

has important impact on the clinical presentation. Fractured ribs 4 to 10 are more frequent in trauma, whereas, fractured ribs 8 to 12 increases the likelihood of the presence of associated abdominal injuries [4].

Anatomically, there is an important arterio-venous network (primitive iliac, external iliac and hypogastric vessels), directly exposed on the endo-pelvic side of the pelvic ring. The superior gluteal artery is often damaged in posterior pelvic ring lesions especially iliac wing fracture, when the artery exits through the greater sciatic notch [5]. Therefore iliac wing fractures with or without pubic symphysis disruptions, can engender massive bleeding on their own [6]. In sacral fractures, the supero-lateral and medium sacral arteries are often damaged [7]. Transforaminal sacral fractures (Denis 2) are associated with lesions of the lateral sacral artery that can lead to massive bleeding.

Control of hemorrhage in patients of pelvic fractures along with replacement of blood products is known to improve survival rates [8]. Blood transfusion carries a risk of well-described adverse reactions including multiorgan failure [9]. In an acute trauma setting, the amount of blood transfusion required is undetermined, but the requirement in an intensive care setting is based on a hemoglobin level of 7.0 g/dl as the critical level triggering transfusion [10].

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Treatment of haemorrhagic shock and prevention of further deterioration should start in the field by applying a pelvic binding device next to intravenous fluid substitution [11]. Some authors promote prophylactic use of a pelvic binder even if a pelvic fracture is not clinically evident [12,13]. The exact treatment pathway of hemodynamic unstable patients with an unstable pelvic ring fracture remains controversial and is often dictated by hospital facilities and of course by the local experience in such cases.

CONCLUSIONS

The treatment of a polytrauma patient is a team effort and the support of the Intensive Care Unit staff is invaluable. But despite the advances made in acute and medium term management of the traumatised patient with a pelvic ring fracture the mortality rate remains unavoidable in the 8-10% range. This proves that treating these patients will be a challenge in the following years too.

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