PUBIC SYMPHYSIS STABILIZATION IN ROTATORY AND VERTICALLY INSTABLE PELVIC FRACTURES - A CASE REPORT

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ABSTRACT: Pelvic fractures are the result of a strong mechanical force, they are rarely isolated, and very common in polytrauma. Vascular lesions and consequent blood loss are the first complications. Hemodynamic instability and hypovolemic shock are very common in pelvic bleeding and quickly lead to death. Hemorrhagic shock is the leading cause of death in the first 24 hours. The imperative in taking care of such injuries is patient restitution and pelvic fracture stabilization. Stabilization of the pelvic ring is one of the conditions for stopping bleeding and hemodynamic restoration, biomechanical instability causes hemodynamic instability, ie. there is a direct correlation. The paper presents sequence of measures by which we assess the type and severity of injuries, as well as the manner of care. After resuscitation and consideration of type and extent of injuries as segment of polytrauma, we performed surgery on our patient. We applied internal fixation of anterior part of the pelvic ring, and thus achieved reposition and stabilization of fragments - both rotatory and vertical stabilization were achieved with radiological verification of reposition degree, form, and shape of pelvic ring during surgery. The final result of the treatment is excellent, the patient was left without consequences in terms of anatomy and functions.
Key words: pelvic fracture, vertical and rotational instability, hemorrhagic shock, osteosynthesis

INTRODUCTION

The pelvis is the central part of the bone static-dynamic chain which transmits forces of weight, load and activity. It has its peculiarities: it has the shape of a ring, built of three flat bones and sacrum, interconnected by strong ligaments; it has a protective role for many organs and blood vessels located in the pelvic cavity; integrity and shape of the pelvic ring play crucial role in load transfer and walking function.

About 3% of all bone fractures belong to pelvic ring disruption (1). They are caused by high energy mechanical trauma in traffic, fall from height or hitting a mechanical tool. Pelvic fractures are rarely isolated, in 60-80% of cases, they occur as part of polytrauma - they are associated with limb fractures (80-85% of cases), chest injuries (60%), head injuries (50-60%), abdominal injuries (in 30%), blood vessel and urogenital tract injuries (15-20%) (2).

At admission, patients with pelvic ring fractures have two problems: hemodynamic instability due to blood loss and mechanical instability due to bone - ligament damage. Vascular lesions and consequent blood loss are the first complications. Hemodynamic instability and hypovolemic shock are very common in pelvic bleeding and quickly lead to death. Hemorrhagic shock is the main cause of death in the first 24 hours (3). Surgical stabilization of unstable pelvic ring fracture does not require urgent treatment, but early temporary stabilization, as the first step of patient resuscitation is imperative (4,5).

The pathomechanism of pelvic fracture occurance is a consequence of force applied on the pelvic ring from different directions:

1. Anterior - posterior compression of mechanical force performs external rotation of the wing, pelvic ring opening and anterior ligaments rupture occur (symphisis pubis and anterior sacroiliac ligament). If the force is stronger and lasts longer, it can break pubic bones branches. In this disruption there is rotational instability and vertical stability.

2. Lateral pelvic wing compression is the most common way of injury. This force compresses or impacts the spongy bone of sacrum or ileum. These fractures are also not rotatory, but vertically stable.
3. The vertical action of force on the pelvic ring is performed by pelvic wing movement in vertical direction with rupture of all ligaments and pelvic floor rupture. These fractures are both rotatoryand vertically unstable (2,6).

Treatment of pelvic fractures has rules and stages of treatment: bleeding control, reconstruction and treatment of associated injuries, and treatment of pelvic ring fractures.

The aim of this paper is to present a case of rotational and vertical instability of the pelvic ring as a result of a traffic injury, stages and method of treatment of associated injuries, and the final surgical treatment and pelvis stabilization.

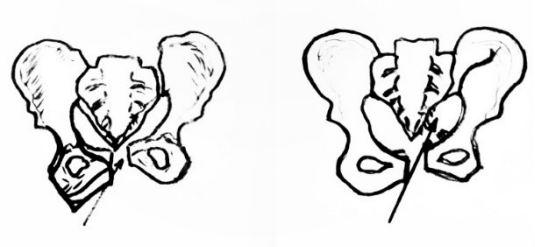
CASE REPORT

The paper presents a 35 year-old patient who suffered pelvic fracture in a traffic accident as part of polytrauma (pelvic fracture, serial rib fracture on the right side of the chest, urethral rupture). At the time of admission, all resuscitation measures were taken, the patient was showing signs of hypovolemic shock (pressure 65mmHg and pulse 95/min). A catheter was placed, and two venous routes for infusion solutions, analgesics and blood transfusion were included.

Determining the severity of polytrauma is one of the decisive factors for determining priority in taking care of the injured, both at the location of injury and in the trauma centers. To successfully solve this difficult problem, a large number of scoring systems is available today, and they are anatomical, physiological or combined. We have used the Injury Severity Score (ISS), it provides a numerical description of injuries within polytrauma and represents anatomical scoring systems. Using this scale, human body is divided into 6 regions, and with the increase of points, mortality also increases (7). Our patient had score of 17 points. We also used Trauma Scor - TS which is a physiological scoring system. It is composed of Glasgow Coma Scale (GCS) which is reduced by one third of the value, and assessment of cardiopulmonary functions. It contains 5 parameters, and the number of points ranges from 1 to 16; the higher the score, the greater the possibility of the polytraumatized patient to survive (8). Our patient had a score of 12 points.

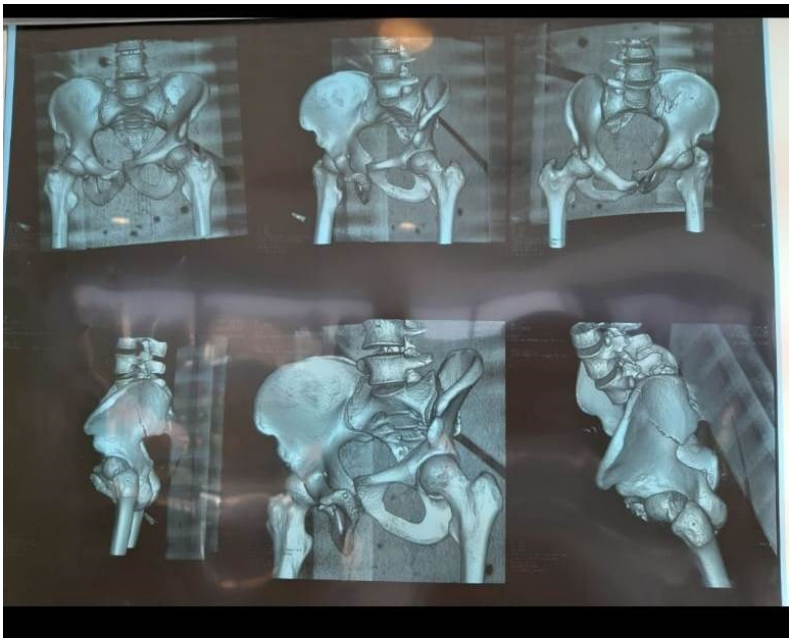
To determine the type of pelvic ring fracture, we initially performed AP radiography and pelvic MSCT. In relation to the mechanism of injury and position of pelvic ring elements, and according to Young - Burgess classification (9), the fracture has vertical sliding of left hemipelvis with rupture of pubic symphysis, all pelvic ligaments and floor, and sacroiliac joint ligaments, so the fracture has both rotatory and vertical instability. Strong mechanical force had a bottom-up direction of action, and caused rupture and dislocation of pubic symphysis on the left hemipelvis, as well as fracture of iliac bone in the sacrum area (Scheme 1A, B and Figure 1).

Scheme 1. Course and direction of mechanical force that causes hemipelvis sliding in vertical direction. The fractures are both rotatorily and vertically unstable. A-in young people there is pubic symphysis rupture, a pelvic floor tear and sacroiliac luxation, and sometimes a fracture of the pelvic wing. B-in elderly, there is a pubic symphysis rupture, and due to osteoporosis, pelvic wing fracture



A . B

Figure 1. Pelvis MSCT shows left hemipelvis dislocation with rotational and vertical instability resulting from pubic symphysis disruption and iliac bone great wing fracture near the sacroiliac joint.

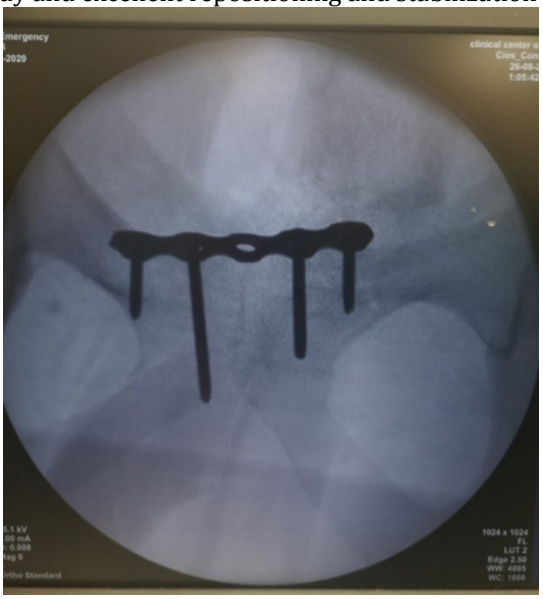


Urogenital injuries in pelvic fractures are detected by inspection of external genitalia (labia, penis, scrotum), we monitor bleeding on the outer opening of the urethra, ability to urinate and urine color, we examine the perineum, vagina and prostate. If there is a high displacement of pelvic ring anterior, there is a suspicion of partial or complete rupture of urethra, so we place a catheter - if possible. In our case, there is a high displacement, so we placed a catheter.

During patient follow-up period, an ultrasound examination of abdomen is performed to detect intra-abdominal bleeding. Hypotensive patients with positive ultrasound results are an indication for diagnostic peritoneal lavage. If it is positive (> 8 ml of blood is aspirated), surgical exploration is indicated (10). In our patient, the ultrasound abdomen finding was negative.

After complete resuscitation and general condition improvement, on the third day since injuring, pelvic ring stabilization was performed. Internal fixation was performed primarily, stabilization of anterior part with adequate hemipelvis repositioning – traction, and internal extremities and pelvic wing rotation with radiological control. A plate was placed over the upper side of the body and pubic bones branches, and 4 screws were placed over the entire height of pubic bones body (Figure 2). This way of placing screws ensures complete stability of the pelvic ring without subsequent dislocation. Sometimes, for greater pelvic stability, a second plate is placed at the front of pubic bones. On the fourth day after the surgery, the patient was discharged, physical treatment was initiated - sitting and activities in bed, and getting up and walking with assistance of crutches without support on the left leg after 2 weeks. Complete recovery and leg support was allowed after 6 weeks.

Figure 2. X-ray after internal pelvic fracture fixation. The screws were placed over the entire height of pubic bone body and excellent repositioning and stabilization was achieved.



DISCUSSION

Pelvic ring fractures can be classified based on mechanical instability according to Tile classification (A: stable, B: rotationally unstable, C: vertical and rotationally unstable) (11); or based on direction and strength of mechanical vector according to the Young - Burgess classification (lateral compression, antero - posterior compression, vertical displacement or combined mechanism) (9).

Pelvic fractures are caused by large mechanical force acting on the human body, and are always accompanied by bleeding. Bleeding from spongy bone, presacral venous plexuses and / or iliac arteries and venous branches, causes hypotension and hemorrhagic shock. Bleeding is frequent and extrapelvic due to accompanying injuries (chest 15%, intra-abdominal 32%, long bones 40%). This type of bleeding is the cause of high mortality in the first 24 hours - more than 40%. In order to repair hemorrhage, many authors recommend preperitoneal pelvic packing (12,13).

Pelvic ring stabilization is one of the conditions for stopping bleeding and hemodynamic restitution, because biomechanical instability conditions hemodynamic instability, ie. there is a direct correlation. The external fixation method is often used (14,15). This method can also be temporary, ie. can be translated into internal fixation. This procedure reduces intrapelvic volume and achieves tamponade effect, which leads to the reduction of bleeding. This way, fracture stability and posterior pelvic ring elements bone contact is achieved. Many authors recommend primary internal pelvic ring fixation to achieve both rotatory and vertical stability (16). In our case, we have also performed internal fixation of anterior part and thus achieved complete stabilization and excellent reduction and shape of the pelvic ring.

Urogenital injuries are common in pelvic ring injuries and pose a risk of infection and death. The result is penetration of a bone fragment or indirectly due to symphysis diastase (17).

In conclusion, we present experience in treatment of a patient with pelvic fracture that is both rotatory and vertically unstable. It is important to assess general condition and bleeding at the time of admission, as well as to take care of accompanying injuries within polytrauma, and early stabilization of the pelvic ring fracture.

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