PELVIC FRACTURES – MEDICAL-SURGICAL EMERGENCY

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Abstract: The management of patients with pelvic fractures, in special cases with hemodynamic instability related to pelvic fracture is a major challenge, with high morbidity and mortality. Severe pelvic fractures pose a great challenge for physicians. The purpose of this review is to highlight recent changes in the management of patients with pelvic fractures. In this review, the current stains of pelvic fracture management is presented including an evaluation of roles of angioembolization and preperitoneal packing, recently proposed algorithm for management. In present study, the bilateral iliac artery ligation as a salvage surgery is reviewed and the early (<24h) pelvic fracture operative fixation. The key elements in pelvic fractures management are the adequate resuscitation, reverse acidosis and shock and the early, definitive control of hemorrhage. A multidisciplinary approach has been shown to reduce the mortality rates.

Keywords: early fixation, preperitoneal packing

Cuvinte cheie: reducerea mortalității și inmovilizarea focarelor de fractură și meșearea spațiului preperitoneal

The management of patients with pelvic fractures can be challenging. The mortality rates from pelvic fractures have been ranged from 18-40%.(1-4) The mortality in the early phase after trauma, within 24 hours of injury is most often due to hemorrhage.(2) The management of patients with hemodynamic instability related to pelvic fracture is a multidisciplinary challenge with mortality between 10-42%.(5-9), and in uncontrolled pelvic bleeding the mortality is more than 40% of the cases.(10-12)

In centres where the algorithms for the management of these cases have been adopted, mortality has decreased.(13-15) A multidisciplinary approach is essential for the proper therapy of hemodynamically unstable patients with pelvic fractures, the trauma surgeon, orthopedic surgeon and interventional radiologist have important roles to play. This study aims to review the current management stereotypes in the evaluation and management of patients with pelvic fractures.

The pelvic girdle is the largest and strongest entity of the musculo-skeletal system, and large forces are needed to disrupt the pelvic ring of a healthy person.

Recognizing the severity of the lesion

Many cases with the pelvic ring lesion are severely injured.

The examination of the pelvic girdle is performed clinically and radiological.

The presence of the traumatic lesions, or open wounds of the back, on the buttocks, or in the perineum are direct signs of the amount of traumatic force.

In every severely injured patient, the pelvic overview has to be completed with thorax x-ray, and cervical spine x-ray.(16) In case of any suspicion, CT examination of the pelvis must be performed. X-Rays and CT images allow for exact classification of the pelvic lesions.

Tile (17) distinctness stable (type A), rotationally unstable(type B), as well as vertically and rotationally unstable lesions (type C).

In the classification of Burges, lateral compression, antero-posterior compression, vertical shear and complex injuries are distinguished.(18,19) Between these, the vertically unstable lesions, open pelvic injuries and complex lesions are the most dangerous, as they are associated with retroperitoneal bleeding and soft tissue destructions. In pelvic fractures blood lose may be active and continues (20,21), because self tamponade is less likely than in “open book” lesions. In pelvic fractures lesions of the urethra, bladder, nerves or vessels are more frequent.(22)

Complex pelvic injuries are defined as pelvic lesions with severe damage of soft tissues urogenital, neurovascular lesions.(23,24)

All lesions of pelvic fractures have in common that there may be severe and ongoing blood lose inside and outside the pelvic ring, with risks of patient’s survival.(25,26)

Sources of hemorrhage

A classic study of autopsy specimens demonstrates a
contrast extravasations from the hypogastric arteries in 85%, with bilateral sources of hemorrhage in 63% and more than one bleeding site identified in 61%, and from the fracture sites as well.(27)

Another study from Miller and Al has shown bleeding in over 70% of hemodynamically unstable with pelvic fractures.(28) Pubic rami fractures are associated with obturator vessel trauma, sacroiliac joint separation correlates with severe bleeding, as well as hemorrhage from gluteal and hipogastric branches.(29,30)

**Early management**

Primary treatment must be focused on the hemodynamic situation of the patient. The cause of hemodynamic instability is blood loss out of the fracture fragments especially of the dorsal pelvic ring.

Slates and company presented a series of 27 postmortem angiographies and dissection after pelvic trauma, and they found that leakage from the fractured cancellous bone was the major source of bleeding.(31)

If larger vessels such as iliac arteries are ruptured, there is massive blood loss, with hemodynamic disorders.

The management algorithm of pelvic ruptures should include adequate diagnosis, pelvic stabilization modality, abdominal evaluation, surgical options and angiography.

The algorithm referred here was developed by the Western Trauma Association.(32)

**Figure no. 1.**

![Diagram](Image)

DPA=diagnostic peritoneal aspirate; FAST=focused assessment with sonography for trauma; OR=operating room

**External fixation**

External fixation of the broken pelvis has been a well accepted technique of provisional or definitive stabilization for decades.(33-37)

In patients with hemodynamic instability, external fixation with pelvic stabilization may be indicated, this stabilization can reduce pelvic volume by 10%.(38,39)

A retrospective study by Numm et al.(40) demonstrated an increase in SBP by 40mmHg with a use of external pelvic stabilization for open book fractures or pubic symphisis diastasis is indicated, in lateral compression fractures or pubi rami fractures may exacerbate hemorrhage.(41-45)

**C-clamp**

This anti-shock pelvic clamp was introduced in 1991.(46)

In 1996, Heivic et al published a first series of 30 cases. This application was hemodynamically effective in 10 out of 18 cases with an acute unstable hemodynamic situation, there were no complications related to the C-clamp application.(47)

An external fixator or posterior C-clamp may be used for pelvic stabilization as well.(47,48) The pelvic C-clamp provides direct and improved stabilization of the posterior pelvic ring providing tamponade.

However the C-clamp should not be used with fractures of the ilium or with transiliac wing fracture – dislocation.

After C-clamp application, the possible complications are the injury to the gluteal neurovascular structures, risk of secondary nerve injury in patients with posterior sacroiliac fractures. In recent studies, pin tract infections and pelvic organ perforation have been also reported.(41)

**Pelvic Packing**

In some European Trauma Centres, pelvic packing have been advocated as an additional salvage control procedure in posttraumatic pelvic bleeding.(50,51,52)

The goal is to control bleeding which originates from broken cancellous bone, from the dorsal venous plexus and from the smaller arteries. Packing can be done with intra or extra peritoneal approach and in absence of any abdominal lesions, a laparotomy is not needed.

In pelvic packing, through a incision above the symphisis pubis, the middle fornal lager, between both rectus abdominal muscles is transected and the peritoneum is not opened.

Preperitoneal pelvic packing is alternative option in unstable patients with refractory hemorrhage shock and packing may be the only options for the experienced surgical team if the interventional radiology is not available.

Before packing is provide, the procedure of preperitoneal packing is performed by evacuation of the hematoma anteriorly. After the bladder retraction laterally and carefully dissection of the pelvic brim, cautions dissection is carried out to avoid avulsion of the vascular connections between the iliac and obturator vessels. Deep to the pelvic brim must be placed three laparotomy packs, the first sponge is placed below the sacroiliac joint, the second sponge is place anterior to the first, and the third sponge is placed in the retropubic space, deep and lateral to the bladder.(54)

**Bilateral iliac artery ligation**

A recent study was investigated using bilateral iliac artery ligation and pelvic packing as an adjuvant to hemorrhage control in patients with expanding retroperitoneal hematoma.

In recent study from Dubose et al (50), the mortality rates was 64% in expanding retroperitoneal hematoma with hemodynamic instability and at least some of the survivals went on to angiembolisation for hemorrhage control.

**The hemodynamically unstable patients**

Clinical pathways were developed and published during the last 20 years for management of hemodynamically unstable patients. Criteria for this are SBP<90 mmhg, acidosis with base deficit <-6 or have a persistent transfusion requirement, represent a group in whom there is controversy in management.(51-54,55)

The current controversies centres on angiography versus pelvic packing

Some authors believe that rather embolisation is the last choice.(28,30,56-58)

Miller et al (28) stratified patients with pelvic fractures and hypotension.

Others authors strongly advocate for pelvic packing as the initial manoeuvre in controlling pelvic hemorrhage.(49)

**Conclusions:**

In patients with hemodynamic instability rapid resuscitation with appropriate component therapy, reverse of the
shock and acidosis and rapid control of the hemorrhage are the key elements. External pelvic fixation, when appropriate, can be a useful adjuvant.

REFERENCES