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OTVORENI PRELOMI KARLICE – REZULTATI MULTI – INSTITUCIONALNE STUDIJE

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OPEN PELVIC FRACTURES - RESULTS OF AN MULTI-INSTITUTIONAL STUDY

OTVORENI PRELOMI KARLICE – REZULTATI MULTI – INSTITUCIONALNE STUDIJE

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Abstract

Open pelvic fractures are devastating injuries, rare, and with high mortality. Leading causes of mortality are: haemorrhage, infection and associated injuries. The aim of this paper is to point out methods of treating these injuries and great number of prognostic mortality factors.

Material - in period from January 2011 to December 2015, 221 patients with pelvis ring fracture were treated in three large clinical centers of Serbia, of which 13(5%) had an open fracture type. We have classified pelvic ring fractures according to the Young - Burgess classification. We have classified injuries according to Gustilo at I, II, and III degree, and the location of the wound according to Faringer classification was distributed in zone I, II and III. Urogenital and intra-abdominal injuries were monitored, and severity of injuries was determined according to Severity Score Injury (ISS) and Trauma Score (TS).

Results - there were 6(46%) women and 7(54%) men at the average age of 41(13 - 76). Injuries from traffic trauma are dominant. The most common cause of pelvic ring fracture is an anterior posterior compression - 6(46%), lateral compression - 4(31%) and vertical force in 3 (23%) patients. Dominant injuries are type I and II according to Gustilo, and zone I according to Faringer classification. There were 6 (46%) patients with urogenital injuries, and the same number with intra-abdominal injuries, of which 3(23%) patients have been treated with colon resection and diversion. Due to abundant hemorrhage and hypovolemic shock 2 patients died, and another one died after three days due to sepsis and multisystem organ failure (MSOF).

Conclusion - Open pelvic fractures have high mortality rate, due to: haemorrhage, infection, associated abdominal and genitourinary tract injuries, ISS> 25, TS <8 and age of patient >65 years.

ABSTRAKT

Uvod – otvoreni prelomi karličnog prstena su razorne povrede, retke i sa velikom smrtnošću. Vodeći razlozi smrtnosti su: hemoragija, infekcija i udružene povrede. Cilj rada je da ukažemo na metode zbrinjavanja ovih povreda i veći broj prognostičkih faktora smrtnosti.
Materejal – za period od 2011. do 2015. godine lečen je 221 pacijent sa prelomom karličnog prstena u tri velika klinička centra Srbije, a 13 (5%) imalo je otvoren tip preloma. Prelome karličnog prstena smo klasifikovali prema Young – Burgess klasifikaciji. Za klasifikaciju otvorenih preloma korišćena je klasifikacija Gustilo, a lokaciju rana prema Faringer klasifikaciji na zonu I, II i III. Praćene su urogenitalne i intra – abdominalne povrede, a težina povreda određivana je prema Injury Severiti Scor (ISS) i Trauma Scor (TS).

Rezultati – bilo je 6 (46%) žena i 7 (54%) muškaraca prosečne starosti 41 godina (13 – 76). Dominiraju povrede iz saobraćajnog traumatizma. Najčešći način nastajanja preloma karličnog prstena je antero – posteriorna kompresija – 6 (46%), lateralna kompresija – 4 (31%) i vertikalna sila kod 3 (23%) pacijenta. Dominiraju povrede tipa I i II po Gustilo i zone I po Faringer klasifikaciji. Bilo je 6 (46%) pacijenata sa urogenitalnim povredama, a isti broj i sa intra – abdominalnim povredama, od toga kod 3 (23%) pacijenta urađena je resekcija kolona. Zbog obilne hemoragije i hipovolemskog šoka umrla su 2 pacijenta, i još jedan posle tri dana zbog sepse i multisistemskog organskog poremećaja.

Zaključak – otvoreni prelomi karlice imaju veliku stopu smrtnosti, a tome doprinose: hemoragija, infekcija, prateće povrede abdomena i genitourinarnog trakta, ISS > 25, TS < 8 i starost > 65 godina.

INTRODUCTION

Open pelvic fractures represent one of the most devastating injuries in orthopedic trauma. An open pelvic fracture is defined by communication to lesion of integument, gastrointestinal or urogenital tracts, i.e. direct communication between fracture and the external environment (through the rectum, vagina or skin) (1,2). They are usually result of extensive force trauma and are associated with multiple injuries. Most often they occur in traffic accidents, in motorcycle drivers, and as a consequence from falling from height.

Fractures of pelvis are reported to represent 3 % of all fractures, with associated mortality rate of 10 to 16% ( 3). Open pelvic fractures occur in 2 to 4% of all pelvic fractures, and mortality is high - until 1980 it was up to 50%, due to early hemorrhage and late sepsis (3,4,5). Today, there are standard resuscitation protocols (Advanced Trauma Life Support - ATLS) that include permanent airway and cervical spine control, good ventilation and circulation (6,7). With this procedure, mortality is reduced to 5 to 25%. Mortality is not the result of pelvic fractures,
but of jointed injuries - urogenital injuries (23% to 57%), intra-abdominal injuries (up to 50%) and head injuries (up to 35%) (8,9). There is a high risk of pelvic sepsis and hemorrhage in these injuries.

It can be difficult to determine if hemorrhage arises from abdominal trauma, fractured bone surfaces, or ruptured pelvic vessels. Hemorrhagic shock is the most common cause of death in the first 24 hours (2).

Treatment of open pelvic fractures has conventionally had four critical elements: control of hemorrhage, treatment of soft tissue wound and prevention and treatment of subsequent sepsis, recognition and treatment of associated injuries, and treatment of the fracture itself. Soft tissue injuries should be adequately treated with extensive debridement and rinsing, along with antibiotic therapy, while at the same time performing open reduction and stable fixation, thus preventing infection development and hemorrhage (10,11).

Our purpose in this study is to present an overview of demographic data related to open pelvic fractures, assess methods and results of our analysis, and examine prognostic factors for mortality.

MATERIALS AND METHODS

Patients presented in this study were treated and monitored in three different centers: the Clinic for Orthopedics and Traumatology in Niš, the Clinic for Orthopedics and Traumatology at the Military Medical Academy in Belgrade, the Clinic for Orthopedics and Traumatology in Novi Sad. From January 2011 to December 2015, 221 patients with pelvic fractures were directed to our trauma center, while 13 (5%) of them had an open fracture type. Following data were observed: patient age, sex, injuries, type of pelvic bones fracture, extent and location of soft tissue injuries, orthopedic treatment of fractures and wounds, jointed urogenital and abdominal injuries, long bones fractures, Injury Severity Score (ISS), Trauma Score (TS), number of transfusions in first 24 hours, mortality.

Patients were treated in trauma room according to Advanced Trauma Life Support (ATLS) guidelines - permanent airway and cervical spine control, good ventilation and adequate circulatory support. When patients were in severe hemorrhagic shock, principles of damage control resuscitation were applied. Systolic blood pressure, presence of shock on arrival and base deficit were all significant predictor of haemodynamic instability. Haemodynamic stability is achieved first by aggressive resuscitation with intravenous
fluids and blood products, including clotting factors. Pelvic fracture instability increases haemodynamic instability, so we immediately check initial stability - positioning and leg rotation, traction or connecting pelvic ring. If these methods and measures of resuscitation do not achieve hemodynamic stability, it is necessary to gain early stability of the pelvis – provisional stabilization of the pelvic ring can be achieved either by application of an external fixator frame or the pelvic C-clamp.

In order to determine the type of pelvic ring fracture, we initially apply anteroposterior pelvic radiograph. If the patient is in stable haemodynamic condition, additional inlet and outlet pelvic radiographs help to identify pelvic ring disruption and associated displacement. If patient with open pelvic fracture is stable, computed tomographz (CT) is applied in order to exclude abdomen injuries and to show spatial position of pelvic fragments.

When it comes to injury mechanism, pelvic ring fractures were classified according to Young - Burgess classification (12). For classification of open pelvic fractures in relation to stability and rectal injuries, we used the Jones classification (13.14). For pelvic fracture stabilization, the method of external, internal or combined fixation was used,( Figure 1). Hospitalization to surgerz time differs, and depends on patient stability and localization and condition of injury – surgery was performed in 10-12 hours to 14 days, and in average after four days. In extremities fractures, stabilization was applied at the same time, and sometimes even later, depending on general condition of the patient.

The extent of injury in open pelvic fractures is classified according to Gustilo (15). Surgical treatment of open pelvic wounds includes extensive irrigation and debridement of traumatised and devitalised soft tissues. If the condition of the wound allows, this might be followed by delayed secondary wound closure. If there is a great loss of soft tissue, an infection and great soft tissue necrosis, when the wound is treated, a delayed skin graft is applied.

Due to the massive forces applied causing this injury, most fractures are grade I and II open fractures. All patients with open fractures received tetanus prophylaxis and antibiotics. Furthermore, location of soft tissue injury in open pelvic fractures can be classified as zone I (perineum, anterior pubis, medial buttock, posterior sacrum), zone II (medial thigh, groin crease) or zone III (postero-lateral buttock, iliac crest)- Faringer's classification (16),(Figure 2).

Urogenital injuries in open pelvic fractures are detected by inspection of external genitalia (labia, penis, scrotum), we monitored bleeding of external urethral meatus, ability to urinate and color of urin, we examined perineum, vagina and prostate. If there was a large displacement of anterior part of the pelvis ring, than there would be a suspicion of partial or complete rupture of
urethra, and we introduced a catheter - if possible. If there is large intestine injury and perianal wound, a colon resection and derivation is applied, and the wound is irrigated periodically, devitalized and necrotic tissue is removed until conditions are met for secondary suture.

During monitoring period, an ultrasound study of the abdomen was performed in order to detect intra-abdominal bleeding. Hypotensive patients with a positive ultrasound study were indicated for diagnostic peritoneal lavage (DPL). It was applied via supra-ventile entry point in order to minimize possibility of piercing pelvic haematoma and producing a false positive result. If the DPL was grossly positive (> 8 ml of blood aspirated on entry into peritoneum), operative exploration was indicated (17).

Determining severity of the polytrauma is one of the crucial factors for determining priority in managing injured patients, whether at the injury site, or trauma centers. In order to successfully resolve this difficult problem, today we have a number of scoring systems available, and they are anatomical, physiological or combined. We used the Injury Severity Score (ISS); it gives a numerical description of injuries within the polytrauma and is a type of anatomical scoring systems. According to this scale, the body is divided into 6 regions, and with the increase in points, mortality (18) increases. We also used Trauma Score – TS, which is a physiological scoring system. It consists of Glasgow Coma Scale (GCS), which is reduced by one third of the value, and assessment of cardio-pulmonary functions. It is composed of 5 parameters, and the number of points is 1 to 16; the higher the score, the greater possibility of polytraumatized patient to survive is (19).

RESULTS
In the period from January 2011 to December 2015, 221 patients with a pelvic ring fracture were monitored in these three orthopedic traumatology clinics, of which 13 (5%) patients had an open fracture type. Demographic information, trauma scoring and mechanism of injury are listed in Table 1.

The Young - Burgess classification system was used to classify pattern of bone injury. The most common cause of pelvic fracture is antero posterior compression (APC) - total of 6 (46%) patients. Lateral compression (LC) as a mechanical fracture factor was noted in 4 (31%), and vertical force (VS) in 3 (23%) patients.

In relation to stability of open pelvic ring fracture and rectal injury, we used Jones classification. The first open pelvic ring fractures group (stable open pelvic ring fractures)
was reported in 4 (31%) patients, the second (unstable open pelvic ring fractures without rectal injury) in 4 (31%), and the third group (unstable open pelvic ring fractures in combination with rectal injury) in 5 (38%) patients, Table 2.

The magnitude of the injury was classified using the Gustilo. There were 4 (31%) patients with type I, 7 (53%) type II and 2 (16%) type III.

The location of soft-tissue injury was classified according to the Faringer system. In 9 (68%) patients the wound was located in zone I, 2 (16%) patients in zone II, and in 2 (16%) patients in zone III.

Haemodynamic instability at reception is registered in 9 (69%) patients. Average transfusion requirement for the first twenty-four hours was three units of packed red blood cells.

In 6 (46%) patients, urogenital injuries were registered, of which 4 women and 2 men. In one girl, vaginal laceration and uterine amputations were found, as well as intraperitoneal bladder rupture. The other three women had lacerations of the vagina, one had intraperitoneal bladder rupture, second one had extraperitoneal, and the third one had urethra rupture. In two men rupture of the urethra was found. Three women were immediately operated, when reconstruction of the vagina and urinary tract were performed, and the fourth died 8 hours after admission. Both male patients with uretral disruption required suprapubic drainage and subsequent delayed repair. The mortality rate of patients with associated urogenital injuries was 33% (1 of 3 patients).

In this serie, 6 (46%) patients were diagnosed with intra-abdominal injuries. They all had laparotomy performed for various reasons: in two women was found intraperitoneal bladder rupture, and besides that, in one of them was also present colon serosseal tear - requiring a sigmoid colon resection and diversion, and the other had small bowel injury - requiring surgical repair; 2 patients required a sigmoid colon resection and diversion, 1 had liver laceration - requiring surgical repair, 1 was with splenic laceration requiring splenectomy. The mortality rate of patients with associated intra-abdominal injuries was 33% (1 of 3 patients).

Orthopedic stabilization of the open pelvic fracture was performed in 11 (85%) patients, and 2 (15%) patients died in the initial resuscitation phase. External fixation was applied in 7 (54%) patients, of which 1 vertically and 6 rotationally unstable fractures. In 3 (23%) patients, internal fracture stabilization was performed, and one had combination of internal and external fixation – internal femur fracture fixation was applied (Figure 3). After managing wounds in pelvic region – average 15 days, a delayed internal fixation was performed in two patients - 1 vertically and 1 rotationally unstable fractures,frontal bow of pelvic ring was stabilized. Seven patients were treated using external fixation method, and the apparatus was fixed for seven weeks in average.
In 3 (41%) patients there was minor infection around pegs – five pegs in total, and it was treated with periodic bandaging. We replaced two pegs of the external fixator in series, i.e., pegs were reinserted in crista iliaca because of constant moist and loosing.

We found no significant correlation between fracture pattern and wound type or location. In 2 (17%) patients, wounds have healed per primam - they were located in zone III, in 9 (66%) patients the wounds have healed per secundam with prolonged period of bandaging and antibiotic therapy, and in 2 (17%) patients was applied skin graft by Tiersch.

Associated injuries are commonly found with pelvic fractures. The most common joined injuries are fractured extremities - there were 5 femur fractures – external femur fixation was applied in two patients in the same act when pelvic ring was fixated, and in three internal femur fixation was applied with delay, after nine days in average, and 6 cruris fractures found, - external fixator stabilization was applied in 4, and in 2 patients was performed lower leg amputation. There were 3 closed head injuries, 1 ruptured diaphragm, 2 pneumothorax, 1 liver laceration, 1 small intestine injury, 3 colon lesions, 4 perineal and vaginal tears, 3 uretral injuries, 3 bladder ruptures.

Three of 13 patients died (mortality rate 23%), two died in the first 24 hours due to abundant hemorrhage and hypovolemic shock, and one died after three days due to pelvic sepsis and multisystem organ failure (MSOF). Many factors have been analyzed, and Table 3 shows their impact on mortality.

Kolmogorof Smironov test for small samples with marginal value of p <0.05, D = 7 was used for statistic data processing on a small sample of 13 subjects. Interpretation of the results: The results showed that there is a statistically significant difference in our material compared to expected values, so there is greater number of deaths present.

DISCUSSION

Open pelvic fractures are usually the result of a high energy transfer and are most often seen as part of a trauma mechanism. They most commonly occur in traffic traumatism, and are less frequent in case of falling from height or industrial traumatism (5.7).

Pelvic fractures are a marker of excessive force applied to the human body and are associated with haemorrhage. Haemorrhage from the cancellous bone surface, the presacral venous plexus and/or iliac arterial or venous branches can cause hypotension. Haemodynamically unstable pelvic fracture represents a difficult diagnostic and therapeutic
challenge for the trauma team. Bleeding is often also extrapelvic due to following injuries (chest 15%, intra-abdominal 32%, long bones 40%). This bleeding is the cause of high mortality in the first 24 hours - more than 40% (11,20,21). One of potential causes of late mortality is most likely to be a direct result of "bloodless vicious cycle" of continuing haemorrhage and transfusion, since blood transfusion is an indispensable risk factor for development of multisystem organ failure (MSOF) and death (22,23). In our series, 2 (67%) patients died in the first 24 hours due to hemorrhage, and 1 (33%) died after three days due to MSOF.

Grotz et al. (5) and Birch et al. (24) have reviewed management priorities in patients with open pelvic fractures, including control of haemorrhage, aggressive assessment and management of the wound, stabilizing pelvic ring, early diagnosis of rectal and/or urogenital injuries, and selective use of fecal diversion. This is a protocol for successful open pelvic fractures management, which we have also adhered to.

Pelvic ring stabilization is one of conditions for stopping bleeding and haemodynamic restoration, biomechanical instability causes hemodynamic instability, ie there is a direct correlation. Traditionally, only external fixation techniques were used in open pelvic fractures patients (25,26). These tools, via external compression, reduce intrapelvic volume and create a tamponade effect against ongoing bleeding. They also restore stability and bone contact to posterior elements of pelvis and contribute to blood clotting. Pubic symphysis is the weakest link of the structure, representing only about 15% of its stability. Posterior elements - sacroiliac, sacrospinous, and sacrotuberous ligaments - are the strongest, contributing to vertical and anterior-posterior stability of the pelvis (27).

In our series, an external fixator was used in 7 (54%) patients. Many authors recommend internal fixation of pelvic ring in order to achieve both rotational and vertical stability (28). In 3 (23%) patients, we performed internal fixation of frontal pelvis ring, while performing laparatomy, and in 2 (17%) patients external fixation was replaced by the inner one, and only after treating wounds and local infection, average after 15 days.

Hemorrhagic shock is the most common cause of death in the first 24 h. In order to eliminate hemorrhage, many authors recommend pelvicpecking, i.e. preperitoneal pelvic packing has been suggested to be ineffective for hemorrhage control in open pelvic fractures (2,4,20,29). In our series this was applied with 4 (31%) patients.
Urogenital injuries are common in open pelvic fractures and are possible cause for developing infection and death. Vaginal lacerations are the result of either penetration of a bony fragment or indirect forces from diastasis of symphysis pubis or bilateral pubic rami fractures (30). Primary treatment of these injuries is indicated in order to prevent abscess formation. We had 4 (31%) women with vaginal laceration, of which two had complete uterus amputation up to cervix. One died 8 h after injury, and in 3 patients was performed revision and bone fragments removal from vagina. Urethral lesions were conservatively treated with placing suprapubic catheter. Intraperitoneal urinary bladder ruptures have been operated, and extraperitoneal have been treated with urethral catheter.

Rectal lacerations with open pelvic fracture are rare, causing infection, sepsis, and death. Opinions on the method of treatment are opposed. Maull et al (31), Birolini et al (32), Song W et al. (14) have operated on all patients and performed totally diverting colostomy. The incidence of pelvic infection was lower in patients with early colostomy. Woods et al. (33) and Pell et al (34) treated less patients with this method, and treated more patients inoperatively, and found no differences in frequency of infection. In our serie were 3 (23%) patients with rectal injury and in all of them diverting colostomy was performed, extensive irrigation and debridement of traumatised and devitalised soft tissues, and secondary seam was applied.

There were 6 (46%) patients in the serie with urogenital injuries, 4 women and 2 men. One woman died in the first 24 hours, and 5 patients were regularly monitored. All three women have dyspareunia (painful sexual intercourse), and the youngest (18 years old) was performed a gynecological surgery in order to apply vagina dilatation and remove the scars; at the time of injury she had cervix amputation in relation to vagina. The causes of dyspareunia are: vagina laceration and formation of scar tissue that narrows its lumen, impingement of visceral pelvic organs due to deformation of pelvic ring, as a result of poor treatment of rotational and vertical unstable fractures and residual displacement of the fracture - more than 5 mm. One male patient is registered with erectile dysfunction of medium level, and the result is pubic diastasis and urethral rupture (35,36).

The mortality rate in our series of open pelvic fractures was 23% (3 deaths out of 13 patients). The mortality rate from closed pelvic fractures was 7% (15 deaths out of 221 patients). Using Fischer's exact test, difference in mortality is statistically significant for p<0,005. This is also present in reviewed literature. Despite modern improvements in injury treatment, early management, intensive care therapy, damage control and definitive fracture stabilization techniques, mortality rate due to pelvic fractures continues to range from 4 to 25%.
Risk factors for open pelvic fractures increased mortality include: increased injury severity score (ISS), > 25; decreased trauma score (TS), < 8; age > 65 years; initial systolic blood pressure < 100; blood transfusion of > 10 units in 24 hours; mortality was higher in larger soft-tissue injuries (Gustilo III); location of wounds (Faringer zone I or II); type of bone injury (vertical shear and anterior posterior type); intra-abdominal injury; urogenital injury; pelvic sepsis (38, 39, 40). In our series, the results presented in Table 3 indicate the same risk factors for mortality in open pelvic fractures.

In conclusion, we have presented experiences in treatment of patients with open pelvic fracture in our listed institutions. Vascular damage and bone bleeding that are associated with pelvic fracture can lead to a very significant, potentially fatal, hemorrhagic shock. Open pelvic fractures have high mortality, which is due to hemorrhage, infection, intra-abdominal and urogenital injury. Based on our results, we suggest that ISS > 25, TS < 8 and the patient age > 65 years have a poor prognosis on the outcome of treatment. A strategic multidisciplinary response is a critical component in managing these complex and difficult injuries. (7, 8, 37).
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**Table 1.**

Demographic information, trauma scoring and mechanism of injury

| Characteristics                | Average | Rang  |
|-------------------------------|---------|-------|
| Age                           | 41      | 13 – 76 |
| No, sex %                     | 7 (54% ) male | 6 ( 46% ) female |
| ISS                           | 30,7    | 10 – 69 |
| TS                            | 10,8    | 4 – 16 |
| PRBCs ( first 24 hours )      | 7       | 0 - 18 |
| Mechanism of injury           | No of patients ( % ) | |
| Pedestrian struck by car      | 5 ( 39 ) | |
Motorcycle collision 3 (23)  
Fall 3 (23)  
Tractor driver 2 (15)  

ISS, Injury Severity Score; TS, Trauma Score; PRBCs, Packed Red Blood Cells.

**Table 2.**
Type and magnitude of pelvic fractures

| Young – Burgess classification | Magnitude | No. of patients | Total ( % ) |
|-------------------------------|-----------|----------------|-------------|
| APC                           | I         | 2              | 46          |
|                               | II        | 3              |             |
|                               | III       | 1              |             |
| LC                            | I         | 1              | 31          |
|                               | II        | 2              |             |
|                               | III       | 1              |             |
| VS                            |           | 3              | 23          |

Yones classification

| Group | Magnitude | No. of patients | Total ( % ) |
|-------|-----------|----------------|-------------|
| Group | I         | 4              | 31          |
| Group | II        | 4              | 31          |
| Group | III       | 5              | 38          |

APC, anterior – posterior compression; LC, lateral compression; VS, vertical shear.
Table 3.
Risk factors for overall mortality

| Variable                          | Death | K-S test (D-value) | p<0,05 |
|-----------------------------------|-------|-------------------|--------|
| Pedestrian struck by car          | 2     | 3                 |        |
| Motorcycle collision              | 0     | 3                 | D=7    | p<0,05 |
| Fall                              | 0     | 3                 |        |
| Tractor driver                    | 1     | 1                 |        |
| Young – Burgess class             |       |                   |        |
| APC                               | 2     | 4                 |        |
| LC                                | 0     | 4                 | D=7    | p<0,05 |
| VS                                | 1     | 2                 |        |
| Jones class                       |       |                   |        |
| Group I                           | 0     | 4                 |        |
| Group II                          | 1     | 3                 | D=7    | p<0,05 |
| Group III                         | 2     | 3                 |        |
| Gustilo – Anderson grade          |       |                   |        |
| I                                 | 0     | 4                 |        |
| II                                | 1     | 6                 | D=0    | p<0,05 |
|                | Zone I | Zone II | Zone III |
|----------------|--------|---------|----------|
| Faringer class | 2      | 7       | 0        |
| Zone I         | 2      | 7       | 0        |
| Zone II        | 1      | 1       | D=7      |
| Zone III       | 0      | 2       |          |

|                        | Yes | No | D=7 | p<0.05 |
|------------------------|-----|----|-----|--------|
| Urogenital injury      | 1   | 5  | D=7 | p<0.05 |
| Intra – abdominal injury| 1   | 5  | D=7 | p<0.05 |
| Gender                 |     |    |     |        |
| Male                   | 2   | 4  |     |        |
| Female                 | 1   | 6  | D=7 | p<0.05 |
| Age                    |     |    |     |        |
| < 30                   | 1   | 4  |     |        |
| >30                    | 2   | 6  | D=7 | p<0.05 |
| ISS                    |     |    |     |        |
| < 25                   | 0   | 8  |     |        |
| > 25                   | 3   | 2  | D=8 | p<0.05 |
| TS                     |     |    |     |        |
| < 8                    | 3   | 3  |     |        |
| > 8                    | 0   | 7  | D=7 | p<0.05 |

ISS, Injury Severity Score; TS, Trauma Score.
Slika 1. Rtg snimak otvorenog preloma karlice
Slika 2. Otvoreni prelom karlice stabilizovan spoljnim fiksatorom
Slika 3. Mekotkivne povrede kod otvorenog preloma karlice, Faringer zona I,II