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STRES PRELOM VRATA BUTNE KOSTI NAKON ZADNJEG IŠČAŠENJA KUKA - TIP IV PO PIPKINU

Authors: 1,2Nemanja Gvozdenović, 1,2Srdjan Ninković, 1,3Mladen Jovanović, 1Dušica Marić; Vojnosanitetski pregled (2017); Online First August, 2017.

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Stres prelom vrata butne kosti nakon zadnjeg iščašenja kuka - tip IV po Pipkinu

Stress fracture of the femoral neck after Pipkin type IV hip injury

1, 2 Nemanja Gvozdenović, 1, 2 Srdjan Ninković, 1, 3 Mladen Jovanović, 1 Dušica Marić.

1 Faculty of Medicine, University of Novi Sad, Serbia
2 Department for orthopaedic surgery and traumatology, Clinical Center of Vojvodina, Novi Sad, Serbia
3 Department for plastic and reconstructive surgery, Clinical Center of Vojvodina, Novi Sad, Serbia

Nemanja Gvozdenović - corresponding author - Faculty of Medicine, University of Novi Sad, Serbia – Department for orthopaedic surgery and traumatology, Clinical Center of Vojvodina, Hajduk Veljkova 1-7, 21000 Novi Sad, Serbia
E-mail: nemanja.gvozdenovic@mf.uns.ac.rs
**Abstract**

**Introduction:** Hip fractures/dislocations Pipkin type IV are rare, often accompanied by complications and poor outcome. We describe a complication in the form of stress fracture of the femoral neck (SFOFN) after Pipkin type IV fracture – dislocation of the hip.

**Case report:** Healthy male TAXIdriver, aged 60, was injured in a traffic accident and admitted as a polytraumatised patient with Pipkin type IV hip injury. Open reduction and internal fixation had been done. Completely recovered, 9 months after injury during a walk he felt pain in the operated hip and was unable to bear weight. We noted a dislocated subcapital SFOFN which didn’t form on the site of the previous osteosynthesis.

**Conclusion:** Pipkin type IV hip injury as a result of polytrauma, unstable joint and osteosynthesis, inadequate weight bearing and disposal of physical therapy, increase the risk of complications such as avascular necrosis, or as in our case stress fracture.

**Key words:** Pipkin type IV fracture, stress fracture, hip, avascular necrosis, car accedent, polytrauma. **Number of words:** 150
Introduction

Traumatic hip dislocations are usually caused by high energy force and occur often in polytrauma patients (1). There are several classifications for hip dislocation set by different authors and all of them are based on the direction of hip dislocation (2). Posterior hip dislocations constitute about 90% of all traumatic dislocations and usually occur in traffic accidents (2). Pipkin’s classification is generally accepted and is the most commonly used classification of hip dislocation associated with fractures of the upper part of the femur (2, 3, 4). According to Pipkin, Type I represents a dislocation associated with the fracture of the femoral head under the fovea centralis capitis; Type II represents a hip dislocation associated with the fracture of the head above the fovea centralis; Type III represents Type I and Type II associated with femoral neck fracture; and Type IV represents Type I and Type II associated with the fracture of acetabulum. With increase of Pipkin classification grade, final treatment results become worse and complication rate higher (4). Frequency of complications and final functional outcome are affected by associated bone lesions and the time elapsed from the dislocation to the reposition of the dislocated hip joint and therefore reposition represents an urgent orthopedic procedure (3, 4).

Complications of hip fracture/dislocations can be: Early – interruption of the vascularization of the femoral head due to damage to the blood vessels of the femoral neck, injury of the sciatic nerve, infection, inability to perform reposition, and Late – avascular necrosis (AVN), post-traumatic osteoarthritis and heterotopic ossification (4).

The main goal of this case report is to show SFOFN as complication after Pipkin type IV hip injury, without any previous clinical or radiological signs.

Case report

A 60 year old male TAXI driver without previous comorbidities is injured in a traffic accident as a driver and taken immediately to Emergency Center of the Clinical Centre of Vojvodina (ECCCV) for treatment. At the reception, patient was unstable and advanced trauma life support measures were applied immediately. Initial diagnosis was polytrauma with Injury Severity Score of 22. Patient had injuries of the face, tongue and chest (pneumothorax with rib fractures, II-V right and II-VII left), as well as posterior dislocation of the left hip associated with fracture of the posterior acetabular wall and fracture of the femoral head (Figure 1a, b).
Pneumothorax and face injuries have been resolved immediately by the maxillofacial and general surgeons. Closed reposition of the hip had been done under general anesthesia. The position and the stability of the hip is maintained by the transtibial traction with the load of 6 kg. On the third day, after the patient’s general condition stabilized, using posterior (Koher – Langebeck) approach, osteosynthesis of the posterior acetabular wall and the femoral head had been done with two screws each (Figure 2). Verticalization and physical therapy began immediately, first day after the surgery. Full weight bearing on the leg is accomplished 3 months later with monthly controls and X-ray verifications of the progress of the fracturesanation (Figure 3.). After the end of the physical therapy the patient returned to his daily activities and job, fully functionally recovered. Six months after, respectively 9 months after the injury, the patient felt intense hip pain in the previously operated leg while walking and was unable to bear weight. He was taken to ECCCV and dislocated subcapital stress fracture of the left femoral neck was diagnosed (Figure 4a,b). After preoperative preparations, total hip replacement with cement fixation had been done (Figure 5). Intraoperatively, a complete recovery of acetabular and femoral head fractures with no signs of strong arthrosis were diagnosed but with softening of the bone tissue in the femoral neck which, presumably had enabled the occurrence of SFOFN as a complication of the primary treatment of the dislocation.

Discussion

Traumatic hip dislocation usually occurs with high intensity force in traffic accidents in younger people (1, 2). Giannoudis P. et al, noted that almost 50% of patients with Pipkin type IV fracture dislocations have bad final outcomes developing some of the complications (4). Although we applied all recommended methods for hip fractures/dislocation treatment, the patient developed a complication in the form of SFOFN.

Stress fractures are defined as the spontaneously occurred fractures caused by the weight overload. They usually occur in the lower leg and the foot in middle aged women. They may also be caused by repetitive mechanical stress; amenorrhoea; nutritional disorders; osteoporosis; rheumatoid arthritis; the Paget disease; hyperparathyroidism; steroid therapy and pregnancy (5, 6). According to Daevvis B. there are two types of SFOFN: Type I – Transversal fracture – occurs in younger people, usually caused by
repetitive mechanical stress and tends to be complicated by dislocation, and Type II – Compressive fracture – usually occurs in elderly people with systemic diseases with no tendency for dislocation (5). Our patient is not a diabetic and doesn’t have any other diseases or pathological conditions as a predisposition for this complication. We assume that in our case SFOFN occurred due to the local softening of the bone tissue (intraoperative findings) as a consequence of the early stage of AVN, or local osteopenia caused by insufficient activity and weight bearing of the injured extremity. Jung Sub Lee and associates have published the case of Type I SFOFN that occurred in a heavy alcohol drinking woman after the development of the aseptic necrosis of the femoral head (6). Glimcher and Kenzo have explained the occurrence of SFOFN together with AVN of the femoral head as a result of the difference between the elastic moduli and the compliance of the two bone types. According to these authors, the stress fracture occurs in subhondral necroticly altered bone or at the junction between necrotic and emerging reparative bone (7). Our patient also had dislocated SFOFN type I. Vinod K. and associates have published case report with similar type of subcapital neck fracture (radiological characteristics) calling it „unclassified type of neck fracture“, but their patient had a sure sign of AVN (8). Even though the occurrence of AVN is characteristic after the type IV fracture of the acetabulum, in our case there were no previous radiological indicators, nor did the patient have any symptoms that would indicate the development of the AVN of the femoral head.

AVN of the femoral head occurs in about 5% - 53% of cases of posterior dislocations of the hip as a late complication. Its occurrence is affected by the time of reposition, associated injuries, injuries caused by the influence of the “high energy force” and injuries of the blood vessels responsible for feeding the hip joint (2). The initial, so called “asymptomatic stage” of the occurrence of AVN was characterized by absence of pain and normal bone architecture on X-ray (7). Definite diagnosis of AVN (based on X-ray film) of the femoral head usually occurs 2 years after the initial injury when the hip joint becomes painful and also when the radiological changes of the femoral head have developed and are clearly visible (7, 9, 10). In our case, the patient didn’t have any symptoms, he has fully recovered with no signs of development of AVN of the femoral head and neck on the control X-rays (which didn’t exclude its presence, because it’s been 9 months since the initial injury).

Borschmann K. and associates have noticed in their research an increased incidence of SFOFN based on osteopenic bone in patients who have been in bed for a long time and
who didn’t immediately begin physical therapy (9). The higher incidence of stress fractures based on osteopenic bone have been confirmed also by Myburgh K. et al in their research, which was conducted on athletes (11). Our patient didn’t bear weight on the injured leg for three months because of the fracture sanation, but the physical therapy began immediately and was performed for 6 months till full recovery. Literature data indicate that there must be a minimum loss of 30 – 50% of the bone before it can be detected by an X-ray (9, 11). In our case, during control radiological examinations, any radiological presence of osteopenia was not observed, which was later confirmed intraoperatively. We assume that osteopenia in the femoral head and neck has facilitated the occurrence of the SFOFN. Treatment of dislocated SFOFN is always surgical, usually by total hip replacement which we have used in our case (5, 6)

Pipkin type IV hip fracture/dislocations as a part of polytrauma, late reduction of the hip, unstable osteosynthesis, too late or too early weight bearing and disposal of physical therapy increase the possibility of occurrence of complications, like avascular necrosis and stress fracture of femoral neck caused by the local osteopenia and that is how we would explain this case, or better said – complication.

Limitations of this case report is that we didn’t make postoperative Magnetic Resonance Imaging (MRI) of the hip and dual-energy x-ray absorptiometry (DEXA) examination. MRI was not done because of earlier implantation of iron screws and complete recovery of the patient (no doubt the development of complications). DEXA examination for the detection of osteoporosis was not done considering the injured patient was a middle aged male previously healthy with no comorbidities.

Abbreviations

SFOFN – Stress fracture of femoral neck
AVN – Avascular necrosis
ECCV – Emergency Center of the Clinical Centre of Vojvodina
MRI – Magnetic Resonance Imaging
DEXA – Dual-energy X-ray absorptiometry
Contributions

**Figure 1a.** CT 3D reconstruction of the pelvis with both hips – left hip without initial fracture of the femoral neck.
Arrow 1: Fracture of the posterior acetabular wall;
Arrow 2: Fracture of the femoral head
Figure 1b. Antero-posterior pelvis X-ray film – Left hip fracture/dislocation Pipkin type IV

Figure 2. Antero-posterior left hip joint X-ray film after an open reduction and internal fixation with solitary screws
Figure 3. X-ray film 3 months after the injury – full sanation of fractures without AVN

Figure 4a. Antero-posterior pelvis X-ray film made 9 months after the injury after sudden pain in the hip – subcapital stress fracture of the neck of the left femur at the place with no previous fracture
Figure 4b. CT 3D reconstruction of the pelvis with both hips – stress fracture of the left femoral neck.
Arrow 1: Stress fracture of the femoral neck
Arrow 2: Healed acetabular fracture – posterior wall
Arrow 3: Healed fracture of the femoral head

Figure 5. Final result - antero-posterior pelvis X-ray film – total hip replasment with cement fixation on the left hip after a stress fracture of the femoral n
Literature
