



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

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

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Abstract

Introduction. Hip fractures/dislocations of Pipkin type IV are rare, often accompanied by complications and poor outcome. We describe a complication in the form of a stress fracture of the femoral neck (SFOFN) after the Pipkin type IV fracture – dislocation of the hip. **Case report.** A healthy male, TAXI driver, aged 60, was injured in a traffic accident and admitted as a polytraumatised patient with the Pipkin type IV hip injury. Open reduction and internal fixation had been done. Completely recovered, 9 months after the injury during a walk he felt pain in the operated hip and was unable to bear weight. We noted a dislocated subcapital SFOFN which did not 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, increases the risk of complications such as avascular necrosis, or as in our case, a stress fracture (caused by weight overload).

Key words:

hip dislocation; hip fracture; multiple trauma; fractures, stress; orthopedics; reoperation.

Apstrakt

Uvod. Povrede kuka (fraktura-luksacija) Pipkin tipa IV su retke, često praćene komplikacijama i lošim krajnjim rezultatom. Opisujemo slučaj komplikacije lečenja frakture-luksacije kuka tipa Pipkin IV u vidu stres preloma vrata butne kosti (SFOFN). **Prikaz bolesnika.** Taksista star 60 godina, inicijalno zdrav, povređen je u saobraćajnom udesu kao politraumatizovan, sa zadnjim iščašenjem kuka i prelomom zadnjeg zida acetabuluma i glave butne kosti, tipa Pipkin IV. Odmah je operativno zbrinut – načinjena je otvorena repozicija kuka i osteositeza ulomaka solitarnim zavrtnejevima. Poptuno oporavljen, devet meseci nakon inicijalne povrede u toku hoda osetio je bol u predelu operisanog kuka i nemogućnost oslonca. Konstatovana je dislokacija i supkapitalna SFOFN koji nije nastao na mestu prethodne osteosinteze. **Zaključak.** Pipkin tip IV povreda kuka nastala u politraumi, nestabilan kuk i osteosinteza, kasno ili prerano davanje oslonca i odlaganje fizikalne terapije povećavaju mogućnost nastanka komplikacija, u vidu avaskularne nekroze ili kao u našem slučaju, stres preloma (preloma preopterećenja).

Ključne reči:

kuk, iščašenje; kuk, prelom; povrede, multiple; prelomi usled zamora; ortopedске procedure; reoperacija.

Introduction

Traumatic hip dislocations are usually caused by high energy force and occur often in polytrauma patients¹. There are several classifications of hip dislocation set by different authors and all of them are based on the direction of hip dislocation². Posterior hip dislocations constitute about 90% of all traumatic dislocations and usually occur in traffic accidents². Pipkin classification is generally accepted and it is the most commonly used classification of hip dislocation associated with fractures of the upper part of the femur²⁻⁴. 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; type IV represents type I and type II associated with the fracture of acetabulum. The higher Pipkin classification grade is, the final treatment results become worse as well as the complication rate⁴.

Frequency of complications and final functional outcome are affected by the associated bone lesions and the time passed from the dislocation to the reposition of the dislocated hip joint, and therefore, the reposition represents an urgent orthopedic procedure^{3,4}.

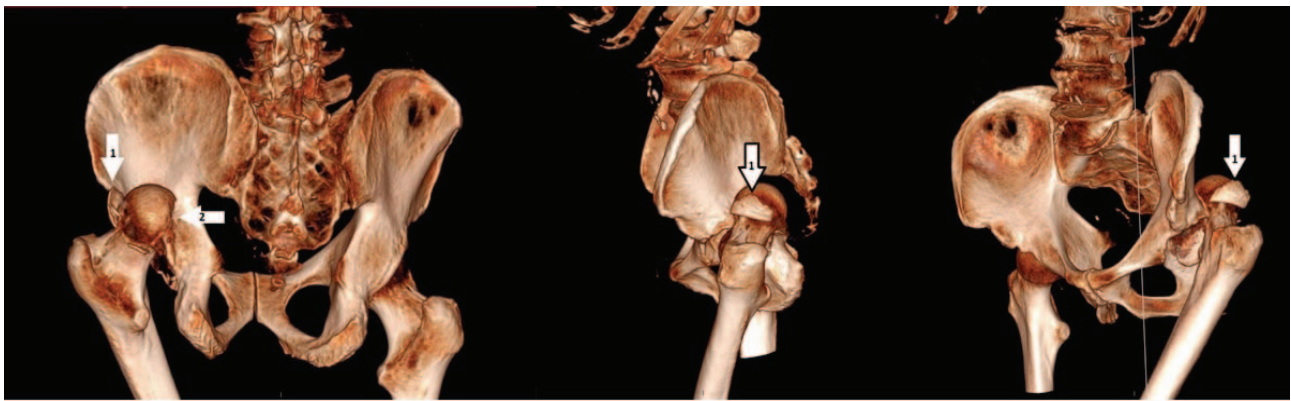


Fig. 1a – Computed tomography 3D reconstruction of the pelvis with both hips – the left hip without initial fracture of the femoral neck.

Arrow 1: Fracture of the posterior acetabular wall; Arrow 2: Fracture of the femoral head.

Complications of the hip fracture/dislocations can be early – interruption of the vascularization of the femoral head due to the damage of the blood vessels of the femoral neck, injury of the sciatic nerve, infection, inability to perform reposition; late – avascular necrosis (AVN), post-traumatic osteoarthritis and heterotopic ossification⁴.

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

Case report

A 60-year-old male TAXI driver without previous comorbidities was injured in a traffic accident as a driver and was taken immediately to the Emergency Center of the Clinical Centre of Vojvodina (ECCCV) for treatment.

At the reception, the patient was unstable and advanced trauma life support measures were applied immediately. Initial diagnosis was polytrauma with the Injury Severity Score of 22. The patient had injuries of the face, tongue and chest (pneumothorax with rib fractures, II-V right and II-VII left) as well as the posterior dislocation of the left hip associated with the fracture of the posterior acetabular wall and fracture of the femoral head (Figures 1, a and b).

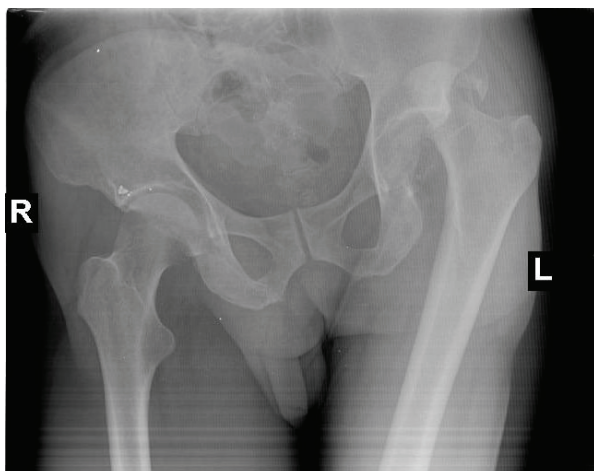


Fig. 1b – Antero-posterior pelvis radiography film: left hip fracture/dislocation of Pipkin type IV.

Pneumothorax and face injuries were resolved immediately by the maxillofacial and general surgeons. Closed reposition of the hip was done under general anesthesia. The position and the stability of the hip was maintained by the transstibial 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 were done with two screws each (Figure 2).



Fig. 2 – Antero-posterior left hip joint radiography film after the open reduction and internal fixation with solitary screws.

Verticalization and physical therapy began immediately, on the first day after the surgery. Full weight bearing on the leg was accomplished 3 months later with monthly controls and radiographic verifications of the progress of the fracture sanation (Figure 3). After the end of the physical therapy the patient returned to his daily activities and job fully functionally recovered. Six months later, 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 the ECCCV and dislocated subcapital stress fracture of the left femoral neck was diagnosed (Figures 4, a and b).



Fig. 3 – Radiography 3 months after the injury – full sanation of fractures without avascular necrosis.

After preoperative preparations, a total hip replacement with cement fixation was 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.

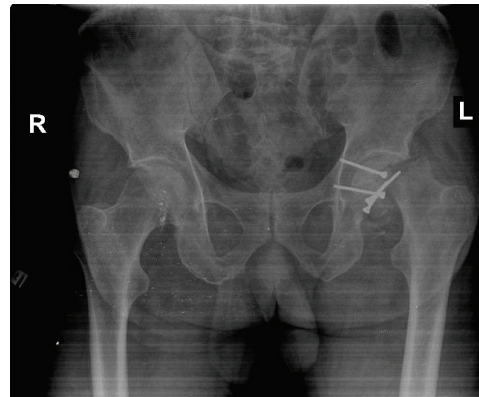


Fig. 4a – Antero-posterior pelvis radiography film made 9 months after the injury after sudden pain in the hip: subcapital stress fracture of the neck of the left femur at the place with no previous fracture.



Fig. 5 – Final result – antero-posterior pelvis radiography: total hip replacement with cement fixation on the left hip after a stress fracture of the femoral neck.

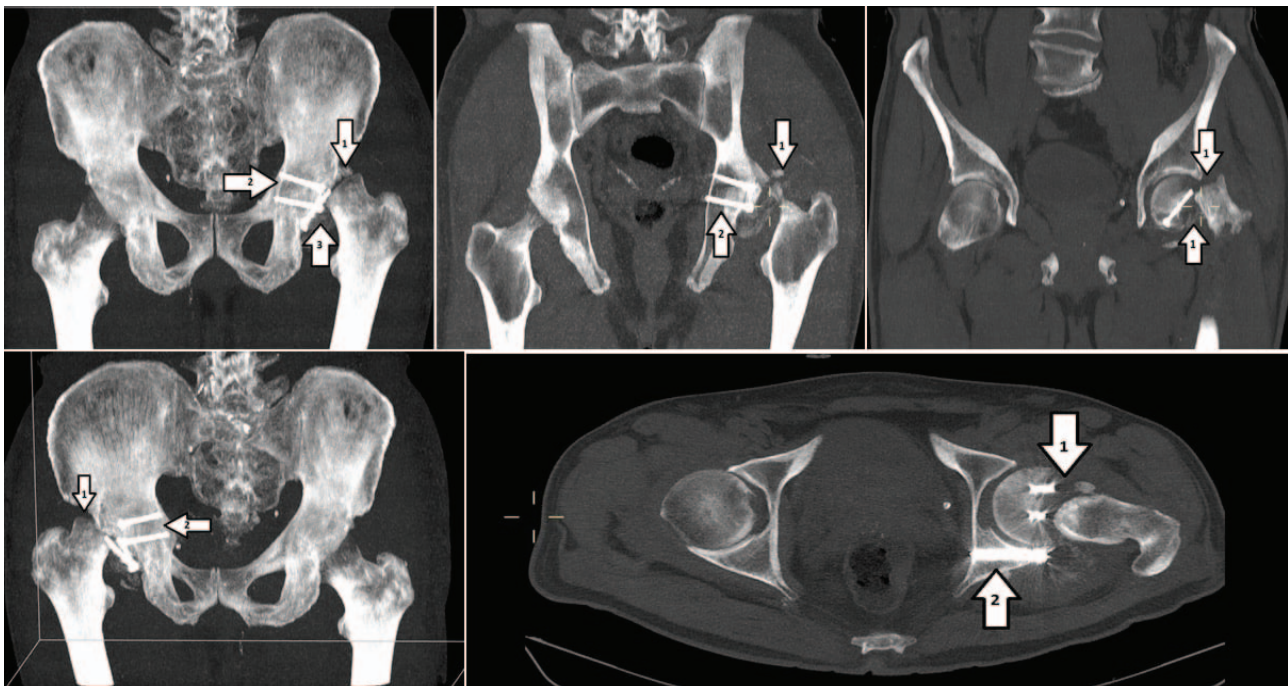


Fig. 4b – Computed tomography 3D reconstruction of the pelvis with both hips: stress fracture of the left femoral neck. Arrow 1: Stress fracture of the femoral neck; Arrow 2: Healed acetabular fracture – posterior wall; Arrow 3: Healed fracture of the femoral head.

Discussion

Traumatic hip dislocation usually occurs with high intensity force in traffic accidents in younger people^{1,2}. Giannoudis et al.⁴ noted that almost 50% of the patients with the Pipkin type IV fracture dislocations had bad final outcomes developing some of the complications.

Although we applied all recommended methods for a hip fractures/dislocations 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 the repetitive mechanical stress, amenorrhoea, nutritional disorders, osteoporosis, rheumatoid arthritis, the Paget disease, hyperparathyroidism, steroid therapy and pregnancy^{5,6}. According to Devas⁵, there are two types of SFOFN: type I – transversal fracture (occurs in younger people, usually caused by the 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 was not a diabetic and without any other disease or pathological condition 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 an early stage of AVN, or local osteopenia caused by insufficient activity and weight bearing of the injured extremity. Lee and Suh⁶ 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. Glimcher and Kenzora⁷ 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 subchondral necrotically altered bone or at the junction between necrotic and emerging reparative bone. Our patient also had dislocated SFOFN type I. Vinod et al.⁸ published a 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. 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 had any symptoms that would indicate the development of 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 joint². The initial, so called “asymptomatic stage” of the occurrence of AVN was characterized by an absence of pain and normal bone architecture on radiography⁷. A definite diagnosis of AVN (based on radiography 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 developed and are clearly visible^{7,9,10}. In our case, the patient did not have any symptoms, he had full recovery with no signs of development of AVN of the femoral head and neck on the control radiography (which did not exclude its presence, because it had been 9 months since the initial injury).

Borschmann et al.⁹ noticed in their research an increased incidence of SFOFN based on the osteopenic bone in the patients who were in bed for a long time and who did not immediately begin physical therapy. The higher incidence of stress fractures based on osteopenic bone was also confirmed by Myburgh et al.¹¹ in their research conducted on the athletes. Our patient did not bear weight on the injured leg for 3 months because of the fracture sanation, but the physical therapy began immediately and was performed for 6 months till full recovery. The relevant literature data indicate that there must be a minimum loss of 30%–50% of the bone before it can be detected by radiography^{9,11}. In our case, during the 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 a total hip replacement which we did in our case^{5,6}.

Limitations of this case report are that we did not make the postoperative magnetic resonance imaging (MRI) of the hip and the dual-energy radiography absorptiometry (DEXA) examination. The MRI was not done because of earlier implantation of iron screws and complete recovery of the patient (no doubt about the development of complications). The DEXA examination for the detection of osteoporosis was not done considering the injured patient was a middle-aged male previously healthy with no comorbidities.

Conclusion

The 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.

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