

ARTROSKOPSKI ASISTIRANA OSTEOSINTEZA PRELOMA PLATOA TIBIJE ŠACKER III TIPA - PRIKAZ SLUČAJA

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CASE REPORT

ARTHROSCOPICALLY ASSISTED OSTEOSYNTHESIS OF TIBIAL PLATEAU FRACTURE, SCHATZKER TYPE III - CASE REPORT

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SAŽETAK

Uvod. Prelomi platoa tibije su složene povrede koje u najvećem broju slučajeva zahtevaju hirurško lečenje kako bi se sprečile dalekosežne posledice na funkcionalnost i kvalitet života pacijenta. Iako su opisane brojne hirurške tehnike, pokazalo se da tehnika artroskopski asistiranu repozicije i unutrašnje fiksacije ima potencijal da preuzme vodeće mesto u zbrinjavanju ovih tipova povreda.

Prikaz slučaja. Prikazujemo pacijentkinju staru 36 godina povređenu u saobraćajnom udesu, sa prelomom platoa leve tibije tipa III, prema Šackerovoj klasifikaciji. Nakon sprovedene dijagnostike i pripreme, pacijentkinja je operisana artroskopski asistiranom repozicijom i unutrašnjom fiksacijom uz popunjavanje koštanog defekta kombinacijom koštanog grefona i sintetske zamene za kost. Intraoperativno nisu dijagnostikovane druge unutarzglobne povrede. Postoperativni tok protekao je bez komplikacija, a nakon perioda od 10 nedelja hoda bez oslonca na operisanu nogu i funkcionalne rehabilitacije došlo je do kompletnog srastanja preloma i povratka punog obima pokreta u kolenu.

Zaključak. Iako se ova vrsta povreda tradicionalno zbrinjavala otvorenom hirurzijom, smatramo da je minimalno invazivna hirurgija budućnost, kada su u pitanju prelomi platoa tibije Šacker tipova I-III. U literaturi i dalje nema dovoljno podataka koji se odnose na dugoročne ishode ove vrste lečenja, ali rani postoperativni rezultati izuzetno su ohrabrujući, budući da ova hirurška tehnika omogućava brži oporavak i manji broj postoperativnih komplikacija.

Glavne reči: artroskopska hirurgija, prelomi tibije, rana mobilizacija

ABSTRACT

Introduction. Tibial plateau fractures are complex injuries that, in most cases, require surgical treatment in order to prevent far-reaching consequences for the functionality and quality of life of the patient. While numerous surgical techniques have been described, it is evident that the technique of arthroscopically assisted repositioning (reduction) and internal fixation has the potential to take the lead in the management of these types of injuries.

Case report. We present the case of a 36-year-old patient injured in a traffic accident with a fracture of the left tibial plateau, type III by Schatzker classification. After the diagnostic procedures and preparation, the patient was operated on using arthroscopically assisted repositioning (reduction) and internal fixation, with the filling of the bone defect with a combination of allogenic and synthetic bone graft. No other intra-articular injuries were diagnosed intraoperatively. The postoperative recovery went without complications, and after a period of 10 weeks of non-weight bearing and functional rehabilitation, the fracture healed completely, while the patient regained full range of motion in the knee.

Conclusion. Although this type of injury has traditionally been treated with open surgery, we believe that minimally invasive surgery is the future, when it comes to tibial plateau fractures Schatzker types I-III. There is still not enough data in literature regarding the long-term outcomes of this type of treatment, but the early postoperative results are extremely encouraging, since this surgical technique enables faster recovery and fewer postoperative complications.

Keywords: arthroscopic surgery, tibial fractures, early mobilization

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UVOD

Prelomi proksimalnog okrajka tibije predstavljaju složene povrede koje uključuju oštećenja koštanih i mekotivnih struktura kolena. Najčešće nastaju pri dejstvu sile uzdužnog pravca visokog intenziteta i/ili usled velikog valgus/varus stresa u zglobu kolena. Nelečeni i neadekvatno lečeni prelomi dovode do razvoja sekundarne zglobne inkongruencije i degenerativne bolesti [1,2]. Uprkos relativno maloj učestalosti ovih povreda, njihovo adekvatno zbrinjavanje je od velike važnosti jer su pacijenti u većini slučajeva radno aktivni [1,3].

Glavni cilj lečenja ovih povreda jeste uspostavljanje što bolje, po mogućstvu i anatomske, repozicije zglobne površine tibije i ligamentarne stabilnosti zgloba, te poravnavanje osovine kolena i dobijanje punog obima pokreta [4]. Budući da se radi o unutarzglobnim prelomima, ovakvi ciljevi ostvarivi su gotovo isključivo operativnim putem.

Danas postoji izvesno neslaganje oko izbora hirurške tehnike u lečenju ovih preloma. Najčešće se primenjuju otvorena repozicija i unutrašnja fiksacija (engl. *open reduction and internal fixation* - ORIF) i artroskopski asistirana repozicija i fiksacija (engl. *arthroscopically assisted reduction and internal fixation* - ARIF) [1,4-7].

Postoji više klasifikacija ovih preloma, a od najvećeg kliničkog značaja su AO klasifikacija i Šackerova klasifikacija (engl. *Schatzker classification*) [8,9]. Lakši tipovi preloma (Šacker I-III) mogu se zbrinjavati kako ORIF tako i ARIF hirurškom tehnikom, dok se teži prelomi (Šacker IV-VI) obično rešavaju otvorenom hirurģijom, mada ima autora koji su mišljenja da se ARIF hirurģija može primeniti i u ovim slučajevima [10].

Prednosti ARIF hirurģije ogledaju se u direktnom sagledavanju zglobne površine tokom čitave intervencije, mogućnosti artroskopskog zbrinjavanja udruženih unutarzglobnih koštanih i mekotivnih povreda, manjoj traumi okolnog tkiva, bržem postoperativnom oporavku i manjem broju postoperativnih komplikacija [1,10-12]. Sa druge strane, prednosti otvorene hirurģije ogledaju se u mogućnosti zbrinjavanja svih tipova preloma, posebno složenih preloma ili preloma kod pacijenata sa osteoporozom, kod kojih je sama repozicija zahtevna, a stabilizacija je moguća upotrebom potpornih ili zaključavajućih ploča [13-15]. Nezavisno od izbora hirurģke tehnike, loše zbrinuti prelomi imaju značajne i dugoročne posledice na funkcionalnost i ukupno zadovoljstvo pacijenta, kao i na povećan rizik od razvoja sekundarne degenerativne bolesti, koja zahteva artroplastiku [16,17].

Cilj ovog rada je prikaz slučaja pacijentkinje sa prelomom platoa tibije Šacker III tipa, koji je lečen metodom artroskopski asistirane repozicije i unutrašnje fiksacije, uz prikaz rezultata rane postoperativne rehabilitacije.

INTRODUCTION

Fractures of the proximal tibia are complex injuries which involve damage to the osteal and soft tissue structures of the knee. They most commonly occur due to the impact of high intensity vertical force and/or as the result of great valgus/varus stress in the knee joint. Untreated or improperly treated fractures lead to the development of secondary joint incongruency and degenerative disease [1,2]. Despite a relatively low incidence of these injuries, their appropriate treatment is of great significance as the patients are, in most cases, members of the active work force [1,3].

The main goal in the treatment of these injuries is establishing the best possible, hopefully anatomical, repositioning of the tibial joint surface and achieving ligamentous stability of the joint, while also achieving knee axis alignment and a full scope of movement in the joint [4]. As these are intra-articular fractures, such goals are attainable almost exclusively with the surgical method.

At present, there is a certain dissensus as to which surgical technique should be applied in the treatment of these fractures. The procedures most commonly applied are open reduction and internal fixation – ORIF, and arthroscopically assisted reduction and internal fixation – ARIF [1,4-7].

There is a number of classifications of these fractures, the two clinically most significant being the AO classification and the Schatzker classification [8,9]. Simpler fracture types (Schatzker types I-III) can be treated both with the ORIF and with the ARIF surgical technique, while more severe fractures (Schatzker types IV-VI) are usually resolved with open surgery, although there are authors who feel that ARIF surgery can also be carried out in such cases [10].

The advantages of ARIF surgery are as follows: direct view of the joint surface during the entire procedure, possibility of arthroscopic treatment of the associated intraarticular osteal and soft tissue injuries, lesser trauma to the surrounding tissue, swifter postoperative recovery, and fewer postoperative complications [1,10-12]. On the other hand, the advantages of open surgery lie in the possibility of treating all types of fractures, especially complex fractures or fractures in patients with osteoporosis, in whom the repositioning itself is challenging, while stabilization is possible with the application of buttress plates or locking plates [13-15]. Independently of the choice of surgical technique, poorly treated fractures have significant and long-term effects on the function and overall satisfaction of the patient, as well as on the increased risk of the development of secondary degenerative disease, which requires arthroplasty [16,17].

The aim of this paper is to present the case of a female patient with a fracture of the left tibial plateau, type III by

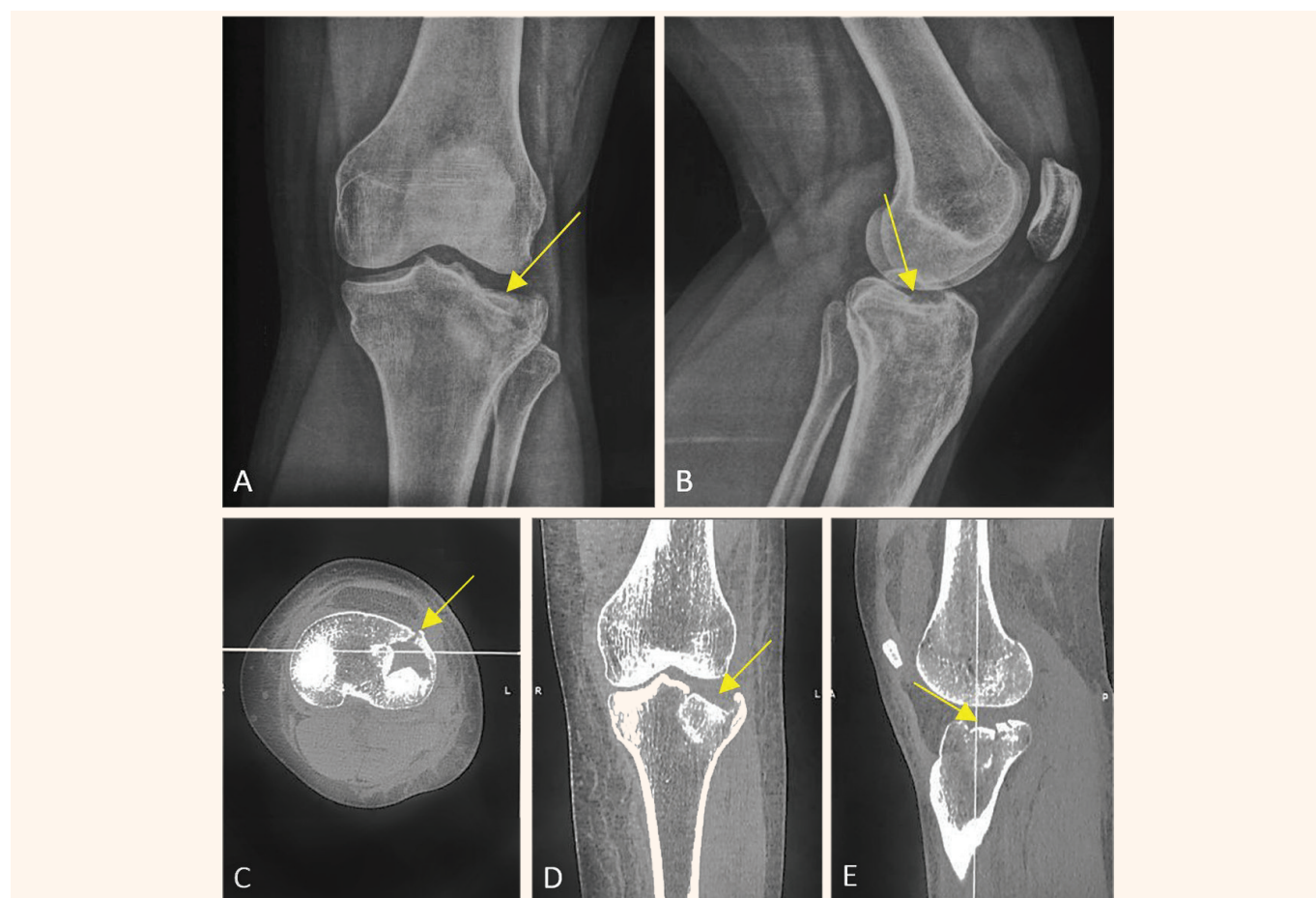
PRIKAZ SLUČAJA

Pacijentkinja stara 36 godina, primljena je u ambulantu hitne službe zbog povrede levog kolena zadobijene u saobraćajnoj nesreći, nastale direktnim udarcem vozila u spoljašnju stranu levog kolena. Na prijemu se žalila na difuzni bol u predelu levog kolena, koji se pogoršavao pri oslanjanju na nogu, i na bolom ograničene pokrete u zglobu. Prilikom pregleda uočeno je prisustvo umereno izraženog otoka u anterolateralnom aspektu kolena i potkolenice, uz prisustvo krvnog podliva sa zadnje spoljašnje strane proksimalnog dela potkolenice. Sa spoljašnje strane potkolenice bila je prisutna ekzorijacija dimenzija oko 1 cm x 0,5 cm, koja nije bila u komunikaciji sa dubljim strukturama. Aktivni i pasivni pokreti u zglobu kolena bili su ograničeni bolom – fleksija od oko 20 °, a ekstenzija 180 °. Testovi za ispitivanje ligamentarne stabilnosti bili su onemogućeni bolom. Neurološki i vaskularni nalazi leve noge bili su uredni, uz palpabilne pulseve nad magistralnim krvnim sudovima. Klinički nije bilo znakova prisustva kompartment sindroma potkolenice. Pacijentkinja nije imala drugih povreda.

Schatzker classification, treated by the application of the method of arthroscopically assisted repositioning (reduction) and internal fixation, and to present the results of the early postoperative rehabilitation of this patient.

CASE REPORT

A 36-year-old patient was admitted to the ER with an injury to the left knee sustained in a car accident after direct impact of the lateral side of the left knee with the vehicle. At admission, she complained of diffuse pain in the region of the left knee, which was exacerbated by putting weight on it, and of restricted movement in the knee, caused by pain. On examination, a moderate swelling was noted in the anterolateral aspect of the knee and the lower leg, with the presence of a hematoma on the posterolateral side of the proximal end of the lower leg. On the lateral side of the lower leg there was an abrasion, 1 cm x 0.5 cm in size, which was not in communication with the deeper structures. Active and passive movement in the knee joint was limited by pain – flexion of around 20 °, and extension 180 °. Ligament stability tests were prevented by pain. Neurological and vascular findings of the left leg were normal, with pal-



Slika 1. Preoperativna dijagnostika: AP radiografija (A), LL radiografija (B), CT snimak -transverzalni (C), CT snimak -frontalni (D) i CT snimak-sagitalni (E)

Figure 1. Preoperative diagnostics: AP radiography (A), LL radiography (B), CT image - transverse section (C), CT image – frontal section (D), and CT image – sagittal section (E)

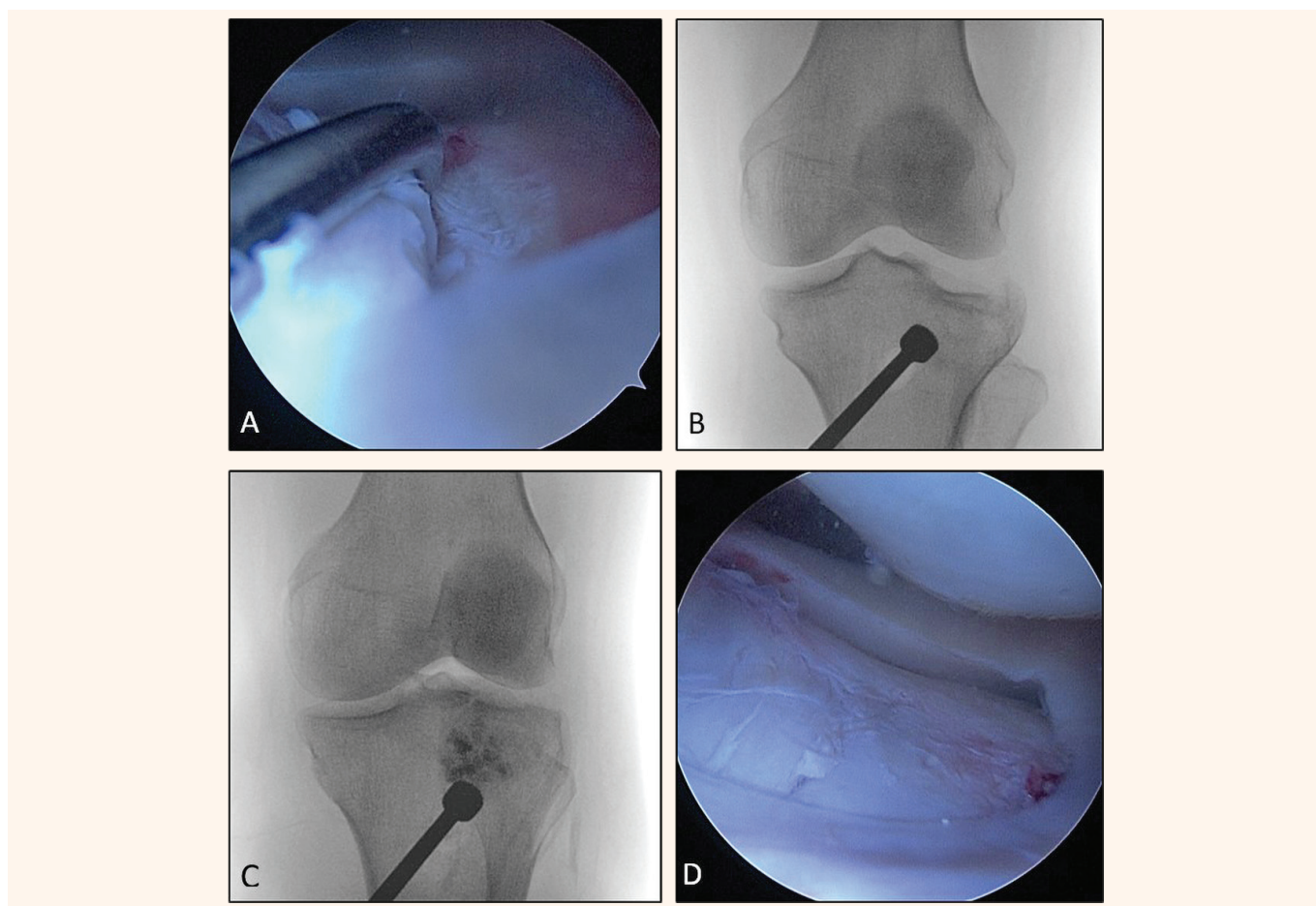
Nakon pregleda, učinjena je planarna radiografija levog kolena u dva pravca - anteroposteriornom (AP) i levom lateralnom (LL). Na radiografskim snimcima uočen je prelom spoljašnjeg kondila tibije sa utonućem prelomljenog fragmenta (tip III preloma, prema Šackerovoj klasifikaciji), bez znakova koštane povrede ostalih struktura. U sklopu dalje dijagnostike, radi preciznije evaluacije i klasifikacije preloma, učinjena je kompjuterizovana tomografija (CT). Na snimcima je uočen izolovan prelom lateralnog platoa tibije, sa centralnim utonućem. Potvrđeno je odsustvo drugih koštanih povreda (Slika 1).

Odmah nakon sprovedene dijagnostike, postavljena je natkolena gipsana longeta (meniskus šina), te je pacijentkinja primljena u bolnicu radi operativnog lečenja. U cilju procene stanja mekih tkiva povređene regije i smanjenja uočenog otoka, koji je mogao ugroziti ishod planiranog terapijskog postupka, pacijentkinja nije operisana odmah nakon prijema. Savetovan je hod uz pomoć štaka bez oslonca na povređenu nogu do operacije. Davana je tromboem-

pable pulsation above the magistral blood vessels. Clinically, there were no signs of compartment syndrome of the lower leg. The patient had no other injuries.

After the examination, planar radiography of the left knee was performed in two directions -anteroposterior (AP) and left lateral (LL). A fracture of the lateral condyle of the tibia with a sinking of the broken fragment (type III fracture, by Schatzker classification), without signs of bone injury in the surrounding structures, was noted on the radiographic images. For the purpose of more precise evaluation and fracture classification, as a part of further diagnostics, computerized tomography (CT) was performed. An isolated fracture of the lateral tibial plateau, with central sinking, was noted on the CT images. The absence of other bone injury was confirmed (Figure 1).

Immediately after the diagnostics, an above the knee plaster-of-Paris splint (meniscus splint) was placed, and the patient was admitted to hospital for surgical treatment. For the purpose of assessing the condition of the soft tissue in the injured region and reducing the observed swelling, which could have jeopardized the



Slika 2. Artroskopski prikaz frakture (A), Fluoroskopski prikaz pozicioniranja tupog instrumenta u koštanom kanalu (B), Fluoroskopski prikaz nakon utiskivanja smese grefona i sintetske zamene za kost (C), Artroskopski prikaz nakon repozicije (D).

Figure 2. Arthroscopic image of the fracture (A), fluoroscopic image of the positioning of a blunt instrument into the canal in the bone (B), fluoroscopic image after the implantation of the combination of allogenic and synthetic bone graft substitute (C), arthroscopic image after repositioning (D)

bolijska profilaktička terapija - nadroparin-kalcijum u dozi od 3.800 I.J., dva puta dnevno subkutano, uz analgetsku terapiju paracetamolom u dozi od 1.000 mg, četiri puta dnevno u sporij intravenskoj infuziji, uz dodatnu primenu metamizol-natrijuma, u dozi od 2,5 g u sporij intravenskoj infuziji, u fazama pogoršanja bola.

Operacija je izvršena četvrtog dana od dana povređivanja, po smanjenju otoka i hematoma povređene regije, u uslovima opšte endotrahealne anestezije. Perioperativno je administrirana profilaktička antibiotska terapija u vidu spore intravenske infuzije ceftriaksona od 1.000 mg u jednoj dozi. Neposredno po uvođenju u anesteziju, primenom kliničkih testova, utvrđena je stabilnost kolena u sagitalnoj i frontalnoj ravni. Pacijentkinja je postavljena u ležeći položaj na leđima, sa povređenom nogom oslonjenom na držač u nivou sredine leve natkolenice, tako da je moguće izvršiti punu pasivnu fleksiju u kolenu. Desna noga pozicionirana je u abdukciju. Pneumatska poveska postavljena je natkoleno, te je nakon elevacije ekstremiteta i kompresivne eksangvinacije napumpana do unutrašnjeg pritiska od 220 mmHg.

Po pripremi operativnog polja, pristupljeno je zglobu kolena kroz dva standardna artroskopska portala: anterolateralni (AL) i anteromedijalni (AM). Artroskopski je konstatovano postojanje hemartroze, te je zglob ispran fiziološkim rastvorom pod pritiskom. Uočen je impresijski prelom lateralnog platoa tibije (Slika 2.A). Artroskopski nisu pronađene patološke promene na ostalim koštanim i mekotkivnim strukturama.

Standardnim tibijalnim vodičem za rekonstrukciju prednje ukrštene veze (ACL) ušlo se kroz AM portal i njegov vrh je pod kontrolom optičkog instrumenta postavljen iznad identifikovane depresije lateralnog kondila. Na mestu donjeg pola vodiča, u visini medijalnog tibijalnog platoa, napravljena je uzdužna incizija kože i potkožnog tkiva, dužine oko 2 cm, te je mandren vodiča prislonjen na korteks. Kroz mandren vodiča uvedena je igla vodilja do sredine depresije lateralnog platoa pod kontrolom optičkog instrumenta i flouroskopije, vodeći računa da se ne probije zglobna hrskavica. Po uklanjanju tibijalnog vodiča, a preko igle vodilje, postavljena je burgija prečnika 10 mm kojom se probija korteks i ulazi u metafiznu regiju. Potom je depresija lateralnog platoa reponirana uz pomoć tupog instrumenta i čekića, pod direktnom kontrolom fluoroskopije i optičkog instrumenta (Slika 2.B).

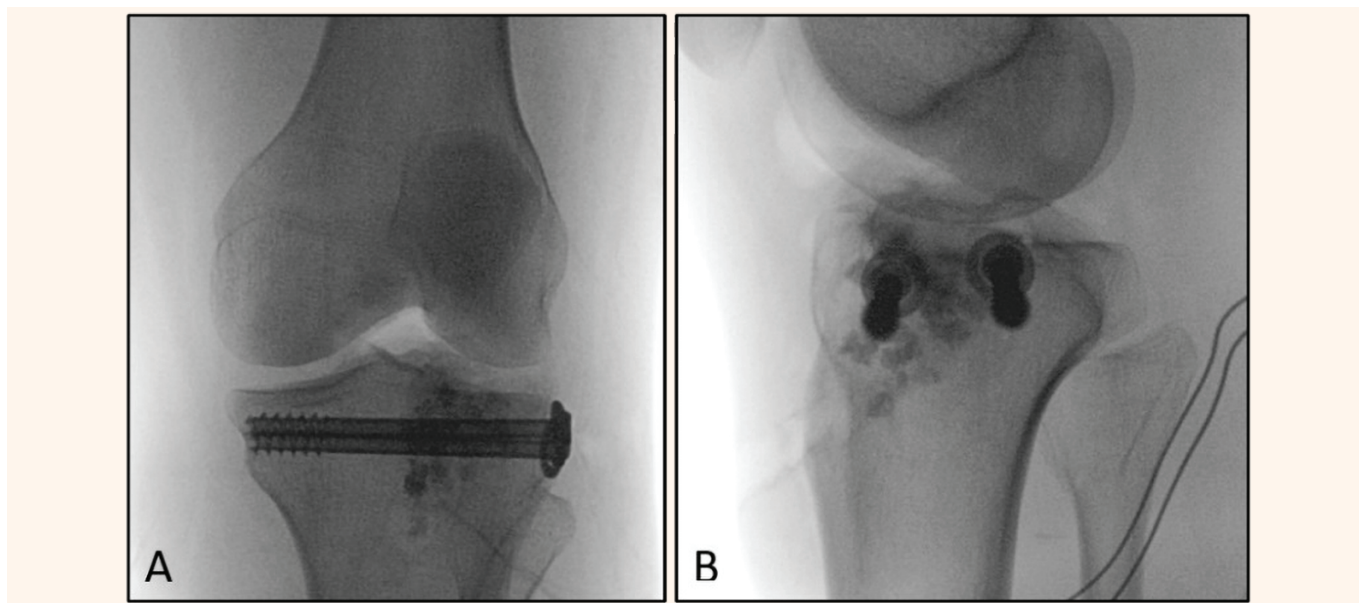
Kroz formirani koštani kanal je u metafiznu regiju utisnuta smesa grefona iz koštane banke i sintetske zamene za kost kako bi se popunio nastali subhondralni koštani defekt. Ostatak košanog kanala ispunjen je smesom do nivoa korteksa (Slika 2.C i 2.D).

planned therapeutic procedure, the patient was not operated on immediately after admission. The patient was advised to walk with the aid of crutches without putting any weight through the injured leg, until surgery. The following therapy was administered: prophylactic thromboembolic therapy – 3,800 IU of nadroparin calcium, administered subcutaneously, twice a day; analgesic therapy – 1,000 mg of paracetamol, four times a day in slow intravenous infusion, with additional administering of 2.5 g of metamizole sodium, in slow intravenous infusion, in periods of pain exacerbation.

On the fourth day after injury, once the swelling and the hematoma in the injured region had subsided, the operation was performed under general endotracheal anesthesia. Prophylactic antibiotic therapy was administered perioperatively in the form of slow intravenous infusion of a single dose of 1,000 mg of ceftriaxone. Just before the administering of anesthesia, stability of the knee was established in the sagittal and the frontal plane, with the application of clinical tests. The patient was placed to lie on her back, with the injured leg resting on the surgical leg holder at the level of the middle of the left lower leg, making it possible to perform full passive knee flexion. The right leg was positioned in abduction. A pneumatic tourniquet was positioned above the knee, and was, after extremity elevation and compressive exsanguination, pumped up to the internal pressure of 220 mmHg.

After the operative field was prepared, the knee joint was accessed via the two standard arthroscopic portals: the anterolateral (AL) and the anteromedial (AM). Hemarthrosis was determined arthroscopically, which is why the joint was rinsed with saline solution under pressure. An impression fracture of the lateral tibial plateau was detected (Figure 2.A). Arthroscopically, no pathological changes were found on the remaining osseal and soft tissue structures.

Entry was made via the AM portal with the standard tibial guide for the reconstruction of the anterior cruciate ligament (ACL), and its tip, controlled by an optical instrument was placed above the identified depression of the lateral condyle. At the site of the inferior end of the guide, at the level of the medial tibial plateau, a vertical incision was made into the skin and subcutaneous tissue, around 2 cm in length, and the tip of the guide was leaned against the cortex. With the control of an optical instrument and fluoroscopy a guide-needle was introduced via the guide to the middle of the depression of the lateral plateau, taking care not to rupture the joint cartilage. After the removal of the tibial guide, a drill, 10 mm in diameter, used to penetrate the cortex and enter the metaphyseal region, was positioned via the guide-needle. Then, the depression of



Slika 3. Postoperativni kontrolni radiografski snimci: AP (A) i LL (B).

Figure 3. Postoperative follow-up radiographic images: AP (A) and LL (B).

Pod kontrolnom fluoroskopije, perkutano su uvedene dve paralelne igle vodilje sa lateralne strane plateau tibije u pravcu medijalno, subhondralno, i paralelno sa zglobnom površinom. Preko njih su uvedena dva kanulirana zavrtnja sa parcijalnim navojima dimenzija 6,7 mm x 70 mm sa podloškama. Nakon toga učinjena je kontrolna radiografija radi provere pozicije *rafting* zavrtnja. Po fiksiranju preloma proverena je stabilnosti kroz pokrete u zglobu kolena (Slika 3).

Artroskopski je uklonjen preostali tkivni debris iz zglobne šupljine, a nakon provere hemostaze, postavljen je unutarzglobni dren, nakon čega je učinjena sutura rane pojedinačnim šavovima. Potom je u zglobnu šupljinu ubrizgan analgetsko-hemostatski koktel (8 ml 0,5% rastvora za injekciju bupivakaina, 1 ml rastvora 1% adrenalina i 500 mg rastvora traneksamične kiseline). Po previjanju rana sterilnim zavojem aplikovan je elastični zavoj radi prevencije venske staze, te je postavljena natkolena gipsana longeta, a operisana noga u postelji pozicionirana u elevaciji.

Rani postoperativni period protekao je uredno, bez lokalnih i sistemskih komplikacija. Nakon inicijalne opservacije u jedinici intenzivnog lečenja, pacijentkinja je prevedena na odeljenje i istog dana vertikalizovana i osposobljena za hod uz pomoć dve štake, bez oslonca na operisanu nogu.

Prvog postoperativnog dana uklonjen je dren i započeto je sa pasivnim vežbama za povećanje obima pokreta u kolenu. Drugog postoperativnog dana pacijentkinja je otpuštena kući sa svetom da hoda sa dve štake bez oslonca na operisanu nogu tokom narednih 10 nedelja, te da u kućnim uslovima nastavi

the lateral plateau was repositioned with the aid of a blunt instrument and a hammer, under direct control of fluoroscopy and an optical instrument (Figure 2.B).

A mixture of bone graft from the bone bank and synthetic bone graft substitute was implanted into the metaphyseal region via the canal created in the bone, in order to fill the subchondral bone defect. The remainder of the canal was filled with the mixture up to the level of the cortex (Figure 2.C and 2.D).

With the use of fluoroscopic control, two parallel needles were introduced subcutaneously from the lateral side of the tibial plateau, directed medially, subchondrally and parallel to the joint surface. Through these needles, two cannulated partially threaded screws, 6.7 mm x 70 mm, were introduced, with foundations. After that, a follow-up radiography was carried out in order to check the position of the rafting screw. After the fixation of the fracture, stability was checked through knee joint movement (Figure 3).

The remaining tissue debris was arthroscopically removed from the joint cavity, and, after a test of hemostasis, an intraarticular drain was placed, after which a suture with individual stitches was made. Then, a cocktail with analgesic and hemostatic effects (8 ml of 0.5% bupivacaine injection solution, 1 ml of 1% adrenalin solution and 500 mg of tranexamic acid solution) was injected into the joint cavity. After the wounds were dressed with a sterile bandage, an elastic bandage was applied in order to prevent venostasis, upon which an above the knee plaster-of-Paris splint was placed, and the surgically treated leg was elevated while the patient was in bed.

Early postoperative recovery was normal, without lo-

sa pasivnim vežbama za povećanje obima pokreta u operisanom kolenu. Gipsana imobilizacija zamenjena je funkcionalnom ortozom za koleno sa otključanom fleksijom. Pacijentkinja je savetovana da, nakon sprovođenja vežbi, dugog stajanja ili hodanja, u ležećem položaju sa eleviranom nogom vrši masažu kolena hladnim oblogama u cilju smanjenja otoka.

Tokom postoperativnog bolničkog lečenja nastavljeno je sa tromboembolijskom profilaktičkom terapijom nadroparin-kalcijumom u dozi od 3.800 I.J., dva puta dnevno, aplikovano subkutano, kao i sa analgetskom terapijom - paracetamol u dozi od 1.000 mg, četiri puta dnevno, ketorolak u dozi od 30 mg, tri puta dnevno, uz dodatak metamizol-natrijuma u dozi od 2,5 g, u fazama pogoršanja bola. Na otpustu je propisana tromboembolijska terapija - rivaroksaban tablete od 15 mg, jednom dnevno, do isteka 21. postoperativnog dana, kao i analgetska terapija etorikoksibom od 90 mg, jednom dnevno tokom prva tri dana, a zatim samo u slučaju pojave bolova većeg intenziteta. Savetovana je i lokalna aplikacija heparin-natrijuma od 1.000 I.J./g u obliku gela, tri puta dnevno i masaža kolena ledom, tri do četiri puta dnevno, u pravilnim vremenskim razmacima, do isteka 30. dana od dana operacije.

Prvi kontrolni pregled obavljen je 12 dana nakon operativnog zahvata, kada su uklonjeni konci iz operativnih rana. Pacijentkinja se tokom kućnog lečenja pridržavala uputstava datih na otpustu iz bolnice. Operativni ožiljci bili su mirni, bez znakova infekcije, zarasli *per primam intentionem*. Registrovan je difuzno prisutan blagi otok kolena. Tokom pregleda izvedena je pasivna fleksija u operisanom kolenu do 90°, a ekstenzija je zaostajala za 5°. Neurološki i vaskularni nalaz leve noge bili su uredni. Na kontrolnoj radiografiji potvrđena je zadovoljavajuća pozicija prelomljenih fragmenta i ugrađenog osteosintetskog materijala. Pacijentkinji je savetovan nastavak hoda sa dve štake bez oslonca na operisanu nogu, kao i intenziviranje već započete rehabilitacije u cilju povećanja obima pokreta u kolenu i jačanja natkolene muskulature.

Drugi kontrolni pregled obavljen je nakon 6 nedelja od operacije. Kliničkim pregledom konstatovana je aktivna fleksija u kolenu od 140°, ekstenzija do -5°. Na kontrolnoj radiografiji konstatovano je zarastanje preloma u nepromenjenoj poziciji.

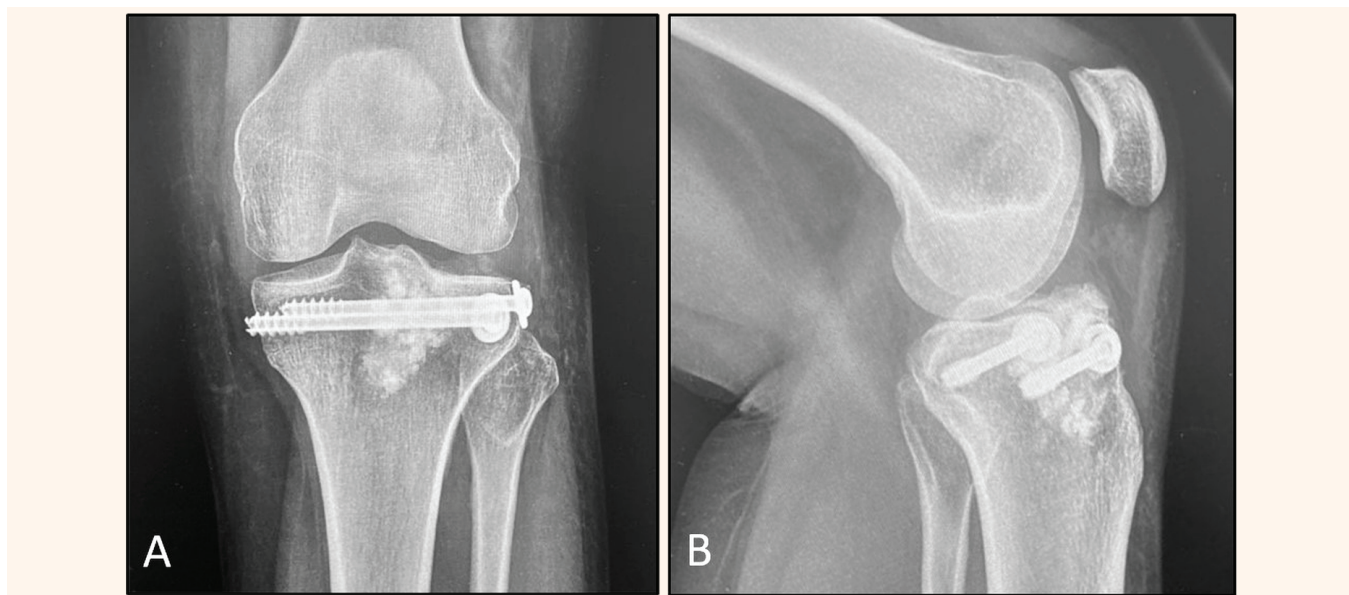
Treći kontrolni pregled obavljen je 10 sedmica nakon operacije. Klinički su konstatovani puni, bezbolni pokreti u operisanom kolenu, dok je radiografski potvrđeno srastanje preloma u nepromenjenoj poziciji (Slika 4). Pacijentkinji je savetovan prekid nošenja funkcionalne ortoze i započinjanje hoda uz pomoć štaka sa delimičnim osloncem na operisanu nogu tokom naredne dve nedelje, a nakon toga postepen

cal or systemic complications. After initial observation in the intensive care unit, the patient was transferred to the hospital ward and, on the same day, she was verticalized and enabled to walk with the help of two crutches, without putting weight through the surgically treated leg.

On the first postoperative day the drain was removed, and the patient was started on a regimen of passive exercises for the purpose of increasing the scope of movement in the knee. On the second postoperative day, the patient was discharged and was advised to walk using both crutches, without putting weight through the surgically treated leg, for the following 10 weeks. She was also advised to continue with the passive exercises for increasing the scope of movement in the surgically treated knee. The plaster-of-Paris splint was replaced with a functional knee orthosis in unlocked knee flexion mode. The patient was advised to lie down, elevate the leg and massage the knee with cold compresses after exercises, or after a longer period of time spent standing up or walking, in order to reduce swelling.

During postoperative hospital treatment, prophylactic thromboembolic therapy was continued – 3,800 IU of nadroparin calcium, administered subcutaneously, twice a day, as well as analgesic therapy – 1,000 mg of paracetamol, four times a day, 30 mg of ketorolac, three times a day, with additional administering of 2.5 g of metamizole sodium, in periods of pain exacerbation. At discharge, thromboembolic therapy was prescribed – rivaroxaban tablets, 15 mg, once a day, until the end of the 21st day after surgery, as well as analgesic therapy – etoricoxib, 90 mg, once a day in the first three days, and after that only in case of intense pain. Local application of heparin sodium, 1,000 IU/g in the form of a gel was advised, three times a day, as well as massage of the knee with ice, three to four times a day, at regular intervals, until the end of the 30th postoperative day.

The first follow-up examination was performed 12 days after the procedure, when the sutures from the patient's surgical cuts were removed. During her recovery at home, the patient adhered to the instructions given to her at hospital discharge. The scars from the operation showed no sign of inflammation or infection and healed *per primam intentionem*. A mild diffuse swelling of the knee was registered. During the examination, passive flexion of the surgically repaired knee of 90° was performed, while extension was lacking by 5°. The neurological and vascular findings of the left leg were normal. Follow-up radiography confirmed a satisfactory position of the broken fragments and the implanted osteosynthetic material. The patient was advised to continue walking with two crutches without putting any weight through the injured leg, as well as to intensify the rehabilitation she had already started



Slika 4. Kontrolna radiografija nakon 10 nedelja od operacije: AP (A) i LL (B).

Figure 4. Follow-up radiography, 10 weeks after the operation: AP (A) and LL (B).

no odbacivanje pomagala i uspostavljanje normalne šeme hoda sa punim osloncem. Sledeća kontrola planirana je nakon 16 nedelja od operacije, kada će biti razmotreno postepeno vraćanje u sportske aktivnosti niskog intenziteta.

DISKUSIJA

Prelomi tibijalnog platoa predstavljaju terapijski izazov čak i za iskusnog hirurga, s obzirom na složenost preloma, širok spektar udruženih mekotkivnih povreda, zahtevnu hiruršku tehniku i invalidnost koja zaostaje kod nelečenih i neadekvatno lečenih preloma, a koju ponekad nije moguće izbeći ni nakon veoma precizno izvršenih operacija. Kao i kod većine unutarzglobnih preloma, najbolji rezultati se očekuju nakon hirurškog lečenja, no kod određenog broja pacijenata metoda izbora je neoperativno lečenje.

Neoperativno lečenje primenjuje se kod starijih pacijenata sa izrazito osteoporotičnim kostima, malim funkcionalnim zahtevima; kod pacijenata sa brojnim komorbiditetima, koji čine hirurško lečenje neprihvatljivo rizičnim po život; kod nedislociranih ili minimalno dislociranih preloma; kao i kod manje depresije lateralnog platoa tibije, bez osovinog deformiteta [14,18]. Kod takvih pacijenata prelomi se leče imobilizacijom natkolenom gipsanom longetom ili, ako je moguće, šarkastom longetom sa bočnim uzdužnim ojačanjima, koja dozvoljava pokrete u kolenu, tromboembolijskom i analgetskom terapijom, uz fizikalnu terapiju. Hod uz pomoć štaka bez oslonca na povređenu nogu preporučuje se u trajanju od najmanje četiri do osam nedelja, u zavisnosti od tipa preloma [14].

so as to increase the scope of movement in the knee and to strengthen the upper leg musculature.

The second follow-up examination was carried out six weeks after the operation. Through clinical examination, active flexion of 140° and extension up to -5° were noted. Follow-up radiography showed healing of the fracture in unchanged position.

The third follow-up examination was performed 10 weeks after surgery. Clinically, full painless movements were noted, while radiographically, healing of the fracture was confirmed in unchanged position (Figure 4). The patient was advised to discontinue wearing the functional orthosis and to start walking with the aid of crutches with partial weight-bearing through the surgically treated leg during the following two weeks, and after that gradual rejection of the orthopedic aids and the establishing of a normal walking regimen with full weight-bearing. The next follow-up was planned for 16 weeks after surgery, when gradual return to sports activities of low intensity might be planned.

DISCUSSION

Fractures of the tibial plateau are a therapeutic challenge, even for an experienced surgeon. This is due to the complexity of these fractures, the wide array of associated soft-tissue injuries, the demanding surgical technique, as well as invalidity occurring as the consequence of untreated or inadequately treated fractures, which is sometimes impossible to avoid even after very precisely executed surgical procedures. As in most intraarticular fractures, the best results are expected after surgical treatment, however, in a certain number of patients, the method of choice is nonsurgical treatment.

Izolovana depresija lateralnog platoa tibije od 10 i više milimetara, koja zahvata mali deo zglobne hrskavice, može se uspešno lečiti i neoperativno, ali ukoliko je udružena sa razdvajanjem tibijalnog platoa ili ukoliko je zahvaćen veći deo zglobne površine, često prouzrokuje sekundarni valgus osovinski deformitet, te se takve povrede leče operativno [14]. U brojnim studijama prikazani su dobri do odlični rezultati neoperativno lečenih pacijenata sa prelomima tibijalnog platoa [19-22]. U svojoj studiji, Vadel i saradnici navode da se depresija ili razdvajanje lateralnog platoa manje od 10 mm uspešno leči neoperativno, dok su Honkonen i saradnici u svom radu objavili da se razdvajanje od 5 mm i depresija lateralnog platoa tibije od 3 mm dobro tolerišu kod neoperativno lečenih pacijenata, dok prelome medijalnog kondila ne treba lečiti neoperativno [23,24].

Ipak, prevladava stav da se ovi unutarzglobni prelomi leče operativno, kada god je to moguće. Najčešće indikacije za operativno lečenje su: dislocirani, nestabilni prelomi sa depresijom koštanih fragmenata većom od 5 mm i osovinskim deformitetom većim od 10° u koronarnoj ravni, u poređenju sa suprotnom, zdravom nogom, potom prelomi sa metafizno-dijafiznom propagacijom ili nestabilni bikondilarni prelomi, otvoreni prelomi, prelomi sa udruženim ili pretećim kompartment sindromom, prelomi udruženi sa neurovaskularnim povredama i prelomi proksimalnog okrajka tibije udruženi sa prelomima distalnog okrajka butne kosti (*floating knee*) [25]. Hung i saradnici navode da su kao indikacije za operativno lečenje uzimali varusne ligamentarne nestabilnosti u punoj ekstenziji - kod preloma medijalnog platoa tibije, varusne i valgusne ligamentarne nestabilnosti veće od 10° - kod preloma lateralnog platoa tibije, kao i utonuća tibijalne zglobne površine veća od 3 mm i/ili razdvajanja tibijalnih kondila veća od 5 mm, merena preoperativno na radiografijama [1].

Preciznu veličinu depresije zglobne površine često je teško izmeriti na AP i LL rendgenskim snimcima. Martin i saradnici navode da se, kada posmatrači mere radiografska odstupanja nezavisno jedni od drugih, njihova merenja razlikuju za 12 i više milimetara [26]. Zbog toga neki autori smatraju da je broj milimetara pojednostavljena i ne uvek pouzdana metoda za postavljanje operativnih indikacija [14]. Veličina depresije zglobne površine tibije se sa velikom sigurnošću i precizno može izmeriti na CT snimcima. Na taj način se prelomi preciznije klasifikuju, a izbor hirurške tehnike je pouzdaniji [15,27]. Čan i saradnici pokazali su značajne izmene preoperativnog plana uvođenjem CT dijagnostike, nakon standardne radiografije kolena [28].

Nonsurgical treatment is applied in elderly patients with markedly osteoporotic bones, with low functional requirements; in patients with numerous comorbidities, which render surgical treatment unacceptably risky, i.e., life-threatening; in non-displaced or minimally displaced fractures; as well as in the case of a lesser depression of the lateral tibial plateau, without axial deformity [14,18]. In such patients, fractures are treated by immobilizing the leg with an above-the-knee plaster-of-Paris splint, or, if possible, with a hinged knee brace with longitudinal side reinforcements, which allows movement in the knee, as well as with thromboembolic and analgesic therapy and physical therapy. Walking with crutches without putting any weight through the injured leg is recommended for a period of at least four to eight weeks, depending on the type of fracture [14].

An isolated depression of the lateral tibial plateau of 10 or more millimeters, which covers only a small surface of the joint cartilage, can be treated successfully non-surgically. However, if it is accompanied with tibial plateau separation, or if a significant portion of the joint surface is affected, it frequently causes secondary valgus axial deformity, which is why such injuries are treated surgically [14]. Numerous studies have reported good to excellent results in the nonsurgical treatment of patients with tibial plateau fractures [19-22]. In their study, Waddell et al. report that a depression or separation of the lateral tibial plateau smaller than 10 mm can be successfully treated non-surgically, and Honkonen et al., in their study, report that a separation of 5 mm and a depression of the lateral tibial plateau of up to 3 mm are well tolerated in non-surgically treated patients, while fractures of the medial condyle should not be treated nonsurgically [23,24].

Nevertheless, the pervasive view is that these intraarticular fractures should be treated surgically, whenever possible. The most common indications for surgical treatment are the following: displaced, unstable fractures with bone fragment depression of more than 5 mm and axial deformity greater than 10° in the frontal plane, as compared to the other, healthy leg; also, fractures with metaphyseal-diaphyseal propagation or unstable bicondylar fractures, compound fractures, fractures with accompanying or impending compartment syndrome, fractures with accompanying neurovascular injuries, and fractures of the proximal tibia with accompanying fractures of the distal end of the femur (*floating knee*) [25]. Hung et al. have reported that they took, as indications for surgical treatment, varus ligament instabilities in full extension – in fractures of the medial tibial plateau, varus and valgus ligament instabilities greater than 10° - in lateral tibial plateau fractures, as well as depression of the tibial joint surface greater than 3 mm

Klasična, otvorena hirurgija izvodi se najčešće kroz anterolateralni pristup, uz potrebu za submeniskalnom artrotomijom, radi boljeg uočavanja zglobove površine i kontrole repozicije preloma [29]. Velika incizija mekih tkiva i artrotomija, koja može biti praćena transverzalnom sekcijom meniskusa, postoperativno mogu prouzrokovati brojne komplikacije: poremećaj propriocepcije, bolove koji remete normalnu funkciju zgloba, smanjenje obima pokreta, ukočenost kolena, hematom u predelu operativne rane, postoperativnu secernaciju iz rane, produženo zarastanje rane, nekrozu ivica rane, te dehiscenciju i infekciju [1,6,11,30]. U svojim studijama, Savoie i Lačviz navode dobre do odlične rezultate preloma lateralnog platoa lečenih ORIF tehnikom [31,32].

Od kada su Kaspari i Dženings prvi objavili svoje studije o seriji pacijenata lečenih artroskopski asistiranom osteosintezom, 1985. godine, ova hirurška tehnika postaje sve prihvaćenija metoda u lečenju preloma lateralnog platoa tibije [33,34].

Artroskopski asistirana hirurgija omogućava bolje sagledavanje zglobovne površine, direktnu procenu i istovremeno adekvatno zbrinjavanje pojedinih unutarzglobnih koštanih i mekotkivnih povreda, koje se prema nekim studijama javljaju u 30% do 71% pacijenata sa prelomima tibijalnog platoa [11]. Pored toga, kao i svaka endoskopska procedura, i ova, u odnosu na klasičnu, otvorenu hirurgiju ima prednosti kao što su: manji broj postoperativnih komplikacija, manje incizije i ožiljci, manji gubitak krvi, manji postoperativni otok i hematom, mogućnost uklanjanja hematoma i tkivnog debrisa iz zgloba, poštediti mekih tkiva, a samim tim brži i lakši oporavak [7,29]. Prema nekim studijama, kod preloma tibijalnog platoa, ugrožena je intramedularna vaskularizacija, dok je periostalna uglavnom očuvana [35]. Artroskopski asistirana perkutana fiksacija preloma čuva periostalnu vaskularizaciju, na taj način smanjujući rizik od nesrastanja preloma, osteonekroze i nekroze mekih tkiva, kao i od infekcije [36].

Foubl i saradnici navode daleko bolje rezultate kod pacijenata lečenih ARIF metodama u odnosu na ORIF [37]. Kifer, Van Glabik i Odera su prikazali dobre do odlične rezultate pacijenata lečenih artroskopski asistiranom hirurgijom [38-40]. ARIF i ORIF tehnikama dobijeni su dobri klinički i radiografski rezultati, bez statistički značajne razlike u stopama komplikacija, dok su pacijenti lečeni artroskopski asistiranom hirurgijom kraće bili hospitalizovani, uz ranije postizanje punog oslonca [3,11]. Određeni autori smatraju da je artroskopska hirurgija izuzetno tehnički zahtevna procedura, koju treba da izvodi isključivo iskusni hirurg, te da se može koristiti samo kod preloma lateralnog kondila tibije (Šacker tipovi I-III) [41].

and/or tibial condyle separation greater than 5 mm, measured radiographically, prior to surgery [1].

The exact size of the joint surface depression is often difficult to measure on AP and LL X-ray images. Martin et al. state that, when different observers independently measure radiographic discrepancies, their measurements differ by 12 or more millimeters [26]. For this reason, some authors believe that the number of millimeters is a simplified and not always reliable method for determining surgical indications [14]. The size of the tibial joint surface depression can be measured precisely and with great certainty on CT scans. In this way, fractures are classified more precisely, and the choice of surgical technique is more reliable [15,27]. Chan et al. have demonstrated significant changes in the preoperative plan upon introducing CT diagnostics to follow standard radiographic imaging of the knee [28].

Classical, open surgery is most often performed through the anterolateral access, with the need for submeniscal arthrotomy, for the purpose of a better view of the joint surface and better control of fracture reduction [29]. A large incision into the soft tissue and arthrotomy, which may be accompanied by a transversal section of the meniscus, may postoperatively cause numerous complications, including the following: disruption in proprioception, pain which upsets normal joint function, reduction of the scope of movement, knee stiffness, hematoma in the area of the surgical wound, postoperative wound discharge, prolonged wound healing, necrosis of the wound margins, wound dehiscence, and infection [1,6,11,30]. In their studies, Savoie and Lachiewicz have reported good to excellent results with lateral plateau fractures treated with the ORIF technique [31,32].

Since Caspari and Jennings first published their studies on series of patients treated with arthroscopically assisted osteosynthesis, in 1985, this surgical technique has become an increasingly accepted method in treating lateral tibial plateau fractures [33,34].

Arthroscopically assisted surgery enables a better view of the joint surfaces, direct assessment and, at the same time, appropriate treatment of certain intraarticular and soft-tissue injuries, which, according to certain studies, occur in 30% to 71% of patients with tibial plateau fractures [11]. In addition, like any endoscopic procedure, this one also, when compared to classical, open surgery, has advantages, such as: a lesser number of postoperative complications, smaller incisions and scars, less blood loss, reduced postoperative swelling and hematoma, possibility of removing hematoma and tissue debris from the joint, reduced soft tissue trauma, and thereby, swifter and easier recovery [7,29]. According to some studies, in tibial plateau fractures, intramedullary vascularization is jeopardized, while periosteal

Uprkos preporukama pojedinih studija da se uzme u obzir činjenica da se korišćenjem pumpe može razviti kompartment sindrom [3,11,42], mi smo se odlučili za takav način ispiranja zgloba kolena, ohrabreni studijama koje navode da je ova komplikacija ređa kod preloma lateralnog platoa tibije, budući da se na taj način tkivni debrisi iz zglobove pukotine bolje otklanjaju [43]. Po ispiranju zgloba konstatovali smo izolovani impresijski prelom lateralnog tibijalnog platoa. Nije bilo udruženih povreda koštanih i mekotkivnih struktura, za razliku od studije Verone i saradnika, u kojoj su se mekotkivne povrede javile kod 52,5% pacijenata, i studije Kajalija i saradnika, u kojoj je ovakve povrede imalo 67% pacijenata [7,11]. Vang i saradnici u svom radu navode da su prelomi lateralnog platoa tibije bili udruženi sa nekim vidom povreda prednje ukrštene veze u oko 80% slučajeva, od kojih se u 48% slučajeva radi o kompletnoj leziji, dok su se povrede lateralnog meniskusa desile kod 48% ispitanika [44]. Koštani defekt smo popunili kombinacijom alografta (grefon iz koštane banke) i sintetske zamene za kost, a prelom smo stabilizovali kanuliranim zavrtnjima, postavljenim paralelno, subhondralno, "rafting tehnikom", opisanom od strane brojnih autora [1,7,11,14,15,36].

Neposredno postoperativno, noga je imobilisana i elevirana, uz primenu hladnih obloga na operisano koleno, u skladu sa preporukama Hunga i saradnika [1]. Dužina nošenja imobilizacije razlikuje se od studije do studije, u rasponu od 2 dana do 12 nedelja, najčešće od 3-6 nedelja [45]. Usled nedovoljnog iskustva hirurga sa ovom vrstom hirurške tehnike u lečenju preloma lateralnog platoa tibije, kod našeg pacijenta, koleno smo imobilisali funkcionalnom ortozom, koja dozvoljava pune pokrete u zglobu, u trajanju od 10 nedelja. Sa pasivnim povećanjem obima pokreta u operisanom kolenu i aktivnim izometričkim vežbama natkolene muskulature, započeto je prvog postoperativnog dana, po vađenju drena, u skladu sa studijom Boldina i saradnika [46]. Sa aktivnim vežbama u operisanom kolenu započeto je nakon uklanjanja konaca.

Prema pregledu Arnolda i saradnika, u čak 79% slučajeva postoperativno vreme hoda bez oslonca na operisanu nogu bilo je kraće od 10 nedelja, dok je hod sa delimičnim osloncem u 46% slučajeva uveden između 4. i 6. postoperativne nedelje [45]. Budući da nema jasnih preporuka o uvođenju oslonca kod pacijenata operisanih ARIF hirurškom tehnikom, mi smo se odlučili za konzervativniji pristup i pacijentkinji smo savetovali hod uz pomoć štaka bez oslonca tokom 10 nedelja, što je u skladu sa važećim AO preporukama i drugim većim studijama [1,45,47]. Nakon deset nede-

vascularization is mostly preserved [35]. Arthroscopically assisted percutaneous fracture fixation protects the periosteal vascularization, thereby reducing the risk of the fracture failing to heal, the risk of osteonecrosis and soft-tissue necrosis, as well as the risk of infection [36].

Fowble et al. have reported far better results in patients treated with ARIF methods as compared to those treated with ORIF [37]. Kiefer, Van Glabbeek, and Ohdera have shown good to excellent results with patients treated with arthroscopically assisted surgery [38-40]. With ARIF and ORIF techniques, good clinical and radiographic results have been achieved, without statistically significant differences in complication rates, while patients treated with arthroscopically assisted surgery were hospitalized for a shorter period of time, and achieved full weight bearing earlier [3,11]. Certain authors feel that arthroscopic surgery is a very demanding procedure, in the technical sense, and that it should be carried out exclusively by an experienced surgeon and applied only in fractures of the lateral condyle of the tibia (Schatzker types I-III) [41].

Despite recommendations by certain studies to be aware of the fact that the use of a pump may lead to the development of the compartment syndrome [3,11,42], we decided to use that particular method of rinsing the knee joint, encouraged by the studies stating that this complication is rarer in fractures of the lateral tibial plateau, since, in this way, tissue debris is better removed from the joint fissure [43]. After rinsing the joint, we noted an isolated impression fracture of the lateral tibial plateau. There were no accompanying injuries of the bone and soft-tissue structures, as opposed to the study by Verona et al., where soft-tissue structures occurred in 52.5% of the patients, and a study by Kayali et al., where such injuries were present in 67% of patients [7,11]. In their paper, Wang et al. have stated that fractures of the lateral tibial plateau were accompanied by some form of injury to the anterior cruciate ligament in around 80% of cases, out of which 48% had a complete lesion, while 48% of the subjects sustained injury to the lateral meniscus [44]. We filled the bone defect with a combination of allograft (graft from the bone bank) and synthetic bone graft substitute, while the fracture was stabilized with cannulated screws, positioned parallel to each other, subchondrally, by means of the rafting technique, as described by numerous authors [1,7,11,14,15,36].

Immediately after the operation, the leg was immobilized and elevated, with the application of cold compresses on the injured knee, in keeping with the recommendations by Hung et al. [1]. Patients used immobilization from two days to twelve weeks, but most commonly from three to six weeks, which varies from study to study [45]. Due to insufficient experience by

lja od operacije, na poslednjoj kontroli, dobijen je pun obim pokreta u kolenu.

Kod prikazanog pacijenta nije bilo jatrogenih povreda, intraoperativnih niti ranih postoperativnih komplikacija. Svesni smo da je period praćenja kratak i da rehabilitacija nije završena, ali dobar rani funkcionalni rezultat i radiografski nalazi nas ohrabruju da nastavimo sa ovom hirurškom procedurom i da pokušamo nadalje da usavršimo i poboljšamo hiruršku tehniku i postoperativni period. Prikazanog pacijenta ćemo svakako nastaviti da klinički i radiografski kontrolišemo. Analizom većeg broja pacijenata i dužim periodom praćenja došlo bi se do relevantnijih podataka, koji bi ukazali na to da li je artroskopski asistirana osteosinteza preloma lateralnog kondila tibije adekvatna i isplati va hirurška metoda.

Sukob interesa: Nije prijavljen.

the surgeon in the use of this particular type of surgical technique for treating lateral tibial plateau injuries, in the case of our patient, we immobilized the knee with a functional knee orthosis which allows for full movement in the knee joint, for a period of 10 weeks. Passive increase of the scope of movement in the surgically treated knee and active isometric exercises of the upper leg muscles began on the first postoperative day, upon drain removal, in keeping with a study by Boldin et al. [46]. Active exercises for the surgically treated knee began after the removal of sutures.

According to the review by Arnold et al., in as many as 79% of the cases, the postoperative time of non-weightbearing walking was shorter than 10 weeks, while partial weightbearing was introduced, in 46% of the cases, between the fourth and the sixth postoperative week [45]. As there are no clear recommendations on introducing increasing levels of weight bearing in patients treated with the ARIF surgical technique, we decided on the more conservative approach, recommending our patient to walk with crutches without putting weight through the injured leg, for a period of 10 weeks, which is in keeping with the current AO recommendations and other larger studies [1,45,47]. Ten weeks after the operation, at the latest check-up, full scope of movement in the knee was achieved.

In the presented patient there were neither any iatrogenic injuries nor were there any intraoperative or early postoperative complications. We are aware that the follow-up period is short, and that rehabilitation is not yet over, however a good early functional result and the radiographic findings are encouraging as to the further application of this surgical procedure, motivating us to try and perfect it further and improve the surgical technique, as well as postoperative recovery. We will definitely continue to monitor the patient, both clinically and radiographically. Analysis and monitoring of a larger number of patients over a longer period of time would provide more relevant data, which would indicate whether arthroscopically assisted osteosynthesis of lateral tibial condyle fracture is an appropriate and cost-effective method.

Conflict of interest: None declared.

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