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## KOMPLIKACIJE U LEČENJU SEGMENTNIH PRELOMA POTKOLENICE

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**Sažetak:** Segmentni prelomi potkolenice spadaju u grupu najtežih preloma lokomotornog sistema. Najčešće se sreću kod politraumatizovanih bolesnika. Lečenje segmentnih preloma potkolenice može biti konzervativno ili operativno. Lečenje segmentnih preloma potkolenice prati čitav niz komplikacija, kao što su usporeno zarastanje, dislokacija fragmenata u jednom ili drugom žarištu preloma, zarastanje preloma u lošoj poziciji, nezarastanje preloma, aseptična i septična pseudoartroza, infekcija oko klinova fiksatora, infekcija rane otvorenog segmentnog preloma potkolenice, jatrogena infekcija, osteomijelitis i amputacija ekstremiteta. U radu se prikazuje bolesnica sa teškim segmentnim prelomom potkolenice na dva nivoa, koja je lečena spoljnom skeletnom fiksacijom. Bez otvaranja žarišta preloma urađena je repozicija u proksimalnom i distalnom delu i prelomi su stabilizovani spoljnim skeletnim fiksatorom. Nakon operativnog zahvata bolesnica je aktivirana sa potpazušnim štakama sa rasteretnim osloncem na povređenu nogu. Ordiniran niskomolekularni heparin, fraxiparin u prevenciji tromboze i tromboembolije pluća i fortikolinn u cilju stimulacije zarastanja preloma. Po zarastanju preloma spoljni skeletni fiksator je odstranjen i bolesnica se vratila svojim radnim i životnim aktivnostima. Na kontrolnom pregledu pet godina nakon segmentnog preloma potkolenice, pacijentkinja ima stabilan i čvrst oslonac na povređenu nogu.

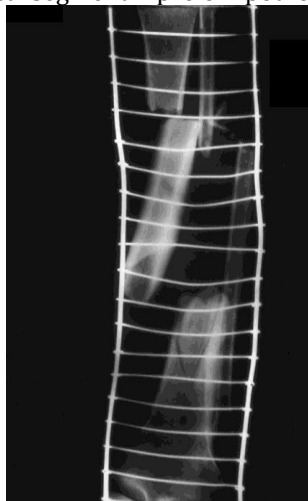
**Ključne reči:** Segmentni prelom potkolenice, spoljni skeletni fiksator, stabilizacija preloma, prevencija tromboembolije pluća, usporeno zarastanje preloma, petogodišnje praćenje

### UVOD

Segmentni prelomi potkolenice predstavljaju prekid kontinuiteta koštanog tkiva dijafize tibije na dva ili više nivoa. Pored konkvasantnih preloma spadaju u najteže prelome lokomotornog sistema. Najčešće nastaju pod dejstvom snažne traume u

saobraćajnom i industrijskom traumatizmu. Između dva nivoa preloma na tibiji postoji intermedijalni fragment, deo tibije koji odvaja dva žarišta preloma. Dužina intermedijalnog fragmenta može varirati od 3 do 20 santimetara (slika1).

Slika 1. Radiografija potkolenice sa segmentni prelom potkolenice u bolesnice stare 40 godina



Kominucija može biti prisutna i u jednom i u drugom žarištu preloma [1,2,3].

#### CILJ RADA

Cilj rada je bio prikaz uspešnog lečenja bolesnice sa teškim segmentnim prelomom potkolenice, metodom spoljne skeletne fiksacije.

#### MATERIJAL I METOD RADA

Bolesnica je lečena u Klinici za ortopediju i traumatologiju KC u Nišu metodom

spoljne skeletne fiksacije, bez otvaranja žarišta preloma. Ista je nakon operativnog zahvata, praćena pet godina.

#### PRIKAZ SLUČAJA

Bolesnica stara četrdeset godina zadobila je težak zatvoreni segmentni prelom potkolenice pri padu sa visine (slika 2 i 3).

Slika 2 i 3. Segmentni prelom potkolenice, sa dva žarišta preloma u proksimalnom i distalnom delu potkolenice.



Odmah nakon prijema započeto je sa preoperativnom pripremom i bolesnica je operisana pri čemu je nakon repozicije pod kontrolom rentgena urađena stabilizacija

preloma sa dva klina u proksimalni, dva u distalni deo tibije i dva klina u intermedijalni fragment (slika 4 i 5).

Slika 4 i 5. Segmentni prelom stabilizovan spoljnim skeletnim fiksatorom „Mitković“, nakon repozicije preloma pod kontrolom rentgena



U toku hospitalnog lečenja bolesnica je redovno previjena oko klinova spoljnog skeletnog

fiksatora i aktivirana uz pomoć potpazušnih štaka (slika 6).

Slika 6. Segmentni prelom potkolenice stabilizovan spoljnim skeletnim fiksatorom.



Po završenom hospitalnom lečenju bolesnica je upućena na fizikalnu terapiju, u Ribarsku banju. Po završenoj rehabilitaciji, pacijentkinja je nastavila sa rehabilitacijom u mestu življenja. Oslonac na operisanu nogu postepeno je povećavan. Registrovano je usporeno zarastanje preloma i u proksimalnom i u distalnom žarištu

preloma. Po zarastanju preloma i u proksimalnom i distalnom delu tibije spoljni skeletni fiksator je odstranjen.

Na kontrolnom rentgenskom snimku, pet godina nakon preloma vidi se dobro zarastao prelom (slika 7 i 8).

Slika 7 i 8. Rentgenski snimak potkolenice pet godina nakon segmentnog preloma i spoljne skeletne fiksacije.



Kliničkim pregledom utvrđeno je da ne postoji skraćanje povređene noge, da nema angularnih

deformiteta i da pacijentkinja ima čvrst i stabilan oslonac (slika 9 i 10).

Slika 9 i 10. Noge su jednake dužine, bez angularnih deformiteta, što omogućava stabilan i čvrst oslonac na povređenu nogu.



#### DISKUSIJA

Prema podacima iz literature učestalost segmentnih preloma potkolenice kreću se od 1% do 6%. U preko 60% slučajeva radi se o otvorenim prelomima potkolenice. Segmentni prelomi potkolenice su retko izolovana povreda, i često se sreću kod politraumatizovanih bolesnika [2,3].

Lečenje segmentnih preloma potkolenice može biti konzervativno ili operativno. Konzervativno lečenje primenjuje se kod nedislociranih segmentnih preloma potkolenice i kod preloma koji mogu biti reponirani i zadržani u toj poziciji. Metode konzervativnog lečenja su gipsana imobilizacija, klinovi inkorporirani u gips i skeletna trakcija. Segmentni prelomi potkolenice mogu biti operativno lečeni: osteosintezom pločom i zavrtanjima, intramedularnim klinom i spoljnom skeletnom fiksacijom [4,5]. Nakon repozicije segmentnog preloma potkolenice, bez otvaranja žarišta preloma, postavljaju se klinovi u proksimalni, distalni fragment i intermedijarni fragment pod kontrolom rentgena. U zavisnosti od veličine intermedijarni fragment može biti stabilizovan sa dva klina, a ukoliko je mali onda jednim klinom. Postavljaju se kleme i šipka fiksatora i segmentni prelom je stabilizovan spoljnim skeletnim fiksatorom. Još jednom se proverava položaj fragmenata u operacionoj sali. Pacijentu se ordinira niskomolekularni heparin, u prevenciji tromboze i tromboembolije pluća i preparat u cilju stimulacije zarastanja preloma.

Kod otvorenih segmentnih preloma potkolenice pored primarne obrade rane otvorenog preloma uključuju se antibiotici koji pokrivaju i gram negativnu i gram pozitivnu floru (Ceftriaxon a 2g/24h iv amp. Amikacin a 1g/24h, Metronidazol 500mg/8h). Nakon operativnog zahvata pacijent se aktivira sa potpazušnim štakama.

Previjanje oko klinova spoljnog skletnog fiksatora se radi na sedam dana. U slučaju infekcije oko klinova previjanje se radi češće [6, 7]. Oslonac na povređenu nogu se postepeno povećava, sa zarastanjem preloma. Fizikalna terapija se sprovodi u hospitalnim uslovima ili ambulantno, sa postepenim povećanjem oslonca na povređenu nogu.

Lečenje segmentnih preloma potkolenice prati čitav niz komplikacija, kao što su usporeno zarastanje segmentnog preloma, dislokacija fragmenata u jednom ili drugom žarištu preloma, zarastanje preloma u lošoj poziciji, nezarastanje preloma, aseptična i septična pseudoartroza, infekcija oko klinova spoljnog skletnog fiksatora, infekcija rane otvorenog segmentnog preloma potkolenice, jatrogena infekcija, osteomijelitis i amputacija ekstremiteta [8,9,10].

#### ZAKLJUČAK

Segmentni prelomi potkolenice spadaju u grupu najtežih preloma lokomotornog sistema. Spoljna skeletna fiksacija predstavlja jednu od

metoda lečenja kako zatvorenih, tako i otvorenih preloma potkolenice.

Ukoliko je moguće treba uraditi repoziciju preloma pod kontrolom rentgena radioskopije, bez otvaranja žarišta segmetnog preloma. Ukoliko se radi o otvorenom segmentnom prelomu neophodno je uraditi primarnu obradu rane otvorenog preloma,

spoljnu skeletnu fiksaciju, ordinirati antitetanusnu zaštitu i antibiotsku terapiju (longacef i amicacin, metronidazol 500m/8h). I kod zatvorenih i otvorenih segmentnih preloma ordinira se i niskomolekularni heparin u prevenciji tromboze i tromboembolije pluća i preparati u cilju stimulacije zarastanja preloma.

#### LITERATURA:

1. Butković I. Prelomi potkolenice. U: Banovic D. (ed). Traumatologija koštano-zglobnog sistema. Zavod za udžbenike i nastavna sredstva Beograd, 1998;39-46.
2. Golubović Z. Lečenje zatvorenih preloma potkolenice. Zadužbina Andrejević, Beograd, 1997.
3. Golubović I, Vukašinić Z, Stoilković P, Golubović Z, Stamenić S, Najman S.: Open segmental fractures of the tibia treated by external fixation. Srpski Arhiv Celokup. Lek. 2012; 140(11-12); 737-47.
4. Mitković M. Spoljna fiksacija u traumatologiji. Prosveta, Niš, 1992.
5. Golubović Z, Mitković M, Maksimovic M. Retrospective analysis of postoperative infections frequency after open fracture internal fixation treatment. Acta Orthop Jugosl. 1995;26(suppl 1):211-3.
6. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones. Retrospective et prospective analyses. J Bone Joint Surg Am. 1976; 58: 453-8.
7. Ivan Golubović, Branko Ristić, Predrag Stoilković, Milan Ćirić, Ivana Golubović, et al. Results of open tibial fracture treatment using external fixation. Srpski Arhiv Celokup. Lek. 2016;144(5-6):293-299.
8. Golubović Z, Stoilković P, Mačukanović Golubović L, Milić D, Milenković S, Kadija M et al. External fixation in the treatment of open tibial shaft fractures. Vojnosanitetski pregled 2008;65(5):343-348.
9. Mitković M, Bumbaširević M, Golubović Z, Micić I, Mladenović D, et al. New concept in external fixation. Acta Chir Jugosl. 2005;52(2):107-11.
10. Swiontkowski MF, Aro HT, Donell S, Esterhai JL, Goulet J, et al. Recominat human bone morphogenetic protein- 2 in open tibial fractures. A subgroup analysis of data combined from two prospective randomized study. J Bone Joint Surg Am. 2006;88: 1258-65.

## COMPLICATIONS IN THE TREATMENT OF SEGMENTAL TIBIAL FRACTURES

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**Summary:** Segmental tibial fractures belong to the group of the most severe fractures of the locomotor system. They are most common in polytraumatized patients. Treatment of segmental tibial fractures can be conservative or operative. Treatment of segmental tibial fractures is accompanied by a number of complications, such as delayed healing, dislocation of fragments in one or the other fracture point, healing of fractures in poor position, non-healing of fractures, aseptic and septic pseudoarthrosis, infection around fixator wedges, wound infection of open segmental tibial fracture, iatrogenic infection, osteomyelitis, and limb amputation. The paper presents a female patient with a severe segmental tibial fracture on two levels, who was treated with external skeletal fixation. Without opening the fracture point, repositioning was performed in the proximal and distal part and the fractures were stabilized with an external skeletal fixator. After the operation, the patient was activated with underarm crutches with relief support on the injured leg. For the purpose of stimulating fracture healing, low molecular weight heparin, Fraxiparine (to prevent thrombosis and pulmonary thromboembolism) and Forticolinn were prescribed. After the fracture healed, the external skeletal fixator was removed and the patient returned to her working and living activities. At the follow-up examination five years after the segmental tibial fracture, the patient had a stable and firm support on the injured leg.

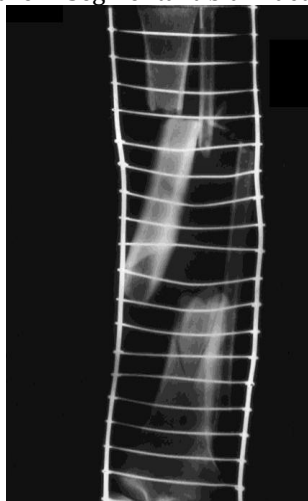
**Key words:** Segmental tibial fracture, external skeletal fixator, fracture stabilization, prevention of pulmonary thromboembolism, delayed fracture healing, five-year follow-up

### INTRODUCTION

Segmental tibial fractures represent a break in the continuity of the bone tissue of the diaphysis of the tibia at two or more levels. In addition to comminuted fractures, they rank among the most severe fractures of the locomotor system. They most often occur under

the influence of strong trauma in traffic and industrial trauma. Between the two levels of fracture on the tibia, there is an intermediate fragment, the part of the tibia that separates the two centres of fracture. The length of the intermediate fragment can vary from 3 to 20 centimetres (Figure 1).

Figure 1. Segmental tibial fracture.



Comminution can be present in both fracture points [1,2,3].

#### THE AIM OF THE PAPER

The aim of this paper is to present the treatment of a female patient with a segmental tibial fracture, by using the method of external skeletal fixation.

#### MATERIALS AND METHODS

The patient was treated at the Clinic for Orthopaedics and Traumatology of the Clinical

Centre in Niš by using the method of external skeletal fixation, without opening the fracture point. After the operation, the patient was followed up for five years.

#### CASE REPORT

The forty-year-old female patient suffered a severe closed segmental tibial fracture after falling from a height (Figures 2 and 3).

Figures 2 and 3. Segmental tibial fracture, with two fracture points in the proximal and distal part of the tibia.



Right after admission, preoperative preparation was started and the patient was operated on; after repositioning under X-ray control, fracture stabilization was performed with two wedges in

the proximal, two in the distal part of the tibia and two wedges in the intermediate fragment (Figures 4 and 5).

Figures 4 and 5. Segmental fracture stabilized by external skeletal fixator "Mitković", after fracture repositioning under X-ray control



During hospital treatment, the patient had the wounds regularly dressed around the wedges of

the external skeletal fixator and activated with the help of underarm crutches. (figure 6).

Figure 6. Segmental tibial fracture stabilized by an external skeletal fixator.



After completing the hospital treatment, the patient was referred to physical therapy in Ribarska Spa. After completing the rehabilitation in the spa, the patient continued with the rehabilitation in the place of living. The support on the operated leg was gradually increased. Slowed fracture healing was registered in both

the proximal and distal fracture points. After the fracture healed in both the proximal and distal part of the tibia, the external skeletal fixator was removed.

A control X-ray, five years after the fracture, shows a well-healed fracture (figures 7 and 8).

Figures 7 i 8. X-ray of the tibia five years after segmental fracture and external skeletal fixation.



Clinical examination revealed that there was no shortening of the injured leg, that there were no

angular deformities and that the patient had a firm and stable support. (figures 9 and 10).



Figures 9 and 10. The legs are of equal length, without angular deformities, which enables stable and firm support on the injured leg.



#### DISCUSSION

According to the data from the literature, the frequency of segmental tibial fractures ranges from 1% do 6%.

In over 60% of cases, these are open tibial fractures. Segmental tibial fractures are rarely an isolated injury, and they are frequently found in polytraumatized patients [2,3].

Treatment of segmental tibial fractures can be conservative or operative. Conservative treatment is applied in non-dislocated segmental tibial fractures and in fractures that can be repositioned and kept in that position. Methods of conservative treatment are plaster immobilization, wedges incorporated in plaster and skeletal traction. Surgically, segmental tibial fractures can be treated with osteosynthesis with a plate and screws, intramedullary wedge and external skeletal fixation [4,5]. After repositioning of the segmental tibial fracture, without opening the fracture points, wedges are placed in the proximal, distal and the intermediate fragment under X-ray control.

Depending on the size, the intermediate fragment can be stabilized with two wedges, and if it is small, then with one wedge. The clamps and the fixator rod are installed and the segmental fracture is stabilized by an external skeletal fixator. The position of the fragments is checked once again in the operating room. The

patient is prescribed low molecular weight heparin, Fraxiparine to prevent thrombosis and pulmonary thromboembolism and Forticolinn to stimulate fracture healing. In open segmental tibial fractures, in addition to the primary treatment of the open fracture wound, antibiotics covering both gram-negative and gram-positive flora are included (Longacef a 2g/24h and amp. Amicacin a 1g/24h, Metronidazole 500/8h). After the operation, the patient is activated with underarm crutches. Dressing of the wounds around the wedges of the external skeletal fixator is done for seven days. In case of infection around the wedges, dressing of the wounds is done more often [6, 7]. As the fracture heals, the support on the injured leg gradually increases. Physical therapy is performed in hospital or in an outpatient facility, with a gradual increase in support on the injured leg.

Treatment of segmental tibial fractures is accompanied by a number of complications, such as delayed healing of segmental fracture, dislocation of fragments in one or the other fracture point, healing of fractures in poor position, non-healing of fractures, aseptic and septic pseudoarthrosis, infection around the wedges of external skeletal fixator, wound infection of open segmental tibial fracture,

iatrogenic infection, osteomyelitis, and limb amputation. [8,9,10].

### CONCLUSION

Segmental tibial fractures belong to the group of the most severe fractures of the locomotor system. External skeletal fixation is one of the methods of treatment of both closed and open tibial fractures. If possible, X-ray-controlled fracture repositioning should be performed, without opening the point of the

segmental fracture. If it is an open segmental fracture, it is necessary to perform primary treatment of the open fracture wound, external skeletal fixation, prescribe anti-tetanus protection and antibiotic therapy (Longacef and Amicacin, Metronidazole 500mg/8h). In both closed and open segmental fractures, low molecular weight heparin (Fraxiparine) is prescribed to prevent thrombosis and pulmonary thromboembolism, and Forticolin in order to stimulate fracture healing.

### LITERATURE:

1. Butković I. Prelomi potkolenice. U: Banovic D. (ed). Traumatologija koštano-zglobnog sistema. Zavod za udžbenike i nastavna sredstva Beograd, 1998;39-46.
2. Golubović Z. Lečenje zatvorenih preloma potkolenice. Zadužbina Andrejević, Beograd, 1997.
3. Golubović I, Vukašinović Z, Stoilković P, Golubović Z, Stamenić S, Najman S.: Open segmental fractures of the tibia treated by external fixation. Srpski Arhiv Celokup. Lek. 2012; 140(11-12); 737-47.
4. Mitković M. Spoljna fiksacija u traumatologiji. Prosveta, Niš, 1992.
5. Golubović Z, Mitković M, Maksimovic M. Retrospectiv analysis of postoperative infections frequency after open fracture internal fixation treatment. Acta Orthop Jugosl. 1995;26(suppl 1):211-3.
6. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones. Retrospective et prospective analyses. J Bone Joint Surg Am. 1976; 58: 453-8.
7. Ivan Golubović, Branko Ristić, Predrag Stoilković, Milan Ćirić, Ivana Golubović, et al. Results of open tibial fracture treatment using external fixation. Srpski Arhiv Celokup. Lek. 2016;144(5-6):293-299.
8. Golubović Z, Stoilković P, Mačukanović Golubović L, Milić D, Milenković S, Kadija M et al. External fixation in the treatment of open tibial shaft fractures. Vojnosanitetski pregled 2008;65(5):343-348.
9. Mitković M, Bumbaširević M, Golubović Z, Micić I, Mladenović D, et al. New concept in external fixation. Acta Chir Jugosl. 2005;52(2):107-11.
10. Swiontkowski MF, Aro HT, Donell S, Esterahai JL, Goulet J, et al. Recombinant human bone morphogenetic protein-2 in open tibial fractures. A subgroup analysis of data combined from two prospective randomized study. J Bone Joint Surg Am. 2006;88: 1258-65.