

## TREATMENT OF PERIPROSTHETIC FEMORAL FRACTURES WITH SELF-DYNAMISABLE INTERNAL FIXATOR

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Femoral fractures, after hip arthroplasty (Periprosthetic fractures), may impose an immense problem in the treatment and recovery of such patients. The treatment is very difficult because there is not any universal treatment method. In the present study, the patients with femoral fractures after total hip arthroplasty are presented, treated at the Clinic of Orthopedics of the Clinical Center Nis. Vancouver Classification System was used. The fractures have been fixed by cerclage wire, Muller's plates and Mitkovic's self-dynamizing Internal Fixator. The authors present 37 patients with femoral fractures after total hip arthroplasty. The average age is 67.3 years (26 women, 11 men).

Type A fracture was found in 8 patients, type B in 23 patients, and type C in 6 patients.

The femoral fracture occurred during the period from 2 months up to 4 years after the primary arthroplasty. Patients were followed 1 – 5 years after the surgery. All patients were mobile early and able to walk with crutches. The signs of fracture consolidation and healing appeared 3 – 5 months after the operation. In 5 cases there was no fracture consolidation up to 4 years. There were no mechanical complications. Periprosthetic femoral fractures are considered severe complications, particularly among the elderly. Mitkovic's dynamisable Internal Fixator represents an implant which enables fixation of all types of periprosthetic fractures, without impairing periosteal vascularisation, the fixation being at the same time less invasive compared to other implants. In addition, the implant enables dynamic fixation of a fracture, which reduces the risk of mechanical complications related to fixation. *Acta Medica Medianae* 2017;56(3):31-37.

**Key words:** Periprosthetic fractures, femoral bone, treatment

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### Introduction

Femoral fractures, as an outcome of hip endoprosthesis insertion (periprosthetic fractures) may impose an immense problem, for both the treatment and recovery of such patients. A socio-economic aspect in these patients is equally essential, considering the seriousness of the injury and treatment costs. The treatment of these injuries may be very delicate and challenging for a surgeon, while there is no universal method of treatment. There are many surgical approaches to the problem, such as free-screw fixation, cerclage wire, plates of various types (with or without

osteoplasty), up to a revision of total hip arthroplasty use (1, 2).

Mitković's dynamisable Internal Fixator is a modern dynamic implant, which allows efficient fixation of all types of periprosthetic fractures (3).

Mitković's Dynamic Internal Fixator is an implant which enables fracture fixation in both cortexes, regardless of the presence of the endoprosthesis stem. The implant has mobile clamps vertically placed and round cylindrical clamp bar, enabling convergent placement of the screws and allowing their being shifted along the vertical axis. Therefore, the screws can be placed without any exception.

It is important that using this implant, all types of femoral fractures can be treated.

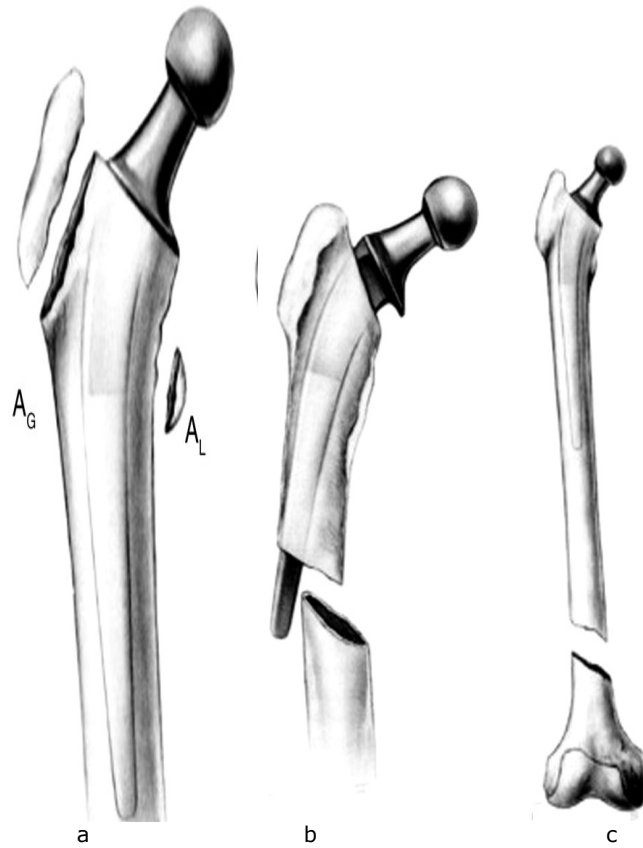
The purpose of the study is the treatment of periprosthetic fractures with the dynamisable Internal Fixator as one of the options in modern orthopaedic treatment (4, 5).

### Material and methods

This study included 37 patients with periprosthetic femoral fractures treated at the Orthopaedic Clinic, Clinical Center Niš. The Van-

couver Classification system was used for fracture classification (6).  
The patients were treated by the application

of Mitković's dynamisable Internal Fixator, Muller's plates, cerclage wires and free screws (Figure 1 and 2).



**Figure 1.:** Vancouver's Classification of Periprosthetic Fractures of the Femur



**Figure 2.:** Vancouver's Classification of Periprosthetic Fractures of the Femur

## Results

Thirty seven patients (26 females and 11 males) with average age 67.3 years were evaluated. There were 8 fractures of A-Type, 23 fractures of B-Type and 6 fractures of C-Type. The times of fracture occurrence were intraoperative (5 patients) and from 2 months up to 4 years from the moment of primary arthroplasty in 32 patients. A-Type fractures that occurred intraoperatively, were treated by cerclage wire and screws, while one was treated by the application of revision long stem and osteoplasty of the femoral proximal end.

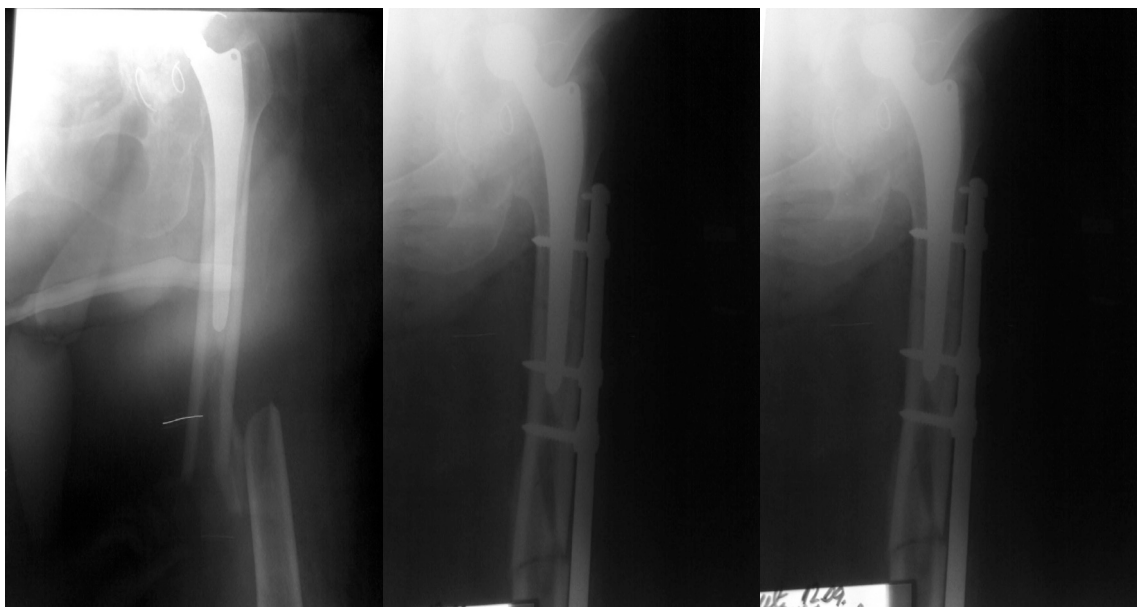
One of the fractures that occurred intraoperatively, was treated by the application of rigid Muller's plate. All other postoperative fractures of B and C type were treated by the application of Mitković's dynamisable Internal Fixator. In four patients with B-type fracture, fracture osteoplasty was done.

In three patients self-dynamizing Internal Fixator was used with a cerclage wire.

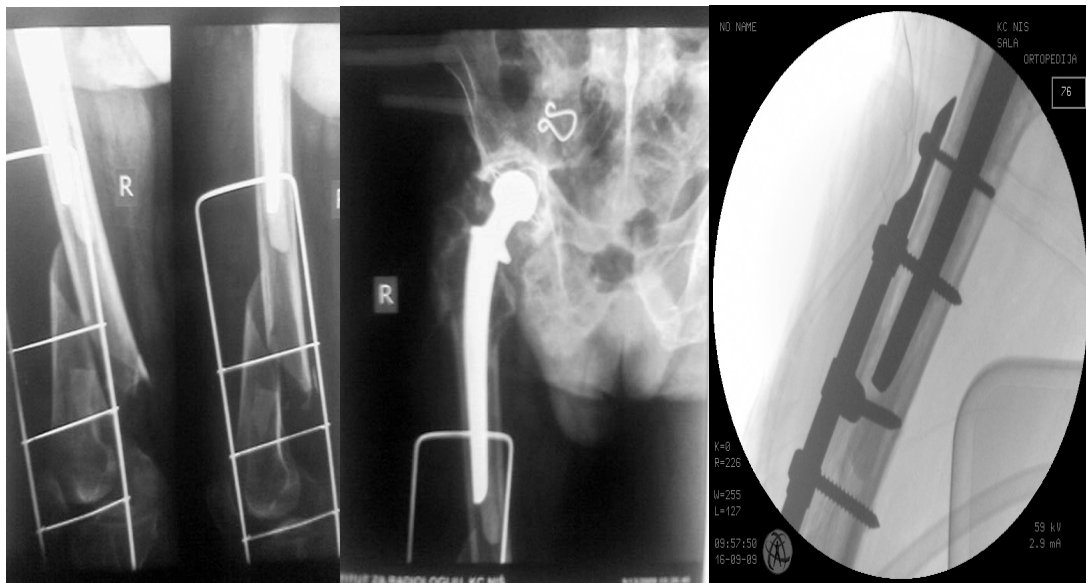
All patients were able to move very early, instructed to walk with crutches, without weight bearing on the operated leg. The signs of healing and consolidation were visible 3–5 months after



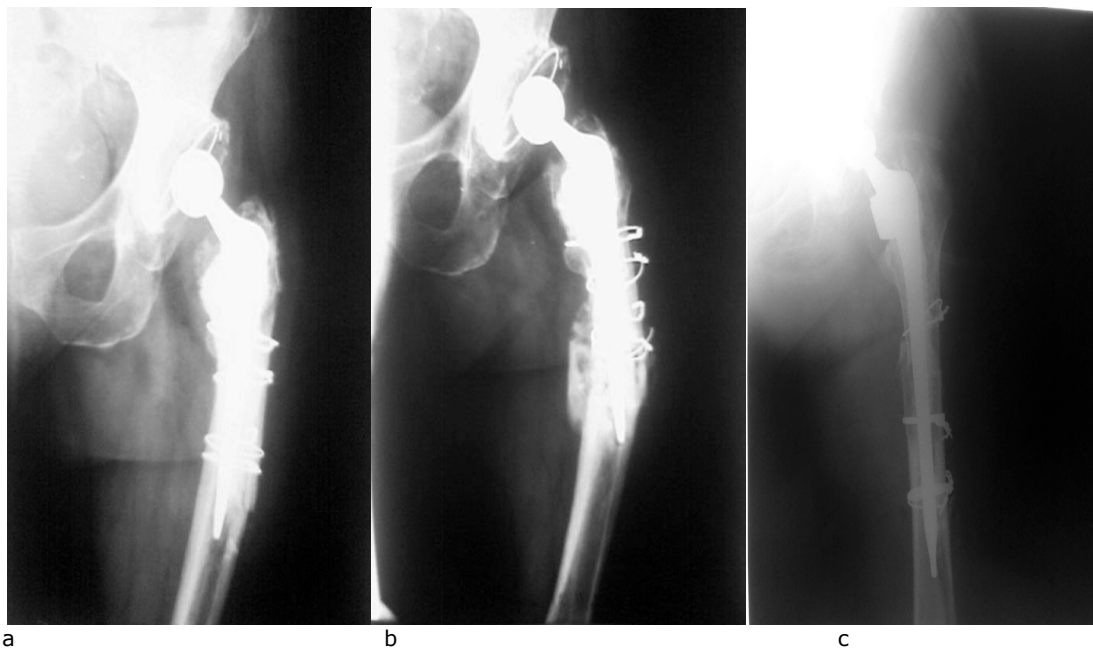
**Figure 3.** Periprosthetic fracture Type B treated with Mitković's Self dynamisable Internal Fixator



**Figure 4.** Periprosthetic fracture Type C treated with Mitković's Self dynamisable Internal Fixator



**Figure 5.:** Periprosthetic fracture Type C treated with Mitković's Self dynamisable Internal Fixator (intraoperative radiography)



**Figure 6.:** Periprosthetic fracture Type B treated with cerclage wire (a., b. after primary Hip replacement, c. after revision ZMR Hip arthroplasty)

the surgery. Mechanical complications did not occur and the final functional outcome of the treatment was good (Figure 3-7).

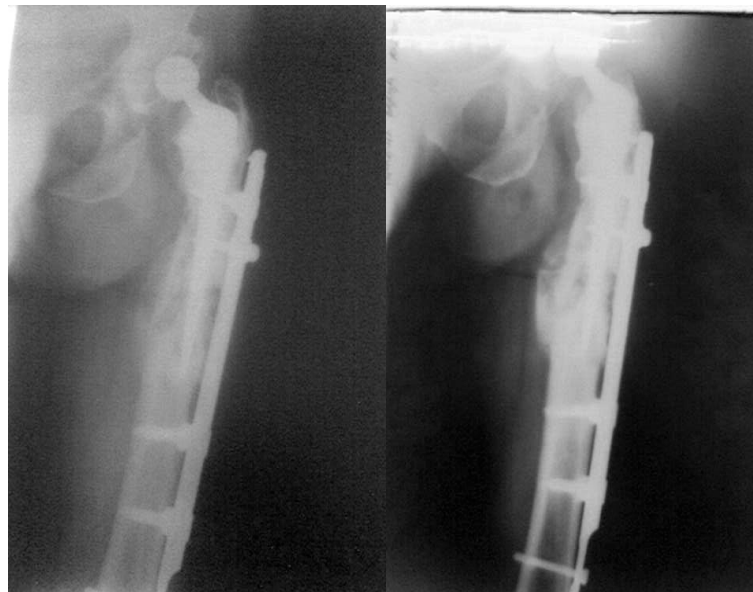
### Discussion

Periprosthetic fractures were for the first time described in medical studies in 1954 by Horwitz and Lenobel (1). They may occur intraoperatively or postoperatively.

The incidence of intraoperative periprosthetic femoral fractures from 1–17.6% (2).

Periprosthetic fractures are a difficult problem for all affected patients, but are a great challenge for surgeons as well, since there is not any universally applicable treatment approach. There are various risk factors. Among the general risk factors there are metabolic osseous disorders (osteopenia, osteomalacia, osteoporosis), rheumatoid arthritis, osteopetrosis, osteogenesis imperfecta, M. Paget femur deformities (3-5).

The risk factors for intraoperative fractures are intraoperative performance during the reaming of the femoral canal, reposition of endoprosthesis,



**Figure 7.:** Reoperation of Periprosthetic fracture Type B with Mitkovic's Self dynamisable Internal Fixator

revision surgery of any kind, mechanical damage of the femoral canal. Postoperative risk factors are trauma, osteolysis, loss of bone stock, osteoporosis (6-8). Periprosthetic femoral fractures may result in a non-healing or poorly-healing fracture, as well as endoprosthesis disintegration. For these kinds of fractures, operations are extremely complicated, particularly if there is a significant loss of bone stock, i.e. comminution, which is not rare. According to the studies, 4% of periprosthetic fractures belong to fractures Type A. Type B fractures comprise about 86.7% (B1 – 18.5%, B2 – 44.6%, B3 – 36.9%), while Type C comprise about 9.3% (8).

The treatment of these fractures may be non-surgical or surgical. Some authors recommend non-surgical treatment of these fractures – by plaster immobilization or traction.

The majority of authors share the opinion that non-surgical treatment is associated with a large number of complications, high percentage of non-healing or poorly-healing fractures (7, 8).

Our standpoint is that surgical treatment is much more efficient for a patient, as it avoids a long period of inactivity, due to immobilization and constant lying, which is rather harmful for the elderly. Therefore, surgical treatment is the best approach for periprosthetic fractures (7). From a surgical standpoint, there is no universal method. It depends on the type of fracture, patients's age and his general medical state, osteolysis and bone defects, fracture stability and endoprosthesis, comminution. Fracture fixation can be done with a cerclage wire, screws or rigid plates. Often, revision total hip arthroplasty is needed in both endoprosthesis components, sometimes using long revision stems, with bone cement fixation, or interlocking screws.

In the past, those fractures were treated by

rigid plates, without a satisfactory outcome (7, 8). Much effort has been invested in the improvement of fixation material, inserting the component dynamisable, which was partially fulfilled by the alteration of the place of hole and form on the plates. One of the major problems in the treatment of periprosthetic femoral fractures is that the holes on the plate mostly determine the direction of screw placement, while the main problem is related to the endoprosthesis stem, which prevents the classical way of screw placement and allows them to pass through both cortexes and secure the fixation. The often applied technique of a cerclage wire and/or free screw technique, does not provide satisfactory fixation stability of the fracture, especially if the fractural crack is short (7). Each of these methods may, if necessary, be combined with bone osteoplasty. The method of External fixation may be applied as well, if the fracture cannot be fixed by any of the previously mentioned methods (8, 9).

Our study showed that Mitković's self-dynamizing Internal Fixator is an implant which may be applied in all types of periprosthetic femoral fractures. Owing to its dynamic features, the implant secures three-dimensional stability of the fixed bone. The screws are convergently placed, allowing femoral fixation of both cortexes, regardless of the presence of endoprosthesis stem, which is difficult or even impossible to obtain with classical rigid plates due to femoral stem. Moreover, periosteal vascularisation is preserved in this way, which directly correlates with slow healing, non-healing or osteosynthesis disintegration.

The method is less invasive, the operation is shorter and there is no deperiostation of femoral lateral side. A significant characteristic is allowing the fracture dynamisation at the axis of femoral

diaphysis (10-13).

### Conclusion

Periprosthetic femoral fractures are severe complications, particularly among the elderly. Mitković's Dynamic Internal Fixator is an implant which enables fixation of all types of fractures,

without damaging periosteal vascularisation. Such fixation is less invasive compared to other implants, while convergent orientation of the screws allows the fixation of both cortexes of the femoral part where the endoprosthesis stem is situated.

Furthermore, the implant allows dynamic fracture fixation, which reduces the risk of mechanical complications related to the fixation.

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Profesionalni članak

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## LEČENJE PERIPROTETIČKIH PRELOMA BUTNE KOSTI SAMODINAMIZIRAJUĆIM UNUTRAŠNJIM FIKSATOROM

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Prelomi femura nakon ugradnje endoproteze kuka (periprotetički prelomi) mogu da predstavljaju veliki problem za lečenje i oporavak pacijenata. Lečenje je delikatno, a univerzalna metoda lečenja ne postoji. U radu su prikazani pacijenti sa prelomima femura nakon artroplastike kuka, lečeni na Klinici za ortopediju Kliničkog centra Niš. Korišćen je Vankuver klasifikacioni sistem. Prelomi su fiksirani žičanim serklažima, Milerovim pločama i unutrašnjim dinamičkim fiksatorom po Mitkoviću. Autori prikazuju 37 pacijenata sa prelomom femura posle artroplastike kuka. Prosečna starost je 67,3 godine (26 žena, 11 muškaraca). Tip A preloma imalo je 8 pacijenata, tip B 23 i tip C 6 pacijenata. Vreme nastanka preloma je od dva meseca do četiri godine od primarne artroplastike. Vreme praćenja pacijenata je 1-5 godina nakon operacije. Svi pacijenti su rano mobilisani i osposobljeni za rasteretni hod sa štakama. Znake konsolidacije preloma i zarastanja pokazivali su posle 3-5 meseci od operacije. U pet slučajeva nije bilo konsolidacije preloma posle dva meseca do četiri godine. Mehaničkih komplikacija nije bilo. Periprotetični prelomi femura su teške komplikacije, posebno kod starijih ljudi. Unutrašnji dinamički fiksator po Mitkoviću je implantat koji omogućava fiksaciju svih tipova preloma bez oštećenja periostalne vaskularizacije, a fiksacija je manje invazivna u odnosu na druge implantate. Takođe, implantat omogućava dinamičku fiksaciju preloma, što smanjuje mogućnost nastanka mehaničkih komplikacija fiksacije. *Acta Medica Medianae* 2017;56(3):31-37.

**Ključne reči:** periprotetički prelomi, butna kost, lečenje

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