



# Usefulness of Bilateral Plate Fixation for Distal Femoral Periprosthetic Fracture after Total Knee Arthroplasty

Kwangkyoun Kim\*

Department of Orthopedic Surgery, Konyang University Hospital, Korea

## Abstract

Periprosthetic fractures after total knee arthroplasty are difficult to treat for orthopedic surgeon. Peri-articular locking compression plates have become popular for fixation of the periprosthetic fracture. However, secure fixation can be difficult to achieve, owing to far distally extended fracture line, osteoporosis, chronic infection, and interference of the prosthesis. Author reports two cases that could get reliable fixation with double locking plating in situation could not get secure stability by a unilateral lateral locking plating.

## Introduction

As our society being aged, the rates of Total Knee Arthroplasty (TKA) grow up, and this phenomenon result in increase of periprosthetic fractures after TKA [1,2]. Periprosthetic fracture of TKA usually can be operated by intramedullary nailing, plating or revision arthroplasty [3-5]. Recently, in case of fixation using plate, good results of Locking Compression Plate (LCP) has been reported. But if fractures extend too distal over the proximal border of femoral component operations are highly challenging. Reliable fixation can be difficult to achieve, owing to interference of the prosthesis and presence of poor bone stock. Authors report two cases that couldn't get reliable fixation by lateral locking plate alone because of poor bone quality and far juxta-fracture of prosthesis.

## Case 1

A 76 years old woman brought emergency center by painful swelling in right knee caused by falling down from wheelchair. Right distal femur showed a periprosthetic fracture of the TKR operated 15 years ago (Figure 1A). Two days ago, she visited an outpatient department because of serous discharge from anterolateral aspect and varus instability of right knee. Radiographs, checked outpatient clinic, showed a huge mass like soft tissue lesion on anterolateral aspect of knee (Figure 1B). Joint fluid analysis showed that white blood cell count was 1728 and CRP 0.5 mg/dl. Culture result showed no growth for 48hr hours. We operated with lateral locking plate (Synthes, Switzerland) and changing a bearing insert with debridement of the huge mass and sinus track (Figure 2A). At post-operative 7 days, Candida was detected from the culture obtained at operation, equivalent to catheter tip culture. So after then, we use anti-fungal antibiotics. In 9<sup>th</sup> post-operative day, author felt the abnormal motion at fracture site at changing the dressing gauzes. We found fixation failure and reduction loss on the radiography (Figure 2B, 2C). Author removed the failed lateral plate, and reduced fracture and placed the new lateral plate again. Because of poor bone

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### \*Correspondence:

Kwangkyoun Kim, Department of Orthopedic Surgery, Konyang University Hospital, Gasowon-dong, Seo-gu, Daejeon, Korea, Tel: 82426006902; Fax: 825452373;

E-mail: kimajouos@gmail.com

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Figure 1A: Radiograph showed a complete displaced fracture, which was not seen at visiting an outpatient clinic.



**Figure 1B:** Radiograph taken at outpatient clinic showed a huge soft tissue mass shadow on antero-lateral aspect of knee.



**Figure 2A:** Postoperative radiography showed a reduction of displaced fracture and fixation with LCP on the lateral side of femur.

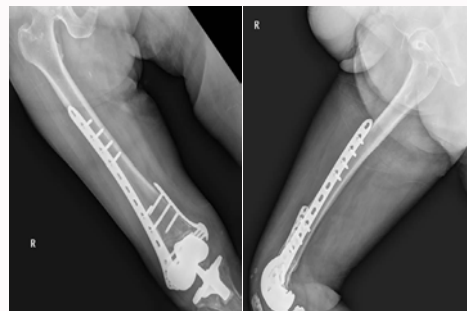


**Figure 2B-C:** At postoperative 9<sup>th</sup> day, radiograph showed the reduction loss of fracture and fixation failure.

quality (total hip = -4.2 g/cm<sup>2</sup>) and chronic fungal infection, we could not acquire rigid fixation after lateral locking plating. In addition, author cannot use enough length of screws for penetrating the far cortex, because femur prosthesis was a posterior cruciate ligament scarifying type with a closed box. So we placed a LCP on the medial side additionally. After 6 months later, fracture was healed and infection was controlled (Figure 3).

**Case 2**

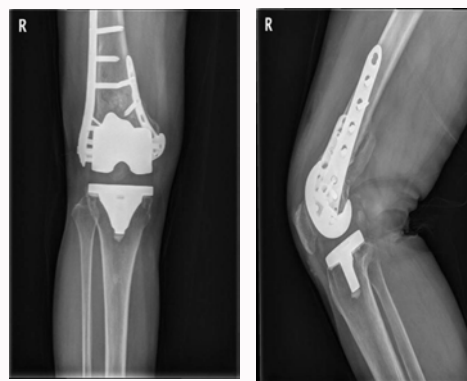
A 71-year-old woman brought emergency center by painful swelling on right knee after slipping down from a scooter. Periprosthetic fracture was shown in right distal femur. Fracture was severely comminuted on medial and lateral side and fracture line extended to distal to proximal femoral border of prosthesis (Figure 4).



**Figure 3:** Radiographs at postoperative 6 months, showed a complete fracture healing with dual plating.



**Figure 4:** Preoperative radiographs showed that fracture line extends more distal than proximal border of an implant.



**Figure 5:** In the postoperative 6 months, radiographs show complete fracture healing after dual plating on both sides.

Author used a minimally invasive lateral approach. An about 4 cm incision was made over the lateral femoral condyle, directly over the fracture site and point of entry of the LCP. After reduction of fracture temporally as necessary, the plate was passed through the incision proximally, beneath the vastus lateralis. Using anatomical landmarks and C-arm imaging placed the plate on the lateral condyles. Because fracture was very severely comminuted on both medial and lateral sides and too distal over the proximal border of femoral component, there was not enough space for placing screws with secure on the distal fragment of the fracture. It made the lateral locking plating alone to be not secure the fracture. So, additional medial side plate was needed to get firm fixation. We made another

midline skin incision along the previous incision scar for a total knee replacement, and made a medial parapatellar approach. We retracted patella and confirmed fracture reduction and femoral component rotation and alignment. We checked the screws which not penetrate intercondylar box with native eye. After conforming secure fixation of fracture, we checked the stability of knee. The polyethylene insert was nearly wasted. So, we exchanged it with new one. Wounds were closed layer by layer. Post-operative 6 months, radiography shows complete healing of the fracture (Figure 5).

## Discussion

Over recent years, locking compression plate has read to good clinical result for the management of supracondylar femoral fracture [5-8]. The characteristic stable plate-screw connection of LCP reduces the risk of secondary loss of reduction, preservation of the blood supply to soft tissues and bone, providing absolute or relative stability, and improvement of the fixation in osteoporotic bone. Nevertheless, reliable fixation of periprosthetic fracture of TKA can be difficult to achieve, owing to interference of the prosthesis. Poor bone stock, osteoporosis, and juxta-prosthetic fracture type.

In our first case, we couldn't get enough stability by only lateral locking plating. Ricci et al. [5] reported that implant failure of locked plate fixation of distal femur was related to open fracture, smoking, increased body mass index, and shorter plate length. In this case, causes of the failure were the interference of closed box of the femur prosthesis and poor bone quality, which were low bone mineral density (T-score; total hip = -4.2 g/cm<sup>2</sup>) and chronic fungal infection. It is necessary to know that only lateral plating cannot be enough to reliable fixation, so bilateral locking plating was considered for fracture too distal over the prosthesis and poor bone quality.

In our first case, fracture line was too distal over the prosthesis. Reflecting difficulty about too distal fracture, Su et al. [9] established three periprosthetic fracture types according to the most distal extent of the fracture relative to proximal border of the femoral component. Type I fractures are located proximal to the component, Type II extend from the proximal aspect anterior prosthetic flange proximally, and Type III extend distally beyond the proximal border of the femoral component.

Authors used medial parapatellar approach for placing a plate on the medial side of distal femur [10]. In use of medial approach, careful observation is needs not to injury neurovascular structures, because it's already rebuted state. Medial parapatellar approach have many

advantages that it can confirm the screw length which not penetrate intercondylar box or medial cortex, and can check component stability, rotation, polyethylene insert state. It is easy for polyethylene insert exchange when it was wasted, and for thorough debridement suspected infection.

## Conclusion

Double locking plating through parapatellar approach is useful method for obtaining secure fixation to poor bone quality or extremely distal femoral periprosthetic fracture.

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