Supracondylar extra-articular femur fracture after cementless unicompartmental knee replacement: A rare complication

Tugrul Yildirim[1], Dogac Karaguven[2], and Burak Akan[2]

[1]Hand and Microsurgery Orthopaedic Traumatology Hospital
[2]Ufuk Universitesi Doktor Ridvan Ege Egitim Arastirma Hastanesi

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Abstract

This case report defines an infrequent complication of unicompartmental knee replacement. Periprosthetic supracondylar femoral fracture after total knee replacement is a challenging problem for orthopedic surgeon. To our knowledge, this is the only case describing periprosthetic supracondylar femoral fracture after unicondylar knee replacement.

1.Introduction

Oxford unicompartmental knee replacement (UKR) has become an alternative procedure for osteoarthritis of the knee with excellent long-term results [1,2]. UKR is a safe procedure, and low perioperative complication rates have been reported in the literature [3]. The most common complications are aseptic loosening, polyethylene dislocations, unexplained pain, and periprosthetic tibial fractures [2,4] The prevalence of supracondylar fractures after total knee replacement (TKR) is reported to be 0.5%-2% [5,6]. Although few case reports have been published on condylar fractures, to our knowledge, periprosthetic supracondylar femoral fracture after UKR has not been reported in the literature [7,8,9].

In this case report, we present a patient with a postoperative supracondylar femoral fracture who had been previously treated for ipsilateral condylar periprostatic femur fracture after UKR. We aimed to discuss the mechanism of the fracture, treatment strategies, and its impact on patient's clinical outcome.

2.Case report

A 53-year-old woman underwent cementless mobile-bearing Oxford partial knee phase 3 (Biomet Orthopaedics) by the senior author in 2012 for anteromedial osteoarthritis. One year after an uneventful postoperative recovery, the patient fell on the ground level, while walking on the street. A minimally displaced medial femoral condyle fracture was diagnosed without ligamentous instability, and a closed reduction and percutaneous fixation with 6.5 mm cannulated cancellous lag screws was performed [7]. Prior to the fracture, the patient's Oxford Knee Score (OKS) was 46. After the fracture healing, her OKS was 42. In 2014, the patient had a second fell at ground level, which resulted in the Unified Classification System (UCS) type C supracondyllary femoral fracture [10] (**Figure 1**). Both femoral and tibial components seemed well-fixed, and insert dislocation was not observed in x-rays. We performed an open reduction and internal fixation and used compression screws and anatomical distal femoral locking plate for fixation (**Figure 2**). Active and passive range-of-motion exercises were initiated immediately after the surgery. Union was observed at the fracture site at 12 weeks on x-rays, and full weight-bearing was allowed. The patient had 130^0 range of motion and was able to walk independently 6 months after surgery. Four years after surgery, the implants were still well-fixed, and OKS was 36 (**Figure 3**).

3. Discussion

This case report proves unicondylar prosthesis remains intact even after two subsequent periprostatic fractures, and fracture healing can be achieved without complications. The clinical outcome was excellent, and the patient regained almost full range of motion. To the best of our knowledge, no cases have been reported in the literature regarding such a fracture.

The goal of managing these injuries includes restoration of axial alignment and length and stability to allow early mobilization. However, achieving this goal remains to be challenging for orthopedic surgeons. Because of poor bone quality and fracture location, nonunion is not uncommon with periprosthetic distal femoral fractures after total knee replacement, and nonunion rates have been reported between 0% to 50% [11]. Preservation of soft tissue and osseous vascularity have been recommended as much as possible to reduce nonunion rates [12]. We think that the same principles should be applied in the surgical management of periprosthetic fractures after UKR. Restoring axial alignment was especially crucial in our case because we think unicondylar prosthesis would less tolerate shear forces than TKR caused by malalignment.

Fracture localization and displacement are essantial considerations in the management of supracondylar periprosthetic femur fractures. Despite the fact that the use of locked plating and retrograde intramedullary nailing (IMN) has been recommended for displaced supracondylar femoral fractures after TKR, no consensus exists regarding the ideal treatment strategy. We think both strategies are applicable for periprosthetic femoral fractures after UKR. Retrograde IMN offers more stability in the presence of comminution of the medial cortex but is limited by poor cancellous bone, type of prosthesis, and pre-existing hardware in the proximal femur [13,14]. Due to the inherent advantage of UKR design that the femoral notch is not occupied by the femoral component, IMN may be more applicable. Locked plating has been recommended for low supracondylar fractures due to difficulties in achieving distal fixation with IMN and controlling varus collapse [15]. In a recent meta-analysis, Li et al. compared the clinical results of locked plates and retrograde IMN and found no statistically significant difference in terms of union, operating time, and rates of complication [16].

Several factors can be attributed to the fractures in our patient. As we discussed previously, the replacement of an intramedullary rod during the procedure, may have created a stress riser effect, which eventually diminished the structural strength of the femur [7]. Subsequent fractures with minor trauma may indicate that osteoporosis might have played a role in the etiology. However, our patient did not have any known patient-related risk factors or previous fractures related to osteoporosis.

Meniscal bearing dislocation is a well-known complication of UKR with mobile bearing insert due to inappropriate ligament balance and component replacement [16]. Despite the fact that the patient's knee was exposed to shear forces during trauma, the insert remained in its place. We think mobile-bearing causes more compressive and less tensile and shear force on the implants, thus avoiding an excessive load at the bone-implant interfaces. Thanks to this mechanism, components may not be loose despite the load transferred during the trauma.

Although many systems are available for classifying periprosthetic fractures after TKR, there is no such classification regarding UKR periprosthetic fractures [17]. The reason for not needing such a classification may be due to the relatively low incidence of periprosthetic fractures after UKR than TKR. However, UCR can be considered as the most applicable and inclusive classification for periprostatic fracture after UKR [10]. This system is based on the Vancouver classification and has been defined as a relatively simple alternative that can be used to describe any periprosthetic fracture [10,18]. According to UCR classification, our case had Type C fracture, in which the fracture line was distant to the bed of the implant. It was suggested that these fractures could be managed open or closed osteosynthesis without involving the implant as we did in our case.

In conclusion, despite subsequent fractures, if UKR is properly replaced and has appropriate ligament balance, insert dislocation would not occur, and the components would remain intact. In addition, bone healing could be achieved with an excellent clinical outcome. The treatment goal should be the restoration of alignment and achieving stability to allow early mobilization.

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Author Contribution

TY: managed the patient and wrote the manuscript. DG: edited the draft and reshaped into this manuscript. BA: managed the patient.