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Case Report

Post-Traumatic Total Knee Arthroplasty: A Case of Hoffa Fracture Nonunion and Review of Literature

Seyed Mohammad Javad Mortazavi[1], Ahmed Ramezanpour[2], Furqan Mohammed Yaseen Khan[3,*], Mohammad Javad Dehghani-Firoozabadi[3]

[1] Professor, Department of Orthopedic Surgery, Joint Reconstruction and Research Center, Tehran University of Medical Sciences, Tehran, Iran
[2] Fellow of Knee Surgery, Joint Reconstruction and Research Center, Tehran University of Medical Sciences, Tehran, Iran
[3] Resident, Department of Orthopedic Surgery, Joint Reconstruction and Research Center, Tehran University of Medical Sciences, Tehran, Iran

[*]Corresponding author: Furqan Mohammed Yaseen Khan; Department of Orthopedic Surgery, Joint Reconstruction and Research Center, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98-9904177825, Email: drfurqan@outlook.com

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Abstract

Background: Post-traumatic arthroplasty is associated with higher rates of complications and overall inferior outcome when compared with primary joint replacement. Literature revealed no precise guidelines on management of nonunion of Hoffa fracture. Hence, we tried to elicit a management protocol in such patients from literature perspective.
Case Presentation: A 62-year-old patient survived a car accident with distal femoral fracture in coronal plane (Hoffa fracture) and was treated with open reduction and internal fixation (ORIF). Three years later, the patient developed nonunion with post-traumatic arthritis (PTA). Owing to joint degeneration and poor bone quality, patient was treated with total knee arthroplasty (TKA). One year follow-up showed excellent outcome.
Conclusion: In patient with healthy joint surface and good bone density, treatment of choice should be ORIF and in those with joint degeneration and low bone stock, arthroplasty is a better choice.

Keywords: Osteoarthritis, Knee; Femoral Fracture; Fracture, Ununited; Knee Arthroplasty

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Background

Arthroplasty is one of the latest therapeutic approaches for post-traumatic arthritis (PTA). However, in traumatic patients, joint replacement has been associated with higher rates of complications and overall inferior outcome is reported when compared to primary total knee arthroplasty (TKA) (1). Dealing with PTA is challenging in every aspect from management to patient expectation. Hardware, wound scars, atypical bone deformities, and infection are among major concerns which need to be addressed when planning PTA (2).

Malunion or nonunion from fractures of distal femur or proximal tibia may lead to PTA. Distal femoral fracture in coronal plane ('Hoffa fracture', named after "Albert Hoffa") is a rare occurrence. Therefore, its complications are as well rarely reported (3). Literature revealed no precise guidelines on management of nonunion of Hoffa fracture. Hence, we tried to elicit a management protocol in such patients from literature perspective.

Array of treatment possibilities can be adopted in treatment of nonunion of Hoffa fracture; ranging from conservative to TKA. Literature has identified several factors such as age, joint surface, and bone quality that guide in treatment plan. Our aim is to present this rare kind of Hoffa fracture nonunion and explore possible treatment options including the role of TKA in post-traumatic patients.

Case Presentation

A 62-year-old male sustained trauma to his right knee following a car accident 3 years ago. Initial radiographs showed right distal femoral fracture in coronal plane (Hoffa fracture). The patient was initially treated with anatomical plate and screws fixation in distal femur.

Three years later, the patient was referred to outpatient clinic with chronic knee pain and restricted range of motion (ROM). On examination, ROM of the right knee was 40 to 90 degrees (Figure 1).

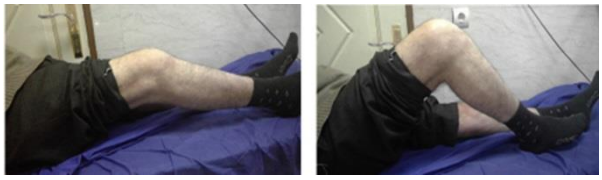

Figure 1. Preoperative knee range of motion (ROM)

X-ray showed osteoarthritic joint with a nonunion of distal femoral fracture (Figure 2).

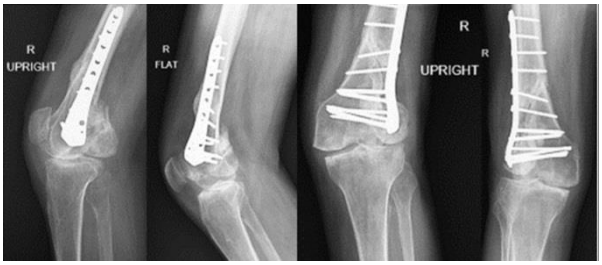

Figure 2. Preoperative x-rays, anteroposterior (AP) and lateral view

After considerable literature review, expert advice, accounting patient factors such as age and degenerative joint disease (DJD), patient was advised for TKA. All laboratory data including erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were in normal ranges, ruling out infection from previous intervention.

Patient was prepared for surgery using standard arthroplasty protocol under spinal anesthesia. Medial patellar approach (MPA) was used and all previously-inserted hardware were removed. Arthroplasty was done using long-stem constrained condylar knee (CCK) system from Zimmer-Biomet (Figure 3).

Figure 3. Post-operative x-rays, anteroposterior (AP) and lateral view

Partial knee ROM was started the day after the surgery and partial weight-bearing was initiated a week later. Patient was kept on follow-up and no signs of infection were noted. Five weeks later, patient started full weight-bearing and had knee flexion of 90 degrees without flexion contracture (Figure 4).

Figure 4. 5 Weeks post-operative knee range of motion (ROM)

Patient also had significant improvement in Knee Society Score (KSS) from 23 to 82. One year later, patient showed excellent outcome with near complete ROM and pain-free gait.

Discussion

TKA in post-traumatic patients has higher rate of complications and overall poorer outcome when compared with primary elective TKA. Roffi and Merritt reported a study on patients undergoing post-traumatic TKA and concluded that 38.5% had poor outcome (2). Other studies showed overall 70% favorable outcome in post-traumatic TKA and noted the initial fracture management as an important factor influencing the outcome of TKA in such patients (4).

Weiss et al. reported a study of 13821 patients who underwent TKA between 1980 and 1997, of whom 109 were post-traumatic. They concluded that TKA was an effective method of treatment for the majority of post-traumatic patients with arthrosis after a previous distal femoral or proximal tibial fracture (5).

Hoffa fracture is the fracture of distal femoral condyle in coronal plane. It is a rare fracture appearing in less than 1% of all femoral fractures. It is three times more common in medial condyle (3, 6).

Largely, mechanism of Hoffa fracture is sheer force from posterior condyle dividing patellofemoral and tibia-femoral joints; therefore, weight-bearing and joint movements cause fracture instability and displacement (3, 6). Hoffa fracture was classified into 3 types by Letenneur et al. (7): type 1, fracture of posterior cortex and posterior condyle, type 2, fracture line is posterior to posterior condyle, and type 3 is oblique fracture of posterior condyle (8, 9). As occurrence of Hoffa fracture is rare, its complications are as well rarely reported; therefore, nonunion of Hoffa fracture is a valuable case to report (10, 11).

Current literature has the following details regarding nonunion of Hoffa fracture. As the fracture itself is in coronal plane, it could not be easily diagnosed with x-rays, leading to nonunion (12). In type 2 fracture due to no soft tissue involvement, fracture fragment itself could be articular, causing nonunion (13). As most of the Hoffa fractures are displaced and unstable, conservative management does not have good prognosis, again leading to nonunion (3, 9, 11). Open reduction and rigid, stable fixation significantly reduce the risk of nonunion (11).

In the study conducted by Reddy et al., 2 patients, 48 and 52 years old, were reported with nonunion of Hoffa fracture. They were treated surgically with long-stem TKA. Both patients had significant improvement in ROM and KSS and showed good union post-operatively (10). This report as well emphasized on considering patients' specific factors such as age, activity level, and bone stock before planning appropriate intervention.

Nonunion of Hoffa fracture or implant failure after ORIF leads to severe disability with restriction of ROM and weight-bearing inability. In such patients, treatment of choice should be revision ORIF, knee arthrodesis, or prosthetic replacement (14). Patients with good bone density should be preferably treated by ORIF. In older patients with poor bone quality or poor joint surface, knee arthroplasty is a better option (10, 14).

Nandy et al. reported a case of nonunion Hoffa fracture which was treated with a novel sandwich technique. Patient was 16 years old with medial femoral condyle fracture in coronal plane. Initially treated conservatively for nine months, he developed ROM restriction with pain. Medial sub-vastus approach was used. Iliac bone graft was used between two fracture fragments and reduction was achieved with two cancellous screws, reducing the bone graft between two fragments. Fracture site was then stabilized with a 3.5mm 6-hole plate and screws (11).

Previously, hinge mega prosthesis was used for implant failure after ORIF in complex distal femur fractures, but the outcome results are unknown. Currently, the use of long-stem TKA in nonunion of distal femoral fracture shows good patient outcome (9).

Patient's age, comorbidity, bone stock, and more importantly, condition of joint surface are important factors to consider in management of nonunion of Hoffa fracture. It is better for young individuals with good joint surface and good bone density to be treated with ORIF, but

in case of older population with poor joint surface and low bone density, TKA is more preferable treatment option.

Conflict of Interest

The authors declare no conflict of interest in this study.

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