CASE REPORT

Treatment of Simultaneous Femoral Supracondylar Nonunion and Tibial Plateau Malunion along with Stiff Knee in a Young Patient: A Case Report

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Abstract

A 41-year-old man underwent Total Knee Arthroplasty with NexGen Legacy Constrained Condylar Knee (LCCK) system to treat his nonunion of distal femur, stiff knee, and malunion of tibia plateau. The treatment involved femoral and tibial stems and PS polyethylene. As a result, his knee range of motion improved, and he no longer experienced pain. After two years, he resumed work without any signs of loosening or stiffness.

Level of evidence: IV

Keywords: Loosening, Nonunion, TKA

Introduction

Distal femur fractures are unusual, with an incidence rate of 0.3% to 2.5%.[1] Nonunions of distal femur fractures are uncommon but can happen with or without prior surgery. The occurrence rate is 0% to 13%.[2] Most nonunions can be treated with revision surgery with or without bone graft. Some surgeons reported using tumor mega prosthesis for nonunion of distal femur fractures in elderly.[3-5] Another potential complication is stiffness in the knee, which can be treated with a soft tissue procedure or total knee arthroplasty (TKA).[6,7] Treating supracondylar femoral nonunion and the associated complications in young and middle-aged patients through surgical methods is still a challenge, even with advancements in techniques and technologies. We are reporting a young patient who successfully uses TKA with a long stem for resistant nonunion of the distal femur fracture with tibial malunion and stiff knee.

Case Presentation

A 41-year-old male presented to us with pain, genu valgum over the left knee, and inability to walk without support. Four years ago, he had a motor-car accident with an open fracture of type C2 (AO) classification distal femur fracture and type 1 Schatzker classification plateau fracture; the non-displaced fracture in the patella was also detected. Distal femur fracture was fixed by distal femur locking compression plate and proximal lateral tibia locking plate for plateau fracture, and the patella was treated non-operatively. He underwent revision surgery with a bone graft for nonunion of distal femur fracture. No evidence of union was observed throughout the entire follow-up period, and all plates were subsequently removed 19 months after the initial surgical procedure. Upon examination, the patient's knee exhibited instability and stiffness. The range of motion (ROM) was limited to 0-80 degrees from the nonunion site [Figure 1]. There were, however, no signs of local induration, the skin condition was healthy, and the local temperature was maintained. The acute phase reactants, including C-reactive protein (4 mg/dl), erythrocyte sedimentation rate (22 mm/h), and D-dimer (271 ng/ml), were reported within the normal range. A Radiograph of the region showed nonunion at the distal femur fracture site with severe diffuse chondral lesions, and OA on the lateral compartment of the knee was

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apparent [Figure 2]. Three-joint-alignment view radiograph measurement showed lateral-distal-femur-angle (LDFA) 76 degrees and medial-proximal-tibia-angle (MPTA) 93 degrees with 14 degrees valgus angle [Figure 3]. The patient was desperate and unmotivated; he refused revision surgery with a plate and bone graft. After carefully considering the complex situation, a TKA was performed.

Before the operation, 1 g of intravenous tranexamic acid was administered. Without the control of a tourniquet, a midline longitudinal incision was made on the skin, with a standard medial parapatellar approach used for the knee arthrotomy. A total synovectomy was performed. Reaming the femoral canal was done. Five samples from the femoral canal and synovium were sent for culture. We needed to release the quadriceps muscle from the anterior cortex of the femur and perform lateral collateral ligament needling to achieve a standard extension/flexion gap.

Figure 1. Photography of the patient before surgery A: knee joint in extension B: knee joint in flexion C: Limbs alignment in standing

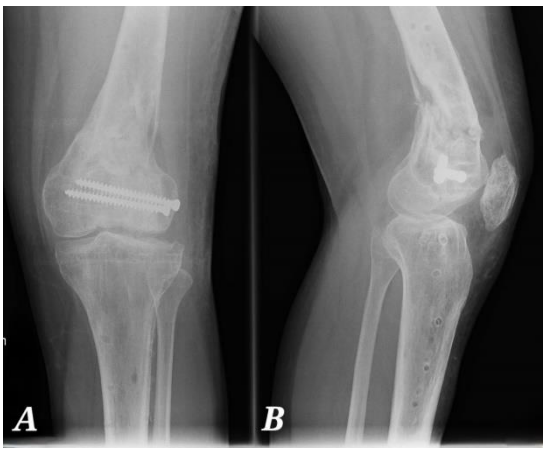

Figure 2. A: AP radiography shows severe osteoarthritis in the lateral compartment. B: LAT radiography shows a non-union femoral supracondylar region with osteoarthritis changes in the patellofemoral joint

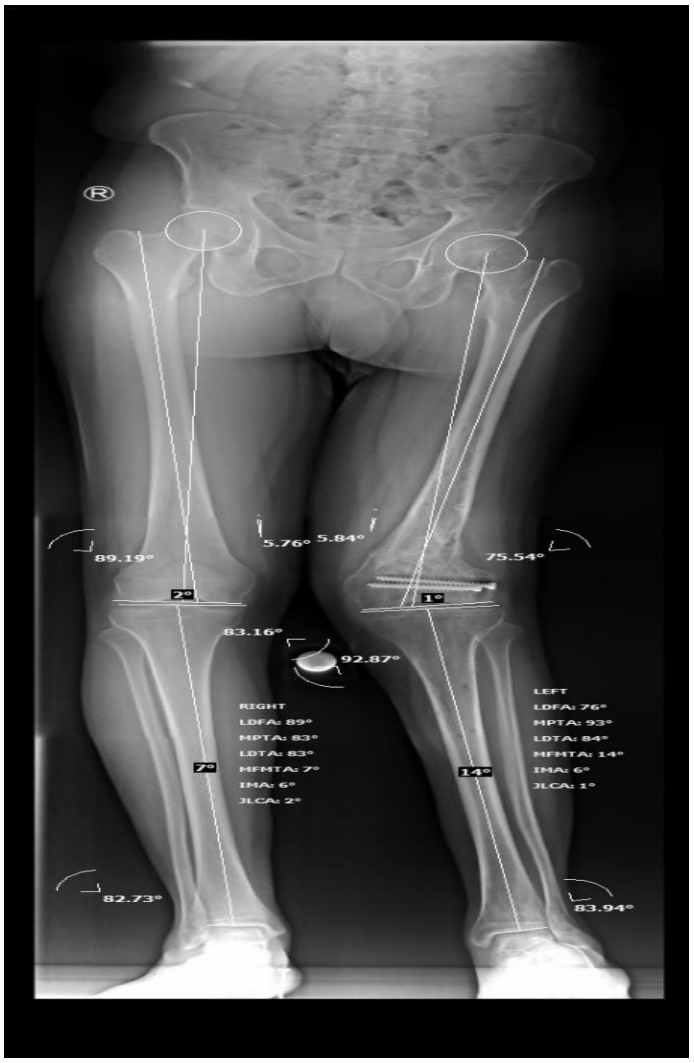

Figure 3. 3-Joint Alignment view radiography shows LDFA=76°, MPTA=93°, MFMTA=14°. LDFA=lateral distal femoral angle, MPTA=medial proximal tibia angle, LDTA=lateral distal tibia angle, MFMTA= mechanical femoral mechanical tibia angle, IMA=inter mechanical anatomical angle, JLCA=joint line convergence angle

We used the NexGen Legacy Constrained Condylar Knee system (Zimmer Biomet, Warsaw, IN, USA) with a posterior-stabilized polyethylene insert to reconstruct the knee joint [Figure 4]. We used a cemented size F femoral component with a 5 mm augment block and 155 mm cementless stem length; A size 4 tibial component with a 100 mm stem length with hybrid cementing technique, 10 mm height polyethylene was inserted, and after a thorough wash with saline, wound closure was done without drain use, and 1.5 g tranexamic acid with 30 mg ketorolac was injected intra-articularly. Knee ROM and full weight-bearing ambulation with walker assistance were started the day after surgery. Intraoperative culture samples were negative. After two years, the patient can move without restriction and weight bearing without experiencing any pain [Figure 5].

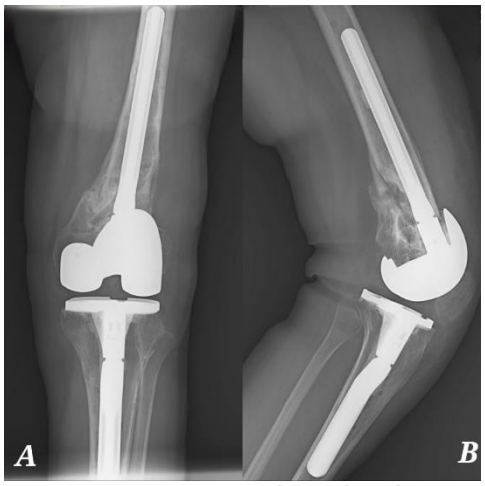

Figure 4. Post Operative radiography shows NexGen legacy Constrained Condylar Knee (LCCK) system with femoral and tibial stem and PS polyethylene A: Anter-posterior view B: Lateral view

Figure 5. Photography 2 years after surgery A: standing view B: knee flexion C: knee extension

Discussion/ Conclusion

A distal femur fracture is rare, with an incidence rate of 0.3% to 2.5%.[1] the treatment choice is a fixation by implants. In a recent study, the implant of choice was locking compression plate.[8] Distal femur nonunions (DFN) are a complex problem for the treating surgeon as they are inherently difficult to manage and associated with significant patient disability.[4] The treatment of choice is revision surgery using different implants with or without bone grafts. Due to such factors as poor bone stock, low activity levels, and medical co-morbidity in older people, the outcomes of revision surgery were poorer in this population.[2,9]

We explained the issues to our patient during his consultation for revision surgery with a bone graft. However, he declined to undergo the revision surgery. Instead, he requested to have all his problems treated, including DFN, reduced ROM, and knee OA, through a single surgery. Rajasekaran et al. operated on 24 cases of distal femur nonunion in older people and concluded that mega prosthesis is a viable single-stage solution for distal femur nonunion.[4] our patient was 41 years old, an uncommon and challenging age for knee replacement surgery. Few reports describe acceptable results and survival rates (around 80/90%) at midterm follow-up.[10,11] Castagnini et al. evaluated 224 patients under 45 who underwent knee replacement with a mean follow-up of 5.4 years. The survival rate of the study was 93% at five years, 91% at seven years, and 81% at ten years. The rate of revision surgery was 8.8%. Three main reasons for revision were detected: aseptic loosening (3.3%), infection (2.9%), and insert wear (0.8%).[12] our patient was pain-free for two years, and radiography showed no signs of loosening.

The nonunion site had a ROM from 0 to 80 degrees, and the knee was stiff in our patient. Despite attempting physiotherapy and manipulation under anesthesia, these initial steps were unsuccessful. Kundu et al. conducted Thompson's quadricepsplasty on 22 male patients aged 20 to 45 with posttraumatic knee stiffness resulting from distal femoral fractures and a knee flexion range of less than 45 degrees. Twenty patients had excellent to good results.[6] Rajgopal et al. analyzed the outcomes of total knee replacement surgery on 84 knees of 53 patients with naturally fused knee joints and a preoperative ROM of 0-20 degrees. The follow-up period lasted between 4 to 15 years. After the surgery, the ROM varied from 55 to 100 degrees. In addition, 81% of patients had results rated as excellent or good.[7]

The patient had a tibial plateau malunion with a MPTA of 93 degrees and knee instability. Scott et al. examined the indications for, and outcomes of, TKA after fracture of the tibial plateau; they identified 888 fractures of the tibial plateau (875 patients) treated in their institution. Thirty-one patients underwent TKAs for post-traumatic osteoarthritis. Patients with instability or nonunion needed TKA earlier than those with intra-articular malunion. The author concluded that TKA undertaken after a fracture of the tibial plateau had a higher rate of complications than that undertaken for primary OA. Still, patient-reported outcomes and satisfaction are comparable.[13]

Our patient presented with three significant complications: a distal femur nonunion, lack of knee joint ROM with 80 degrees ROM at the nonunion site, and tibial plateau malunion. After consulting with the patient, we performed TKA to address all three issues in one surgery. After the procedure, the patient achieved a knee ROM from 0 to 100 degrees, full weight-bearing without pain, a complete union of the nonunion site, and no cane needed for two years after surgery. There have been no indications of aseptic loosening or infection, and the patient is now pain-free from their initial trauma and has resumed his job.

In young patients, the rate of aseptic loosening and infection after TKA is higher than in older patients. These drawbacks reinforce concerns about TKA in young patients and emphasize the need to select candidates carefully. However, TKA can effectively treat distal femur nonunion in appropriately selected patients. More research is required to evaluate the effectiveness of TKA in treating nonunion of the

distal femur.

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