

Case Report

A rare case of periprosthetic supracondylar fracture with fracture medial condyle of femur after total knee arthroplasty

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ABSTRACT

Periprosthetic supracondylar fracture with fracture of medial condyle of femur after total knee arthroplasty (TKA), is of rare incidence. The risk factors include morbid obesity, increased varus deformity after primary TKA, osteopenia, prolonged use of corticosteroids or even trivial trauma leading to stress fractures. We reported a case of periprosthetic supracondylar fracture with fracture medial condyle of right femur after TKA in a patient of rheumatoid arthritis, with severe varus right knee and morbid obesity. X rays of knee revealed the periprosthetic supracondylar fracture with anterior femoral notching; CT scans revealed supracondylar fracture with severe comminuted fracture of right prosthetic medial condyle. Revision arthroplasty was done with augmented long-stem implant and patient was discharged on the 10th post-operative day. Knee movement at 6 months was 0-120 degrees with satisfactory outcome scores on follow-up. Periprosthetic supracondylar fracture with fracture medial condyle of the femoral implant requires immediate diagnosis and treatment; revision arthroplasty is mandatory if associated with morbid obesity, osteopenia and varus knees, after primary TKA. Obesity leads to excessive joint overloading, which together with varus malalignment and poor bone stock, may lead to component loosening, requiring revision arthroplasty. Weight reduction is necessary before primary TKA to improve the functional outcomes and reduce the incidence of revision arthroplasty.

Keywords: Periprosthetic supracondylar fracture femur, Fracture prosthetic medial condyle, Morbid obesity, Revision TKA, Long-stem augmented knee implant

INTRODUCTION

Femoral component fracture after TKA is a rare catastrophic complication, but mostly stress fractures of the femoral component have affected the medial condyle of uncemented fixed bearing knees.¹ A multitude of factors leading to these type of fractures may be implicated, which include higher body mass index, uncemented components, increased athletic activity, prolonged use of corticosteroids, which can cause fatigue fractures of the femoral component.² The mechanism of implant fractures remains difficult to describe but may be attributed to several factors like, defective implant designs, severe osteolysis or osteopenia, aseptic component loosening, rotational malalignment of components and stress factors

on the implant due to excessive joint overloading, as in morbid obesity.³

CASE REPORT

A 63-year-old female patient with rheumatoid arthritis and morbid obesity [BMI: 43.4], presenting with windswept knees [varus right knee and valgus left knee], (Figure 1 A), showing bilateral Kellgren Lawrence grade 4 osteoarthritic changes on X-rays, (Figure 1 B) had undergone TKA under spinal anesthesia. Standing long leg films/orthoscanograms showed preoperative windswept knees deformity, as evident on measurement of HKA (Hip-knee-ankle) angle (Figure 1 C); but postoperative correction of HKA angle in the right knee showed severe varus changes

(Figure 1 D). Axial CT scans done postoperatively showed normal rotational alignment of femoral and tibial components of the right side, that is combined external rotation [CER]<10 degrees (Figure 1 E). The implant used was fixed bearing posterior stabilized cruciate sacrificing cemented type of knee implant. The patient was mobilized with walker and discharged normally on the 10th post operative day.

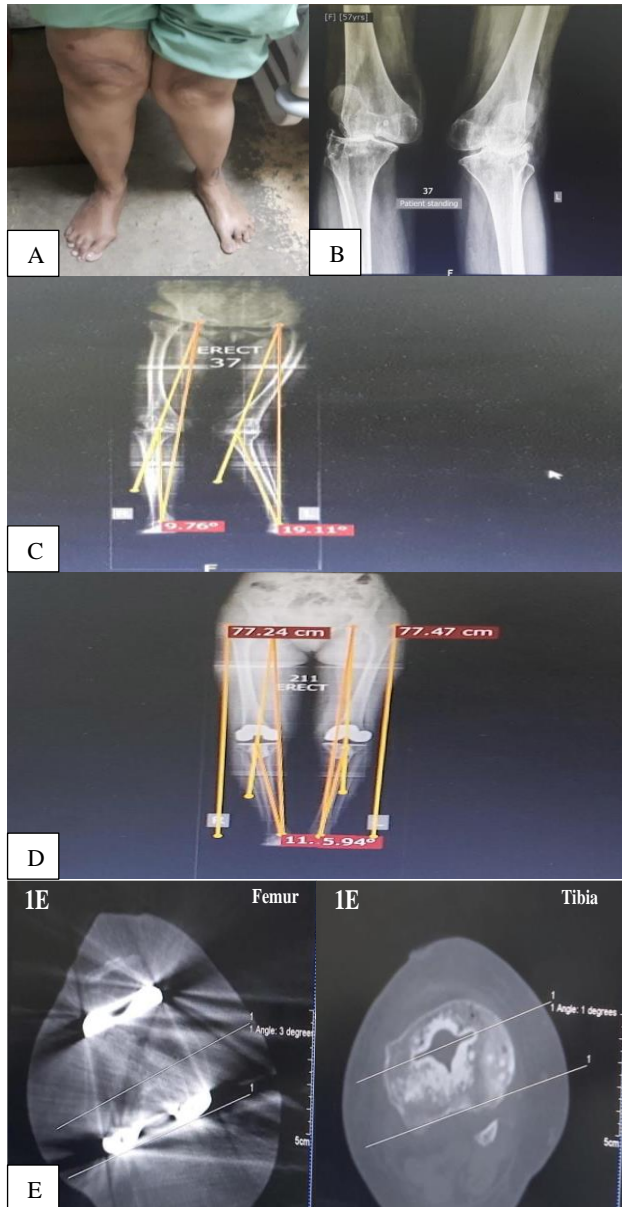


Figure 1 (A-E): Patient with rheumatoid arthritis and morbid obesity with windswept knees, varus [R] and valgus [L], requiring primary TKA. X-rays knee, AP view with patient standing, showing grade 4 osteoarthritic changes bilaterally. Standing long leg films/ orthoscanograms showing measurement of HKA angle, both preoperatively and post-op. HKA angle has been bilaterally corrected to varus after primary TKA [R>L]. Axial CT scans after primary TKA showed normal rotational alignment of components [femur and tibia]; CER<10 degrees.

Post-op recovery was uneventful with physiotherapy and rehabilitation; but at 3 months the patient experienced a minor trauma while lifting an object from the ground, which led to a feeling of clicking sensation inside the right prosthetic knee, with progressive swelling and persistent pain around the joint. X rays AP view of knees showed supracondylar fracture of the medial condyle of the femur of the right side, with anterior femoral notching and fracture line extending to the femoral component (Figure 2); and partially extending proximally (Figure 4). Axial CT scans showed a complete comminuted fracture of the right medial condyle of the femoral component of the implant (Figure 3). 3D reconstruction image of this type of fracture showed a complete comminuted fracture of the right medial condyle of the femoral component, with the supracondylar fracture (Figure 4).

The patient had marked osteopenia, probably due to long-term use of corticosteroids, for control of rheumatoid arthritis, as bone mineral density scans of lumbar spine and dual femur showed low bone mass (Figure 5 A and B). Revision arthroplasty was done with TC3 mobile bearing prosthesis with a 30 mm Tantalum cone with adjuvant stems [cemented] and metallic bone augments for additional stability (Figure 6). The patient was mobilized with walker and knee braces (Figure 7), and discharged on 10th postoperative day from the hospital.



Figure 2: X-Ray AP view of knees after trauma [post TKA], showed supracondylar fracture of medial condyle of femur [R], with anterior femoral notching.

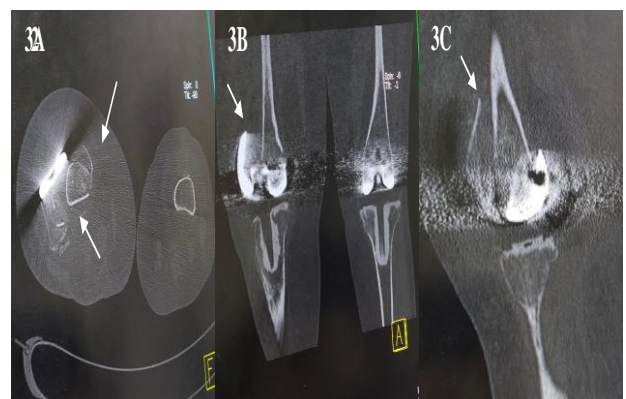


Figure 3 (A-C): Axial CT scans showing type 3 femoral component fracture of medial condyle [R].

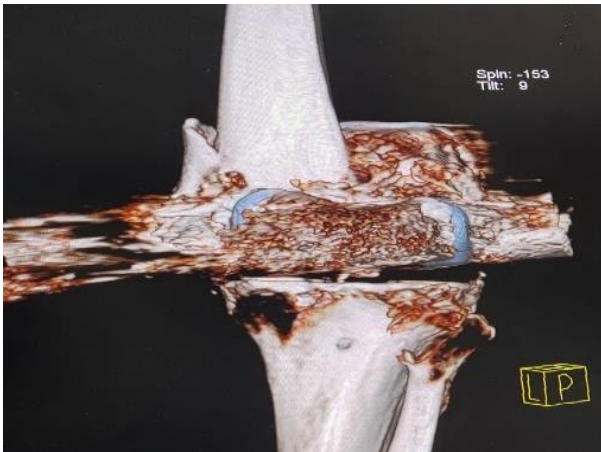


Figure 4: 3D CT reconstruction image of type 3 femoral component fracture with supracondylar fracture and fracture of prosthetic medial condyle of femur [R].



Figure 7: Patient mobilized on walker with knee braces on 10th post operative day during discharge from hospital.

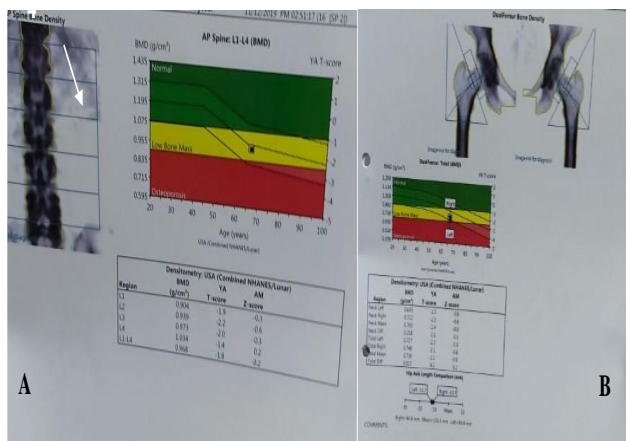


Figure 5 (A and B): Bone mineral density scan of lumbar spine and dual femur showing low bone mass or osteopenia.



Figure 6: Revision arthroplasty done with TC3 mobile bearing prosthesis with a 30 mm tantalum cone with adjuvant stems [cemented] and metallic bone augments for additional stability.

The patient was subsequently followed up for 6 months with knee society score, Oxford knee score, lower extremity functional scale; which showed satisfactory outcomes and knee flexion was 0-120 degrees, with a painless stable prosthetic knee joint. Since the patient had morbid obesity, weight reduction was advised by diet monitoring and active physical exercise, to improve the outcome of revision TKA.

Ethics committee approval was obtained prior to commencement of the study. The patient gave verbal and written consent for participating in the study.

DISCUSSION

Femoral supracondylar fractures are not quite common, they are observed in 0.3-2.5% TKA patients within 2-4 years after surgery.⁴

Su et al suggested a classification system that accounts for the height of a fracture line relative to the femoral component: type 1 fractures are proximal to the femoral component, type 2 fracture lines originate at the proximal end of the femoral component and partially extend proximally, type 3 fractures occur distal to the upper edge of the femoral component; following which the supracondylar fracture observed here was defined as a type 2 fracture.⁵ According to the Rorabeck and Taylor classification, a type 3 fracture is accompanied by component loosening/ instability and polyethylene wear irrespective of the displacement of fracture fragments; as was seen in this case of fracture medial condyle of the femoral implant.⁶ A similar classification by Kim et al including factors like remaining bone stock, prosthesis fixation status, and reducibility of the fracture, indicated that the observed fracture prosthetic medial condyle was a type 3 fracture, which was severely comminuted with inadequate distal bone for fixation requiring prosthesis replacement/ revision arthroplasty with a long stem augmented implant.⁷

As observed in this case, these fractures are most commonly noted in knees with well-fixed femoral component, mostly after low-energy injuries caused by torsional or compressional forces, associated with daily activities. Risk factors for femoral supracondylar fractures, as observed in this case, include anterior femoral notching, mismatch of elastic modulus between the metal implant and the femoral cortex, rotationally constrained components, osteopenia, prolonged use of corticosteroids as in rheumatoid arthritis, and advanced age for primary TKA.⁸ Anterior femoral notching, as seen in this patient, indicates deformation of the anterior femoral cortex caused by external forces, which result from excessive resection of anterior femur during TKA.⁹

Revision TKA was done with a long-stemmed prosthesis to reduce the stress on the anterior femoral cortex, as the patient already had osteopenia/ poor bone stock, due to prolonged use of corticosteroids for control of rheumatoid arthritis; as revealed on bone mineral density scans. Post operative weight-bearing was restricted to use of knee braces and walking aids. Morbid obesity with increased postoperative varus HKA angle of the right knee, was another risk factor, as increased joint overloading probably caused wear of the polyethylene insert and shearing stress on the implant, leading to the type 3 fracture of the medial prosthetic femoral condyle. This was also observed by Bordini et al as one of the reasons for early failure of primary TKA requiring revision arthroplasty.¹⁰

CONCLUSION

Periprosthetic supracondylar fracture with fracture medial condyle of the femoral implant after primary TKA is of a rare occurrence in available literature. However, if the patient with morbid obesity and severe varus malalignment after TKA complains of persistent pain and swelling around the prosthetic knee, the incidence of such fractures should be considered, for early diagnosis and treatment. Patients with morbid obesity and long-term use of corticosteroids are a high-risk group for femoral periprosthetic fractures; hence weight reduction is mandatory before primary TKA, by active exercise and dietary control, to improve the functional outcomes and reduce the incidence of revision arthroplasty.

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REFERENCES

1. Thompson SM, Railton G. Catastrophic failure of the femoral condylar prosthesis in total knee arthroplasty. J Orthop Trauma. 2016;6.
2. Swamy GN, Quah C, Bagouri E, Badhe NP. Nontraumatic fracture of the femoral condylar prosthesis in a total knee arthroplasty leading to mechanical failure. Case Rep Orthop. 2014;896348.
3. Gilg MM, Zeller CW, Leitner I, Leithner A, Labek G, Sadoghi P. The incidence of implant fractures after knee arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2016;24(10):3272.
4. Chen F, Mont MA, Bachner RS. Management of ipsilateral supracondylar femur fractures following total knee arthroplasty. J Arthroplasty. 1994;9:521-6.
5. Su ET, DeWal H, Di Cesare PE. Periprosthetic femoral fractures above total knee replacements. J Am Acad Orthop Surg. 2004;12:12-20.
6. Rorabeck CH, Taylor JW. Classification of periprosthetic fractures complicating total knee arthroplasty. Orthop Clin North Am. 1999;30:209-14.
7. Kim KI, Egol KA, Hozack WJ, Parvizi J. Periprosthetic fractures after total knee arthroplasties. Clin Orthop Relat Res. 2006;446:167-75.
8. Dennis DA. Periprosthetic fractures following total knee arthroplasty. J Bone Joint Surg Am. 2001;83:120-30.
9. Culp RW, Schmidt RG, Hanks G, Mak A, Esterhai JL Jr, Heppenstall RB. Supracondylar fracture of the femur following prosthetic knee arthroplasty. Clin Orthop Relat Res. 1987;222:212-22.
10. Bordini B, Stea S, Cremonini S, Viceconti M, De Palma R, Toni A. Relationship between obesity and early failure of total knee prosthesis. BMC Musculoskeletal Disord. 2009;10:29.

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