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Tibial baseplate fracture associated with polyethylene wear and osteolysis after total knee arthroplasty[☆]



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ABSTRACT

INTRODUCTION: Fracture of the tibial baseplate following total knee arthroplasty is very rare given the developments in modern prosthesis design. Tibial baseplate fracture secondary to polyethylene wear, osteolysis and component malalignment in an elderly obese patient is reported in the present article.

PRESENTATION OF CASE: A 69-year-old woman had undergone total knee arthroplasty eleven years prior to presentation and reported nine months of chronic pain, which was caused by a neglected fracture of the baseplate.

DISCUSSION: We discuss the prevention of implant fracture after total knee arthroplasty and address the risk factors associated with this complication.

CONCLUSION: The present case emphasizes the importance of properly informing patients and encouraging them to report such complaints immediately to allow for early revision and prevention of component fracture, especially in patients with risk factors such as obesity and component, malalignment.

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1. Introduction

Failure of total knee arthroplasty is widely investigated to understand the underlying factors given the increasing numbers of revision arthroplasty procedures.^{1,2} Component fracture is a devastating complication of total knee arthroplasty and requires a more complex revision arthroplasty procedure.^{3,4} Femoral component fractures have been reported in several articles.^{2,5–7} However, fracture of the tibial baseplate is still a rare complication, and the etiological mechanisms need to be elucidated.⁴

We report a case of a tibial baseplate fracture associated with polyethylene wear, osteolysis, metallosis and tibial malalignment in an obese elderly female patient who underwent total knee arthroplasty eleven years prior to presentation.

2. Case report

A 69-year-old woman had undergone total knee arthroplasty eleven years prior due to a diagnosis of primary gonarthrosis. She had a

history of hypertension and goiter and was 98 kg and 164 cm tall with a calculated body mass index of 36.43 kg/cm². Her height and weight were approximately the same when the primary total knee arthroplasty was performed. After this initial procedure, she underwent regular follow-ups every year for five years; her last follow-up was conducted six years prior to presentation, and she was not informed of the need for continued follow-up. Her control radiograph revealed varus malalignment of the tibia three years after the primary surgery (Fig. 1). Approximately one and a half years prior to presentation, she experienced a slight pain in her operated left knee, which increased over the subsequent six months. When she was admitted to the local hospital, an analgesic drug was prescribed to her.

As her pain continued to increase over time, she presented to our central hospital; radiographs taken at that time revealed significant osteolysis in the medial condyle of the tibia (Fig. 2). Physical examination revealed a healthy-appearing obese woman in no acute distress and normal examination of the lower extremities. There was a well-healed anterior incision over the left knee without any evidence of skin infection. Active and passive motion of the knee caused pain in the medial part of knee. C-reactive protein, erythrocyte sedimentation rate, thyroid function tests and all other laboratory values were in the normal range. Loosening of the tibial component without any infection was reported on the bone scintigraphy.

The patient underwent a revision knee arthroplasty, and the previous incision site was used. There was a medial tibial baseplate fracture in the sagittal and coronal planes and a heavily worn polyethylene insert (Fig. 3A and B). There was no loosening in the lateral part of the tibial baseplate and no evidence of infection.

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Fig. 1. Follow-up radiograph revealed varus malalignment of the tibia three years after the total knee arthroplasty.



Fig. 3. Intraoperative view of the fractured tibial component (A) and the fractured tibial component showing bone ingrowth in the lateral part of the knee with severe polyethylene wear (B).

Revision knee arthroplasty was performed after removal of the implants (Fig. 4). There were no post-operative complications, and the patient was ambulating with partial weight-bearing on the second day after the surgery. Significant pain relief and functional improvement was achieved based on early follow-ups.

3. Discussion

As total knee arthroplasty has been performed in increasing numbers given the successful results achieved with the procedure, revision arthroplasty associated with knee arthroplasty failure has become a serious clinical problem. Wear, osteolysis and aging of the materials are the main problems that lead to total knee arthroplasty failure.^{1,2,4,5,7,8} Fracture of the tibia baseplate is a rare complication that is associated with devastating bone loss resulting in a more complex revision arthroplasty.⁴ The etiology of component fractures has been investigated in an attempt to reduce the numbers of complex revision procedures. The design of the prostheses, surgical factors, body mass index and activity level of the patient are the important factors implicated in these component fractures.³⁻¹⁰

Manufacturing and design were suggested to be the main predisposing factors while patient weight and surgical technique were suggested to be contributory factors.^{3,6} Femoral component fracture of total knee arthroplasty was investigated in these studies; it was proposed that improved manufacturing and design might better tolerate patient obesity and component malalignment.^{3,6} Han

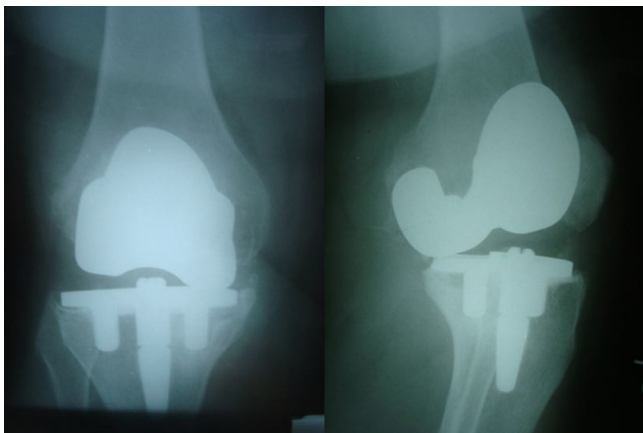


Fig. 2. Preoperative AP and lateral radiographs.

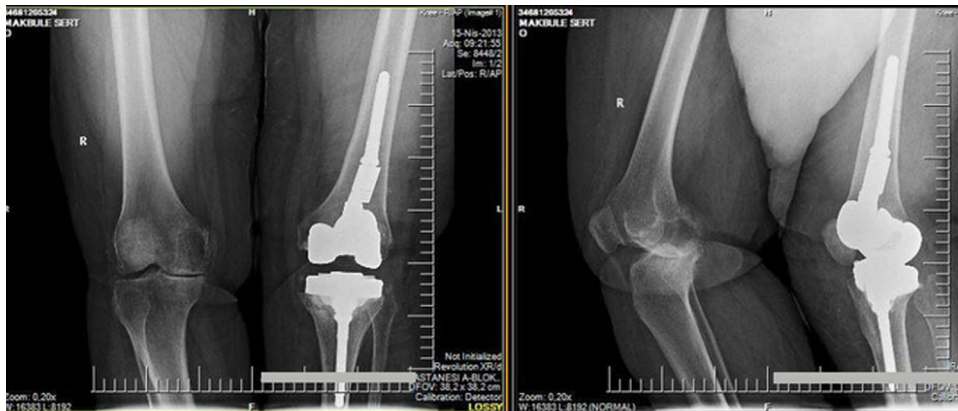


Fig. 4. Postoperative AP and lateral radiographs after the revision knee arthroplasty.

et al.⁵ and Huang et al.⁷ addressed polyethylene wear and osteolysis leading to femoral component fracture in their case reports. Even proper manufacturing and design could not prevent fatigue fracture due to the repeated cyclic stress as severe osteolysis weakened the osseous support at the fracture site.^{5,7} Because osteolytic processes associated with polyethylene wear are slow and there is a clear correlation between the site of a fractured tibial baseplate and the region of the bone loss, factors that delay early diagnosis and intervention are important in the prevention of component fracture.^{4,9} Contralateral knee arthritis might mask symptoms of osteolysis,⁹ and lack of regular follow-up might delay the diagnosis of the osteolytic process.⁴

In the present case, as observed on the early pre-operative X-ray, the cemented tibial stem was relatively well-fixed, but there was varus malalignment due to inadequate ligament balance, which resulted in continuous overloading of the medial compartment of the knee. Osteolysis and bone loss occurred in the medial region of the tibia in the present case, and this was the site of the tibial fracture; this clinical situation is consistent with those in previous articles.^{4,5,8} The current patient was obese when the initial procedure was performed and had no follow-up for six years. Although these multifactorial predisposing factors of osteolysis leading to the possible failure of the knee arthroplasty existed, the patient had not been informed about the possible complications and the need for regular follow-up even years after the initial procedure. Furthermore, when she was admitted to the local hospital after her pain worsened, an analgesic drug was prescribed without a meticulous investigation of her knee; the chance of an early revision was therefore missed.

4. Conclusions

We emphasize the importance of properly informing patients and encouraging them to report pain immediately to allow for early revision and prevention of component fractures, especially in patients with risk factors such as obesity and component malalignment.

Conflict of interest

The authors declare that they have no competing interests.

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None.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chiefs of this journal.

Author contributions

Serdar Yilmaz: intellectual contribution to the paper and helped in writing last section; Alper Devenci: collected and analysed the data, then revised written paper.

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