

## Case Report

# Floating total knee: periprosthetic fracture of the distal femur combined with tibial plateau fracture in primary total knee arthroplasty

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### ABSTRACT

We are currently witnessing an increasing number of complications associated with arthroplasty, both due to its greater prevalence, whether primary or revision, and to the population's longer average life expectancy. Periprosthetic fractures associated with a floating knee, in the context of total knee arthroplasty, are rare and their treatment is challenging. We present a case of ipsilateral periprosthetic fracture of the distal femur combined with fracture of the tibial plate in total knee arthroplasty. The 80-year-old female patient was admitted to the emergency department after falling from her own height at home. She reported diffuse pain in her right knee and associated functional incapacity. The limb was stabilized and immobilized in a posterior long leg splint. Initial X-rays showed an ipsilateral periprosthetic fracture of the distal femur and medial tibial plate. The patient's only previous surgery was a total right knee arthroplasty performed in 2020. She underwent surgical treatment with osteosynthesis of the distal femur with a locked anatomical plate and arthroplasty revision of the tibial component. Periprosthetic fractures associated with knee arthroplasty typically involve the distal femur. Fractures involving the tibia are rare and usually occur in the medial tibial plate, in the presence of detachment of the tibial component. There is little published literature on this type of fracture in elderly patients. Periprosthetic fractures in total knee arthroplasty require individualized and planned treatment according to the personality of each fracture and the existence or not of prosthetic detachment.

**Keywords:** Floating knee, Periprosthetic fracture, Total knee arthroplasty

### INTRODUCTION

We are currently witnessing a growing number of complications associated with arthroplasty, both because of its greater prevalence, whether primary or revision, and because of the population's longer average life expectancy. The literature reports an incidence of 0.3-3% for periprosthetic femoral fractures, with fractures of the tibial component being even more uncommon (0.1-0.4%).<sup>1-4</sup>

This type of fracture occurs more frequently in the geriatric population, as a result of low-energy trauma (falling from a height).

Periprosthetic fractures associated with a floating knee, in the context of total knee arthroplasty, are rare and their treatment is challenging. Despite all efforts, these patients have a high rate of complications and mortality.<sup>5</sup>

There are few cases reported in the literature and there is no established treatment strategy. Therefore, we consider it important to share our experience and outcome following the surgical treatment of an ipsilateral periprosthetic fracture of the distal femur combined with a fracture of the medial tibial plateau in primary total knee arthroplasty.

**CASE REPORT**

An 80-year-old female patient with a history of primary total right knee arthroplasty in 2020 was admitted to the emergency department after falling from her own height at home. She reported diffuse pain in the right knee and restricted active and passive knee mobility.

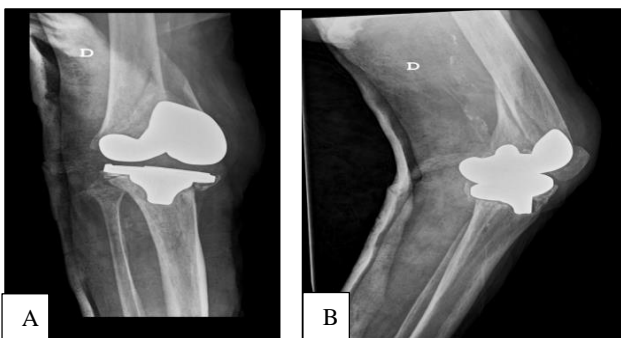
Initial X-rays showed an ipsilateral periprosthetic fracture of the distal femur and medial tibial plate, classified as Lewis and Rorabeck type II and Felix type IB, respectively. The floating knee scenario can be classified as type IIa of the Fraser classification.

The patient was assessed by the multidisciplinary orthopedics and anesthesiology team, who considered her fit for surgical treatment. The limb was immobilized in a posterior long leg splint until definitive treatment.

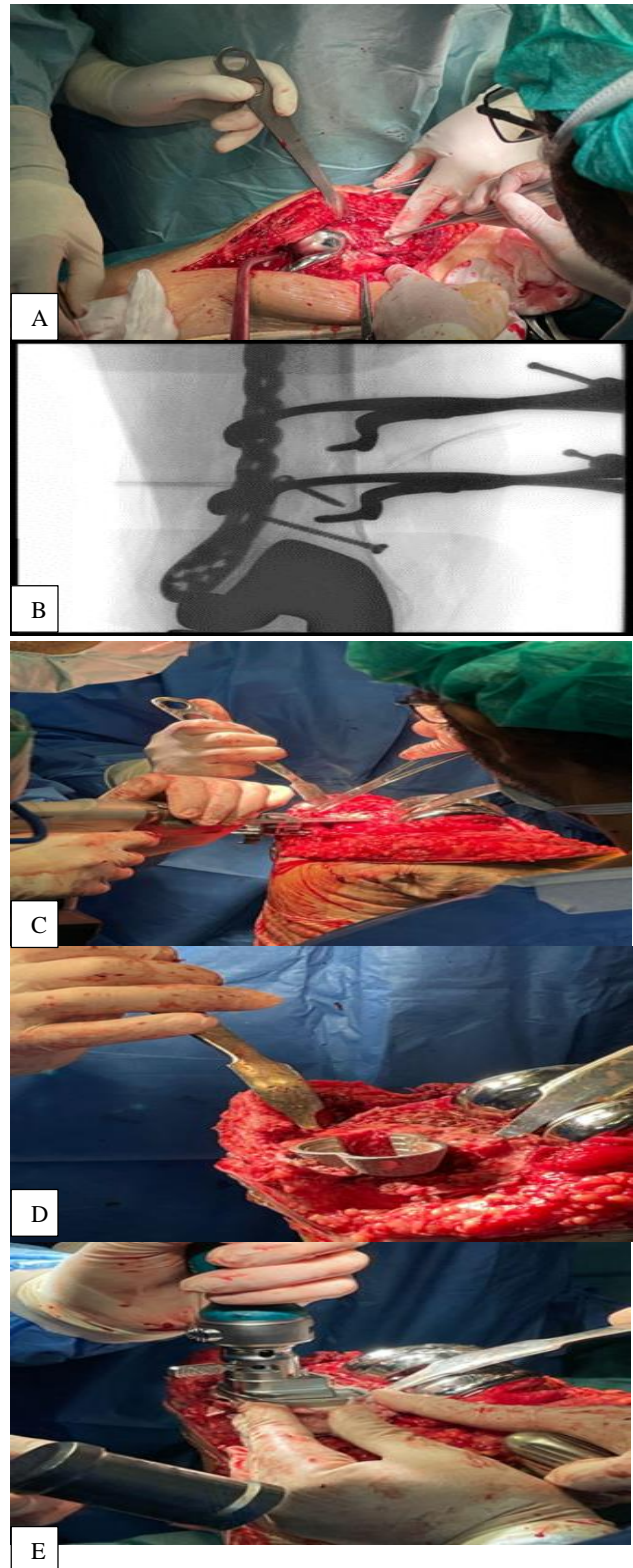
The surgery was performed on 18<sup>th</sup> day of hospitalization, due to medical complications and decompensation of cardiac function that required medical stabilization. Under general anesthesia, in dorsal decubitus and using the previous medial parapatellar approach, the fracture was surgically treated. We opted for osteosynthesis of the distal femur with a locked anatomical plate and two interfragmentary compression screws, after intraoperative verification of stability of femoral prosthesis component.

The plate was tunneled through a submuscular plane and the proximal screws placed through a minimally invasive proximal incision. Following this, and given the detachment of the tibial component, we proceeded with its arthroplasty revision using a diaphyseal support stem and an asymmetrical metaphyseal cone.

In the post-operative period, hemoglobin values remained stable and the patient began rehabilitation in bed and was mobilized to an armchair on the third post-operative day. Antibiotic prophylaxis was maintained for 48 hours. The patient was discharged on the 15th day following surgery, with the ability to tolerate lifting, although her walking ability remained debilitated.



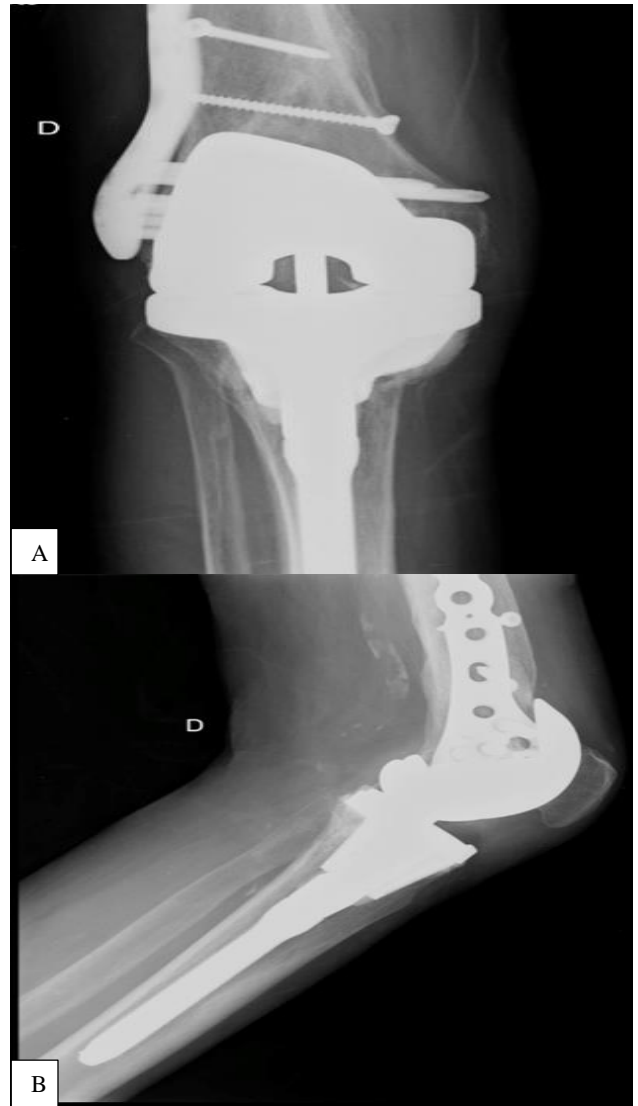
**Figure 1 (A and B): Initial X-rays, displaying a floating total knee: periprosthetic fracture of the distal femur combined with tibial plateau fracture in primary total knee arthroplasty.**



**Figure 2 (A-E): Intra-operative: We opted for osteosynthesis of the distal femur with a locked anatomical plate and two interfragmentary compression screws, after intraoperative verification of the stability of the femoral prosthesis component. Following this, and given the detachment of the tibial component, we proceeded with its arthroplasty revision using a diaphyseal support stem and an asymmetrical metaphyseal cone.**



**Figure 3 (A-C): Post-operative X-rays: osteosynthesis of the distal femur with a locked anatomical plate and two interfragmentary compression screws; arthroplasty revision using a diaphyseal support stem and an asymmetrical metaphyseal cone.**



**Figure 4 (A and B): Post-operative X-rays at 12 months follow-up.**

At 12 months after surgery, the patient has a range of motion of the right knee between 10° and 110°. She walks independently with a walker and has no complaints of knee pain. She has a score of 29 on the functional assessment of the Karlström and Olerud grading system, which represents a satisfactory result. Radiologically, the fracture is consolidated and well aligned, with no signs of prosthetic detachment or other complications.

#### **DISCUSSION**

Periprosthetic knee fractures are technically challenging due to their prevalence in elderly patients with reduced bone quality.<sup>6</sup>

Most periprosthetic fractures associated with knee arthroplasty involve the distal femur. Fractures involving the tibia are rare and usually occur in the medial tibial plateau, in the presence of detachment of tibial component.<sup>1-4</sup>

When there is a periprosthetic fracture of the distal femur associated with an ipsilateral tibial fracture, the knee prosthesis is disconnected from the bony skeleton. This situation is identical to a floating knee.

Rorabeck's classification is based on the misalignment of the distal femur fracture and the stability of the femoral prosthetic component. Felix's classification takes into account the location of the periprosthetic tibial fracture and the stability of the tibial component.<sup>4</sup> However, there is no classification for periprosthetic fractures in the setting of a floating knee.

The main goals of surgical treatment are to restore the length, alignment and rotation of the limb, as well as early mobility.

The risk factors for periprosthetic fractures have been identified in the literature and can be divided into two categories: those specific to the patient and those specific to the surgical technique. Patient-specific risk factors include rheumatoid arthritis, osteoporosis, osteolysis and neurological and balance disorders. Those of the surgical technique itself include axial misalignment, incorrect positioning of components, use of constrictive prostheses and intra-medullary stems.<sup>7</sup>

In the case presented, we had elderly, partially dependent patient with a history of rheumatoid arthritis and total right knee arthroplasty performed 2 years ago.

Regarding the distal femur fracture with a stable prosthetic component, we opted to perform osteosynthesis with an anatomical plate, tunneled proximally, minimizing the length of the incision, tissue dissection and blood loss. With this option, we were able to minimize surgical aggression and retain the primary femoral component.

Regarding the fracture of the medial plate of the tibia associated with prosthetic detachment, according to the literature there is an advantage in arthroplasty revision with a diaphyseal support stem.<sup>3</sup> In our case, we also opted to use an asymmetrical metaphyseal cone due to the bone loss of the medial plateau.

This construction allowed early mobility and armchair raising in the immediate post-operative period.

The functional result is limited by the patient's previous mobility, but we consider it to be an acceptable and uneventful result.

## CONCLUSION

This case highlights the importance of adapting and personalizing the type of treatment to the existence or not of prosthetic detachment and to the characteristics of the population most affected, in order to reduce post-operative morbidity and allow the patient early mobility.

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