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## Bilateral periprosthetic tibial stress fracture after total knee arthroplasty: A case report

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## ABSTRACT

**INTRODUCTION:** Periprosthetic fractures around the knee after total knee arthroplasty can be seen in the femur, tibia and patella. The tibial fractures are rare cases. Our case with bilateral tibial stress fracture developed after total knee arthroplasty (TKA) is the first of its kind in the literature.

**PRESENTATION OF CASE:** 75-year-old male patient with bilateral knee osteoarthritis had not benefited from conservative treatment methods previously applied. Left TKA was applied. In the second month postoperatively, periprosthetic tibial fracture was identified and osteosynthesis was implemented with locked tibia proximal plate-screw. Bone union in 12 weeks was observed in his follow-ups.

After 15 months of his first operation, TKA was applied to the right knee. Postoperatively in the second month, as in the first operation, periprosthetic tibial fracture was detected. Osteosynthesis with locking plate-screw was applied and union in 12 weeks was observed in his follow-up.

He was seen mobilized independently and without support in the last control of the case made in the 24th month after the second operation.

**DISCUSSION:** The number of TKA applications is expected to increase in the future. The incidence of periprosthetic fractures should also be expected to increase in these cases. Periprosthetic tibial fractures after TKA are rarely seen. The treatment of periprosthetic fractures around the knee after TKA can be difficult.

**CONCLUSION:** In the case of persistent pain in the upper end of the tibia after the surgery, stress fracture should be considered.

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## 1. Introduction

Periprosthetic fractures around the knee can be seen in femur, tibia and patella after total knee arthroplasty (TKA). The treatment of these fractures can be difficult since they occur in elderly patients with poor bone stock and poor healing capacity [1]. Supracondylar femoral fractures are the most common type of periprosthetic fractures observed after TKA. Yet, periprosthetic tibial fractures after TKA are rarely seen. In Mayo Clinic series periprosthetic tibial fractures after TKA were observed 0.1% intraoperatively and 0.4% postoperatively [2].

Osteopenia, advanced age, chronic steroid use, female gender, neurological disorders and stiff knee are the factors that increase the risk of periprosthetic fractures after TKA [1,3,4].

Stress fractures can be divided in two types as fatigue fractures caused by repetitive abnormal stress in normal bones and insufficiency fractures caused by normal stress in defective bones [5].

Fatigue fractures usually occur in athletes and military personnel after jumping and running activities [5–7]. Insufficiency fracture are seen in the cases with rheumatoid arthritis [8], osteoarthritis [9,10], post-traumatic deformity [11], pyrophosphate arthropathy [12] and elderly knee arthroplasty [13–16].

Any reported cases with bilateral periprosthetic tibial stress fracture after TKA was not observed in our English literature search. Our case with bilateral tibial stress fracture developed after TKA is the first of its kind in the literature.

## 2. Case report

75-year-old male patient with bilateral knee osteoarthritis had not benefited from conservative treatment methods previously applied. Kellgren-Lawrence stage 4 gonarthrosis was detected in his radiographies and TKA was decided to be applied (Fig. 1, Fig. 2). Hypertension, under controlled with treatment, was only present in the case and he was assessed in ASA risk group 2.

Left TKA was applied to the case under spinal anesthesia. Non-displaced fracture determined in intraoperatively at the lateral femoral condyle, and was fixed by 6.5 fully threaded cancellous screw. In the radiographic examination performed upon pain on

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Fig. 1. Preoperative planning.



Fig. 2. Preoperative clinical view of the patient.

**Table 1**  
Classification of the periprosthetic tibial fractures .

Type1	Fracture partially involving the tibial head
Type2	Fracture involving the whole tibial head around the implant
Type3	Fracture lying below the distal part of tibial component
Type4	Fracture with an isolated involvement of the tuberosity
<hr/>	
Subgroup	
A	Stable prosthesis
B	Loose prosthesis
C	Intraoperative fracture

the tibia in the second month postoperatively, Felix [2] (Table 1) fracture type 3A periprosthetic tibial fracture was identified in the upper end of the tibia and osteosynthesis was implemented with locked tibia proximal plate-screw. Bone union in 12 weeks was observed in his follow-ups (Fig. 3).

After 15 months of his first TKA operation, another TKA was applied to the right knee of the patient under spinal anesthesia. In the radiographic examination of the patient who presented with complaint of pain postoperatively in the second tibial proximal, as in the first operation, Felix [2] Type 3A periprosthetic tibial fracture was detected (Fig. 4). Osteosynthesis with locking plate-screw

was applied and union in 12 weeks was observed in his follow-up (Fig. 5).

No additional pathology was detected in the endocrinological investigations of the case conducted. He was seen mobilized independently and without support in the last control of the case made in the 24th month after the second operation. Any complications such as infections or neurological damage were not observed in our patient's follow-ups.

### 3. Discussion

The number of TKA applications is expected to increase in the future [17]. The incidence of periprosthetic fractures should also be expected to increase in these cases. The treatment of periprosthetic fractures around the knee after TKA can be difficult [1].

Supracondylar femoral fractures are the most common type of periprosthetic fractures observed after TKA. Yet, peripros-



Fig. 3. ORIF of the periprosthetic stress fracture of the left knee and severe osteoarthritis of the right knee.

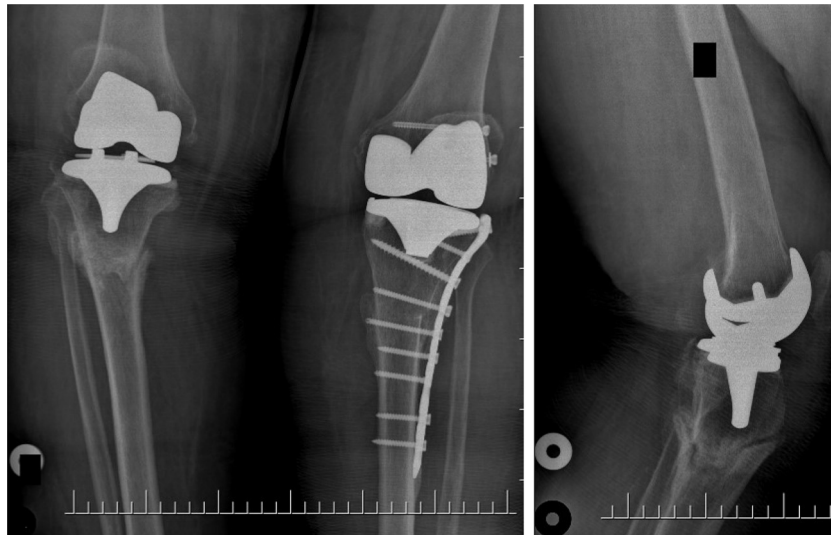


Fig. 4. Periprosthetic stress fracture of the right knee.

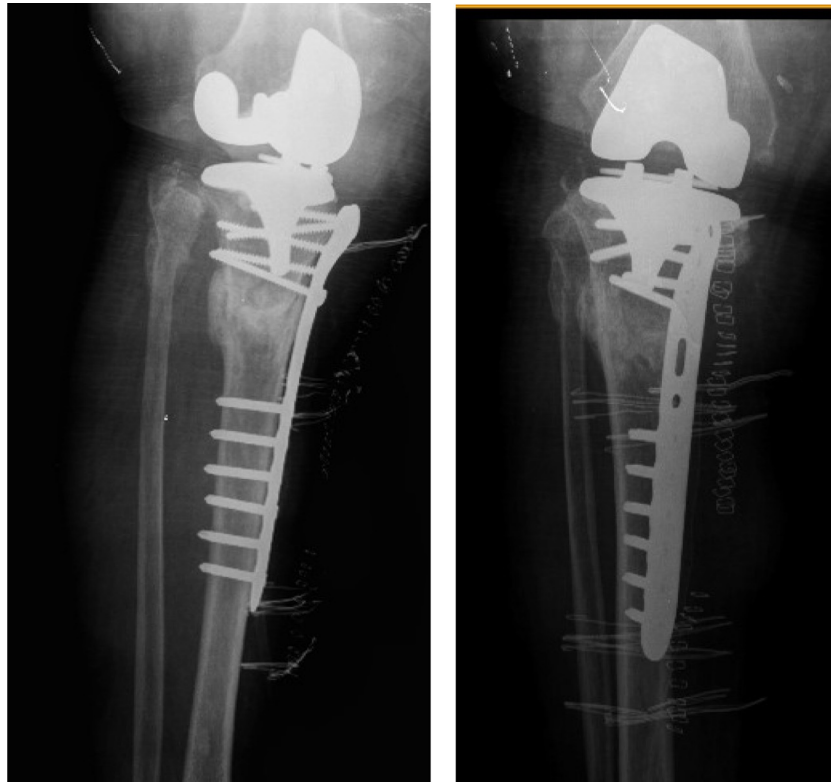


Fig. 5. ORIF of the periprosthetic stress fracture of the right knee.

thetic tibial fractures after TKA are rarely seen. In Mayo Clinic series periprosthetic tibial fractures after TKA were observed 0.1% intraoperatively and 0.4% postoperatively [2]. However, the periprosthetic tibial stress fracture is very rare and brief case series and case reports are found in the literature [13,15,16,18,19].

Tibial stress fractures, seven of which was polycentric and eight of which was geometric design, were seen in 15 patients with applied TKA. It was stated that the main reason was malalignment and improper placement of components. A significant difference between the tibial axis angle and the tibial component is seen in the anteroposterior and lateral radiographies of these cases when compared to the control group in the study. It is understood that varus angulation and decreased tibial slope exist in the fracture cases compared to the control group. Loosening was detected and

revision arthroplasty was performed in all cases [13]. Improper component placement and loosening were not detected in our case.

Stress fractures are associated with the placement of the pin in cases to whom TKA with navigation [16] and unicondylar knee prosthesis [15,18,19] were applied. In our case, no association was determined between the stress fracture and the pins used to show the cutting guidelines during the operation. It was observed that the stress fracture developed approximately 5 cm distal from the pins on both sides (Table 2).

While periprosthetic tibial stress fractures were reported to be observed between 2 and 38 months postoperatively in the literature [15,16,18,19], in our case, it was seen on both sides in the second month postoperatively (Table 2).

**Table 2**  
Literature investigation of the periprosthetic tibial stress fractures after TKA.

Literature	Case	Symptom	Reason	Treatment
Rand and Coventry, [13]	15	2–38 months	(TKA); Axial malalignment and improper component positioning	15 Revision TKA
Seon et al., [15]	2	3–5 weeks	(Navigation UKA); osteoporosis and obesity	1 ORIF 1 Revision TKA
Hoke et al., [16]	3	6–12 weeks	(Navigation TKA); guide wire	3Non-weight bearing
Brumby et al., [18]	4	3–18 weeks	(Minimally invasive UKA); tibial cutting block pin hole	4 Revision TKA
Yang et al., [19]	2	3–5 months	(Minimally invasive UKA); tibial cutting block pin hole	1 Revision TKA 1Non-weight bearing

UKA: Unicompartmental Knee Arthroplasty.

TKA: Total Knee Arthroplasty.

ORIF: Open Reduction Internal Fixation.

In periprosthetic tibial stress fractures developed after TKA, conservative or surgical treatment can be applied after considering fracture stability and the sequence of the components. Stress fractures along with loosening or prosthetic instability require the revision of knee replacement [13,15,16,18,19]. In cases where the prosthesis is stable internal fixation can be applied to fracture fragments with open reduction. In cases where the prosthesis loosening detected tibial intramedullary stem is used extending to diaphysis [1,20].

Felix et al. have developed a classification system after examining 102 periprosthetic tibial fracture after TKA cases [2]. This classification includes four types and three subgroups (Table 1). Our patient's right and left periprosthetic tibial fractures [2] were assessed as Type 3A according to the classification system. Prostheses were evaluated as stable on both sides and internal fixation was performed with open reduction and anatomical locking plague. Bone union in 12 weeks was observed on both sides in follow-ups.

**4. Conclusion**

Tibial stress fractures are rare cases. However, a stress fracture should be kept in mind in the persistent pain in the upper end of the tibia that occurs after surgery.

**Conflict of interest**

None declared.

**Funding**

There is no study sponsor.

**Consent**

We had written and signed consent to publish a case report from the patient.

**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 Chief of this journal on request.

**Author contributions**

All authors contributed to the article. Study design created by Guzelali Ozdemir and Ibrahim Azboy. All data were collected by

Guzelali Ozdemir and Ibrahim Azboy. Guzelali Ozdemir, Ibrahim Azboy and Baris Yilmaz wrote manuscript.

**Guarantor**

Guzelali Ozdemir, M.D.

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