Causes of failure after total knee arthroplasty (TKA) include aseptic loosening of the components, infection, polyethylene (PE) wear, periprosthetic fracture, and component fracture. Although there have been several reports of the PE insert fracture, fracture of the metal components with a modern design is rare.1-7

The authors describe a case with fracture of the tibial metal tray and PE insert 10 years after primary TKA.

**CASE REPORT**

A 73-year-old woman (weight, 76 kg; height, 153.5 cm; body mass index, 32.0 kg/m²) presented to the authors’ outpatient clinic with painful instability of the left knee. She reported that this symptom started abruptly 8 months ago after she fell on her left knee. She had undergone primary total knee replacement with a diagnosis of osteoarthritis at another hospital 10 years prior. The AMK Total Knee System (DePuy, Warsaw, Indiana) was used for the index operation.

At the initial presentation, range of motion was from 5° to 90°, and severe instability was checked. Plain radiographs showed a fracture of the left tibial component at the junction between the tibial stem and the medial aspect of the tibial tray. The PE component was also fractured at the same level. The tibial plateau was undercovered, especially at the medial side. Radiolucent areas under the tibial tray were observed at the medial side. The tibial component was positioned at an angle of 6° varus to the mechanical axis of the tibia, and the hip-knee-ankle angle was 24° on a long-leg radiograph (Figure 1).

The patient underwent revision TKA. During the surgery, the tibial metal tray and PE insert were found to be broken at the junction between the stem and the medial part of the tray, along the border of the locking mechanism for the PE insert (Figure 2). Metallosis was also observed. All components were removed, and the revision was performed with a stemmed revision implant (Legion Revision Knee System; Smith & Nephew, Memphis, Tennessee).

Postoperative plain radiographs showed a neutral alignment of the left knee, with the mechanical axis passing through the center of the knee (Figure 3).

**DISCUSSION**

The authors have described a patient with a fractured tibial metal tray and PE...
Although the rate of metal component fractures is reported to be as high as 4.9% in the unicompartmental knee arthroplasty—especially in patients with a body mass index of greater than 30 kg/m² and deterioration in limb alignment—they rarely occur in TKA. Fracture of a metal component after TKA is rare, and most cases involve femoral components. Fracture of the femoral component after TKA was initially reported to be limited to a specific implant: the cementless double-beaded layered Ortholoc II prosthesis (Dow Corning Wright, Arlington, Tennessee). The failure mechanism was closely related to design and manufacturing features. However, it was also reported in the titanium alloy and both surgical technique and implant design were considered factors contributing to the failure of the femoral component. In the femoral component, fracture usually occurs at the angled portion between the distal surface and the posterior chamfer of the medial condylar portion. The fracture may be related to the radii and thickness that decrease from anterior to posterior in a coordinated fashion to provide full flexion while maintaining excellent bearing congruity with the tibial component.

Fracture of the metal tibial baseplate after TKA is extremely rare and has usually been observed with constrained prostheses and prostheses that have poor mechanical properties. Possible causes of fracture of the tibial metal plate include weak points caused by mechanical properties and improper design, metallurgical defect, stress concentration because of malalignment, preexisting incompetent bone stock, and bone resorption from foreign body reaction. In a study by Altintas et al., fracture of the tibial baseplate occurred transversely at the postero-medial side. They interpreted a possible contributing factor as the use of neutral anatomic rotation of the femoral component and a tibial plate that was smaller than the original plateau. They could not find a stress riser that was associated with the presence of slots.

The AMK Knee System used for the current patient had a tibial baseplate that was made of cobalt-chromium alloy and had a locking mechanism of the PE insert on the tibial baseplate. Therefore, it has a slot for locking the PE insert. In this case, the fracture occurred along the border of the locking mechanism at the medial side, where there is an abrupt change in the shape of the implant. Therefore, it could be assumed that this area had been a stress riser. Additionally, the tibial component was under-sized, especially at the medial side, and the limb was also varus aligned. Therefore, there is a possibility that the medial side of the tibial component may have been supported by weaker cancellous bone only and that the tibial side may have been eccentrically loaded to the medial side. High body mass index may have also contributed to the failure.
Design, size, and position could have contributed to this component’s failure, which may have been prevented by controlling these variables.

**References**


