Knee Disarticulation for a Total Knee Arthroplasty Periprosthetic Fracture

LARRY V. LEE, MD; SEAN M. ESMENDE, MD; CHRISTOPHER T. BORN, MD

abstract

Total knee arthroplasty, although a very successful surgery, can present the patient with several potential complications, including the risk for periprosthetic fractures. Complications involving periprosthetic fractures after total knee arthroplasty can present a complex clinical scenario for orthopedic surgeons. To date, adequate literature exists to guide surgeons in approaching most periprosthetic fractures; however, standard operating procedure can fall short when confronted with more complex clinical scenarios. The authors present an alternative approach, falling outside the traditional paradigm, to addressing a periprosthetic tibial fracture in the setting of a previous total knee arthroplasty. Given both the patient’s physiological factors and the inherent factors of the fracture, the authors found that the first-line treatments for periprosthetic fracture, including open reduction and internal fixation and joint revision, were inadequate and posed more potential risks than benefits for the patient. In light of this situation, the authors elected to treat this patient’s periprosthetic fracture with a through knee amputation, as this provided the patient with the lowest cost in morbidity while still addressing the fracture. [Orthopedics. 2016; 39(4):e775-e778.]

Since its inception in the 1950s by Walldius, total knee arthroplasty (TKA) has positively affected millions of individuals worldwide. Those who have received TKAs have demonstrated consistently better results vs their conservatively treated counterparts when measured from a physical functioning perspective.1,2 Given the efficacy of the total knee replacement system, it is not surprising that it remains one of the most popular primary total knee replacements placed. The lifetime incidence of tibial periprosthetic fractures alone accounts for 0.4% of all primary TKAs placed; this is less than the estimated 0.3% to 2.5% lifetime risk of femoral TKA periprosthetic fractures.4 Risk factors for developing a periprosthetic fracture after TKA include errors in technique and alignment, loose components, osteolysis, and the use of long stem insertions.4 Traditionally, if the fracture was well aligned, the leg could be treated in a long leg cast to maintain alignment, with the shortcomings of this being an extended time spent non-weight bearing and a risk of loss of range of motion after casting.5,6 Intramedullary nailing distal to a TKA for a tibial shaft fracture has also been reported.5,6 Alternatively, open reduction and internal fixation can be attempted if there is no suspicion of com-

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ponent loosening. If the tibial prosthesis is suspected of being loose, it is heavily advocated that a revision of the prosthesis be undertaken and a long stem tibial component placed.

The authors present an alternative approach, falling outside the traditional paradigm, taken to address a periprosthetic tibial fracture.

**Case Report**

A 78-year-old white woman presented from another hospital after sustaining a fall onto her right side and reporting right lower extremity pain. She was transferred with the diagnosis of a Felix Type II tibial periprosthetic fracture, a transverse metaphyseal tibial fracture around a long stem tibial prosthesis (Table).

The patient reported a long-standing history of Huntington’s chorea and had been nonambulatory for the past several years. During the years of nonambulation, she had developed a flexion contracture of bilateral knees to 90° along with concurrent hip flexion contractures. Further evaluation revealed the presence of a 3 × 3-cm necrotic skin with surrounding erythema along the anterior aspect of the tibia approximately 2 cm distal to the tibial tubercle; the skin compromise remained isolated to the anterior half of the tibia (Figure 1). Motion in the affected knee could not be adequately evaluated because of the location of the fracture; however, the ipsilateral hip revealed a 45° flexion contracture and the contralateral knee revealed an 80° flexion contracture with a 45° flexion contracture.

Radiographs of the knee showed a posterior stabilized TKA with long femoral and tibial stems; the femoral component was press fit while the long stemmed tibial component was cemented. The imaging confirmed the presence of a fracture through the metaphysis of the tibia proximal to a long stemmed tibial prosthesis (Figure 2). Given the nature of the fracture and its extension around the proximal tibial component, there was some suspicion that the component would be loose.

On initial evaluation, the patient was temporized with a calcaneal pin for traction. She was then placed in balance traction to isolate movement in the affected limb, given her chorea and flexion contractures (Figure 3). Balance traction was preferred over a more rigid splint because of the chorea and the thought that a rigid splint would lead to increased discomfort and possible skin compromise. After a lengthy discussion with both the family and the staff, the option that would least exacerbate her comorbidities and maximize the odds of a single operation was determined to be amputation of the affected limb. There were and are no plans for prosthesis fitting, given the nonambulatory status. A below-the-knee amputation was initially considered, but posed certain problems, mainly that the authors did not

**Table**

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<td>I</td>
<td>Fracture of the tibial plateau</td>
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<td>II</td>
<td>Fracture adjacent to the stem</td>
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<td>III</td>
<td>Fracture of the tibial shaft distal to the component</td>
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<td>IV</td>
<td>Fracture of the tibial tubercle</td>
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**Figure 1:** Photograph of the patient’s right lower extremity. The anterior skin lesion is just distal to the knee joint.

**Figure 2:** Preoperative lateral (A) and anteroposterior (B) radiographs of the affected (right) knee. The fracture is seen at the proximal tibia.

**Figure 3:** Balance traction of the affected knee.
know if the prosthesis was well fixed or loose. Although there are ways to remove a well-fixed tibial prosthesis, the authors thought that doing so in a patient with these medical comorbidities would have presented severe risk without providing significant benefit, given that they did not expect her to be ambulating in the future. A below-the-knee amputation would not have addressed the problem with the patient’s skin previously described. The presence of the long stemmed femoral prosthesis would result in a very proximal femoral amputation; attempts to remove the femoral prosthesis would result in a much larger surgery in an unhealthy patient. To maximize femoral length and minimize hardware complications, the authors proceeded with a through knee disarticulation. Open reduction with a plate, including percutaneous plating, was briefly considered, but it presented several unique concerns. Plating in the setting of a loose prosthesis would not have yielded significant long-term results. Had the prosthesis been well fixed, plating still would have yielded increased risks due to the skin lesion along the anterior proximal aspect of the tibia. The possibility of skin compromise and wound complications was thought to represent a significant risk, given the nature of the patient’s other comorbidities.

After medical optimization, the patient was taken to the operating room for a transarticular knee amputation. An anterior incision at the level of the joint line was made and the underlying infrapatellar tendon was exposed. The incision was then brought distally and longitudinally to halfway down the calf and the anterior compartment was then meticulously dissected. With the fracture exposed, the distal aspect of the prosthesis was removed; the prosthesis was found to be loose. The remainder of the tibia was then dissected subperiosteally and the final amputation was placed through the posterior compartment. The patella and patellar tendon were found to be well fixed and immobile against the femoral component, and the femoral component was found to be well fixed (Figure 4). All neurovascular structures were carefully dissected and ligated in the usual fashion. The skin was meticulously apposed and the residual limb was appropriately dressed.

The patient’s medical issues stabilized, her postoperative course was uneventful, and she was subsequently discharged to a rehabilitation center.

**DISCUSSION**

Given the location of the fracture line, through the tibia stem prosthesis, attempted fixation of the prosthesis could remain a viable option in a noncomplicated case. The literature reports good results when open reduction and internal fixation is attempted for such fractures. In the current case, operative management would have been complicated by the skin ne-
crosis on the anterior aspect of the tibia, which precluded attempting an incision anteriorly. An attempt to fix the fracture was excluded because of her nonambulatory status and skin quality.

When all of the medical comorbidities were taken into account, this patient presented a unique and complicated situation. Nonoperative management would have yielded significant complication risks concerning further breakdown of the skin and nonunion due to continuous chorea-induced motion.

Through amputation, the authors attempted to treat the fractured limb by removing the fracture itself. Amputation would also address the comorbidities, including the compromised skin and tibial fracture, thereby minimizing the aforementioned complications. Given that the patient had an 80° flexion contracture and was nonambulatory, attempts to fix the fracture with a plate or to revise the tibial component would not have added to her projected quality of life. Compared with either open reduction and internal fixation or revision, amputation did not reduce the patient’s future expectations. Furthermore, amputation would maximize the prospects of a single surgery. This patient was not healthy. An attempted removal of the femoral component would have both extended the time the patient spent on the table and increased the physiological impact of the surgery. In addition to careful patient selection, a thorough discussion with the patient regarding the possible options must occur before undertaking this type of periprosthetic disarticulation.

REFERENCES