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Difficult Tibial Nail Removal using the "Extended Trochanteric Osteotomy" Technique Prior to Total Knee Arthroplasty

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Abstract

Osteoarthritis of the knee may occur in patients who have previously undergone tibial nailing, necessitating nail removal in order to perform total knee arthroplasty. Typically, the nail may be removed without a great deal of difficulty, either as a separate procedure or at the time of the arthroplasty. However, tibial nail removal may pose a significant challenge.Extended trochanteric osteotomy is an exposure technique that provides optimal access to the femoral diaphysis.1 Creating a longitudinal window down the length of the femur exposes the intramedullary canal allowing for removal of well fixed components (such as fully coated press-fit stems) that are adherent to the bone. This technique has been well described in the literature with several variations of this procedure also now used quite universally.2 We report the use of a similar technique, extended tibial osteotomy, to remove an incarcerated tibial nail at the time of planned total knee arthroplasty. Our patient was informed that data concerning the case would be submitted for publication, and she consented.

***Index terms*—**
Difficult Tibial Nail Removal using the "Extended Trochanteric Osteotomy" Technique Prior to Total Knee Arthroplasty Aaron Schrayer ? , Di Lin Parks ? & Russell Wagner ? Abstract-Osteoarthritis of the knee may occur in patients who have previously undergone tibial nailing, necessitating nail removal in order to perform total knee arthroplasty. Typically, the nail may be removed without a great deal of difficulty, either as a separate procedure or at the time of the arthroplasty. However, tibial nail removal may pose a significant challenge. Extended trochanteric osteotomy is an exposure technique that provides optimal access to the femoral diaphysis. 1 Creating a longitudinal window down the length of the femur exposes the intramedullary canal allowing for removal of well fixed components (such as fully coated pressfit stems) that are adherent to the bone. This technique has been well described in the literature with several variations of this procedure also now used quite universally. 2 We report the use of a similar technique, extended tibial osteotomy, to remove an incarcerated tibial nail at the time of planned total knee arthroplasty. Our patient was informed that data concerning the case would be submitted for publication, and she consented.

1 I.

2 Case Report

sixty-three-year-old woman presented to the orthopaedic clinic for persistent right knee pain. Her orthopaedic history included a right tibial shaft fracture five years prior to presentation that was initially treated in a closed fashion. Seven months later, after having continued pain at the fracture site and trouble ambulating, a hypertrophic non-union was diagnosed, an intramedullary nail was placed, and the fracture healed. Subsequently, she had persistent, severe right medial knee pain requiring the use of a wheelchair to travel more than short distances. Physical examination was notable for BMI of 55, 10 to 90 degrees of motion, and palpable medial

osteophytes; radiographs revealed complete loss of medial joint space (Figure 1). A After a complete discussion of treatment alternatives, we planned to perform a right tibial intramedullary nail hardware removal along with a total knee arthroplasty. We began with the distal femoral and proximal tibial resections in order to facilitate insertion of the extraction bolt into the tibial nail. Removal of the intramedullary nail was then attempted using a slap hammer. Although we had very good fixation of the slap hammer onto the nail, the nail could only be extracted about 1cm after approximately an hour of hammering by all members of the operative team. When the nail was hammered in an antegrade manner in an attempt to loosen it, the proximal one-half of the tibia split into large medial and lateral displaced fragments, with the tubercle as a portion of the lateral fragment. Despite the fact that the proximal one-half of the nail was now completely exposed, further hammering did not "budge" the nail. At this point, we decided to perform an extended tibial osteotomy in order to gain access to the nail. An incision was made, continuous with the initial incision, extending down the medial face of the tibia to the ankle. The cortical window was elevated from the anterior crest of the tibia, attempting to leave as much soft tissue on this cortical window as possible. When the window was elevated, we found bone that had grown onto the nail and was larger than the diaphyseal diameter. We used a high speed bur to remove this bone and then were able to remove the nail. At this point, with the displaced bicondylar tibial plateau fracture extending to the mid tibia and the extended tibial osteotomy down to the ankle, we decided to perform a two-staged procedure, with plans for delayed total knee arthroplasty after the fracture and osteotomy had healed. Therefore, the tibial osteotomy cortical window was stabilized using two Luque cerclage wires and the proximal tibial plateau was stabilized with three 3.5mm lag screws. A Rush rod was placed to give overall alignment and to facilitate later rod removal. Although there was no evidence of infection, an antibiotic cement spacer was placed between the femur and the tibia to maintain collateral ligament length (Figure 2). At 4 months, the fracture and osteotomy appeared healed on radiographs and we performed primary total knee arthroplasty. Intraoperative exam and stress fluoroscopy images were consistent with healing of the fracture and osteotomy sites; consequently, the Rush rod was removed. She initially did well, but one month after the arthroplasty, she had increasing pain and clinical motion at the fracture site; therefore we returned to the operating room for plate fixation. The fracture then healed uneventfully. Fourteen months later, she had good pain relief and function, with 0-110 degrees of motion (Figures 3 and 4).

4 Discussion

Tibial intramedullary nailing is a commonly performed procedure for tibial shaft fractures and nail removal is not uncommon. Anterior knee pain is generally the most common indication for nail removal with other common reasons being exchange nailing due to both delayed union and nonunion. 3,4 Complications may occur during nail removal. Though there is limited literature on problems encountered during tibial nail removal, one paper reported four cases of posterior tibial wall fracture upon removing the ACE titanium tibial nail while another described a case of a tibial shaft fracture upon removal of the Synthes Expert Tibial Nail. 5,6 Even though there are other possible complications that can occur, tibial fractures remain the most likely.

In revision hip literature, there is a growing trend toward performing an extended trochanteric osteotomy to remove well-fixed prostheses with the goal being to have a surgically controlled "window" rather than inadvertently causing significant boney damage. 2,7,8 In this patient, once the nail was partially removed, she would be unable to ambulate without removing the nail or cutting it off, which would make future nail removal even more difficult should it be necessary. Based on the senior author's (R.A.W.) use of extended trochanteric osteotomies in total hip procedures, creating a tibial window in a similar fashion seemed to be the best option.

Staged hardware removal with subsequent knee replacement may avoid the complication of prosthesis implantation in the presence of occult infection, but has the downside of two operative procedures. There is limited information on this topic. One study that compared short term outcomes of total hip replacement after complications of ORIF for hip fractures with a matched group of osteoarthritic patients showed that overall functional outcome at 1-year postop was similar for both patient populations despite concerns of increased intraoperative difficulty and risk of fracture. 9 Although performing the proximal tibial resection made insertion of the extraction bolt easier, it also forced us to go forward with a knee replacement or fusion in order for the patient to walk; therefore, in the future, we would plan nail removal prior to performing the boney cuts for total knee replacement, even if the arthroplasty is planned during the same procedure.

Recognizing possible "ongrowth" is vitally important to prevent complications like tibial fractures since forceful hammering is usually necessary for extraction of intramedullary tibial nails. 6 Titanium nails may be expected to have more ongrowth than steel nails.

Creating a tibial window using the same technique as the extended trochanteric osteotomy allows for a controlled extraction of the intramedullary nail without causing unintended boney damage. We hope by this article to warn surgeons of this situation, which may become more common, and to provide a possible solution.

1

Figure 1: Figure 1 :

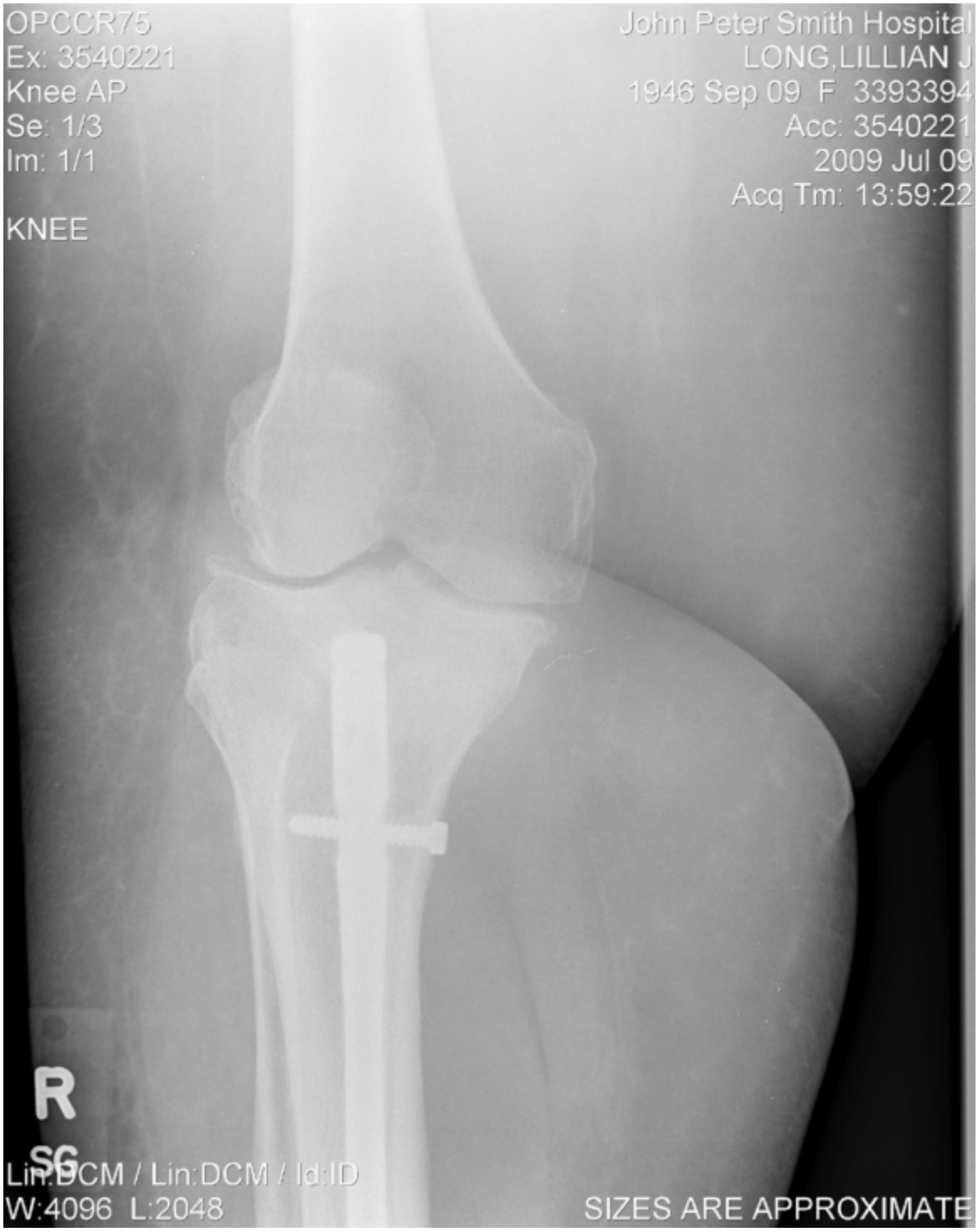
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Figure 2:

Figure 3: Figure 2 :

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Figure 4: Figure 3 :


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