



Case report

Total knee replacement for tricompartmental arthritis in a patient with a below-knee amputation after a previous closing wedge high tibial osteotomy

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ABSTRACT

This is a report of a 64-year-old man who had undergone a high tibial osteotomy (HTO) 17 years ago of his right knee for medial compartment osteoarthritis; 5 days later, he received a below-knee amputation owing to a missed popliteal artery injury at the time of the HTO. We elected to perform a total knee replacement (TKR) for progressive arthritis of the ipsilateral knee 17 years after the transtibial amputation. Although there is a plethora of literature regarding TKR in the contralateral knee of amputees, there is a paucity of data of TKR in the ipsilateral knee. Using medical search engines including Google Scholar and PubMed, we were only able to identify 4 case reports of TKR in the ipsilateral knee of below-knee amputees. This is the first description in the English literature that has the following rare pathology list: tricompartmental arthritis with a previous closing wedge HTO with a resultant truncated valgus tibia and short transtibial amputation.

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Introduction

Although there is a plethora of literature regarding total knee replacement (TKR) in the contralateral knee of amputees, there is a paucity of data of TKR in the ipsilateral knee. Using medical search engines including Google Scholar and PubMed, we were only able to identify 4 case reports of TKR in the ipsilateral knee of below-knee amputees [1–4]. None of these knees had had a previous closing wedge high tibial osteotomy (HTO) with a resultant short truncated valgus tibia.

Performing arthroplasty in an amputee is an uncommon procedure in the amputated knee. Arthritis involving the contralateral knee is more common than the population average. Prosthetic manipulability allows the mechanical axis of the amputated limb to be adjusted thereby simply off-loading the arthritic compartment.

When tricompartmental osteoarthritis is present, prosthetic limb alterations are of no help.

Many surgical challenges need to be met by the surgeon faced with tricompartmental pathology in the below-knee amputee; additional challenges in this case included an altered proximal tibial anatomy after prior closing wedge HTO, extensive soft tissue scarring of the stump, and limited range of movement (Fig. 1). Consideration needed to be taken when preoperatively planning our tibial and femoral resections with regard to what type of alignment guide to use. The incisions needed planning because of multiple scars being present. While performing the surgery, we had to plan how to hold and position the leg to create a stable platform on which to operate. The fact that the fibula had been removed at the time of amputation identifies a likelihood that the fibular collateral ligament would be absent, attenuated, or nonanatomic which may lead to imbalances requiring greater constraint.

Case history

This 64-year-old man had undergone a right HTO 17 years ago, intended to treat medial compartment osteoarthritis. However, 5 days after surgery, he required an emergency below-knee

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Figure 1. Lateral view with previous skin grafted site over lateral proximal tibia.

amputation owing to iatrogenic popliteal artery injury. Multiple skin grafts were performed with staged closure because of compromised perfusion specifically anterolaterally over the proximal tibia. A firm adherent anterolateral scar on his stump remains (Fig. 1). Progression of his knee arthritis occurred in the lateral and patellofemoral joints leading the patient to present 17 years after the HTO with pain sufficient to warrant TKR. His lifestyle had become significantly affected, reducing his walking distances. He struggled to finish a game of golf despite using a golf cart and was taking regular paracetamol and nonsteroidal anti-inflammatories for this knee pain.

Clinical examination demonstrated an antalgic gait on his amputated side with limited range (10–90°). The carbon-fiber suction cup of the prosthesis is designed to overlap the joint line significantly both medially and laterally because the stump is shorter than usual.

Radiographs showed tricompartmental osteoarthritis with a truncated valgus proximal tibia, evidence of the fully united closing wedge HTO. The proximal fibula was absent (Fig. 2). During the surgery, we would not be able to use traditional means to reference the tibial cut because there is no lower leg. For this reason, we chose to use custom computer-generated cutting guides (Fig. 3). Computerized tomography (CT) was performed (Fig. 4) to aid surgical planning and generate patient-specific cutting blocks



Figure 2. Lateral radiograph of right knee.

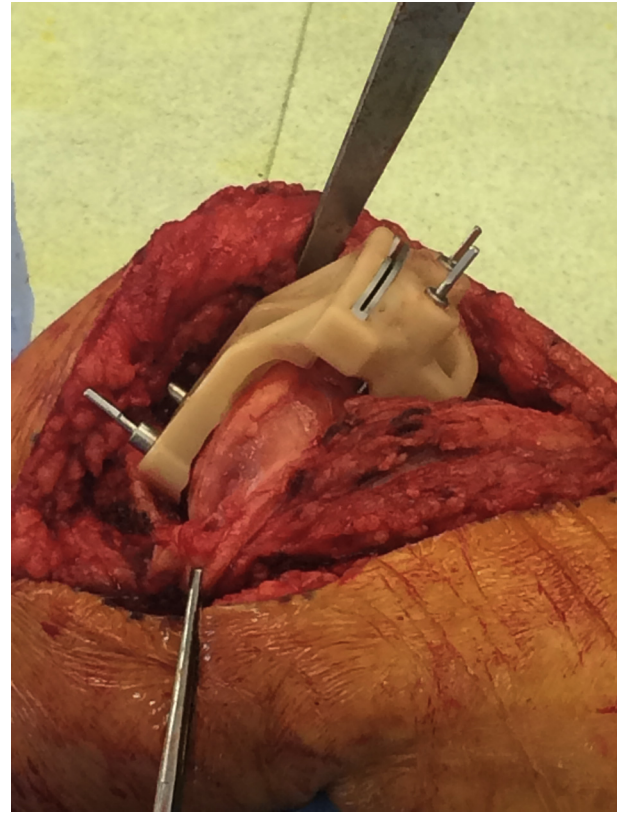


Figure 3. Custom cutting guides applied before performing cuts.

(TRUMATCH; Depuy Synthes, Warsaw, Indiana). The scan was performed while wearing his prosthetic lower leg to determine his current mechanical axis. Surgery was performed with 2 assistants. Skin incisions were chosen after gaining advice from a plastic surgeon. To minimize the risk of skin necrosis, we used the medial approach from the last surgery extending it proximally taking care not to cross the midline (Figs. 5 and 6).

During balancing, the lateral collateral ligament was found to be partially deficient, and we chose to eliminate the risk of spinout by using a fixed-bearing, cemented posterior-stabilized TKR with patella resurfacing (PFC Sigma; Depuy Synthes, Warsaw, Indiana) rather than rotating platform that we were initially planning to use (Fig. 7).

At the time of this article submission, clinical follow-up is only 4 months after surgery. The patient is pleased with the result of his knee replacement (Fig. 8). He has not required any analgesics for the past 8 weeks. His range is 0 to 92°. He has returned to playing 18 holes of golf 3 weeks ago. His comfortable walking distance is 1.5 km limited by pain where his suction cup is abrading the anterolateral skin over his tibia. He has been measured and is receiving his newly shaped prosthesis this week that should help this problem. He is attending gym where he runs for 20 minutes on the treadmill and cycles 10 minutes on an exercise bike before performing leg curls and extensions with 10-kg resistance.

Discussion

Total knee arthroplasty in the ipsilateral limb of below-knee amputees is extremely uncommon. This case is unique to literature in that the tibia had had a prior HTO and fibular excision resulting in unique planning considerations including implant positioning, choice and constraint.

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