



## Case Report

## Total Knee Arthroplasty with Prior Ipsilateral Hip Arthrodesis

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## ABSTRACT

Total knee arthroplasty (TKA) in the setting of previous hip fusion is rare with a paucity of evidence in the orthopaedic literature. Traditionally, TKA is performed supine, with the aid of knee-positioning devices allowing for hip flexion and range of motion of the knee to facilitate ease of surgical intervention. However, TKA using traditional positioning would not be possible in the presence of ipsilateral hip arthrodesis preventing hip motion. This case report describes a TKA performed for a 72-year-old woman with end-stage osteoarthritis of the right knee, ipsilateral hip arthrodesis, and leg-length discrepancy as the sequelae of slipped capital femoral epiphysis. We describe novel surgical positioning to be used to facilitate TKA in the absence of ipsilateral hip motion with bed modifications and the use of an extremity positioning device.

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## Introduction

Total knee arthroplasty (TKA) in the setting of previous hip fusion is rare with a paucity of evidence in the orthopaedic literature [1–5]. Hip arthrodesis is not routinely performed today; however, it can be a viable option in young patients with post-traumatic, postinfectious, or early-onset end-stage symptomatic hip arthritis. Long-term consequences of hip fusion include adjacent joint degeneration resulting in back and ipsilateral knee complaints [6]. Treatment of ipsilateral knee degeneration with TKA can be technically challenging in the absence of hip motion. At our institution, TKA is largely performed on a flat surgical bed with the aid of leg-positioning devices. However, TKA using traditional positioning would not be possible in the presence of ipsilateral hip arthrodesis preventing hip motion. We present a rare case and associated novel positioning technique guide for a 72-year-old woman with end-stage osteoarthritis of the right knee with ipsilateral hip arthrodesis performed as a salvage treatment for childhood slipped capital femoral epiphysis.

## Case history

A 72-year-old woman presented with a past medical history of chronic kidney disease, type II diabetes mellitus (Hemoglobin A1C 6.4%), body mass index (BMI) of 41 kg/m<sup>2</sup>, and right hip fusion in

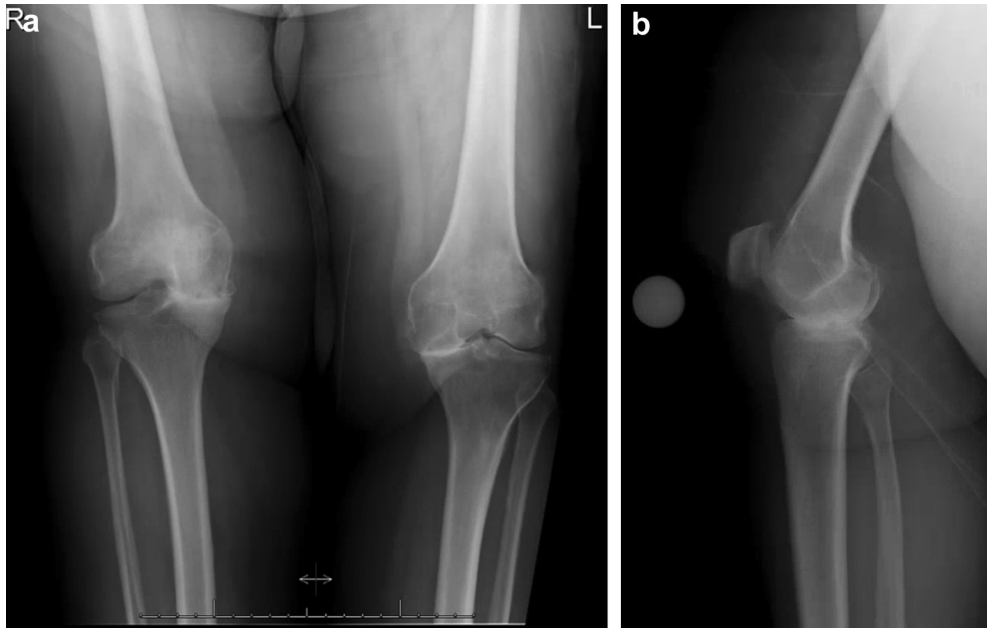
the 1950s as the sequelae of childhood slipped capital femoral epiphysis associated with a leg-length discrepancy of 4 cm (right < left). She presented to our orthopaedic adult reconstruction clinic with complaints of at least 7 years of bilateral knee pain from osteoarthritis failing conservative management. She was ambulatory with a rolling walker with antalgia affecting the right lower extremity and obvious gait asymmetry secondary to ipsilateral hip fusion and leg-length discrepancy. Her right hip was fused in a position of approximately 20-degree flexion and 5-

## Key Points

- Total knee arthroplasty provides good outcomes for patients with prior ipsilateral hip arthrodesis or ankylosis with or without takedown of the fusion and conversion to total hip arthroplasty before knee replacement.
- Conventional positioning with limited knee flexion predisposes the procedure to technical difficulties by limiting femoral and tibial exposure for bone resections, raising concern for potential component malpositioning or soft-tissue injury; however, simple adjustments in positioning facilitate the procedure without a significant increase in operative time or compromise to the sterile surgical field.
- Elevating the patient's upper body allows for adequate knee flexion while keeping the patient in an ergonomic position and minimizing bed manipulation intraoperatively.

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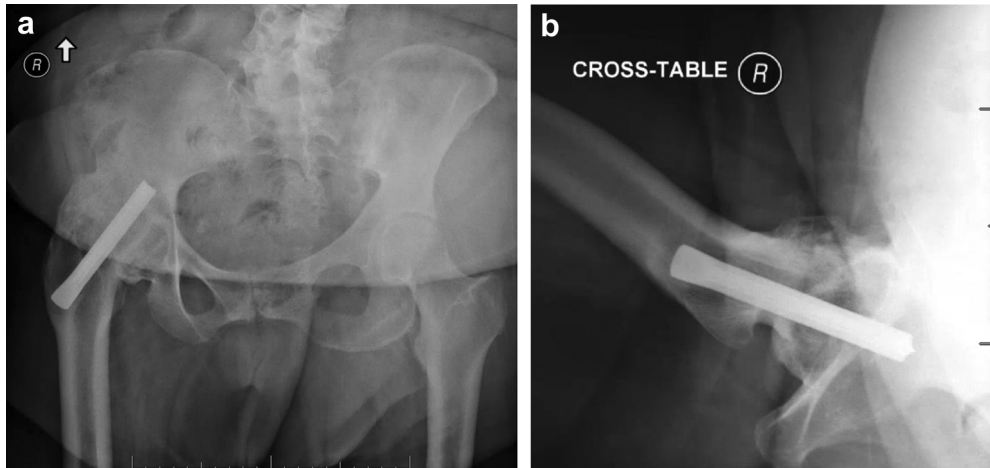
**Figure 1.** (a, b): Preoperative right knee radiographs: (a) anteroposterior and (b) lateral.



**Figure 2.** Leg-length radiographs on a 42-inch film.

degree adduction. Examination of the right knee was significant for varus malalignment correctable with valgus stress, a 10-degree flexion contracture, and arc of motion from 10 to 85 degrees. Good collateral ligamentous stability was noted with varus and valgus stresses. Left knee examination also showed a flexible varus malalignment, a 5-degree flexion contracture, and arc of motion from 5 to 95 degrees. The right knee radiograph was consistent with end-stage osteoarthritis with varus malalignment (Fig. 1), leg-length discrepancy (right < left) (Fig. 2), and a mature right hip fusion with intact hardware (Fig. 3). She elected to proceed with right TKA secondary to debilitating knee pain refractory to maximal conservative therapies.

Before surgery, we obtained verbal and written Health Insurance Portability and Accountability Act -compliant informed consent from the patient to use her clinical history, radiographs, and intraoperative photos and videos for presentation purposes, given the unusual nature of her care. The prior right hip fusion combined with a high BMI presented a unique surgical challenge for right TKA as the knee had significantly limited flexion in the conventional supine position. Conventional positioning with limited knee flexion predisposes the procedure to technical difficulty by limiting femoral and tibial exposure for bone resections, raising concern for potential component malpositioning or soft-tissue injury. To address these concerns, we developed a novel positioning technique through modifications of the conventional supine positioning. First, multiple operating table mattress pads were stacked under the upper body (Fig. 4). Second, we removed the lower extremity padding from the operating room table beneath the operative right lower extremity (Fig. 5). We then used a linen bump beneath the ipsilateral hip to provide neutral resting alignment of the right lower extremity. The combination of the aforementioned modifications resulted in elevation of the right hip, allowing for an increased knee range of motion (ROM) and the ability to use the surgeon-preferred De Mayo Surgical leg positioner (IMP Medical, Inc., Plainville, CT) for the duration of the procedure. Finally, we provided ergonomic support to the nonoperative left lower extremity by stacking linens and securing them to the table (Fig. 6).



**Figure 3.** (a, b) Right hip mature arthrodesis with intact implant and right lower extremity shortening: the (a) anteroposterior pelvis and (b) lateral hip.

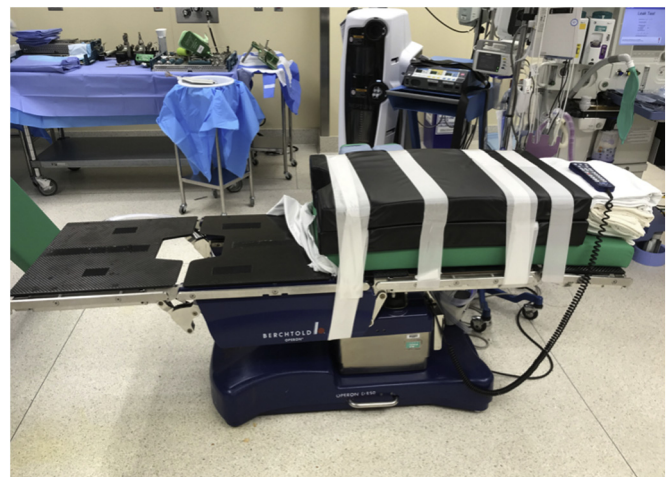
**Figure 7** demonstrates the final position after standard sterile surgical preparation and draping. Although it is not demonstrated here, we were able to achieve deep knee flexion (>100 degrees) and extension as necessary for bony preparation and implant trials and final fixation by removing the leg from the leg positioner for deep flexion and by placing a sterile bump beneath the ankle for supporting knee extension. Before surgery, the decision was also made to use a posterior-stabilized prosthesis with planned posterior cruciate ligament resection to facilitate tibial subluxation and exposure, as well as a short-stemmed tibial baseplate for enhanced component fixation, with concern for added stresses being placed on implants after surgery of a patient with ipsilateral hip arthrodesis and an elevated BMI. Accordingly, a Stryker Triathlon cemented posterior-stabilized implant with 9 × 50 mm tibial stem (Stryker Corporation, Kalamazoo, MI) was used. The patient underwent routine TKA without complication. Postoperative radiographs demonstrated an appropriately sized, well-fixed, and well-positioned implant (**Fig. 8**).

Her immediate postoperative recovery was routine without complications with intact distal neurovascular examination and active knee extension. She was discharged to a local skilled nursing facility (SNF) with multimodal pain medication regimen and venous thromboembolism prophylaxis per our institutional

protocol. Early postoperative recovery was complicated by readmission to the intensive care unit for respiratory failure from opioid oversedation while at the SNF, which improved with naloxone and respiratory support. She was also found to have a prerenal acute or chronic kidney injury and accumulation of renally excreted morphine metabolites that required 2 rounds of hemodialysis. While intubated and immobilized, she developed stage 2 (right heel and sacral decubitus) ulcers and new-onset right foot drop. Routine 2-week orthopaedic follow-up was conducted as an inpatient with a healing incision without evidence of infection, but a foot drop was noted that was not present immediately post-operatively. After pulmonary and renal recovery, she returned to the SNF. During her 6-week and 3-month follow-up evaluations, she was noted to have no knee pain and a well-healed incision and was working with physical therapy, ambulating with a walker and right ankle foot orthosis for foot drop. However, she was mobilizing mostly with the use of a wheelchair with limited walker mobility. Passive right knee ROM was 3–85 degrees with persistent foot drop and weak quadriceps but intact sensation in peroneal and tibial nerve divisions. Electromyography and nerve conduction velocities were requested but were delayed during the coronavirus disease 2019 pandemic. In the interim, the patient also developed mild left lower extremity weakness and numbness. During her 6-month



**Figure 4.** Operating room table with stacked mattresses secured to the table.



**Figure 5.** Operating room table with the lower leg padding removed.



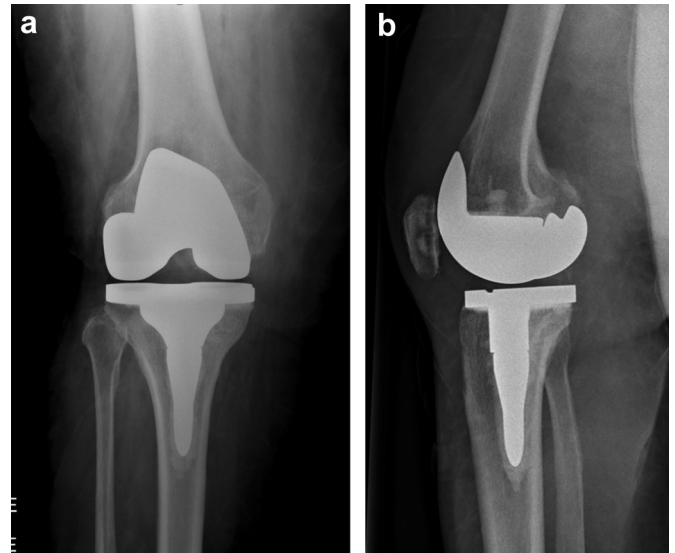


**Figure 6.** Final positioning before standard sterile preparation and draping.

follow-up visit, her passive right knee ROM of 0–110 degrees associated with persistent right foot drop and bilateral lower extremity weakness and numbness. At 6 months, she underwent electromyography and nerve conduction velocities, revealing lumbar polyradiculopathy vs lumbosacral plexopathy. Magnetic resonance imaging of the lumbar spine and additional evaluation to include imaging evaluation of the lumbosacral plexus are pending.

### Discussion

We describe a simple novel technical alternative to measures previously described that may facilitate uncomplicated technical execution of TKA in a patient with ipsilateral hip fusion. Patients with an ipsilateral hip arthrodesis present a unique technical challenge to TKA for the treating orthopaedic surgeon in that absent hip motion limits the ability to manipulate the operative knee with conventional positioning. Our case study presents novel positioning modifications to conventional techniques to safely execute TKA with ipsilateral hip fusion by elevating the patient's upper body and contralateral leg with the use of a mobile leg positioner to facilitate exposure, which will help ensure adequate implant positioning while protecting soft tissues in a manner that does not sacrifice the sterile surgical field. Despite added time needed for bed modifications before surgery, surgical time was not significantly extended with 66 minutes from skin incision to initiation of

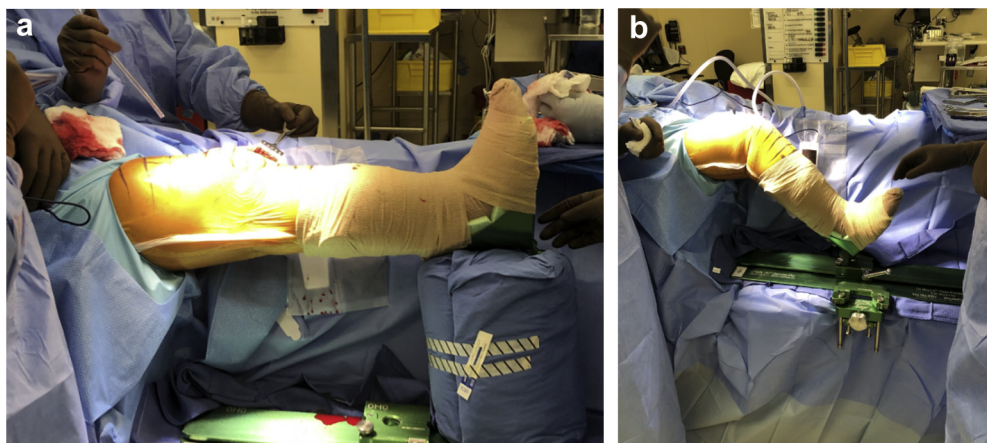


**Figure 8.** (a, b) Postoperative radiographs of right total knee arthroplasty: (a) anteroposterior and (b) lateral.

arthrotomy closure. In this case, the patient did experience significant postoperative complications including opioid overdose leading to acute respiratory distress with associated acute on chronic renal injury requiring hemodialysis and subsequent iatrogenic decubitus ulcers and foot drop palsy from prolonged immobilization while intubated and somnolent; however, none of these complications were thought to be the result of our proposed novel surgical positioning technique and primary subject matter of this report.

### Current controversies and future considerations

TKA is one of the most common and successful surgical interventions provided by orthopaedic surgeons, which includes patients with prior ipsilateral hip arthrodesis [1–5]. Romness and Morrey previously demonstrated good outcomes for their case series of patients with prior ipsilateral hip arthrodesis or ankylosis with or without takedown of the fusion and conversion to total hip arthroplasty before knee replacement, with their focus on patient outcomes rather than technical guidance [1]. Goodman et al provided a technical guide for TKAs performed in 2 patients



**Figure 7.** (a, b) Final positioning after standard sterile preparation and draping: (a) extension and (b) flexion in the limb positioner.

with ipsilateral hip fusion by using a surgical table in the Trendelenburg position, with the operative knee positioned at the table break with various adjustments in table break or height during surgery [2]. Koo et al subsequently reported on their use of a sandbag beneath the ipsilateral buttock and compensatory 20-degree tilt of the table toward the operated leg to facilitate 100 degrees of knee flexion during TKA with good surgical result [3]. Tang et al [4] reported on their experience on performing a TKA in a patient with ipsilateral hip ankylosis by modifying conventional positioning to suspend the operative knee from the end of the operating table. Compared with others' techniques, our novel positioning techniques allow the surgeon to complete TKA with standard equipment and less intraoperative variability. This facilitates technical aspects and preserves sterility of the operation. Future areas of research may include critical evaluation of patient-reported outcomes in patients undergoing TKA with ipsilateral hip arthrodesis.

### Summary

Previously reported good outcomes support the benefit of TKA regardless of whether the prior hip arthrodesis was left in place or converted to total hip arthroplasty before TKA [1–5]. Conversion of a hip fusion to total hip arthroplasty itself is a technically demanding procedure with a relatively high complication rate and may not be necessary before considering TKA [5,7]. We demonstrate TKA may be safely performed in patients with ipsilateral hip fusion without fusion takedown before TKA in a timely manner

using a unique alternative technical approach that minimizes intraoperative variability and does not sacrifice the sterile surgical field. And while our case did experience significant postsurgical medical and iatrogenic complications unrelated to surgery, we believe once resolved, she will make a full recovery with good outcomes from her TKA.

### Conflict of interests

R. Balkissoon is a reviewer for *Arthroplasty Today*. S.A. Samborski and D. Quinzi declare no potential conflicts of interest.

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