

Total Knee Arthroplasty in Patients with Ipsilateral Fused Hip: A Technical Note

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We report the surgical technique used to perform posterior-stabilized total knee arthroplasty (TKA) in two patients with a well positioned and functional hip arthrodesis. Intraoperatively, the operating table was placed in an increased Trendelenburg position. Episodically, we flexed the foot of the table by 90° to allow maximal knee flexion to facilitate exposure and bone cuts. We opted to resect the patella and tibia first to enable exposure, given the stiffness of the arthritic knee. One patient's medical condition prohibited complex conversion total hip arthroplasty (THA) prior to the TKA. The other patient's scarred soft tissues around the hip, due to chronic infection and multiple operations, made THA risky. The final outcome provided satisfactory results at a minimum of 2 years postoperatively. TKA can be successfully performed with adjustments of table position and modification of the sequence of surgical steps in patients with ipsilateral hip fusion.

Keywords: *Knee, Arthroplasty, Hip, Arthrodesis*

The incidence of osteoarthritic changes in the knee after ipsilateral hip fusion has been reported to be up to 50%,^{1,2)} and patients with severe symptoms may need total knee arthroplasty (TKA). The easiest way to perform TKA in this specific situation is to make the fused hip a mobile joint first, by performing a total hip arthroplasty (THA).³⁾ However, when considering the high complication rate of conversion THA and the satisfactory function of patients with a well-aligned fused hip, performing THA first is controversial.⁴⁻⁷⁾ To our knowledge, there have been only three reports about this specific condition for TKA in patients with ipsilateral hip fusion.^{2,3,8)} The three reported cases demonstrated marked postoperative stiffness after TKA in patients with the ipsilateral fused hip.^{2,3,8)} However, the technical considerations and radiographic results have not been primarily addressed.^{2,3,8)}

Here, we report the surgical technique, and the clin-

ical and radiographic results from performing posterior-stabilized TKA in two patients with severe knee osteoarthritis and satisfactory ipsilateral hip fusion.

TECHNIQUE

The preoperative evaluation included assessment of the position of the limb on the side of the fused hip. The optimal position for hip fusion is 15°–30° of hip flexion, 5°–10° of adduction, and 0°–10° external rotation.⁷⁾ In addition to general and more specific examinations of the spine and lower extremities, the ipsilateral knee on the side of the hip fusion was examined with the knee off the end of the examination table to check the degree of flexion, stability, and patellar tracking. The preoperative radiographic evaluation included long leg standing views to assess the overall alignment of the limb and knee, and ensure optimal position of the fused hip.²⁾

For the surgical procedure, the patient was placed supine on the operating table and the knee was placed at the level of the break in the table. Throughout the procedure, the table was elevated and lowered episodically, and the foot of the table was flexed and flattened as needed, keeping the area sterile, using multiple sheets at the distal

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end when the table was lowered or flexed. After inflation of the tourniquet, a midline skin incision was made with a medial parapatellar capsular approach. The patella was everted 90° and a resection of 8-mm thickness was made initially. To facilitate exposure, the table was placed in the Trendelenburg position. Both of the patients' knees were very stiff preoperatively, making initial femoral guide placement difficult. After excising the menisci and cruciate ligaments, a tibial resection was first made using an extramedullary guide system to make gentle flexion of the knee possible for distal femoral resection (Fig. 1A). We resected 10 mm of bone from the less worn plateau to achieve a tibial cut surface that was perpendicular to the shaft of the tibia in the coronal plane. The posterior tibial slope was set to 7° in the sagittal plane, as recommended by the manufacturer (NexGen, Zimmer, Warsaw, IN, USA). The end of table was flexed more, and the knee was gently flexed. A femoral intramedullary guide rod was placed, and an anterior provisional resection was made using the reference to the transepicondylar axis (Fig. 1B). Subsequently, the distal femoral resection was made at 5° of valgus, per the preoperative templating, considering the angle between the anatomical and mechanical axes of the femur. The size for the femoral component was selected, and the final anterior

and posterior femoral cuts were then made. The flexion and extension gaps and limb alignment were evaluated using a spacer block and proximal and distal alignment rods. Osteophytes were excised and contracted soft tissues were released to balance the knee. Finally, tibial, femoral, and patellar preparation were performed and trial components placed. Patellofemoral tracking was checked with the "no thumbs" technique. All components were cemented onto cleaned, dried surfaces. The postoperative rehabilitation protocol was similar to our primary cases.

Case 1

An 87-year-old man had his left hip fused surgically 52 years earlier due to previous femoral head and acetabular

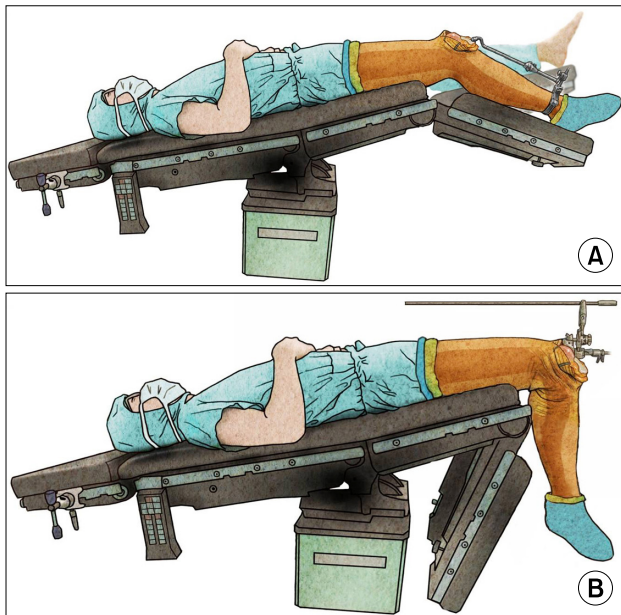


Fig. 1. The position of the table during the tibial and femoral bone resection. (A) A tibial resection can be performed accurately using an extramedullary guide system in the Trendelenburg position even though the patients' knees were stiff preoperatively. (B) Gentle flexion of the knee can be performed after the tibial resection, and the femoral intramedullary guide system could be placed safely.

Table 1. Clinical and Radiographic Results

Parameter	Case 1	Case 2
Position of hip		
Flexion (°)	17.5	15
Adduction (°)	5	5
External rotation (°)	10	0
Preoperative		
Knee score	33	40
Function score	30	50
Flexion contracture (°)	5	15
Further flexion angle (°)	110	30
Mechanical axis (°)	Varus 6.5	Valgus 8
Femorotibial angle (°)	Varus 0.7	Valgus 2
Last follow-up		
Knee score	83	78
Function score	80	80
Flexion contracture (°)	5	0
Further flexion angle (°)	105	60
Mechanical axis (°)	Varus 2.6	Valgus 1.8
Femorotibial angle (°)	Valgus 4.3	Valgus 7.3
α angle* (°)	93.5	97.8
β angle* (°)	87.1	88.2
γ angle* (°)	1.9	1.6
δ angle* (°)	87.9	87.0

* α , β , γ , and δ angles indicate the coronal or sagittal position of the femoral or tibial component using the Knee Society radiographic evaluation method.

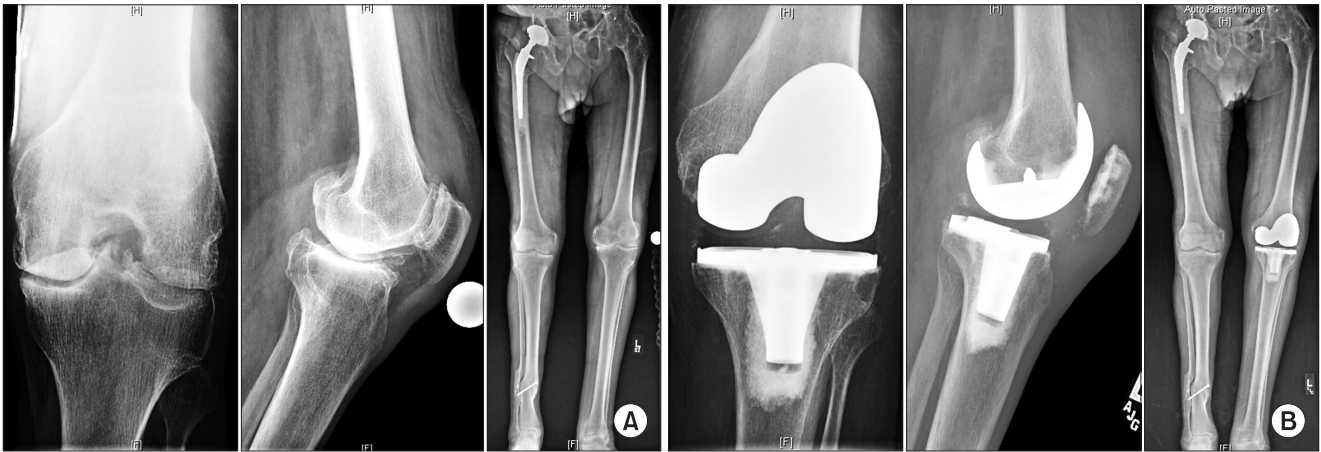


Fig. 2. Preoperative and postoperative radiographs of case 1. (A) Total knee arthroplasty was performed in an 87-year-old man with an ipsilateral fused hip. His chronological age, medical condition, and satisfactory position of the fused hip made total hip arthroplasty prior to the total knee arthroplasty unnecessary. (B) Positioning of the implants and alignment of the lower extremity were satisfactory.



Fig. 3. Postoperative radiographs of case 2. Total knee arthroplasty was performed in a 63-year-old man with an ipsilateral fused hip in satisfactory position. His infection history, soft tissue atrophy, and scarring around the fused hip made total hip arthroplasty prior to the total knee arthroplasty risky. Positioning of the implants and alignment of the lower extremity were satisfactory.

fractures. Severe knee pain and limitation of activities of daily living due to ipsilateral knee osteoarthritis resulted in the need for TKA (Table 1, Fig. 2A). His chronological age, medical condition, and satisfactory position of the fused hip made THA prior to the TKA unnecessary. The TKA was performed with the previously described surgical technique. The position of components⁹⁾ was satisfactory in radiographs at 4.7 years postoperative (Table 1, Fig. 2B).

Case 2

A 63-year-old man had a left hip fracture and left upper extremity amputation due to war injuries. He underwent left hip fusion, but it became infected. He was hospitalized

intermittently and in and out of a spica cast for several years. He had four operations to finally obtain an arthrodesis at 41 years. The skin and soft tissues around the hip were so atrophic and scarred that conversion of the hip fusion to THA was not considered a safe option. TKA was performed successfully with the surgical technique described previously. The clinical and radiographic results were satisfactory at the 7.8 years postoperative, although severe quadriceps scarring limited flexion (Table 1, Fig. 3).

DISCUSSION

Occasionally, performing THA first prior to TKA is not

the best option in patients with severe knee osteoarthritis and ipsilateral hip fusion because of the high complication rate of the conversion THA and the already satisfactory function of patients with a well-aligned fused hip. We report a surgical technique and results of two patients where we performed TKA without a conversion THA. A major limitation of this study is a report of the surgical technique with the results of only two patients. However, patients with this specific condition are extremely uncommon. In this report, the preoperative and intraoperative challenges and technical considerations, as well as the clinical and radiographic results are addressed.^{2,3,8)}

One previous report suggested that TKA alone is unlikely to provide a satisfactory result.³⁾ Another study reported an acceptable clinical result with a postoperative range of motion (ROM) of 84°,²⁾ and a third study reported that postoperative stiffness was encountered and manipulation of the knee under anesthesia was frequently necessary.⁸⁾ Reasons for the postoperative limited ROM might be due to quadriceps scarring, the use of older implants, and suboptimal positioning of knee component due to surgical difficulties encountered. However, adjustment of the operating table position and modification of the surgical steps facilitated initial exposure and the bone cuts. We episodically flexed the foot of the table 90° to allow maximum assistance for flexion of the knee. We

opted to resect the patella and tibia before performing any femoral cuts, given the stiffness of the knee and difficulties accessing the femur.

TKA alone below a fused hip should be reserved for patients in whom the hip was fused in an optimum position with satisfactory alignment.²⁾ Malpositioning of a fused hip in excessive internal or external rotation prohibits accurate positioning of a TKA.³⁾ Inaccurate axial alignment of components will lead to functional limitation and mechanical failure. Our preoperative physical examination included an assessment of the position of the limb on the side of the fused hip. TKA without takedown of the fused hip and conversion THA should be considered only in patients with optimum positioning of the fused hip.

In conclusion, TKA can be performed successfully with adjustments of the table position and modification of the surgical steps in patients in whom the hip is arthrodesed in an already acceptable position. This also avoids the unnecessary conversion of a well-aligned fused hip and avoids the complications of a conversion THA.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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