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Case Report

# Shortening femoral osteotomy with stemmed resurfacing total knee arthroplasty for severe flexion contracture in Juvenile Rheumatoid Arthritis

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ARTICLE INFO

*Article history:*
Received 5 December 2013
Accepted 30 May 2014
Available online 14 July 2014

*Keywords:*
Flexion contracture
Femoral osteotomy
Juvenile rheumatoid arthritis
Total knee arthroplasty

ABSTRACT

Juvenile Rheumatoid Arthritis (JRA) is a progressive disease characterized by pain, swelling, and loss of motion in the joints of adolescents. Total knee arthroplasty (TKA) can be indicated, during the adolescent years, in patients with advanced JRA to alleviate pain and improve function. Because of the relative infrequency of TKA in patients with JRA, evaluation of the type of TKA performed and the results merit review. This case report present two distinct operations performed to obtain full extension. 1. Distal femoral resection with conversion to hinged arthroplasty. 2. Femoral shortening osteotomy with resurfacing TKA.



## 1. Introduction

Juvenile Rheumatoid Arthritis (JRA) is a progressive disease characterized by pain, swelling, and loss of motion in the joints of adolescents. Total knee arthroplasty (TKA) can be indicated, during the adolescent years, in patients with advanced JRA to alleviate pain and improve function. Because of the relative infrequency of TKA in patients with JRA, evaluation of the type of TKA performed and the results merit review. This case report presents a nineteen year old male with advanced JRA and severe knee flexion contractures who received bilateral knee replacement in an effort to achieve ambulation. Two distinct operations were performed to obtain full extension: 1. Distal femoral resection with conversion to hinged arthroplasty. 2. Femoral shortening osteotomy with total knee arthroplasty with revision components. Both methods resulted in intraoperative full extension of the knee, yet the second method preserved more bone stock and

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http://dx.doi.org/10.1016/j.jor.2014.05.002

avoided the use of a hinge. The patient gave his consent for this information to be published.

## 2. Case presentation

A 19-year-old Caucasian male presented with severe bilateral knee flexion contractures due to long-standing Juvenile Rheumatoid Arthritis. He was diagnosed with JRA at age 6 and had been non-ambulatory since age 7. JRA had affected nearly all of the joints in his body, excluding his hips which remained relatively functional. His knees were not excessively painful, yet cumbersome and hindered his ability to function. Initially, he presented requesting bilateral amputations with the goal of using prosthetic legs to stand and ambulate.

Physical exam revealed bilateral knee flexion contractures of 120°, with further flexion upto 140°. Knees were not inflamed or tender. His hips had good painless range of motion and distal motor, sensation, and pulses were intact. Lateral radiographs of both knees revealed squaring of the distal femur which appeared that it would prevent extension (Fig. 1). Because of the severe flexion contractures, AP radiographs were distorted.

Initial considerations included gradual skeletal traction or external fixation as a measure to gain extension, but because gradual distraction via skeletal traction or serial casts is often limited by a boney block[1] and his radiographs revealed a significant boney block (Fig. 1) in the squaring of the distal femur, traction was thought to be more appropriately considered as a possible postoperative treatment. Conversely, knee replacement would provide reshaping of the distal femur, access to the joint, the opportunity to adjust the ligament balance, and treatment for the absence of cartilage. After several office visits discussing options and the significant risk of complications,[2,3] the patient decided to proceed with bilateral knee replacements. The initial surgical plan was to perform a posterior stabilized type TKA with posterior soft tissue releases in a staged type manner as described by Clayton et al[4] Bilateral arthroplasty was scheduled to avoid the difficulty of rehabilitating the first knee in the presence of a severe flexion contracture in the second knee. Because of the severe flexion contractures, significant bone resection was anticipated. If extreme bone resection was required, a hinged knee arthroplasty would be used because of its effectiveness in correcting severe knee contractures.[5]

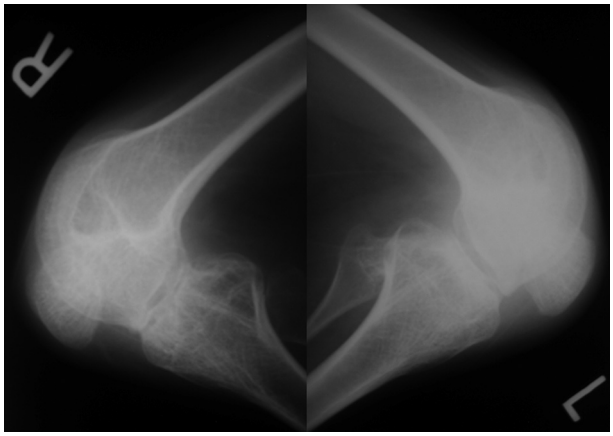

**Fig. 1 – Preoperative lateral radiographs of the right and left knees showing "squaring" of the distal femoral condyles, preventing extension.**

A midline incision was made over the right patella and a medial parapatellar approach was performed. Extensive erosive and fibrous changes were noted, including absolutely no cartilage throughout the joint and fibrous tissue between all of the compartments.[2,3] The fibrous tissue was cleared and the patella subluxed. 14 mm was resected from the distal femur and then another 14 mm from the tibia so that the flexion gap would accommodate the trial components and provide additional extension. The box cut was performed and the posterior cruciate ligament, posterior capsule, and gastrocnemius were completely released. Next, trial femoral and tibial components were placed, resulting in good medial and lateral stability in flexion; however, extension was limited to about 90°. Posteromedial and posterolateral incisions were placed, and the hamstring tendons and popliteus were cut for Z-lengthening. At this point, the posterior aspect of the knee was completely free of soft tissue other than the skin and neurovascular structures, which limited extension at 45°. Gradual distraction with external fixation or a turnbuckle splint was considered. The decision was made to proceed with the rotating hinge arthroplasty. To accommodate the distal femoral replacement prosthesis and obtain extension, an additional 13½ cm of the distal femur was resected. The smallest stem available for the hinged prosthesis was 10 mm and this corresponded to the diameter of the femoral canal; however, the trial stem did not have a stable press-fit. Although cementing the stem required some reaming, thereby polishing the intramedullary canal and diminishing the strength of cemented fixation, the prosthesis was cemented in place. The construct resulted in full extension of the knee with minimal tension of the neurovascular bundle. Pulses were intact. With the preoperative patella baja and now loose quadriceps mechanism, a V-Y quadricepsplasty was performed.[6]

Although full extension of the right knee was achieved, the senior author was not completely satisfied with how the operation had evolved and decided on a different course of action for the left knee. The proximal tibia and distal femur were prepared for resurfacing type knee prosthesis in the same manner as on the right knee, with PCL and posterior capsular release. However, prior to releasing the hamstrings and rather than resecting 15 cm from the distal femur and using a hinged type knee prosthesis, a 15 cm intercalary segment was removed from the supracondylar area of the distal femur. Two step cuts were performed to remove the femoral segments and equalize the leg lengths. The osteotomy was then stabilized by the stemmed femoral component. At this point, only minor mediolateral balancing was necessary to obtain full extension. The femoral stem was cemented and bone from the resections was placed as a bone graft around the junction of the step cuts. A V-Y quadricepsplasty was performed as had been done to the right side. In order to close the skin, a Z-plasty was performed, bringing the lateral side flap proximally and the medial side distally and excising excess skin. Surgical time and blood loss were not individually recorded, but were roughly equivalent (Figs. 2 and 3).