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CASE REPORT

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Bilateral total knee arthroplasty after spontaneous osseous ankylosis in rheumatoid arthritis

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Abstract Total knee arthroplasty (TKA) was carried out on both knee joints for spontaneous bony ankylosis due to rheumatoid arthritis (RA). Preoperative fixation angles were 40°. First, the peroneal nerve was released prior to TKA. Quadriceps snip was performed to evert the patella laterally. Bilateral TKAs were carried out using a stabilized prosthesis. The results showed full extension to 70° flexion at 3 years after the surgery. Absence of pain, maintenance of stability, and walking ability were achieved, without any significant complication. Total knee arthroplasty following takedown of a spontaneous ankylosed knee is an effective procedure under appropriate knee conditions.

Key words Rheumatoid arthritis (RA) · Spontaneous bony ankylosis · Total knee arthroplasty (TKA)

Introduction

Spontaneous bony ankylosis of the knees occurs in rheumatoid arthritis (RA) and ankylosing spondylitis. The joints are fused and the soft tissues contracted and atrophied, resulting in severe disability. Total knee arthroplasty (TKA) can provide a solution; however, there have been few reports on the technique and indications under these difficult circumstances.[1–4] This paper reports the result of knee replacement in a RA patient with bilateral ankylosis of knees.

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Case report

A 50-year-old woman first presented at our hospital in 2000 with spontaneous bony ankylosis of both knee joints. She had been suffering from RA since 1975, and bilateral knee ankylosis since 1990. She was able to walk without a T-cane; however, in spite of conservative therapy, she had recently experienced pain in both ankle joints and in the lumbar spine. The problems induced by her fused knee joints included inability to sit properly, difficulty to stand from a sitting position, and inability to use public transportation.

At the initial physical examination, both knees showed spontaneous ankylosis at 40° flexion and a slight valgus deformity (Fig. 1). Femorotibial angles were 165°. Pain and effusion were absent, and the patella did not move. Atrophy of quadriceps femoris was noted; however, contraction of the muscle was present. She could walk approximately 100 m without a cane and climb stairs one step at a time with support. The Japanese Orthopedic Association (JOA) score was 42 points, and the patient was classified as Steinbrocker class II. Rheumatoid arthritis was well under control with normal white blood cell count and C-reactive protein, and a slightly raised erythrocyte sedimentation rate. Both ankle joints showed valgus deformity, and the range of motion (ROM) was limited. However, she had no pain in the hip joints and ROM was full. There was no neurological deficit in the lower extremities.

Preoperative roentgenogram revealed solid bony ankylosis in both femorotibial joints with flexion at 40°. The joint space had completely disappeared. Fibrous fusions in the patellofemoral joints were also demonstrated in skyline view (Fig. 2). She was knowledgeable about recent advantages in TKA and was persistent in her dissatisfaction with her knee fusion and the associated restricted motion.

Following 3 months of repeated discussions about potential problems, surgery was performed. Right and left TKAs were performed in June and July 2000, respectively. First, the peroneal nerve was released prior to TKA. Using the medial parapatellar approach, a quadriceps snip was

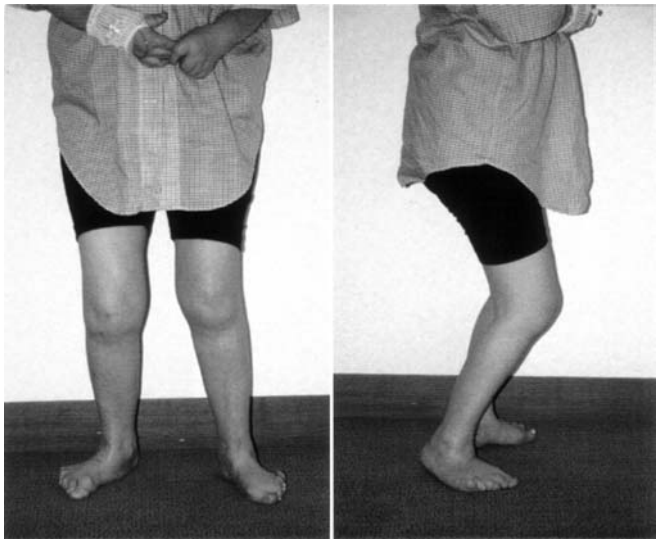

Fig. 1. Both knees show spontaneous fusion at 40° flexion and slight valgus deformity. Femorotibial lateral angle was 165°

performed to evert the patella laterally. The original joint line was easily identified (Fig. 3A), and a saw and an airtome were used to release the solid bony ankylosis. Ankylosis was completely released by careful manipulation following the maximum possible release of the outer side of the joints (Fig. 3B). This procedure was done very carefully to avoid fracture. Cutting of bone became easy once the original joint surface was revealed. When the posterior cruciate ligament was cut, the medial collateral ligament was found to be scarred, and the lateral collateral ligament (LCL) was found to be tight. Medial-lateral soft tissue balance was gained after popliteus tendon, LCL, iliotibial band, lateral head of gastrocnemius, and biceps femoris were cut. After the usual bone cut, the extension gap was much less than the flexion gap. Although additional bone cut of the distal femur was performed, the flexion gap was more than the extension gap. Therefore, a larger size of femoral component was used to equalize the flexion gap and extension gap. By these procedures good soft tissue balance was achieved. Although a semiconstrained-type prosthesis was prepared, there were no bony defects and the bone quality was good. Nexgen Posterior Stabilizer prostheses (Zimmer, Warsaw, IN, USA) were used. After reflection/eversion of the patella, the flexion angle was 60°. Therefore, to achieve greater flexion, the patella was cut adequately. All the components were cemented.

A postoperative roentgenogram of both knees after 3 years showed good alignment of both knees and no loosening of components. Skyline views of both knees showed good patellar tracking (Fig. 4). Standing up with knee extension was achieved 2 weeks after the operation. Walking with the aid of a walker was achieved after 4 weeks, and lumbar pain was improved at approximately 6 weeks. At the time of discharge at 12 weeks, the patient had full extension in both knees with 75° and 70° of active flexion in the right and left knees, respectively. The JOA score had recovered to 75 points. Aggressive ROM exercise was not performed during this period to avoid patellar fracture and patellar tendon rupture.

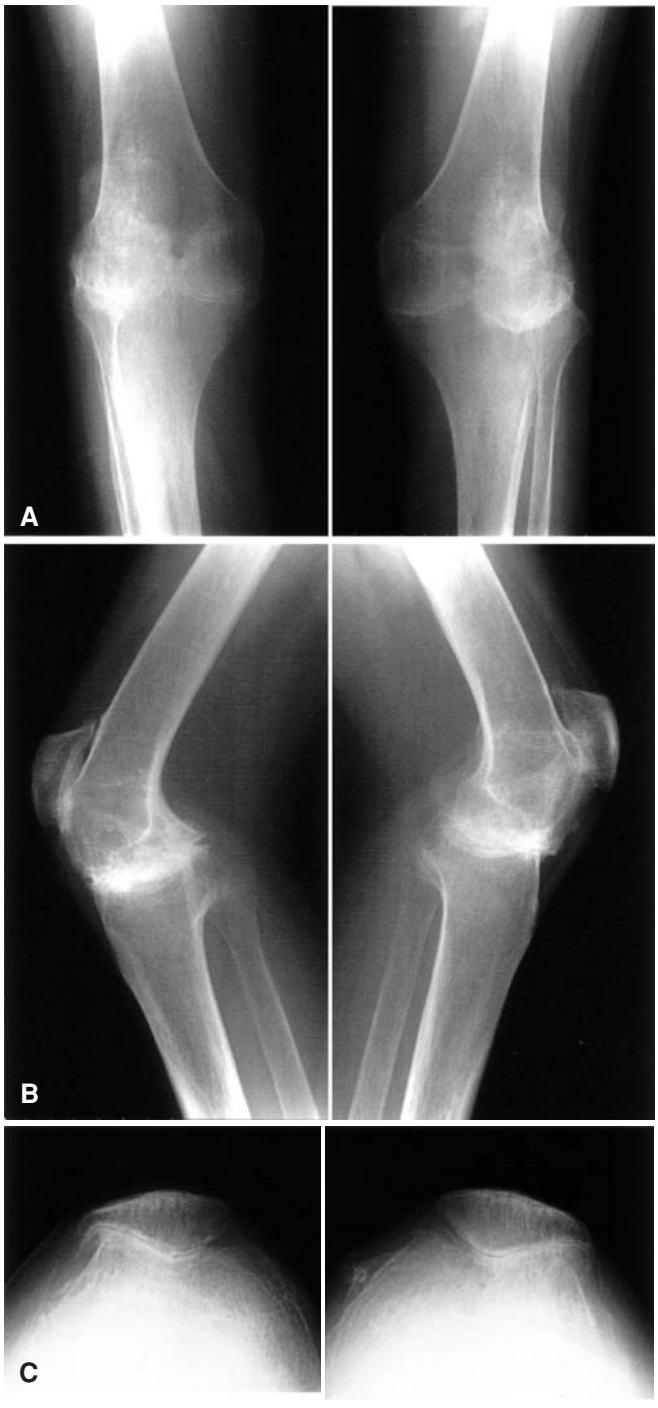

Fig. 2. A A preoperative anteroposterior (A-P) roentgenogram of both knees demonstrates solid bony fusion in femorotibial joint with no joint space. **B** A lateral roentgenogram of both knees demonstrates approximately 40° flexion with solid bony fusion. **C** A skyline view of both knees demonstrates fibrous fusion in the patellofemoral joint

At the 1-year follow-up examination, the patient had 70° of active flexion and full extension in both knees. Good soft tissue balance was maintained. The motions of knee joints

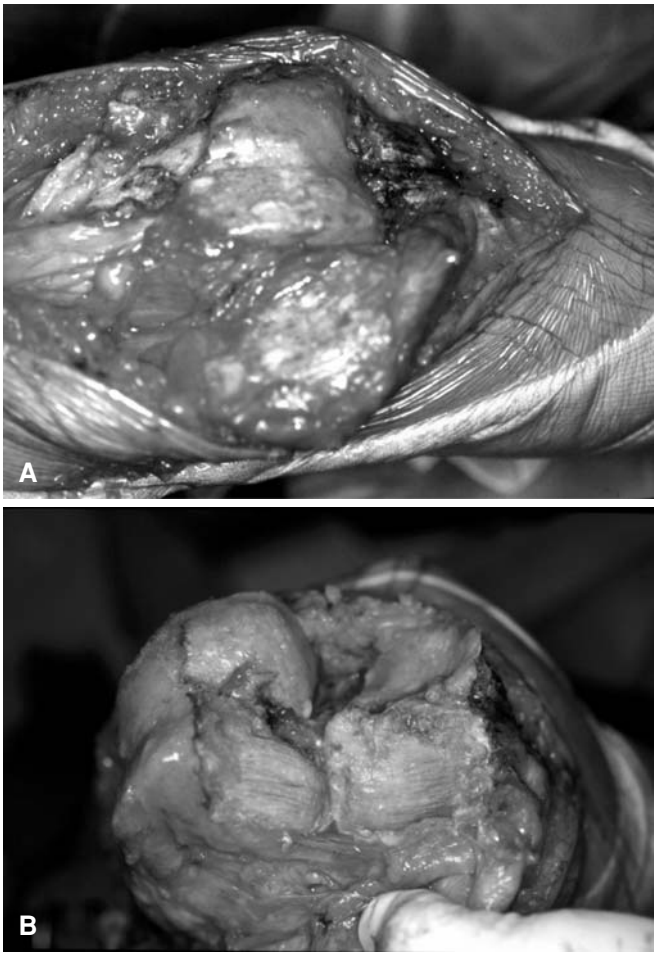

Fig. 3. A Solid bony fusion between femur and tibia was seen after turning back of patella. **B** Solid bony fusion between femur and tibia was released using a saw and an airtome and by careful manipulation

were extremely smooth, muscle power of the quadriceps femoris had recovered, and she could walk without a cane. At the final follow-up examination 3 years after surgery, she could easily walk over 500 m without support and climb stairs without pain. Lumbar pain had disappeared, and ankle pain had decreased (Fig. 5).

Discussion

An ankylosed knee is defined as having no preoperative ROM and the patient usually experiences no pain in the knee. A spontaneously ankylosed knee should be clearly distinguished from a surgically arthrodesed knee because the procedure and the result of operation are different.[5,6] In a spontaneously ankylosed knee, the capsule, collateral ligaments, and extensor mechanism can be dissected from the tibia or femur; these structures will function postoperatively. On the other hand, an arthrodesed knee is different, because the soft tissues may have been completely destroyed by previous surgery. In addition, takedown of a

Fig. 4. A A postoperative A-P roentgenogram of both knees at 3 years demonstrates good axial alignment of both knees and no loosening of components. **B** A lateral roentgenogram of both knees demonstrates good sagittal alignment of both knees and no loosening of components. **C** A skyline view of both knees demonstrates good patellar tracking

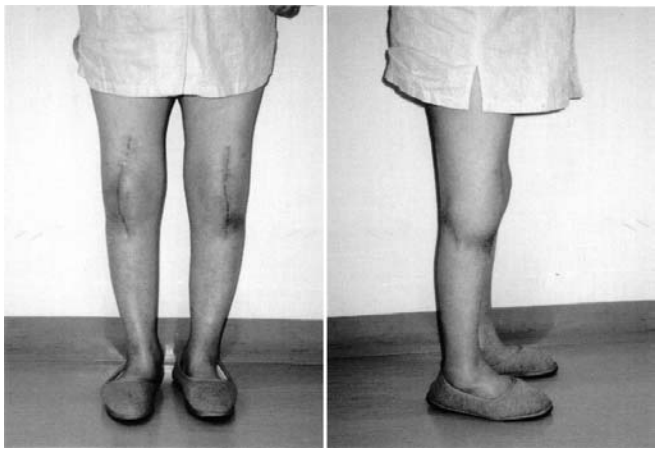

Fig. 5. At the final follow-up examination 3 years after surgery, the patient could walk without support and climb stairs without pain. Lumbar pain disappeared and ankle pain decreased

fused knee requires consideration of the patient's motivation and extensive experience in TKA surgery.

Generally, good results have not been obtained in TKA following surgical arthrodesis.[7–9] Cameron and Hu[7] reviewed 17 cases of knee fusion takedown with follow-up periods of 1–10 years. Complications with respect to patella or infection were found in 53% of the patients. All the patients preferred a mobile knee; however, the complication rate was so high that the authors remain ambivalent about this procedure. Kim et al.[5] compared the results of 16 TKA procedures following spontaneous bony ankylosis and 14 TKA procedures following a takedown of formal knee fusion. This series is a collection of patients suffering from either ankylosis or arthrodesis as a result of previous pyogenic or tuberculous infection. Revision TKA was not performed for loosening at the follow-up. Complications included skin edge necrosis (53.3%), pyogenic infection (2 patients), and quadriceps tendon rupture (1 patient). This indicates that the results are compromised to varying degrees when compared with routine primary TKA results.

Several authors[1–3,9] do not consider patients who had already undergone surgical arthrodesis of the knee as candidates for conversion to TKA. However, these authors claim that the use of minimally constrained prostheses is possible in patients with spontaneous bony ankylosis of the knees, where the supporting soft tissues of the knees, including the collateral ligaments, are intact. Therefore, special consideration should be given to potentially inadequate or nonfunctioning collateral ligaments. In the present case, collateral stability was considered to be sufficient to use a Posterior Stabilizer type prosthesis.

Aglietti et al.[1] reported that it is difficult to equalize the flexion gap and extension gap in knees with several contractures that require extensive releases. The flexion gap is often larger than the extension gap; a stabilized prosthesis is very helpful in handling this discrepancy. On the other hand, Kim et al.[5] claimed that careful preoperative planning and availability of small-sized components is essential in gaining greater flexion. In the present case, femoral component of a larger size was used for equalization of the flexion gap and extension gap. Considering the general standards of TKA, the motion achieved in this case is not impressive. However, after surgery the motion was considerably improved, and a greater physiologic arc of motion was achieved along with full extension. The elimination of flexion contractures below 15° results in significant alleviation of stress across the knee; there is also a marked improvement in the efficiency of quadriceps function.[10] This may be a good explanation for the pain reduction in neighboring joints, lumbar facet, hip, and ankle joints that was observed in this case.

A quadriceps snip or a VY quadricepsplasty may be needed for good exposure in these cases. Adhesion and arthrofibrosis with remarkable loss of ROM was the most frequent postoperative complication. Several authors[2,4,7,8] recommended that the quadriceps muscle should not be lengthened. These authors reported that the quadriceps muscle rarely adheres significantly to the femur and that freeing it is relatively easy. They also claimed that although the initial ROM is frequently only 35–45°, this range improves with time and exercise. The ROM tends to increase during the first few years, and many patients achieve a satisfactory range. On the other hand, Aglietti et al.[1] recommended quadricepsplasty. They believed that there was an increased risk of avulsing the patellar tendon. Therefore, they recommended that the quadricepsplasty should be performed early in the procedure to facilitate exposure. Kim et al.[5] reported that without quadricepsplasty, aggressive postoperative physical therapy for knees may not be effective to gradually stretch and rehabilitate the contracted extensor muscle groups. A quadriceps snip was performed in the present case; however, additional arthrolysis or VY quadricepsplasty was not performed, because joint stability, postoperative muscle recovery, and prevention of complication are more important when compared with flexion angle. Although ROM is limited at 3 years after surgery, the patient is pleased with what she considers to be a significant improvement in her quality of life.

Valgus deformity and flexion contracture are generally considered to be predisposing factors for the development of peroneal nerve palsy after TKA. On the other hand, after a retrospective review of 1476 primary TKA, Schinsky et al.[11] identified 19 patients with a documented neurologic complication with an overall incidence of 1.3%. They encountered a larger percentage of neurologic injury in rheumatoid knees than was expected. Krackow et al.[12] reported surgical decompression for peroneal palsy following TKA. In the present case, preventive surgical decompression was performed prior to TKA for the prevention of peroneal palsy. It is considered that postoperative peroneal palsy was prevented by surgical decompression, gentle and careful surgical procedure, and placing the postoperative knee in a slight flexed position.

Total knee arthroplasty following takedown of a spontaneously ankylosed rheumatoid knee is an effective procedure under appropriate knee conditions. However, indications for the procedure are complex and require spe-

cial consideration of the patient's motivation, adequate collateral stability, and extensive experience in TKA surgery, such as soft tissue balancing, management of extensor mechanism, and prevention of peroneal nerve palsy. In the present case, a satisfactory result has been gained 3 years after TKA. However, long-term results of TKA following takedown of a spontaneously ankylosed rheumatoid knee are unclear, and careful follow-up will be required for this case.

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