Acta Orthopaedica et Traumatologica Turcica 52 (2018) 65–69

Contents lists available at ScienceDirect

Acta Orthopaedica et Traumatologica Turcica

journal homepage: https://www.elsevier.com/locate/aott

Management of knee rheumatoid arthritis and tibia nonunion with one-stage total knee arthroplasty and intramedullary nailing: A report of two cases

Fahri Erdogan, Ilker Abdullah Sarikaya, Ata Can, Baris Gorgun*

Istanbul University, Cerrahpasa Medical Faculty, Istanbul, Turkey

ARTICLE INFO

Article history:
Received 4 August 2015
Received in revised form
9 June 2016
Accepted 28 June 2016
Available online 3 June 2017

Keywords:
Total knee arthroplasty
Tibia nonunion
Rheumatoid arthritis
Gonarthrosis
Intramedullary nailing

ABSTRACT

Total knee arthroplasty (TKA) is a surgical procedure which is widely used in the treatment of gonarthrosis secondary to rheumatoid arthritis (RA). The incidence of stress fractures in tibia in the patients with RA is higher compared to normal patients. In this study, we report two cases of TKA and intramedullary nailing in RA patients with severe knee arthritis and tibial nonunion. Both patients had a satisfactory clinical outcome with radiological healing of the tibial fracture.

Introduction

Rheumatoid arthritis (RA) is an autoimmune disease characterized by synovial joint destruction.[1,2] Knee involvement is common in patients with RA.[3,4] Total knee arthroplasty (TKA) is a widely used surgical treatment method for patients with knee RA.[5] However, osteopenia is a challenging problem in RA and impacts the success rate of TKA procedures. Furthermore, progressive joint destruction leads to flexion contracture of the knee joint, which can cause technical difficulties when performing TKA in RA.[6,7] The RA patients have a higher risk of infection.[8,9] Patients with RA who undergo TKA are at increased risk of prosthetic joint infection.[10,11]

Tibial stress fractures are overuse injuries, which are often associated with RA in elderly people with osteoarthritis, osteoporosis, or post-traumatic deformity.[12,13] Osteopenia, corticosteroid use, poor nutrition and abnormalities of calcium metabolism decrease the strength of bone and are also significant risk factors for prevention of fracture healing in patients with RA.[14] When normal alignment of the lower leg is lost due to an unhealed fracture or other condition, deviations from this anatomic norm may become technical obstacles in performing TKA.[15,16]

There is no current information in the literature regarding the operative treatment for tibial nonunion and severe knee arthritis in patients with RA. This article presents two cases of TKA and tibial corrective osteotomy with intramedullary nail for nonunited traumatic and stress fracture of the tibia in patients with RA. The patients provided informed consent, and the authors have no conflicts of interest.

Case one

A 58-year-old woman was diagnosed with RA 10 years ago and took Deltacortril® 5 mg/week. Gradually, increasing pain in the left knee and tibia deformity made walking difficult. The patient had a left tibia fracture after a fall 9 months ago, which was not treated, leading to nonunion.

On examination, severe knee pain and remarkable varus deformity were observed. Her knee demonstrated −20° extension with flexion to 45°. She had grade 2 varus instability of the knee. The patient was wheelchair-dependent. The knee score and function scores, according to the Knee Society clinical rating system, were 0 and −20 points, respectively.[17]

* Corresponding author.
E-mail address: barsgorgun@gmail.com (B. Gorgun).
Peer review under responsibility of Turkish Association of Orthopaedics and Traumatology.

http://dx.doi.org/10.1016/j.aott.2017.04.003

Radiographs showed a limb length discrepancy of 2 cm. There was significant arthritis (Fig. 1). Hypertrophic nonunion was detected on the metaphyseal-diaphyseal junction of the distal tibia (Fig. 2).

The patient underwent surgery for tibial intramedullary nailing and TKA. After the debridement of fibrous tissues and the osteotomy of the nonunion, the alignment of the lower leg was corrected. An intramedullary nail (11,5 mm × 30 cm TRIGEN® IMN System, Smith and Nephew) was inserted distal to the tibial insertion of the anterior cruciate ligament and lateral to the anterior horn of the medial meniscus, on the proximal anterior part of tibial plateau. This site was slightly distal to the routine insertion point. The nail was secured with proximal and distal screws. After nailing, the femoral component (medium, 70 mm), tibial component (medium, 72 mm) and insert (P-S insert, medium, 10 mm) were placed and TKA (Performance® Cemented Knee System, Biomet) was completed.

Postoperatively the patient received low molecular-weight heparin as prophylaxis for deep vein thrombosis and three doses of a second-generation cephalosporin as infection prophylaxis. ROM exercises were initiated on the next postoperative day. Weight-bearing was started on the first postoperative day. The patient used walker for one month, then a crutch until the bone union was complete. Bony union was achieved in 3 months. During this time she continued physical therapy.

Eight years after surgery, the patient was assessed clinically and radiologically (Fig. 3). She had full ROM of her knee of 0°–120° without pain. The knee score and function scores, according to the Knee Society clinical rating system, were 68 and 60 points, respectively.

Fig. 2. Preoperatively radiographs of the ankle joint of patient number 1.

Case two

A 54-year-old woman was diagnosed with RA 30 years ago and took methotrexate 6 mg/week and prednisolone 35 mg/week. Gradually, persistent pain in left knee and tibia deformity made walking difficult. Her medical history showed no major trauma before.

On examination, severe knee pain and remarkable flexion and varus deformity on the tibia diaphysis were observed. Her knee demonstrated −15° extension with flexion to 30°. The patient was

Fig. 1. Preoperatively AP and lateral radiographs of the knee joint of patient number 1.

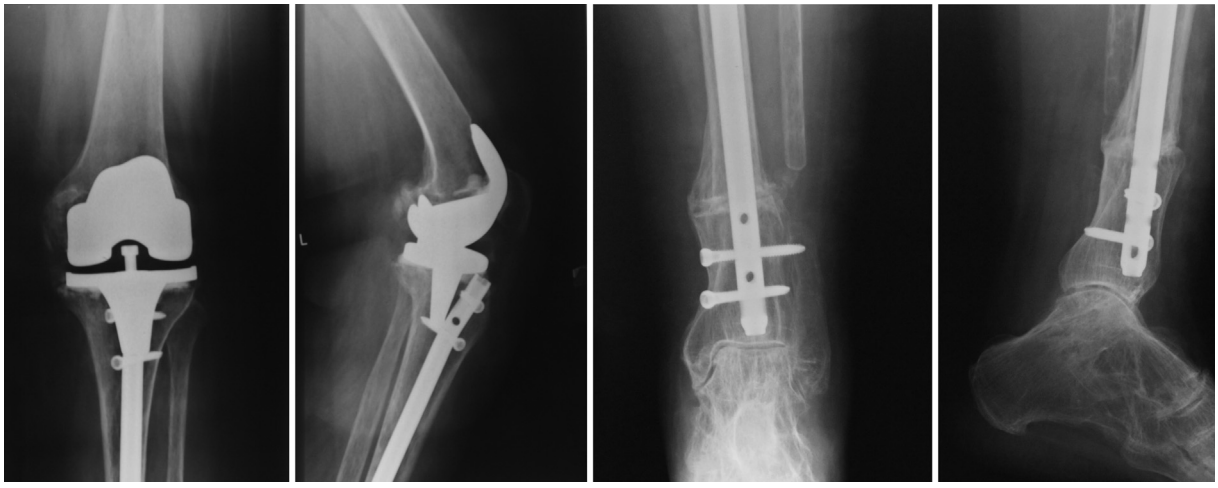

Fig. 3. 8-year follow-up radiographs of the knee and ankle joint of patient number 1.

wheelchair-dependent. The knee and function scores, according to the Knee Society clinical rating system, were 0 and −20 points, respectively.

Radiographs showed a limb-length discrepancy of 3 cm. There was significant arthritis (Fig. 4). Stress fracture and nonunion were detected on the diaphysis of the tibia.

The patient underwent surgery for tibia intramedullary nailing (8,5 mm × 26 cm, TRIGEN® IMN System, Smith and Nephew) and TKA as the first case. After the intramedullary nail, the femoral component (size 4), tibial component (size 3), and insert (P-S insert, 9 mm) were placed and TKA (GENESIS II® Knee System, Smith and Nephew) was completed.

Postoperatively ROM exercises, weight bearing, prophylaxis for deep vein thrombosis and infection protocols were the same as the first case. Bony union was achieved in 3,5 months.

Eight years after knee replacement, the patient was assessed clinically and radiologically (Fig. 5). She had full ROM of her knee of 0°−110° without pain. The knee score and function scores, according to the Knee Society clinical rating system, were 58 and 60 points, respectively.

Discussion

TKA is an effective treatment method with successful results in patients with RA.[4] However, the functional results remain far lower than those for patients with osteoarthritis because of technical difficulties and poor bone quality and infection.[18] Furthermore, because of a reduced mineralization rate in the bones and prolonged systemic corticosteroid usage, nonunion is a notable problem when treating fractures in patients with RA.[19,20]

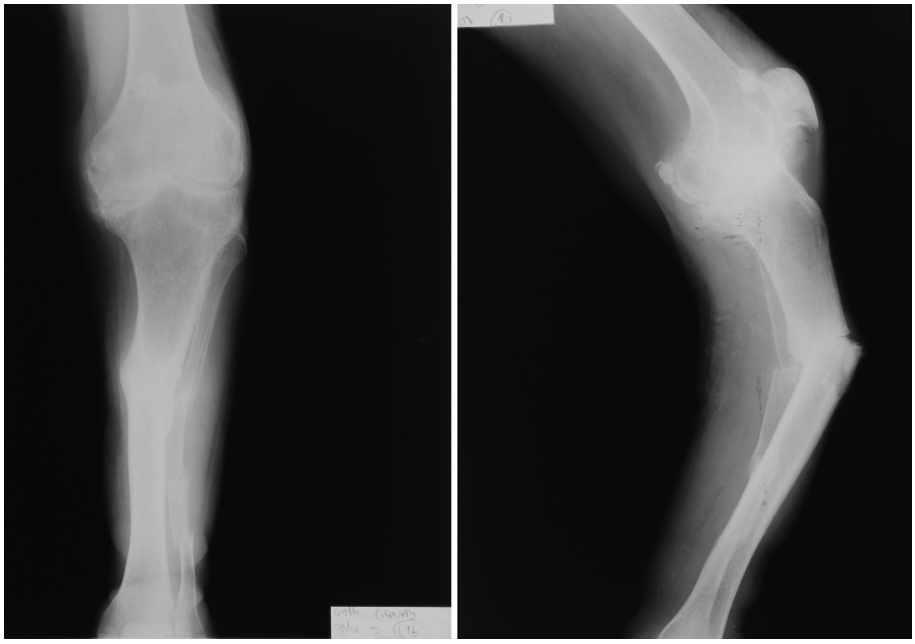

Fig. 4. Preoperatively AP and lateral radiographs of the patient number 2.

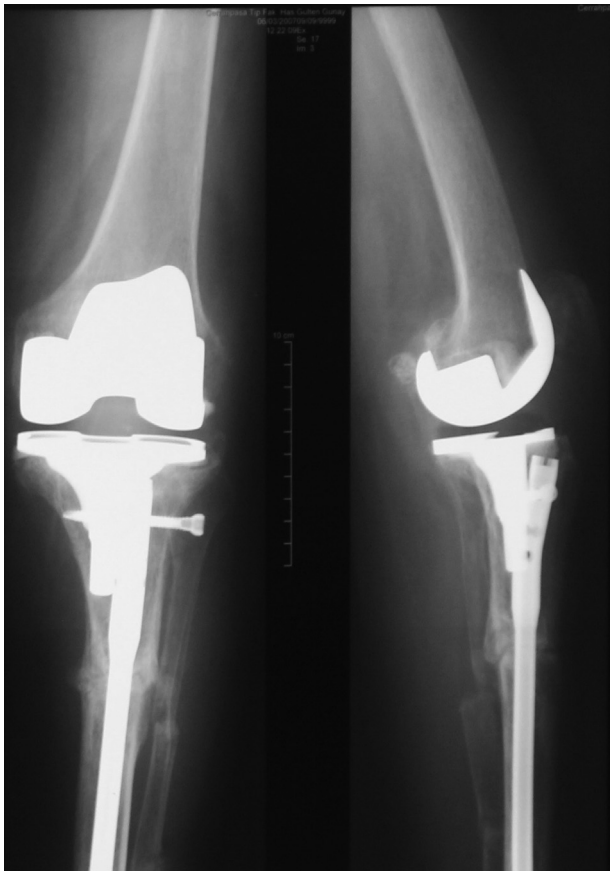

Fig. 5. 8-year follow-up radiographs of the knee joint and tibia of the patient number 2.

Two nonunited tibial fractures (one traumatic fracture and one stress fracture), severe knee RA with TKA, and intramedullary nailing were treated.

Several treatment options exist for severe arthritis of the knee and for nonunion at the tibia. The first option is a two-stage procedure. In the first stage, nonunion of the distal tibial shaft is corrected using an interlocking nail or a plate.[21] In the second stage, after union of the tibial fracture, TKA is performed with simultaneous removal of the nail or the plate. Osteotomy with or without second-stage TKA after bone union has provided successful results.[22] However, two-stage surgery requires two separate operations and prolonged treatment duration, persistent arthritic symptoms, and likewise, uncorrected mechanical axis untreated in the first stage, which may lead to implant failure. The second option is a single stage TKA with a long stem extension of the tibial component to bypass the fracture site or TKA with an interlocking nail or a plate.[23,24] We also preferred performing one-stage tibial corrective osteotomy and TKA to decrease the treatment duration and avoid the problems related to the two-stage procedure. Furthermore, in our cases, the knee flexion was so limited that we could not flex the knee to insert the nail or the guide of the nail to the proximal tibial plateau before performing a tibial cut. For this reason, two-stage treatment was not an option for our cases. Furthermore, the cutting bone fragments were used as an autograft at the nonunion area.

Two fixation options were available to stabilize the nonunion of the tibia; using a plate or an intramedullary nail. The dissection at the nonunion area would be extensive if the plate was used. The intramedullary nail was a load-sharing device and the risk of refracture was lower than the plate and allowed early weight bearing. Because of these, we preferred using intramedullary nails instead of plates for fixation in the osteoporotic bones of our RA patients. The insertion point of intramedullary nail was more distal than routine application and through distal portion of the patellar tendon. Particular attention was paid to leave enough space in proximal fragment for manipulation and proximal locking of the nail. Additionally, the chosen tibial stem did not occlude the medullary canal too much against difficulties in proximal locking of the nail.

Mittal treated arthritic knees and tibiofemoral stress fractures with one-stage long-stem TKA[14] and suggested that a successful outcome can be obtained with pain relief and fracture healing. However, TKA with a long stem would not have been possible in case one because the fracture had occurred in the distal metaphyseal-diaphyseal junction and it was impossible to bypass the fracture site with a long-stem modular implant. Furthermore, we believed TKA with long-stem tibial extension cannot maintain rigid rotational stability when compared with TKA and an intramedullary nail.

Cameron treated two cases of tibial stress fracture with severe medial compartment arthritis of the knee.[25] He reported that after correction of the deformity, TKA was not required. However, in our cases, we had to treat both knee arthritis and deformity. The knee flexion contracture was so severe that we could not perform tibial intramedullary nail insertion unless tibial cuts were made. Furthermore, we believed that the severe varus deformity of the knee caused significant stress on the tibia, shifting the mechanical axis and making it difficult for the fracture to heal. Flexion contracture is a common deformity that causes problem during TKA in RA and requires surgical correction with bony resection, ligamentous releases, and use of increasing constraint prosthesis.[26] We performed excessive release of the posterior capsule and medial or lateral collateral ligament and used constrained prostheses to effectively achieve improvement of the ROM and the functional recovery. Although it was reported that surgical correction of flexion contracture in the knee can cause nerve palsy, we did not experience any neurological complication.[27]

We treated two cases of severe knee RA and nonunited tibia fracture; one of our cases based on a traumatic origin and the other a stress fracture. We performed TKA and intramedullary nailing. Our patient obtained satisfactory knee motion without pain, and fracture union. Performing tibial cuts of TKA before intramedullary nailing provided us better knee flexion.

References

1. Woo YK, Kim KW, Chung JW, Lee HS. Average 10.1-year follow-up of cementless total knee arthroplasty in patients with rheumatoid arthritis. *Can J Surg*. 2011 Jun;54(3):179–184.
2. Nishikawa M, Owaki H, Takahi K, Fuji T. Disease activity, knee function, and walking ability in patients with rheumatoid arthritis 10 years after primary total knee arthroplasty. *J Orthop Surg (Hong Kong)*. 2014 Apr;22(1):84–87.
3. Kajino A, Yoshino S, Kameyama S, Kohda M, Nagashima S. Comparison of the results of bilateral total knee arthroplasty with and without patellar replacement for rheumatoid arthritis. A follow-up note. *J Bone Jt Surg Am*. 1997 Apr;79(4):570–574.
4. da Silva E, Doran MF, Crowson CS, O'Fallon WM, Matteson EL. Declining use of orthopedic surgery in patients with rheumatoid arthritis? Results of a long-term, population-based assessment. *Arthritis Rheum*. 2003 Apr 15;49(2):216–220.
5. Chmell MJ, Scott RD. Total knee arthroplasty in patients with rheumatoid arthritis. An overview. *Clin Orthop Relat Res*. 1999 Sep;366:54–60.
6. Aglietti P, Windsor RE, Buzzi R, Insall JN. Arthroplasty for the stiff or ankylosed knee. *J Arthroplast*. 1989 Feb;4(1):1–5.
7. Tew M, Forster IW. Effect of knee replacement on flexion deformity. *J Bone Jt Surg Br*. 1987 May;69(3):395–399.
8. Doran MF, Crowson CS, Pond GR, O'Fallon WM, Gabriel SE. Frequency of infection in patients with rheumatoid arthritis compared with controls: a population-based study. *Arthritis Rheum*. 2002 Sep;46(9):2287–2293.

9. Bernatsky S, Hudson M, Suissa S. Anti-rheumatic drug use and risk of serious infections in rheumatoid arthritis. *Rheumatol (Oxford)*. 2007 Jul;46(7):1157–1160.
10. Bongartz T, Halligan CS, Osmon DR, et al. Incidence and risk factors of prosthetic joint infection after total hip or knee replacement in patients with rheumatoid arthritis. *Arthritis Rheum*. 2008 Dec 15;59(12):1713–1720.
11. Berbari EF, Hanssen AD, Duffy MC, et al. Risk factors for prosthetic joint infection: case-control study. *Clin Infect Dis*. 1998 Nov;27(5):1247–1254.
12. Wheeldon FT. Spontaneous fractures of the shin in the presence of knee deformities. *Proc R Soc Med*. 1961 Dec;54(12):1108.
13. Young A, Kinsella P, Boland P. Stress fractures of the 142 lower limb in patients with rheumatoid arthritis. *J Bone Joint Surg Br*. 1981 Aug;63-B(2):239–243.
14. Mittal A, Bhosale PB, Suryawanshi AV, Purohit S. One-stage long-stem total knee arthroplasty for arthritic knees with stress fractures. *J Orthop Surg (Hong Kong)*. 2013 Aug;21(2):199–203.
15. Mitani Y. Effective treatment of a steroid-induced femoral neck fracture nonunion with a once-weekly administration of teriparatide in a rheumatoid patient: a case report. *Arch Osteoporos*. 2013 Mar;8(1–2):131.
16. Marczak D, Synder M, Sibiński M, Okoń T, Kowalczewski J. One-stage total knee arthroplasty with pre-existing fracture deformity: post-fracture total knee arthroplasty. *J Arthroplasty*. 2014 Nov;29(11):2104–2108.
17. Insall JN, Dorr LD, Scott RD, Scott WN. Rationale of the Knee Society clinical rating system. *Clin Orthop Relat Res*. 1989 Nov;248:13–14.
18. Wright J, Ewald FC, Walker PS, Thomas WH, Poss R, Sledge CB. Total knee arthroplasty with the kinematic prosthesis. Results after five to nine years: a follow-up note. *J Bone Joint Surg Am*. 1990 Aug;72(7):1003–1009.
19. Koike T, Harigai M, Inokuma S, et al. Postmarketing surveillance of safety and effectiveness of etanercept in Japanese patients with rheumatoid arthritis. *Mod Rheumatol*. 2011 Aug;21(4):343–351.
20. Seto Y, Tanaka E, Inoue E, et al. Studies of the efficacy and safety of methotrexate at dosages over 8 mg/week using the IORRA cohort database. *Mod Rheumatol*. 2011 Dec;21(6):579–593.
21. Wolff AM, Hungerford DS, Pepe CL. The effect of extraarticular varus and valgus deformity on total knee arthroplasty. *Clin Orthop Relat Res*. 1991 Oct;271:35–51.
22. Tey IK, Chong K, Singh I. Stress fracture of the distal tibia secondary to severe knee osteoarthritis: a case report. *J Orthop Surg (Hong Kong)*. 2006 Aug;14(2):212–215.
23. Haspl M, Jelic M, Pecina M. Arthroplasty in treating knee 168 osteoarthritis and proximal tibia stress fracture. *Acta Chir Orthop Traumatol Cech*. 2003;70(5):303–305.
24. Tomlinson MP, Dingwall IM, Phillips H. Total knee arthroplasty in the management of proximal tibial stress fractures. *J Arthroplasty*. 1995 Oct;10(5):707–713.
25. Cameron HU. Double stress fracture of the tibia in the presence of arthritis of the knee. *Can J Surg*. 1993 Aug;36(4):307–310.
26. Berend KR, Lombardi Jr AV, Adams JB. Total knee arthroplasty in patients with greater than 20 degrees flexion contracture. *Clin Orthop Relat Res*. 2006 Nov;452:83–87.
27. Inan M, Sarikaya IA, Yildirim E, Güven MF. Neurological complications after supracondylar femoral osteotomy in cerebral palsy. *J Pediatr Orthop*. 2015 Apr-May;35(3):290–295.