

Original Article

Total knee arthroplasty in rheumatoid arthritis: a mid-term study results

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Abstract

Background: Total knee arthroplasty in patients with rheumatoid arthritis is associated with some problems, and yet is an effective method for management of knee ailments in these patients. The aim of this cross-sectional study was to evaluate the results of this procedure in a series of patients with rheumatoid arthritis.

Methods: Fourteen patients (23 knees) with rheumatoid arthritis who underwent knee arthroplasty were recruited. Clinical and radiographic results including knee score and functional score, radiographic score, the amount of deformity correction, the length of recovery time and complications were evaluated.

Results: All patients were female, with mean age of 64.8 years and were followed for an average of 50.3 months. Average knee range of motion had increased from 87 degrees to 108 degrees postoperatively ($p=0.002$). The mean knee and functional score were 93 (4.49 SD) and 73 (27.99 SD), respectively. None of the patients had radiographic signs of loosening.

Conclusion: Total knee arthroplasty in patients with rheumatoid arthritis improved performance, reduced pain, increased range of motion and corrected knee deformities, but nonetheless was associated with few complications.

Keywords: Rheumatoid arthritis, Total knee arthroplasty, Knee prosthesis.

Introduction

The knee is one of the most commonly involved joints in rheumatoid arthritis (RA). One or both knees are eventually involved in 90% of RA patients (1). Clinical course of rheumatoid arthritis is highly variable from a mild illness to a severe and rapidly

progressive disease that leads to destruction of the joints within a short period of time (2). Despite recent advances in biological agents and treatment methods in the field of rheumatology, progressive joint destruction occurs and ultimately requires surgical treatment (2,3). Total knee arthroplasty (TKA) is the treatment of choice for pain relief and function improvement in patients with osteoarthritis (OA) and RA (3- 5).

The joint destruction, deformity, instability, contracture and osteoporosis occur in rheumatoid arthritis. Poor quality of bone due to inflammatory process or chronic steroid use in RA patients may lead to worse outcomes including joint arthroplasty (6). These patients are also prone to wound healing problems and local and systemic infections due to immune system suppression (3, 7).

Postoperative complications of arthroplasty are more common and severe in patients with RA than OA due to wound healing

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problems, increased incidence of infection, joints deformities and bony lesions. The most important complication is infection that occurs three times higher in RA compared with OA patients (3, 8, 9).

The TKA, especially in patients with RA, requires careful patient selection and meticulous postoperative care (3, 7). In Iran, due to social and economic problems, patients usually refer for surgery in chronic and debilitating phase of the disease. The aim of this cross-sectional study was to evaluate clinical and radiographic results of one series of these patients in a mid-term follow-up.

Methods

Patients: Nineteen patients with primary diagnosis of RA who underwent TKA during 2001-2008 were selected. All patients were female and the mean age at the time of surgery was 64.85 ± 8.29 years (52-79). Of these, 5 patients were lost for last follow up. Therefore, 14 patients (23 knees) were enrolled in this study. The average time of follow up was 50.34 ± 26.53 months (15-106). All patients received medical treatment for RA at the time of the study or had undergone the RA treatment previously. Preoperatively all patients were in stage 4 of degenerative changes (based on Kellgren-Lawrence Score). For prophylactic reasons, patients received steroids (80%), methotrexate (66.7%) and NSAIDs (33.3%). In 9 patients arthroplasty was performed for their both knees in two stages.

Surgical procedures: All procedures were performed by one surgeon using tourniquet, midline skin incision and standard medial parapatellar arthrotomy. Posterior cruciate ligament was excised and minimal synovectomy was performed. Distal femoral cut was made with intramedullary guide and proximal tibial cut with extramedullary alignment guide. Flexion and extension gaps were balanced with modified gap technique. Staged medial and lateral release were performed in varus and valgus deformities

respectively. Patella was replaced in 22 percent of patients. All prostheses were LPS-Flex (Zimmer, Warsaw, Indiana), except in one patient that LCKK prosthesis (same company) was used. Antibiotic-impregnated cement was used in all patients.

Postoperative care: Intravenous antibiotic (Cefazolin) for 48 hours and low molecular weight heparin (Enoxaparin) for deep vein thrombosis (DVT) prophylaxis for three weeks were administered, respectively. Full weight-bearing walking started on the second day and knee motions begun on seventh day postoperatively. Continuous passive movement (CPM) was not used and when knee flexion was reached to 90° , patients were discharged from the hospital. The mean duration of hospitalization was 10 days.

Evaluation Method: All patients were evaluated and examined at the last follow up by one person. Preoperative data was obtained from review of medical records and radiology archive. Clinical evaluation using the Knee Society System (KSS) was performed (10). Joint range of motion and stability were assessed with clinical examination. The relationship between the severity of the deformity with medial and lateral release and the amount of deformity correction were investigated. Any complication during and after surgery were recorded.

Radiographic evaluation was conducted on anteroposterior and lateral knee and standing full leg (hip, knee and ankle) views on preoperative and last follow up radiographs. Evidence of prosthetic loosening, subsidence and radiolucent lines around the prosthesis (based on knee society radiographic evaluation system) were assessed (11). On full-length standing radiographs, alignments of the limb (mechanical axis of the femur and tibia) before and after surgery were compared. An angle between the mechanical axis of the femur and tibia above 0° degree was

considered valgus and less than 0 degree was considered varus.

The collected data was analyzed using SPSS software v.17, mean, standard deviation, frequency, Pearson correlation coefficient; and t-test ($p=0.05$).

Results

Mean knee score and function score in Knee Society scoring system (KSS) were 92.69 (SD: 4.49) and 73.04 (SD: 27.99) respectively. All patients had knee score between 80 and 100 (excellent results). Based on function score, 10 knees (43.5%) had score of 80 to 100 (excellent result), 8 knees (34.8%) 60 to 80 (good results), 3 knees (13%) 40 to 60 (fair results) and 2 knees (8.7%) below 40 (poor results). Two knees with poor functional results were in one patient who had advanced RA with multiple joints involvement (hips, knees, ankles and toes). She was house-bound and not able of walking unless using a walker. Her knee score was 88.

Seven knees (30%) had occasional pain but others were pain free. Two patients could walk with walker, two with cane and others walked independently.

The average preoperative and postoperative knee range of motion were $87.82^{\circ} \pm 23.63^{\circ}$ (60-130) and $108.26^{\circ} \pm 12.1^{\circ}$ (90-125), respectively and were statistically significant ($p=0.002$). Average time to reach

90° of knee flexion was 2.82 (SD, 0.63) weeks.

The average preoperative and postoperative knee flexion contracture were $11.85^{\circ} \pm 12.82^{\circ}$ (0 to 40) and $1.04^{\circ} \pm 0.21^{\circ}$ respectively (only one patient had 5° of flexion contracture). This correction was statistically significant ($p=0.00$). There was no correlation between preoperative knee flexion contracture and postoperative knee score.

In 19 knees (83%) genu varum and in 4 (17%) genu valgum deformity were observed (Fig. 1). The average angle between the mechanical axis of the femur and tibia before the surgery was 10.26° (SD, 4.37) in varus and 5.13° (SD, 3.15) after surgery in varus. This deformity correction was statistically significant ($p=0.00$).

There was a significant correlation between severity of the varus deformity and stage of medial soft tissue release ($p=0.001$) ($r=0.6$). The remained postoperative knee deformity was not correlated with the severity of primary preoperative deformity ($p=0.52$) (power = 95).

In 48% of cases non-progressive radiolucent lines of less than 2 mm was found around the prosthesis. Radiolucent line of 2mm or more was not found in any patient. Mean radiographic loosening score (based on KSS) was 0.65. None of the patients had evidence of prosthesis

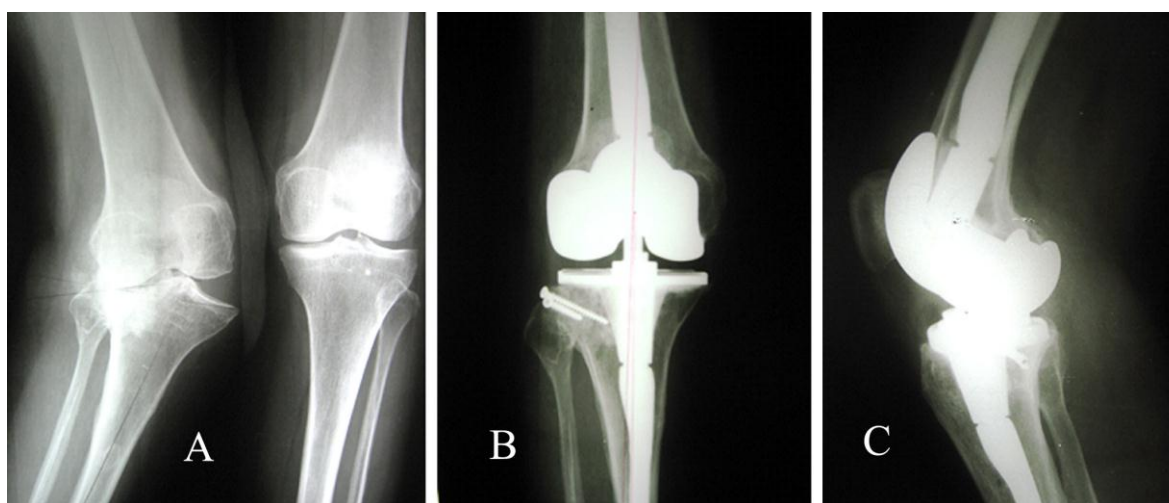


Fig.1. Preoperative (A) and postoperative (B, C) radiographs of a patient with severe valgus deformity replaced with LCKK prosthesis.

subsidence or migration.

The t-test showed a significant correlation between the mean knee score and mean function score ($p=0.007$). This means that patients with a higher knee score also had a higher function score.

Only one patient had postoperative bleeding in which successfully was treated with bandage, ice pack and transfusion of 4 units of blood. None of the patients required reoperation or revision.

Discussion

The knee arthroplasty is a highly successful method for controlling pain, reducing disability and improving the performance of RA patients. Long-term results (ten years) with prosthetic survival of 81 to 97.7% have been reported for these patients (3). Factors that may affect survival of the prosthesis are fixation method (with or without cement) and retaining or substituting the posterior cruciate ligament (PCL). Good long-term results with each of these methods have been reported (13,3). Patients with RA should reach maximum knee flexion because they usually have multiple joints involvement (4).

There is usually concern about secondary posterior instability with cruciate retaining arthroplasty in RA patients. Laskin and O'Flynn (12) in cruciate retaining TKA reported 50% of posterior instability.

Archibeck (13) in 46 TKA with PCL retention in RA patients with a mean follow up of 10.5 years reported 95% successful outcomes and 93% prosthetic survival. Scuderi (14) in a study with 15 years mean follow up reported a 95.6% prosthesis survival.

In Yamanaka study on 32 patients using cementless prosthesis with the PCL retention and with a mean follow up of 8 years, postoperative knee and function scores increased to 88 and 70, respectively. Except for one case of revision due to infection, no case of prosthetic loosening was reported (8). Klemmens in 37 TKA (28 patients) with 11 years follow up reported

no difference between fixation method. The knee and function scores were 77.2 and 75.3, respectively (5).

In our study that the cemented PS prosthesis was used, the knee and function scores were 93 and 73, respectively. Prosthesis survival at mean follow up of 4.2 years was 100% and there was no case of prosthetic loosening.

Gill (15) compared clinical results of TKA in RA (30 knees) and OA (37 knees) with a mean follow up of 9.9 years. All patients had good and excellent results in terms of pain reduction, stability and knee range of motion. However, due to multiple joints involvement in RA, the functional results were lower (15). Lee et al (3) in 75 TKA (55 patients) in RA patients that were followed for 15 years, reported 85.5% prosthesis survival. They reported a considerable increase in revision rate due to prosthetic loosening after 10 years (on average 12.4 years, 3 to 16 years) (3).

Diduch et al (16) performed TKA on 103 RA patients. The postoperative knee and function scores were 94 and 83, respectively. They expressed that the function score high mean was due to young age of subjects and no incidence of underlying disease (16). In 71 RA patients who underwent TKA with 10 years follow up, Kristensen et al (17) showed that 77% had good or excellent, 11% moderate and 11% poor KSS scores. Five percent of patients had residual pain, 58% were able to walk independently and mean knee range of motion was 108° postoperatively (17).

In our study, the knee and function scores were higher than other studies except for Diduch (16). We hypothesized that this difference may be because of relatively shorter follow up period and small sample size of our study and the younger patients in Diduch study.

The TKA complications are more frequent and more severe in RA patients due to poor quality of bone and soft tissue, severe preoperative joint deformity and laxity, poor healing process, increased risk of deep

infection and multiple joints involvement that preclude proper rehabilitation. The main complication that can affect the results of TKA is infection that occurs in RA patients three times greater than in OA (20, 21). Rodriguez with an average follow up of 7 years reported the risk of deep infection in RA as 4.1% (18). The cause of this increased risk is multifactorial but the steroid use is effective in this condition (3). In this study no complication, including infection (other than one case of hemarthrosis) was observed.

Because arthroplasty is performed in younger age patients with RA, assessing the results of TKA in the second and third decades is very important. RA patients have lower activity level and place lower stress on their lower limbs. Therefore their long-term results are comparable with OA patients (19). Our study limitations included small sample size, mid-term follow up period and the study type which was retrospective. Comprehensive prospective studies with larger number of patients are recommended.

Conclusion

Our study indicated that besides improving performance, pain reduction, increasing range of motion and correction of deformity, the TKA in patients with RA is associated with a few complications.

References

1. Fleming A, Crown JM, Corbett M. Early rheumatoid disease. *Ann Rheumatoid Dis.* 1976; 35: 357-360.
2. Momohara S, Inoue E, Ikari K, Kawamura K, Tsukahara S, Mochizuki T, et al. Risk factors for total knee arthroplasty in rheumatoid arthritis. *Mod Rheumatol.* 2007; 17: 476-480.
3. Lee JK, Choe CH. Total knee arthroplasty in rheumatoid arthritis. *Knee Surg Relat Res.* 2012; 24(1):1-6.
4. Ritter MA, Lutgring JD, Devis KE, Faris DM, Berend ME. Total knee arthroplasty effectiveness in

patients 55 year old & younger: osteoarthritis vs rheumatoid arthritis. *The Knee.* 2007; 14: 9-11.

5. Klemmens T, Maximillian S, Thomas S, Wolfgang H, Axel W. Long- term outcome of total knee replacement in patients with rheumatoid arthritis. *Joint Bone Spine.* 2008; 75: 163-166.

6. Chmell MJ, Scott RD. Total knee arthroplasty in patients with rheumatoid arthritis: an overview. *Clin Orthop Relat Res.* 1999; 366: 54-60.

7. Yamanaka H, Goto K, Suzuki M. Clinical results of hi-tech Knee II total knee arthroplasty in patients with rheumatoid arthritis: 5- to 12-year follow-up. *J Orthop Surg Res.* 2012; 7: 1-6.

8. Poss R, Thornhill TS, Ewald FC, Thomas WH, Batte NJ, Sledge CB. Factors influencing the incidence and outcome of infection following total joint arthroplasty. *Clin Orthop Relat Res.* 1984; 182: 117-126.

9. Wilson MG, Kelley K, Thornhill TS. Infection as a complication of total knee-replacement arthroplasty: risk factors and treatment in sixty-seven cases. *J Bone Joint Surg [Am].* 1990; 72: 878-883.

10. Insall JN, Dorr LD, Scott RD, Scott WN. Rationale of the knee society clinical rating system. *Clin Orthop Relat Res.* 1989; 248: 13-14.

11. Ewald FC. The knee society total knee arthroplasty roentgenographic evaluation and scoring system. *Clin Orthop Relat Res.* 1989; 248: 9-12.

12. Laskin RS, O'Flynn HM. The Insall Award: Total knee replacement with posterior cruciate ligament retention in rheumatoid arthritis. Problems and complications. *Clin Orthop Relat Res.* 1997; 345: 24-28.

13. Archibech MJ, Berger RA, Barden RM, Jacobs JJ, Sheinkop MB, Rosenberg AG, et al. Posterior cruciate ligament-retaining total knee arthroplasty in patients with rheumatoid arthritis. *J Bone Joint Surg [Am].* 2001; 38: 1231-1236.

14. Scuderi GR, Insall JN, Windsor RE, Moran MC. Survivorship of cemented knee replacement. *J Bone Joint Surg [Br].* 1989; 71:798-803.

15. Gill GS, Chan KC, Mills DM. 5 to 18 years follow up study of cemented total knee arthroplasty for patients 55 years old or younger. *J Arthroplasty.* 1995; 10: 598-602.

16. Diduch DR, Insall JN, Scott WN, Scuderi GR, Font-Rodriguez D. Total knee replacement in young, active patients: long-term follow up and functional outcome. *J Bone Joint Surg [Am].* 1997; 79(4): 575-582.

17. Kristensen O, Nafei A, Kjaersgaard AP, Hvid I, Jensen J. Long-term results of total condylar knee arthroplasty in rheumatoid arthritis. *J Bone Joint Surg [Br].* 1992; 74(6): 803-806.

18. Rodriguez JA, Saddler S, Edelman S, Ranawat

CS. Long-term results of total knee arthroplasty in class 3 and 4 rheumatoid arthritis. *J Arthroplasty*. 1996; 11: 41-45.

19. Kerner PJ, Clarke HD, Scuderi GR. Total knee arthroplasty for rheumatoid arthritis. *Mod Rheumato*. 2003; 13: 289-292.