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Total ankle replacement in rheumatoid arthritis

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Abstract We reviewed 21 patients with rheumatoid arthritis who had a total ankle replacement between 1984 and 2000. The average follow-up was 72 (15–169) months. Clinical results were evaluated using the American Orthopaedic Foot and Ankle Society (AOFAS) score. At the latest review, three ankles had been revised. Two ankles were excellent, seven good, three fair, and 12 poor. Eleven patients with 13 ankles had residual pain, with radiographs showing a high incidence of radiolucent lines. Migration of the tibial component was seen in 13 ankles and collapse of talus in nine. Although clinical results were poor, patient satisfaction was not.

Résumé Nous avons examiné 21 malades atteints de polyarthrite rhumatoïde qui avaient eu une prothèse totale de la cheville entre 1984 et 2000. La moyenne de suivi était de 72 mois (15–169). Les résultats cliniques ont été évalués avec le score de la Société Américaine du Pied et de la Cheville. À la révision la plus tardive, trois chevilles avaient été réopérées. Deux chevilles avaient un résultat excellent, sept un bon, trois un résultat moyen et 12 un mauvais résultat. Onze malades, avec 13 chevilles opérées, avaient des douleurs résiduelles, avec une grande fréquence de lésions radiologiques. La migration du composant tibial a été notée dans 13 chevilles et l'enfoncement de l'astragale dans neuf chevilles. Bien

que les résultats cliniques étaient assez mauvais, les patients étaient plutôt satisfaits.

Introduction

Rheumatoid arthritis initially affects the ankle and hindfoot in only a few patients; however, with time, the joint is involved in numerous patients. Dereymaeker et al. [2] reported that only 15% of patients with polyarticular rheumatoid arthritis have some involvement of the ankle. Miehle et al. [9] reported that 52% of 300 patients with rheumatoid arthritis with an average duration of disease of 9.5 years had ankle and subtalar affected joints. Conservative therapy such as the use of orthoses and steroid injections is the preferred treatment. Surgical therapy is selected for painful and disabling cases for which conservative therapy is ineffective. In general, ankle arthrodesis is the primary surgical treatment; however, the long-term results are not always good. Lance et al. [7] reported that pseudarthrosis occurred in 22% of their patients treated in this way. The loss of ankle motion caused by arthrodesis increases strain on small joints of the ipsilateral foot, and many patients experience degenerative changes in the subtalar and midtarsal joints [8]. Patients with rheumatoid arthritis who require surgery usually already have degeneration of the subtalar and midtarsal joints. If arthrodesis is done, fusion of the ankle and hindfoot will result. Patients with bilateral ankle arthrodeses have functional problems with gait.

Total ankle replacement that can relieve pain while retaining ankle movement is important for patients with rheumatoid arthritis. The purpose of the current study was to evaluate results and present problems of total ankle replacement in patients with rheumatoid arthritis.

Patients and methods

Thirty-two ankles in 26 patients with rheumatoid arthritis had total ankle replacements between 1984 and 2000. There were two men and 24 women. Six patients received bilateral total ankle replace-

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ments. One patient (one ankle) died for reasons unrelated to the operation. Four patients (four ankles) were lost to follow-up at the time of review. The remaining 27 ankles in 21 patients were evaluated. Average patient age at the time of surgery was 60 (36–75) years, and average follow-up was 72 (15–169) months. Twenty patients had other lower extremity joint replacements. In all patients, the major complaint before surgery was pain and disability in walking.

The implant used was the TNK ankle (Kyocera, Kyoto, Japan), which is made of ceramic and ultra-high-molecular-weight polyethylene [13]. A ceramic implant, provided with a medial facet joint, was inserted from the anterior side. Three sizes (small, medium, and large) were available. The operation was done using an anterior approach as described previously [13]. With the patient under general anesthesia, implants were anchored with cement. A tourniquet was used to control bleeding during surgery.

A longitudinal incision was made between the tibialis anterior tendon and the extensor hallucis longus tendon to retract laterally the dorsalis pedis artery and deep peroneal nerve. Synovium in the tendon sheath of the extensor tendons and at the lateral and medial facet in the joint were removed. The cutting guide for the tibial osteotomy was inserted, and the osteotomy was done from an anterior opening at an angle of 80° from the long axis of the tibia and exited from the posterior tibial cortex. A talar osteotomy was done according to the cutting guide. An anchor hole in the talus was made according to the guide, the trial implant was inserted, and alignment and mobility were examined. The implants were fixed with cement, and a suction drain was inserted followed by suturing. A short leg cast was applied with the ankle in slightly dorsiflexed position. The suction drain was removed 48 h postoperatively. A short leg cast was maintained for 3 weeks before beginning ankle motion to allow for soft-tissue healing. Active flexion-extension began after cast removal. Weight bearing began 4 weeks after the operation.

Clinical results, range of motion (ROM), questionnaires, radiographic findings, complications, and survival rate were examined. Clinical results were evaluated using the clinical rating scale of the American Orthopaedic Foot and Ankle Society (AOFAS) (100 points total) [5]. The questionnaire assessed the level of pain, function, and alignment. Patients were asked to rate pain on a scale of 0–40 points. Function was calculated as the total score of activity limitations (0–10), maximum walking distance (0–5), walking surface (0–5), gait abnormality (0–8), sagittal motion (0–8), hindfoot motion (0–6), and ankle-hindfoot stability (0–8). Alignment was rated from 0 to 10 points (good, fair, poor), giving a total score of 100 points. Excellent was defined as a score of 85–100, good as 75–84, fair as 70–74, and poor as less than 70.

At the latest follow-up questionnaires were completed by 17 patients (24 ankles) whose implants had survived. The questionnaire assessed preoperative and postoperative condition, degrees of satisfaction with the operation, and complaints. Radiolucent lines at the interface between the component and the bone were assessed on anteroposterior (AP) and lateral radiographs. Tibial component migration and talus collapse were also examined. Survival rate was calculated using the Kaplan-Meier method at revision surgery as the end point.

Results

Pain relief was the primary criterion of success in this study. The implant in three patients (three ankles) had been removed because of pain and component loosening. One ankle was treated with revision total ankle replacement, and two ankles were treated with arthrodesis. At the latest follow-up of the 24 surviving ankles in 17 patients, the average ankle-hindfoot score was 66.3 (32–90) points. Clinical results were graded excellent in two ankles, good in seven, fair in three, and poor in 12 (Table 1). Average

Fig. 1 **a** Anteroposterior radiograph showing migration of the tibial component. **b** Lateral radiograph showing collapse of talus after TNK arthroplasty

Table 1 Average American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot score at latest follow-up. Total score: 66.3 (range 32–90)

Pain	Function	Walking distance
33.0	4.3	3.3
Walking surface	Gait abnormality	Sagittal motion
2.6	4.7	3.0
Hindfoot motion	Ankle-hindfoot stability	Alignment
0	8.0	7.3

pain score was 33 (0–40) points. Eleven patients with 13 ankles had no pain. Plantar flexion was 8.5° (–10–20°) and dorsiflexion was 7.5° (0–20°). Average scores for sagittal motion was 3 (0–8) points and hindfoot motion 0 points.

Questionnaires were sent to 17 patients whose implants survived until follow-up, with 15 questionnaires (21 ankles) returned. Conditions compared with before surgery mostly had improved. Twelve patients with 16 ankles improved, and one patient with two ankles deteriorated. Five patients with seven ankles were extremely satisfied, and six patients with eight ankles were satisfied. Major complaints included deformity, low mobility, and pain.

On anteroposterior radiographs, 18 ankles had radiolucent lines at the tibial component and nine also radiolucent lines at the talar component. On lateral radiographs, 15 ankles had radiolucent lines at the tibial component and 12 also had radiolucent lines at the talar components. Tibial component migration was seen in 13 ankles, and talus collapse was seen in nine (Fig. 1a,b).

Complications involved loosening in 10 ankles. One ankle was treated with revision total ankle replacement; however, the ankle later was fused because of early loosening 2 years after revision surgery. Two ankles were treated with arthrodesis. However, two of three fused

ankles fractured within 1 year after arthrodesis and required additional surgery. The remaining seven ankles had mild symptoms, and therefore were followed up without additional therapy. Delayed wound healing occurred in one ankle, which eventually healed with conservative therapy without any deep infection. Intra-operative fracture of the medial facet occurred in one ankle and was treated with internal fixation. Survival rate was 77% at 169 months using revision surgery as the end point.

Discussion

The results of total ankle replacement are not always as satisfactory as total hip replacement or total knee replacement. Many authors recommend ankle arthrodesis for ankle end-stage arthritis as the primary surgical treatment. Dini et al. [3] reported that of 21 Smith total ankle replacements, only 50% were rated as good at the 3-year follow-up. Kitaoka et al. [4] also reported poor results of 204 Mayo-type, total ankle replacements at the 9-year follow-up and stated that "we no longer recommend ankle arthroplasty." Bolton-Maggs et al. [1] reported the results of 62 total ankle replacements after 5.5 years' follow-up and reported only 13 ankles that could be described as satisfactory. Takakura et al. [13] reported the results 69 TNK total ankle replacements with satisfactory results (excellent, good) in only 24% of ankles with a cemented metal component.

Although these reports included both patients with osteoarthritis and patients with rheumatoid arthritis, only patients with rheumatoid arthritis were evaluated in the current study. Only Lachiewicz et al. [6] have reported the results of total ankle replacement in patients with rheumatoid arthritis. Of 15 total ankle arthroplasties in patients with rheumatoid arthritis at 39 months follow-up, seven were rated as excellent and eight as good. Pain relief was gratifying in all their patients. They reported that moderate-to-severe arthritic changes were present in other tarsal joints, and no inversion or eversion motion was observed in many patients. They reported total ankle replacement could be successful in carefully selected patients with severe arthritis of the ankle.

The analysis of old total ankle replacements indicated that the major factors of failure are the fixation method and component design. Takakura et al. [13] reported that uncemented ceramic components with less bone resection yield better results than cemented metal components. The many early design components usually were highly constrained. The high rates of constrained implant loosening are thought to be from greater stress at the bone-prosthesis interface, as constrained implants do not allow rotation and sliding during extension and flexion.

Cement fixation was used for all patients in the current study despite the fact that other authors have shown that uncemented ceramic components with less bone resection yield better results than cemented metal components [12, 13]. The reason for this decision was that patients with

rheumatoid arthritis in the current study had severe osteoporosis develop after using corticosteroids for long periods [10], rendering the use of uncemented fixation too problematic in many patients.

If component loosening occurs, revision surgery or arthrodesis is required. However, this operation is difficult to do because of massive bone loss and poor bone quality. In the current study, one patient (one ankle) had revision total ankle replacement; however, re loosening occurred in 2 years. The ankle then was treated by arthrodesis but fractured after 8 months, requiring additional surgery. The average ROM at the follow-up was approximately 15°. This range is not satisfactory because of the implant design.

Patients with rheumatoid arthritis often have several joint deformities in the lower extremities by the time the ankle is surgically treated. In the current study, all patients except one already had other joint replacements in their lower extremities when the total ankle replacement was done, which may explain the poor clinical score. Patients with no pain cannot live highly active lives because of severe deformities from rheumatoid arthritis requiring multiple operations.

Radiographs showed radiolucent lines around components, implant migration, and talus collapse; however, unacceptable residual pain was observed in only a few patients. Patients with a low clinical score, or loosening or sinking of components, do not always experience pain. Sixty percent of patients with poor results were satisfied, and none was disappointed.

Patients with rheumatoid arthritis usually have degeneration of subtalar and midtarsal joints and no inversion or eversion motion of the ankle by the time they need surgery. If arthrodesis is done in those ankles, increased stress affects other joints and worsens functions such as gait. Although the results of total ankle replacement are poor, the degree of patient satisfaction is not poor in those with rheumatoid arthritis. Therefore, total ankle replacement is an important therapy that can retain hindfoot motion for patients with rheumatoid arthritis.

The latest component design is semiconstrained to allow for rotation and sliding during extension and flexion. Reports of the agility total ankle system (two-component) [11] and the STAR total ankle system (mobile bearing) were encouraging [12]. Future improvements of component design, fixation method, and surgical technique are required to improve outcomes.

The results of 27 total ankle arthroplasties in 21 patients with rheumatoid arthritis were evaluated. Residual pain was present in 11 ankles, with radiographs showing a high incidence of radiolucent lines. There were 13 tibial component migrations and nine talus collapses at follow-up. For low hindfoot mobility in patients with rheumatoid arthritis, total ankle replacement that can retain ankle function is an important therapeutic option; however, implant designs and surgical methods that produce stable results need to be developed.

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