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ORIGINAL RESEARCH

Short-Term and Long-Term Functional Outcomes of Arthroscopic Synovectomybefore Total Ankle Arthroplasty in Rheumatoid Arthritis Patients

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ABSTRACT

Background: Rheumatoid arthritis (RA) frequently affects the ankle joint, resulting in pain, swelling, and functional impairment. Total Ankle Arthroplasty (TAA) is a viable treatment option for end-stage arthritis. Arthroscopic synovectomy, a minimally invasive procedure aimed at reducing synovial inflammation, may potentially enhance the outcomes of TAA. This study aims to evaluate the short-term and long-term functional outcomes of arthroscopic synovectomy performed before TAA in patients with rheumatoid arthritis. **Materials and Methods:** A total of 120 rheumatoid arthritis patients (aged 35–75 years; 70 females, 50 males) with advanced ankle arthritis were enrolled in a randomized controlled trial. Patients were divided into two groups: Group A (n=60) underwent arthroscopic synovectomy followed by TAA after 6 weeks, and Group B (n=60) underwent direct TAA without prior synovectomy. Functional outcomes were assessed using the American Orthopedic Foot & Ankle Society (AOFAS) Ankle-Hindfoot Score and Visual Analog Scale (VAS) for pain at baseline, 6 months, 1 year, and 2 years postoperatively. Radiological assessment and complication rates were also recorded. **Results:** Group A demonstrated significant improvement in AOFAS scores from a preoperative mean of 45.3 ± 6.7 to 85.2 ± 7.1 at 6 months, 87.5 ± 6.4 at 1 year, and 85.9 ± 6.9 at 2 years. In contrast, Group B showed improvement from 46.1 ± 6.9 to 78.4 ± 7.5 at 6 months, 81.2 ± 7.0 at 1 year, and 78.8 ± 7.3 at 2 years. VAS scores decreased significantly in Group A from 7.4 ± 1.2 to 2.6 ± 0.9 at 2 years, whereas Group B demonstrated a reduction from 7.3 ± 1.1 to 3.4 ± 1.0. Radiological evaluation revealed better implant alignment and reduced periprosthetic inflammation in Group A. The incidence of complications was lower in Group A (10%) compared to Group B (18%). **Conclusion:** Arthroscopic synovectomy prior to TAA provides better short-term and long-term functional outcomes in rheumatoid arthritis patients, with enhanced pain relief, improved functional scores, and reduced complications. This pre-TAA intervention may be a valuable approach to optimizing surgical outcomes in this patient population.

Keywords: Rheumatoid arthritis, Arthroscopic synovectomy, Total Ankle Arthroplasty, Functional outcomes, Pain relief, AOFAS score.

INTRODUCTION

Rheumatoid arthritis (RA) is a chronic inflammatory disorder that predominantly affects synovial joints, resulting in pain, swelling, stiffness, and progressive joint destruction (1). The ankle joint is commonly involved in patients with RA, leading to significant functional impairment and reduced quality of life (2). Management of end-stage ankle arthritis often involves Total Ankle Arthroplasty (TAA), which has emerged as a viable alternative to ankle arthrodesis due to its ability to preserve joint mobility and enhance patient satisfaction (3,4).

Despite the advancements in TAA, the presence of chronic synovitis due to RA may adversely affect surgical outcomes. Persistent inflammation can compromise implant stability, hinder soft tissue healing, and accelerate peri-prosthetic tissue damage (5). Arthroscopic synovectomy, a minimally invasive

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technique designed to remove inflamed synovial tissue, has been proposed as an adjunctive procedure to improve outcomes before TAA (6). This procedure can potentially decrease local inflammation, improve pain relief, and enhance functional outcomes (7).

Previous studies have reported positive results of arthroscopic synovectomy in early-stage RA of the ankle, with significant improvement in pain and function (8). However, the impact of arthroscopic synovectomy performed prior to TAA on long-term outcomes remains underexplored. The available literature primarily focuses on the efficacy of TAA in general, without adequate attention to the potential benefits of preoperative synovectomy in rheumatoid arthritis patients (9).

The purpose of this study is to evaluate the short-term and long-term functional outcomes of arthroscopic synovectomy performed prior to TAA in patients with rheumatoid arthritis. We hypothesize that patients undergoing arthroscopic synovectomy followed by TAA will demonstrate superior functional outcomes, reduced pain, and lower complication rates compared to patients undergoing direct TAA.

MATERIALS AND METHODS

Study Design and Participants

This randomized controlled study was conducted at a tertiary care orthopedic center. A total of 120 patients diagnosed with rheumatoid arthritis and end-stage ankle arthritis were recruited. The inclusion criteria consisted of patients aged between 35 and 75 years, with clinical and radiological evidence of advanced ankle arthritis and unresponsive to conservative management for at least 6 months. Patients with a history of previous ankle surgeries, active infections, or severe comorbidities were excluded.

Randomization and Group Allocation

Participants were randomly assigned to two groups (Group A and Group B) using a computer-generated randomization sequence. Group A (n = 60) underwent arthroscopic synovectomy followed by Total Ankle Arthroplasty (TAA) after 6 weeks of recovery. Group B (n = 60) underwent direct TAA without prior synovectomy.

Surgical Procedures

In Group A, arthroscopic synovectomy was performed under regional or general anesthesia using standard anteromedial and anterolateral portals. Inflamed synovial tissue was carefully removed using motorized shavers and radiofrequency ablation devices to reduce synovial inflammation. After a 6-week recovery period, TAA was performed using a standard anterior approach with cementless, mobile-bearing prostheses.

Group B patients underwent direct TAA using the same anterior approach and implant type without prior synovectomy.

Outcome Measures

The primary outcomes were assessed using the American Orthopedic Foot & Ankle Society (AOFAS) Ankle-Hindfoot Score and Visual Analog Scale (VAS) for pain. Evaluations were performed at baseline, 6 months, 1 year, and 2 years postoperatively. Radiological assessment of implant positioning and periprosthetic changes was conducted using standard radiographs at each follow-up. Complication rates, including infection, implant loosening, and persistent pain, were also recorded.

Statistical Analysis

Data analysis was performed using SPSS software version 28.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) and compared using the independent t-test. Categorical variables were presented as frequencies and percentages and analyzed using the Chi-square test or Fisher's exact test where appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Patient Characteristics

A total of 120 patients participated in the study, with 60 patients each in Group A (arthroscopic synovectomy followed by TAA) and Group B (direct TAA). The demographic characteristics of the patients are presented in Table 1. The two groups were comparable with respect to age, gender distribution, and disease duration ($p > 0.05$).

Table 1. Baseline Characteristics of Patients

Characteristic	Group A (n = 60)	Group B (n = 60)	p-value
Age (years)	55.4 ± 10.2	56.1 ± 9.8	0.621
Gender (Male/Female)	28/32	30/30	0.745
Disease Duration (years)	12.3 ± 3.4	12.1 ± 3.5	0.812
BMI (kg/m²)	24.6 ± 2.8	24.9 ± 2.6	0.540
Follow-up Rate (%)	95%	92%	0.633

Functional Outcomes

The improvement in functional outcomes was assessed using the AOFAS Ankle-Hindfoot Score and VAS pain scores at different follow-up intervals (Table 2).

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Table 2. Comparison of Functional Outcomes Between Groups

Outcome Measure	Baseline	6 Months	1 Year	2 Years	p-value (2 Years)
AOFAS Score					
Group A	45.3 ± 6.7	85.2 ± 7.1	87.5 ± 6.4	85.9 ± 6.9	<0.001
Group B	46.1 ± 6.9	78.4 ± 7.5	81.2 ± 7.0	78.8 ± 7.3	<0.001
VAS Score					
Group A	7.4 ± 1.2	3.5 ± 1.1	2.9 ± 1.0	2.6 ± 0.9	<0.001
Group B	7.3 ± 1.1	4.2 ± 1.3	3.8 ± 1.2	3.4 ± 1.0	<0.001

As shown in Table 2, Group A demonstrated significantly greater improvement in AOFAS scores compared to Group B at all follow-up intervals ($p < 0.001$). Additionally, pain reduction, as measured by VAS scores, was significantly better in Group A compared to Group B at 2 years postoperatively ($p < 0.001$).

Radiological Assessment

Radiological evaluations indicated better implant alignment and reduced periprosthetic inflammation in Group A. Only 2 cases (3.3%) of implant loosening were observed in Group A, while 6 cases (10%) were noted in Group B.

Complication Rates

The incidence of complications was lower in Group A (10%) compared to Group B (18%), with the most common complications being infection, implant loosening, and persistent pain (Table 3).

Table 3. Complication Rates

Complication	Group A (n = 60)	Group B (n = 60)	p-value
Infection	2 (3.3%)	5 (8.3%)	0.237
Implant Loosening	2 (3.3%)	6 (10%)	0.151
Persistent Pain	4 (6.7%)	7 (11.7%)	0.352
Total Complications	6 (10%)	11 (18.3%)	0.195

DISCUSSION

This study aimed to evaluate the functional outcomes of arthroscopic synovectomy performed before Total Ankle Arthroplasty (TAA) in patients with rheumatoid arthritis. The findings demonstrate that arthroscopic synovectomy significantly improves both short-term and long-term outcomes, with superior pain relief, enhanced functional scores, and reduced complication rates compared to direct TAA.

The improvement in functional scores observed in Group A (arthroscopic synovectomy followed by TAA) aligns with previous studies indicating that synovectomy can effectively reduce synovial inflammation, thereby enhancing joint function and reducing pain (1,2). Arthroscopic synovectomy is a minimally invasive technique that offers advantages over open procedures, including reduced postoperative pain, shorter recovery time, and improved joint mobility (3,4).

Patients who underwent arthroscopic synovectomy before TAA exhibited a significant increase in AOFAS scores from baseline to follow-up intervals (6 months, 1 year, and 2 years). This improvement is consistent with findings from other studies where preoperative synovectomy was associated with better functional recovery and enhanced implant survival rates (5,6). Additionally, the reduction in VAS pain scores in Group A indicates that synovectomy plays a vital role in controlling inflammatory pain prior to joint replacement (7).

The radiological assessments in the current study demonstrated better implant alignment and reduced periprosthetic inflammation in Group A. This may be attributed to the removal of inflammatory synovium, which otherwise contributes to periprosthetic tissue damage and implant instability (8). Comparable studies have also reported that synovectomy prior to TAA leads to improved implant integration and reduced revision rates (9,10).

In terms of complication rates, Group A showed a lower incidence of infection, implant loosening, and persistent pain compared to Group B. This finding is supported by previous literature suggesting that preoperative control of inflammation through synovectomy minimizes the risk of postoperative complications (11,12). Although the overall complication rate was lower in Group A, it is essential to note that the difference did not reach statistical significance, possibly due to the relatively small sample size.

The current study's findings suggest that performing arthroscopic synovectomy before TAA can enhance surgical outcomes in rheumatoid arthritis patients. This result is in line with several studies indicating that synovectomy improves joint function and decreases pain, making it a valuable intervention for patients with persistent synovitis (13,14). However, some studies have reported contradictory findings, with no significant improvement observed in long-term outcomes following synovectomy (15). These discrepancies may be attributed to variations in surgical techniques, patient selection, and follow-up duration.

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Despite the promising results, this study has certain limitations. The sample size was relatively small, and the follow-up period was limited to two years. Future studies with larger cohorts and extended follow-up durations are recommended to confirm the findings. Additionally, the potential influence of RA disease-modifying drugs on surgical outcomes was not considered, which may affect the results.

CONCLUSION

In conclusion, arthroscopic synovectomy prior to TAA in rheumatoid arthritis patients is associated with superior functional outcomes, reduced pain, and lower complication rates compared to direct TAA. Further research is needed to establish standardized protocols for the optimal use of synovectomy in the management of end-stage ankle arthritis.

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