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Original Article

Arthroscopic ankle arthrodesis: clinical results

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Abstract

Objective: To evaluate the clinical outcome of arthroscopic ankle arthrodesis.

Methods: This is a retrospective study involving 17 patients with ankle arthritis who showed no improvement with conservative treatment. Patients underwent ankle arthrodesis via ankle arthroscopy between January 2015 and December 2020, all performed by the same surgeon. The American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot score was used for functional assessment of patients, while patient satisfaction and quality of life was assessed by the Patient-Reported Outcomes Measurement Information System (PROMIS Global – 10), with maximum of 20 points per evaluated item.

Results: Average surgery time was 81.4 ± 7.9 minutes, and all patients were discharged on the day following surgery. Average time for consolidative arthrodesis was 10.8 ± 1.9 weeks. The preoperative AOFAS ankle-hindfoot score showed a statistically significant improvement when compared to that obtained at the last consultation (from 55.8 ± 3.2 to 89 ± 2.1). The physical status measured by PROMIS preoperatively increased from 9.8 ± 1.2 to 18.2 ± 1.3, just as mental health increased from 8.9 ± 1.1 to 17.9 ± 1.5.

Conclusion: Ankle arthrodesis through arthroscopy is a less invasive option that has shown significant improvement in the AOFAS ankle-hindfoot and PROMIS scores, with a high union rate.

Level of evidence Level IV; Therapeutic studies; Case series.

Keywords: Arthroscopy; Ankle; Arthrodesis.

Introduction

Despite the increased popularity of total ankle arthroplasty, arthrodesis still remains the gold standard surgical treatment for end-stage osteoarthritis[1].

For a long time, ankle arthrodesis was performed using different approaches, such as lateral (transfibular), anterior, medial, and mini-arthrotomy. The open approach facilitates alignment corrections, plate fixation, and bone graft placement; however, it is aggressive and has considerable complication rates[2].

Arthroscopic arthrodesis has been a choice among foot and ankle surgeons who prefer less invasive procedures. Schneider was the first to demonstrate that this option results in less morbidity, shorter consolidation time, and faster mobility[3]. Published studies have shown that arthroscopic arthrodesis, when compared to the open approach, reduced recovery and hospitalization time, accelerated consolidation time, and reduced soft tissue complications[2,4,5].

The aim of this retrospective study is to present results obtained through arthroscopic ankle arthrodesis in a group of 17 patients in a short-term follow-up.

Methods

The work developed was approved by the ethics committee, being registered on Plataforma Brasil under opinion number 6.417.805.

This is a retrospective study involving 17 patients with ankle arthritis who did not show improvement with conservative treatment. Patients underwent ankle arthrodesis via ankle arthroscopy between January 2015 and December 2020, all performed by the same surgeon.

Study performed at the Hospital Universitário Evangélico Mackenzie, Curitiba, PR, Brazil.

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Inclusion criteria were failure of conservative treatment for six months, deformity of less than 10 degrees in the coronal plane, and no active infection in the ankle. Exclusion criteria were patients with less than two years of follow-up, patients without pre- and postoperative radiographs, osteoarthritis in adjacent joints, and patients undergoing other associated procedures in the foot and ankle.

The American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot score was used for functional assessment of patients, while patient satisfaction and quality of life was assessed by the Patient-Reported Outcomes Measurement Information System (PROMIS Global – 10), with a maximum of 20 points per evaluated item.

The procedure duration and the time for arthrodesis to consolidate were evaluated.

Preoperatively, 1 g of intravenous cephalosporin was administered. All procedures were performed by the same surgeon, with patients under spinal anesthesia. A thigh tourniquet with a pressure of 350 mmHg was applied.

Standard anteromedial portal was used, and the anterolateral portal was established under arthroscopic vision. Large joint power shavers and a 4.0 mm arthroscope were used. We did not use any ankle distractor.

The cartilage covering the tibial plafond and the talus dome, the hypertrophic synovium, fibrosis, or any loose bodies were aggressively debrided with the aid of a motorized shaver blade with a 3.5 mm radius. In addition, a curette was inserted to aggressively remove any remaining articular cartilage. A 4.0-mm full-radius burr was then used to remove the subchondral plate to the level of viable bleeding bone. Crossed 7.0 mm partially-threaded steel cannulated screws were used-one screw placed from the medial side and one screw placed from the lateral side for fixation under the guidance of a C-arm image intensifier. Where there was a varus talar tilt, we started from medial screw; where there was a valgus talar tilt, we started from lateral screw. Both screws were angled to advance down to the body of the talus (starting 30 mm above the tibial plafond), avoiding penetration of the subtalar joint with the foot aligned in neutral position (90 degrees) dorsiflexion, neutral varus-valgus, and neutral rotation (Figure 1). Portals and stab incisions for screw placement were closed with simple sutures.

Bulky compressive dressing and posterior plaster splint were applied for six to eight weeks.

Partial weight bearing in a walker splint was permitted after radiographic appearance of bridging trabeculae. Full weight bearing was allowed after two months.

Statistical analysis

Initially, all data were analyzed for normality of distribution using the Kolmogorov-Smirnov test (KS test). Numerical values were presented as means and standard deviations, with a 95% confidence interval. The difference between the preoperative and postoperative means of the AOFAS and PROMIS scores was estimated using paired t-test. A $p < 0.05$ indicated statistical significance for all tests. Post hoc analysis indicated that statistical power was 96.3% for an alpha error of 0.05 and a large size difference made for the two dependent

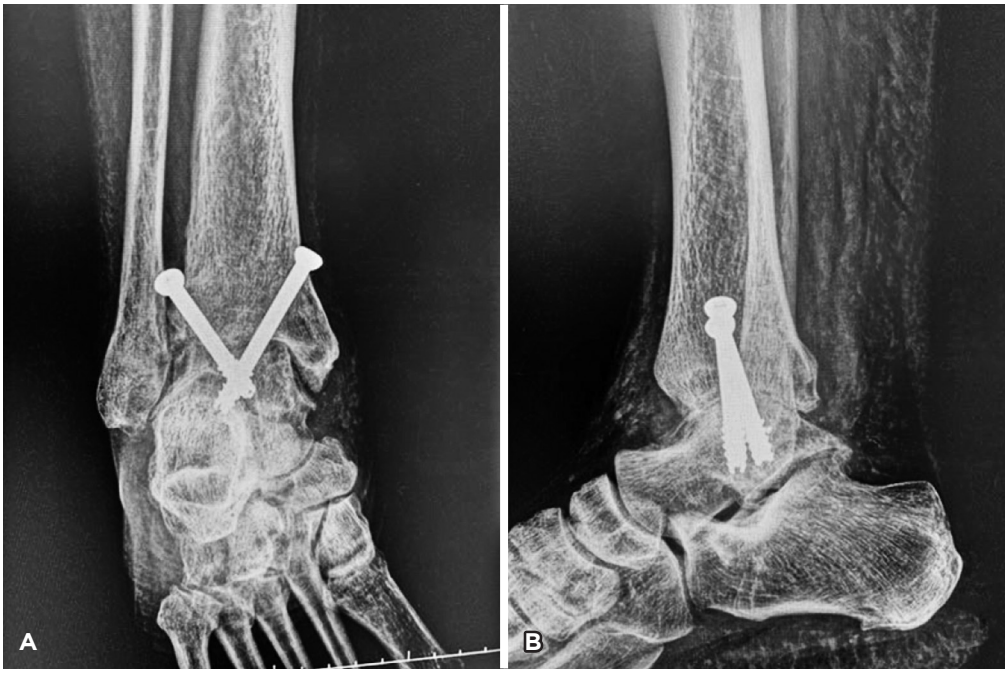

Figure 1. (A) anteroposterior view; (B) lateral view.

means using G*Power version 3.1. For statistical analysis, the Statistical Package for Social Sciences (IBM, version 16.0, Inc, Chicago, IL) was used.

Results

We analyzed 17 patients who underwent arthroscopic ankle arthrodesis (Table 1).

Mean age was 39.6 ± 4.1, and the follow-up was, on average, at 34.3 ± 3.1 months. One case of superficial surgical wound infection treated with oral antibiotics was observed, without other serious complications. There was no nonunion, implant failure, or arthrosis in underlying joints.

Average surgery time was 81.4 ± 7.9 minutes, and all patients were discharged on the day following surgery.

Average time for consolidative arthrodesis was 10.8 ± 1.9 weeks.

The preoperative AOFAS ankle-hindfoot score showed a statistically significant improvement when compared to that obtained at the last consultation (from 55.8 ± 3.2 to 89 ± 2.1, Table 2).

The physical status measured by PROMIS preoperatively increased from 9.8 ± 1.2 to 18.2 ± 1.3; just as mental health increased from 15.9 ± 1.1 to 17.9 ± 1.5 (Table 2).

At the end of follow-up, patients were satisfied with the surgery and returned to work in 20.8 ± 3.3 weeks.

Discussion

Ankle arthrodesis through arthroscopy has been studied over the years and has shown good postoperative results. Advantages, such as shorter time for consolidation, shorter hospital stay, similar consolidation rate, and less pain, have been observed when compared to the open procedure[6].

All patients evaluated in our study progressed to consolidation of ankle arthrodesis, which was confirmed by X ray and clinical findings.

This result is comparable to those obtained by Peterson et al.[7]. One of the concerns of the surgeon responsible for the surgeries in our study was to remove all tibiotarsal cartilage and perform several deepenings in the subchondral bone. After these steps, the tourniquet is released to verify

Table 1. Patients analyzed

Name	Preoperative AOFAS	Postoperative AOFAS	Preoperative PROMIS	Postoperative PROMIS
Patient 1	52	87	8	15
Patient 2	54	91	9	19
Patient 3	59	85	8	16
Patient 4	55	83	9	19
Patient 5	57	84	10	16
Patient 6	55	85	11	17
Patient 7	56	86	10	18
Patient 8	57	87	9	16
Patient 9	58	88	8	17
Patient 10	59	89	9	15
Patient 11	54	90	9	17
Patient 12	53	91	12	18
Patient 13	53	90	11	17
Patient 14	52	88	11	16
Patient 15	55	89	8	17
Patient 16	57	86	9	16
Patient 17	58	85	11	14

Table 2. Pre- and postoperative AOFAS and PROMIS scores

	Pre-op mean	Pre-op 95% CI	Final post-op mean	Final post- op 95% CI	p-value
AOFAS	55.8 ± 3.2	53.1–57.6	89 ± 2.1	87–90.1	<0.00001
PROMIS					
Physical health	9.8 ± 1.2	9.6–11.1	18.2 ± 1.3	17.1–18.7	<0.00001
Mental health	8.9 ± 1.1	8.1–9.8	17.9 ± 1.5	17.1–18.2	<0.00001

CI: confidence interval; AFOAS: American Orthopaedic Foot and Ankle Society; PROMIS: Patient-Reported Outcomes Measurement Information System. A p < 0.01 indicates a significant result.

bone bleeding from the distal tibia and talus. We believe this care was crucial for consolidation in the studied cases. Furthermore, arthroscopy preserves the soft tissues, leading to less damage to the vascularization of the ankle and thus favoring the arthrodesis consolidation.

Average consolidation time was 10.8 ± 1.9 weeks. Several studies show a consolidation time of 9–12 weeks. Our result is similar to that found in the literature[8,9].

Average procedure duration was 81.4 ± 7.9 minutes. Such surgery time is shorter than that found in studies by Gougoulias et al.[10] (104 ± 35 minutes), Wang et al.[11] (140.5 ± 22.2 minutes), and Townshend et al.[12] (99 ± 16.4 minutes). Possibly, the cases included in our study were easier to articulate than those that took longer in other studies. Another possible justification is the surgeon responsible for the procedures in our study having over 10 years of experience in performing arthroscopy.

We found a significant increase in the AOFAS ankle-hindfoot score, which improved from 55.8 ± 3.2 to 89 ± 2.1, a result comparable to that found by Nielsen et al.[5] (AOFAS hindfoot and final ankle of 81.3 ± 3.7) and better than the findings of Wang et al.[11] (77.7 ± 3.8) and Woo et al.[13] (78.9 ± 18.9). This highlights the power of the procedure in improving patients' pain and functionality.

The limitation of our study is the small number of cases evaluated; a larger group is needed to increase statistical power. A control group would also be interesting to evaluate other treatment options and carry out a prospective study, given that ours is retrospective.

Conclusion

Ankle arthrodesis through arthroscopy is a less invasive option that has shown significant improvement in the AOFAS ankle-hindfoot and PROMIS scores, with a high union rate.

Authors' contributions: Each author contributed individually and significantly to the development of this article: BAMS *(https://orcid.org/0000-0002-3008-460X) Conceived and planned the activities that led to the study, interpreted the results of the study, participated in the review process, performed the surgeries, clinical examination; JBV *(https://orcid.org/0000-0002-3025-4584) Data collection, statistical analysis, bibliographic review, survey of the medical records, formatting of the article; HLB *(https://orcid.org/0009-0008-8121-521X) Data collection, formatting of the article; PHST *(https://orcid.org/0009-0008-6742-6838) Data collection, statistical analysis, bibliographic review; RV *(https://orcid.org/0000-0001-5835-9153) Survey of the medical records, formatting of the article, clinical examination; LF *(https://orcid.org/0000-0002-6775-593X) Survey of the medical records formatting of the article. All authors read and approved the final manuscript. *ORCID (Open Researcher and Contributor ID).

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