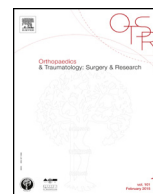




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Original article

Influence of fixation with two vs. three screws on union of arthroscopic tibio-talar arthrodesis: Comparative radiographic study of 111 cases



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ABSTRACT

Background: Ankle arthrodesis is a treatment of choice for advanced tibio-talar disease unresponsive to conservative treatment. Using arthroscopy to perform this procedure minimises soft-tissue trauma while providing similar outcomes to those of open surgery. Union rates have ranged across studies from 85% to 100%. The objective of this study was to assess the potential influence on union of the number of screws used for arthrodesis fixation.

Hypothesis: The working hypothesis was that using three screws for arthrodesis produced a higher union rate than did using only two screws.

Material and methods: This single-centre retrospective comparative study included 111 cases of arthroscopic ankle arthrodesis (in 108 patients) carried out between February 1994 and October 2012. The number of screws was two in 75 cases and three in 36 cases. Union was assessed on radiographs taken 2, 6, and 12 months postoperatively.

Results: Mean age at surgery was 55.8 years. After 12 months, union was achieved in 87.4% cases overall. The non-union rate was 16% with two screws and 5.6% with three screws. Three-screw fixation was associated with a significantly higher rate of union of the medial gutter after 6 months and of the lateral gutter after 12 months.

Discussion: Our findings support the use of three screws for fixation of arthroscopic tibio-talar arthrodesis. Adding a third screw seems associated with a lower risk of non-union and a shorter time to union. These effects can be ascribed to greater stability of the construct.

Level of evidence: Level IV, retrospective study.

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1. Introduction

A distinctive feature of tibio-talar joint disease is the marked predominance of trauma as the aetiology (70% to 78%) [1–3]. Tibio-talar arthrodesis has been proven effective and reliable for advanced disease that fails to respond to conservative treatment [4,5]. Conventional open arthrodesis techniques improve both pain and function [6–8]. Nevertheless, in these patients who often have a history of multiple local surgical procedures, open surgery causes further soft-tissue trauma and can be associated with high rates of complications, including non-union, infection, and impaired healing [9–11]. With the goal of decreasing these complications, Schneider performed the first arthroscopic tibio-talar arthrodesis, in 1983. In recent studies, the arthroscopic technique was

associated with less morbidity, an easier postoperative course, and shorter durations of surgery and hospitalisation compared to the open technique [9–11].

Comparative studies performed by Meng et al. [11], Nielsen et al. [12], and Myerson and Quill [13] showed that arthroscopic surgery produced a similar 1-year union rate to that seen after open surgery but with a shorter time to union. Arthroscopic tibio-talar arthrodesis, which is now a standard procedure, does not fully eliminate the risk of non-union. We started using the arthroscopic technique in our centre in 1992 [14]. Since then, we have modified the fixation method: initially, two screws were used (tibio-talar then tibio- and fibulo-talar), and a third screw was then added, with the goal of increasing the union rate.

Our main hypothesis was that the union rate was higher when three screws, instead of two, were used for tibio-talar arthrodesis fixation. We also evaluated the potential influence of the number of screws on healing of the gutters. Finally, we looked for associations linking the surgical history and arthrodesis position to the union rate.

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Table 1
Characteristics of the two groups.

	2 screws n = 75	3 screws n = 36	Total n = 111	P-value
Age (years) mean ± SD	55.0 ± 14.1	57.4 ± 14.0	55.8 ± 14.0	0.38
BMI (kg/m ²) mean ± SD	27.7 ± 4.6	27.0 ± 3.9	27.5 ± 4.4	0.41
Males/females	50/25	27/9	75/33	0.37
Current smoking (%)	28.4%	38.2%	30.6%	0.31
Vascular disease (%)	17.6%	11.4%	15.3%	0.41
Diabetes (%)	6.7%	16.7%	9.9%	0.10
Glucocorticoid therapy (%)	14.9%	11.4%	13.5%	0.63

BMI: body mass index.

2. Patients and method

2.1. Inclusion criteria

This was a single-centre retrospective comparative study of radiographic outcomes. Consecutive patients who underwent arthroscopic tibio-talar arthrodesis at our centre over the 225-month period between February 1994 and October 2012 were included. During this period, the arthroscopic technique was used routinely for first-line tibio-talar arthrodesis, except when autologous bone grafting was required. The only exclusion criterion was the unavailability of postoperative radiographs allowing assessment of talar dome union 1 year after surgery. All procedures were performed by three senior surgeons (OR, FS, and DM).

The patients were divided into two groups depending on the number of screws used for fixation. At our centre, two screws were used from February 1994 to January 2009 and three screws from February 2009 to October 2012.

2.2. Patients

During the inclusion period, 119 ankles in 116 patients were treated with arthroscopic tibio-talar arthrodesis. For 8 patients, the follow-up radiographs needed for the study were not available. The

Table 2
Causes of ankle joint disease.

Cause	Number	2 screws	3 screws	P-value
Trauma	90 (81%)	58	32	0.64
Infection	9 (8%)	9	0	0.06
Primary	6 (5%)	4	2	1
Neurological	6 (5%)	5	1	0.66
Rheumatic disease	4 (3%)	4	0	0.31
Avascular necrosis of the talus	2 (2%)	2	0	1
Angiomatosis of the joint	1 (1%)	0	1	0.33
Haemophilia	1 (1%)	1	0	1

remaining 108 patients (111 ankles) were included in the study. [Table 1](#) lists their main features. No significant differences were noted between the two-screw and three-screw groups.

Post-traumatic osteoarthritis was the main cause of tibio-talar disease (90/111 ankles, 81%, [Table 1](#)). A history of one or more surgical procedures on the ankle was noted for 61 (55%) ankles, with a mean of 1.6 previous procedures per ankle. Two screws were used in 75 cases and three screws in 36 cases. The causes of tibio-talar disease were not significantly different between these two groups ([Table 2](#)).

2.3. Operative technique

The procedure started with distraction of the tibio-talar joint followed by arthroscopic preparation of the joint surfaces ([Fig. 1](#)). The cartilage was removed and the underlying bone abraded using a curette and a blade ([Fig. 2](#)). The talar dome, tibial joint surface, and medial and lateral gutters were prepared to bleeding.

The second step was fixation of the arthrodesis. Short-thread, cannulated, cancellous screws 7.0 mm in diameter were inserted percutaneously. In the two-screw group, fixation was with a medial tibio-talar screw and a lateral fibulo-talar or tibio-talar screw ([Figs. 3 and 4](#)). When there were three screws, these were medial tibio-talar, lateral tibio-talar, and fibulo-talar ([Fig. 5](#)).

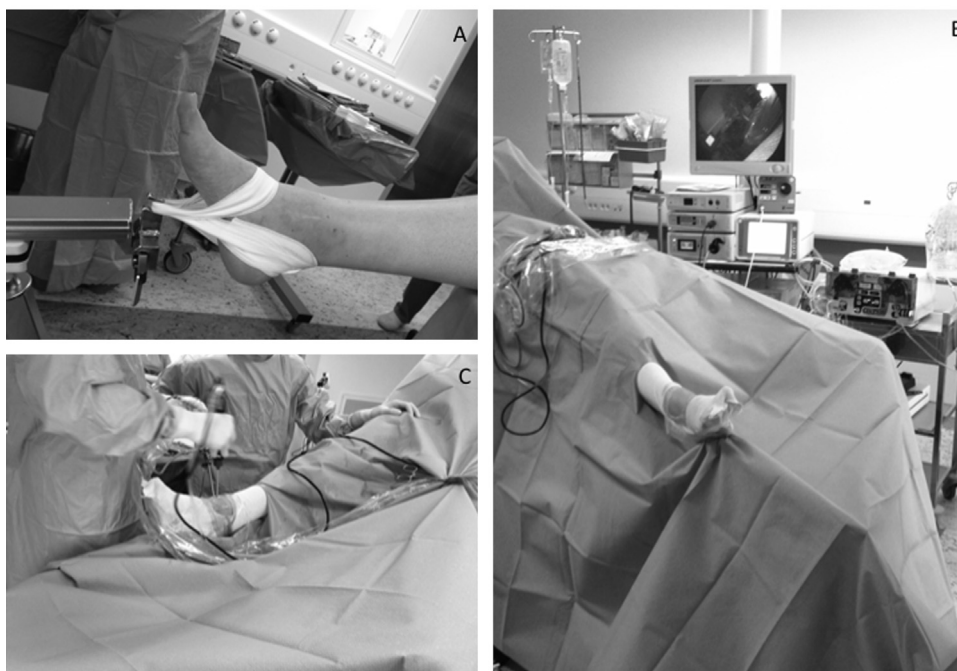


Fig. 1. A. Non-invasive distraction device. B. Installation after draping. C. Intraoperative appearance (arthroscopic step).

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