

## Complex Ankle Arthrodesis Using the Ilizarov Method Yields High Rate of Fusion

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### Abstract

**Background** Ankle arthrodesis may be achieved using the Ilizarov method. Comorbidities, such as diabetes, Charcot neuroarthropathy, osteomyelitis, leg length discrepancy, and smoking, can make an ankle fusion complex and may be associated with lower rates of healing.

**Questions/Purposes** We asked if (1) smoking and other comorbidities led to lower fusion rates, (2) time wearing the frame affected outcome, and (3) simultaneous tibial lengthening improved fusion rates.

**Methods** We retrospectively studied 101 patients who underwent complex ankle fusion using the Ilizarov

technique. The median time wearing the frame was 25 weeks (range, 10–65 weeks). Twenty-four patients had simultaneous tibial lengthening. The minimum followup for 91 of the 101 patients was 27 months (median, 65 months; range, 27–134 months).

**Results** Fusion was achieved in 76 of 91 patients. Smoking was associated with a 54% rate of nonunion. Fifteen of 19 patients with Charcot neuroarthropathy achieved union but had a high rate of subsequent subtalar joint failure. Time wearing the frame did not affect union rates. Tibial lengthening did not improve ankle fusion rates.

**Conclusion** Smokers should be warned of the high risk of nonunion and we recommend they quit smoking. We also recommend surgeons recognize the higher nonunion rate in patients with Charcot neuroarthropathy. We believe tibial lengthening should not be performed to enhance healing at the fusion site.

**Level of Evidence** Level IV, prognostic study. See the Guidelines for Authors for a complete description of levels of evidence.

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Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

*Clinical Orthopaedics and Related Research* neither advocates nor endorses the use of any treatment, drug, or device. Readers are encouraged to always seek additional information, including FDA approval status, of any drug or device prior to clinical use. The work was performed at The Hospital for Special Surgery, New York, NY, USA.

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### Introduction

Ankle arthrodesis has been established as a reasonable salvage procedure for many patients with advanced ankle

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web 1 introducción una matriz es un objeto matemático informalmente podemos decir que una matriz es como una tabla de números tiene filas y columnas y la posición de cada número es relevante la dimensión de una matriz es  $n \times m$   $n \times m$  siendo  $n$  el número de filas y  $m$  el de columnas ejemplo