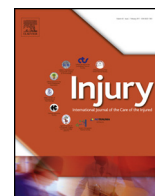




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## Distal tibiofibular synostosis after surgically resolved ankle fractures: An epidemiological, clinical and morphological evaluation of a patient sample

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### ABSTRACT

**Introduction:** Ankle fractures comprise a highly morphologically and etiologically diverse group of injuries, which includes various degrees of impairment of bone and ligamentous structures. The complete synostosis and incomplete bony bridging of tibiofibular syndesmosis are among the local late complications after surgically treated ankle fractures.

**Patients and method:** 269 patients were evaluated, including 203 patients with Weber type-B fractures, and 66 patients with Weber type-C fractures. All patients underwent ankle radiography at standard intervals (post-operatively, 6 and 12 weeks, 6 and 12 months). The final assessment one year after osteosynthesis was performed. The study analyzed age, sex, fracture morphology, the location and morphology of ossification, functional outcomes and subjective evaluations of patient status.

**Results:** As risk factors there were found male sex, tibiotalar dislocation, syndesmotomic screw fixation and Weber type-C fractures. The severity of subjective difficulties and objective status were not dependent on the size of distal tibiofibular synostosis.

**Discussion and conclusion:** Despite relatively extensive imaging findings of complete synostosis or incomplete bony bridging, they only limited functional outcomes to a minimal extent.

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### Introduction

Ankle fractures are among the most common skeleton injuries and are ranked third in terms of incidence after proximal femur and distal radius fractures [1–3]. Complete synostosis and incomplete bony bridging in the area of the syndesmosis occur not only in severe ankle joint injuries, but also in simple fractures or ligamentous ankle injuries. They are caused by hematoma after bone or soft tissue injury to the deep structures of the ankle joint (e.g. ligaments, interosseous membrane) [4,5]. They develop over different time intervals (often three months after injury) and appear as incomplete bony bridging or complete distal tibiofibular synostosis [5–7,13].

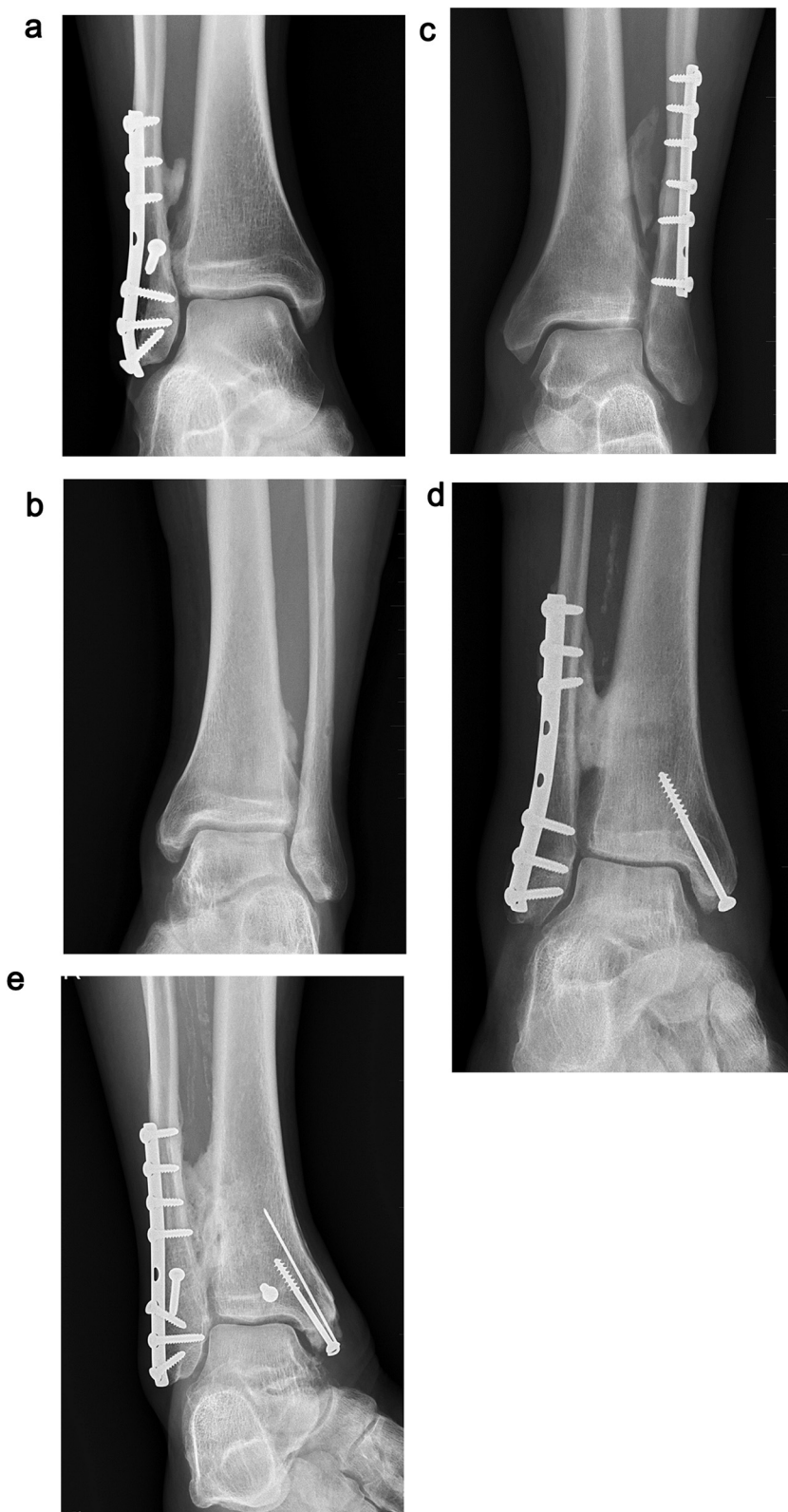
Within the area of the distal syndesmosis as well as the area above it, X-ray images revealed: (1) incomplete bony bridging with fibular, tibial, or free location within the interosseous membrane, and (2) bone formation bridging the entire space between the distal fibula and the tibia (complete synostosis) (Fig. 1a–e).

The objective of this study was to evaluate a sample of patients who underwent surgical treatment of an ankle fracture, with a primary emphasis on the epidemiological, morphological, radiological and clinical aspects of the distal tibiofibular synostosis. An analysis of the groups with complete synostosis, incomplete bony bridging and without ectopic bone formation was performed separately.

### Patient sample and methods

The study is in Level of Evidence on Level 3: Retrospective cohort study without any experimental part.

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**Fig. 1.** X-ray images of incomplete bony bridging and complete synostosis: (a) fibular, (b) tibial – X-ray after metal extraction, (c) isolated bone formation in the interosseous membrane, (d) complete tibiofibular synostosis above syndesmosis, (e) complete tibiofibular synostosis in the area of the syndesmosis.

**Patient sample**

A total of 305 patients (149 men and 156 women) underwent surgical treatment for an ankle fracture at our department between January 1, 2009 and December 31, 2011. Of these

procedures, 12 patients presented with Weber type-A fractures; 213 with Weber type-B; 74 with Weber type-C; and 6 with isolated medial malleolus fractures.

No incidence of synostosis was observed in type-A fractures, or in the group of isolated medial malleolus fractures. The final

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