

New Fixation Methods for the Treatment of the Diabetic Foot

Beaming, External Fixation, and Beyond

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KEYWORDS

- Charcot neuroarthropathy • External fixation • Hindfoot reconstruction
- Midfoot beaming • Plate fixation • Superconstructs • Panfoot arthrodesis

KEY POINTS

- Multiple methods of fixation can be used in the successful reconstruction of the diabetic Charcot foot and ankle.
- New reconstruction-specific systems offer unique locking plates, beaming bolts, and screws that permit easy application with effective realignment and desired compression.
- Augmented external fixation and intramedullary nailing techniques are often used for complex hindfoot correction with successful limb salvage rates.
- Continual development of various fixation methods have helped to achieve long-term, successful outcomes.

INTRODUCTION

Charcot neuroarthropathy (CN) was originally described in 1703 by Sir William Musgrave secondary to complications of known venereal disease.^{1,2} CN, later attributed to Jean Charcot, is an inflammatory arthropathy leading to joint destruction,

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instability, and deformity of the foot and ankle.^{1,3} In 1936, William Riley Jordon reported on the high association of CN with diabetes mellitus (DM) and recognized DM as the primary cause of distal peripheral neuropathy.^{1,2} Patients with neuropathic fracture dislocations with subsequent midfoot or hindfoot deformities are at increased risk for soft tissue ulcerations, osteomyelitis, major lower extremity amputation, and a reduced quality of life.^{1,4} The goals of both nonoperative and operative management are to reduce rates of minor and major amputations through creation of a stable, plantigrade, and ulceration-free foot.⁵⁻⁷

Globally, more than 350 million people are affected with diabetes with estimates nearing 600 million by 2035.^{8,9} The Centers for Disease Control and Prevention estimated that approximately 9.3% of Americans are living with DM, and nearly 28% are unaware of their diagnosis.^{2,10} With the reported incidence of CN between 0.1 and 5% of those with diabetic neuropathy, treatment of its many complications continues to evolve in the medical and surgical realms of medicine.^{5,11} This continued interest has fostered progressive research and new technological advancements leading to a shift toward amputation reduction via stronger emphasis on surgical management for CN ulceration. The surgical management of the CN foot and ankle requires robust fixation strategies to provide consistent long-term stability and deformity reduction. These fixation methods are the focus of this article (Fig. 1).

RECONSTRUCTION TRENDS AND PRINCIPLES

When nonsurgical treatment of the CN foot has failed secondary to persistent deformity, progression to a nonbraceable deformity, or limb-threatening ulceration,

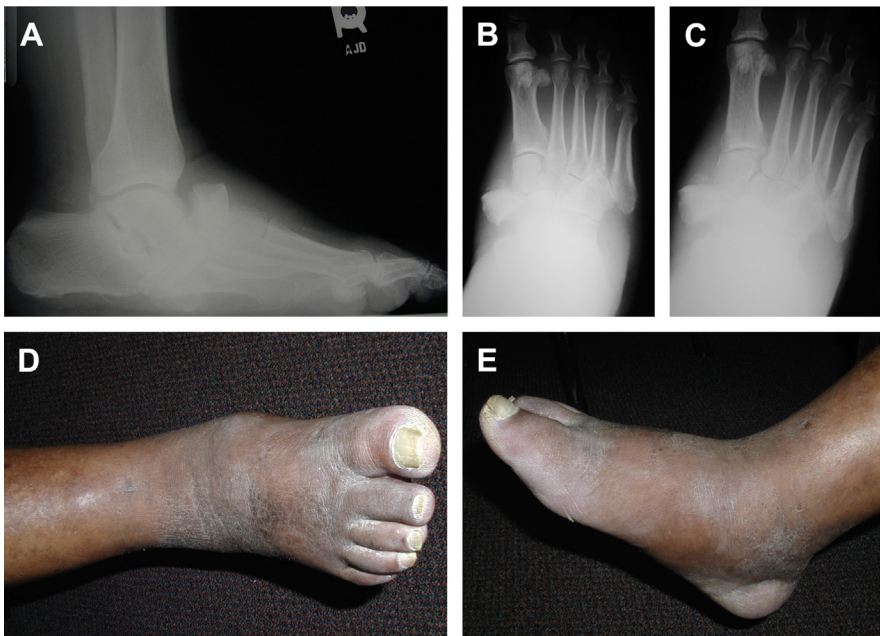


Fig. 1. (A–C) Lateral, anteroposterior, and oblique plain film radiographs of a patient with a midfoot CN deformity with a dorsally and medially dislocated navicular without talonavicular joint instability. (D, E) Clinical photographs demonstrate increased redness and pedal edema, consistent with physical examination findings of CN.

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