



Conservative versus Surgical Management of Charcot Foot and Ankle: A Systematic Review of Literature

Essay

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LIST OF ABBREVIATION

ACA	<i>Acute Charcot arthropathy</i>
CN	<i>Charcot neuropathy</i>
CROW	<i>Charcot Restraint Orthotic Walker</i>
RANKL	<i>Receptor activator of nuclear factor kappa-B ligand</i>
OPG	<i>Osteoprotegerin</i>
EBG	<i>Electronic bone growth stimulators</i>
HFN	<i>Hind foot fusion nail</i>
MFB	<i>Mid foot fusion bolt</i>
PPWB	<i>Prefabricated Pneumatic Walking Brace</i>
TCC	<i>Total contact cast</i>

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Abstract

Introduction: Charcot neuropathy (CN) is a progressive, non-infectious neuro-osteoarthropathy of the bones and joints in patients with sensorial neuropathy leading to destruction of the foot architecture. To date, best practice assessment, diagnosis and management of CN appears to be influenced more by expert consensus than a meticulous evidence-base. This may be because CN is considered one of the rarer complications of those caused by diabetes and thus tends to fall outside of the existing national guidelines or systematic reviews on diabetic foot complications. This paper therefore aims to systematically review current relevant literature and develop an evidence-based clinical pathway for the management of Charcot foot and ankle.

Aim of the work: To review the literature about the management of Charcot foot and ankle and develop an evidence based opinion about the advantages and disadvantages of conservative and surgical management of Charcot foot and ankle.

Materials and methods: Electronic databases (PubMed) will be systematically searched for literature discussing the management of Charcot foot and ankle. After searching PubMed with the key words and applying the inclusion criteria we found 21 papers, 7 of them concerning the conservative management, 12 of them concerning the surgical management and 2 of them concerning both conservative and surgical management of Charcot arthropathy.

Results: different modalities of treatment are compared concerning the outcomes of interest which are: foot ulceration, resolution of acute inflammatory symptoms, postoperative complication and achievement of union and plantigrade foot

Conclusion: surgical management has its complications however it is required to correct deformities and achieve plantigrade foot. Arthrodesis by external fixation is the preferred method to use as it has better results and less complications.

KEY WORDS

Conservative, surgical management, Charcot,
Arthropathy, Foot & Ankle

INTRODUCTION

Charcot neuropathy (CN) is a progressive, non-infectious neuro-osteoarthropathy of the bones and joints in patients with sensorial neuropathy leading to destruction of the foot architecture. CN is an inflammatory condition that leads to osteolysis and is indirectly responsible for the progressive fractures and multiple joint dislocations that characterizes its presentation. It commonly presents in the midfoot but also occurs in the forefoot and hindfoot. CN also has been associated with autonomic neuro-arthropathy, infection (leprosy, HIV), toxic exposure (ethanol, drug related), rheumatoid arthritis, multiple sclerosis, congenital neuropathy, tabes dorsalis, traumatic injury, metabolic abnormalities, and syringomyelia. However, diabetes mellitus has become the most common etiology in recent years.

The goal in the treatment of CN is to achieve a stable foot that is able to fit into a shoe and to also prevent a recurrent ulceration. Treatment depends on many factors including the location, phase of the disease process, deformity, presence or absence of infection, and the other comorbidities. The severity of the disease decides the goals which need to be specific and realistic to achieve while the treatment plan can vary from basic shoe modification to limb amputation.⁽¹⁾

The non-surgical treatment of CN is usually considered for the acute stages and includes offloading of the involved foot, treating the bone disease, and preventing further fractures and/or dislocations. In addition, this treatment can also be used in certain chronic CN patients and foot ulcerations. Offloading is the most important step in the management strategy of acute CN for consolidating the progression of deformity. Total contact casting (TCC) has been considered as the gold standard in the treatment of neuropathic diabetic plantar foot ulcers. The utilization of a TCC reduces the mechanical forces, inflammation, and edema; redistributes the plantar pressure; limits bone and joint destruction; and can consolidate the progression of deformity. Its overall aim is to maintain a foot which can then allow weight bearing in a shoe or a brace.⁽²⁾

Surgical treatment of CN of the foot and ankle is first and foremost dependent on the physician's opinion. Patient's medical comorbidities, compliance, location and severity of deformity, presence or absence of infection, pain or instability are the factors considered in the decision of surgical treatment. In chronic CN, among the surgical techniques of realigning and stabilizing the deformed diabetic Charcot foot, well-known are Achilles tendon lengthening, plantar osteotomy, osseous debridement, realignment osteotomy, selective or extended arthrodesis, and open reduction with various forms of internal fixation with or without external

fixation. There are no comparative studies that have been made between the surgical choices of CN. In recent studies, the advantages of earlier surgical correction of deformity and arthrodesis have been proposed, which are based on the assumption that surgical stabilization would increase a patient's quality of life. Recurring ulcers, joint instability, pain, associated malalignment, prominent exostosis, and potential skin complications from inability to brace or wear a shoe are the most important surgical indications in chronic CN. Due to the increased risk of wound infection and mechanical failure of fixation, surgery should be avoided during the active inflammatory stage.⁽³⁾

To date, best practice assessment, diagnosis and management of CN appears to be influenced more by expert consensus than a meticulous evidence-base. This may be because CN is considered one of the rarer complications of those caused by diabetes and thus tends to fall outside of the existing national guidelines or systematic reviews on diabetic foot complications. This paper therefore aims to systematically review current relevant literature and develop an evidence-based clinical pathway for the management of Charcot foot and ankle.⁽⁴⁾

Table (1): Modified Eichenholtz classification.⁽²⁷⁾

Stage	Radiographic finding	Clinical findings	Treatment
0 (prodromal)	Normal radiographs	Swelling, erythema, warmth	Patient education, serial radiographs to monitor progression, protected weight bearing
I (development)	Osteopenia, fragmentation, joint subluxation or dislocation	Swelling, erythema, warmth, ligamentous laxity	Protected weight bearing with total contact casting or prefabricated pneumatic brace. Cast or brace should be used until radiographic resolution of fragmentation and presence of normal skin temperature (usually needed for 2–4 months).
II (coalescence)	Absorption of debris, sclerosis, fusion of larger fragments	Decreased warmth, decreased swelling, decreased erythema	Total contact casting, prefabricated pneumatic brace, Charcot restraint orthotic walker, or clamshell ankle-foot orthosis
III (reconstruction)	Consolidation of deformity, joint arthrosis, fibrous ankylosis, rounding and smoothing of bone fragments	Absence of warmth, absence of swelling, absence of erythema, stable joint $\pm$ fixed deformity	Plantigrade foot: custom inlay shoes with rigid shank and rocker bottom sole. Non-plantigrade foot or ulceration: debridement, exostectomy, deformity correction, or fusion with internal fixation.

AIM OF THE WORK

To review the literature about the management of Charcot foot and ankle and develop an evidence based opinion about the advantages and disadvantages of conservative and surgical management of Charcot foot and ankle.