Revisional Charcot Foot and Ankle Surgery

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• Charcot foot • Diabetic neuropathy • Diabetic limb salvage
• Revisional foot and ankle surgery • Ilizarov external fixation

RATIONALE FOR SURGICAL INTERVENTION

Certainly not all patients who have Charcot deformities require surgical reconstruction. Many can be effectively managed with proper shoe modifications, orthoses, or bracing. Surgical treatment is indicated for ambulatory patients with recurrent ulceration, unstable scar formation, deep infection, unstable and unbraceable deformities, or chronic pain, however. The goal of operating on a Charcot deformity is to provide the patient with a functional limb that is stable, mechanically sound, and resistant to further skin breakdown while resuming an ambulatory status.[1–4] Reconstructive surgery for Charcot deformities can be quite challenging for the surgeon because of severe irreducible and unstable fractures and dislocations, poor bone quality, infection, and soft tissue compromise.[5]

Revisional cases are even more difficult secondary to inherent conditions, such as scar contractures, nonhealing incisions, further disuse osteopenia, vascular injury, bone loss, nonunions, deep infection, and failed fixation methods. The overall complication rate after surgical intervention for the Charcot foot and ankle varies widely in the literature; however, it is generally thought that patients who have diabetic neuropathy have higher rates of complications.[6] Stuart and Morrey[6] reported a 78% complications rate of neuropathic arthropathy in the failure of ankle arthrodesis, which included nonunions, deep infections, and below-the-knee amputations. As far as revisional surgery for Charcot deformities is concerned, there is little in the literature regarding the management of surgical failures. Unfortunately, surgical complications in the presence of Charcot neuroarthropathy (CN) are often managed with a major limb amputation. At times, a major limb amputation may be warranted or preferred, but alternative surgical procedures and techniques may be useful in the surgeon's armamentarium in managing these difficult revisional cases. The surgical management of Charcot

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deformities is associated with a steep learning curve, and complications are commonly encountered by inexperienced surgeons. This article reviews some of the challenges associated with revisional surgery, discusses potential reasons for surgical failure in patients who have diabetes mellitus and peripheral neuropathy, and, finally, provides some considerations for revisional Charcot reconstruction and limb salvage procedures.[7]

Principles Associated with Revisional Charcot Foot and Ankle Surgery

Establishing a treatment plan for revisional Charcot foot and ankle surgery begins with defining the current issues that need to be addressed, with a time frame for each, while addressing the factors that might have led to surgical failure during the initial operation. Typically, the goals of revisional surgery are different from or perhaps more complicated than those of the initial procedure. There are many potential reasons for treatment failures in the management of Charcot deformities. Those discussed in further detail include the following: missing the correct diagnosis initially, mechanical failure of hardware, recurrent deformity with or without ulceration, appropriately addressing the role of Achilles tendon lengthening, and soft tissue infection with or without concomitant osteomyelitis. Neuropathic osteoarthropathy has been reported by some researchers to contribute to an increased number of complications and failure rates.[1–6] Because revisional surgery may involve multiple complicating issues, a stepwise rationale approach, along with a strong understanding of the timing of surgery, is essential for the patient's successful outcome.

As with any revisional case, a thorough history and physical examination; review of chart records, previous radiographs and imaging studies, operative reports, and laboratory studies; and discussion with the prior treating physicians can give additional insight into the events that led up to a poor surgical outcome. Careful preoperative evaluation and patient selection are fundamental to reduce the risks associated with future surgery. Neglecting such issues as patient compliance and psychosocial issues leads to further complications regardless of the surgical plan. Awareness of patient-related variables that may increase the risks for complications should allow for better preoperative planning and overall management of the patient.

Surgical considerations for the management of failed Charcot intervention mostly depend on the underlying pathologic findings. Often, there are a multitude of factors that lead to poor outcomes, and the treatment approach for revisional surgery is not completely straightforward. The recommendations given here address five major categories that can lead to surgical complications and, at times, limb loss if not appropriately addressed.

Inaccurate initial diagnosis and the "pre-Charcot patient"

If the initial diagnosis of peripheral neuropathy and the loss of protective sensation were not made and the patient was not aggressively immobilized after foot or ankle surgery, a cascade of events can eventually follow, leading to neuropathic fractures, dislocations, and a worsening deformity. The most important factor in potentially altering the outcome of patients who have CN is to have a high clinical suspicion in patients who are "at risk." The surgeon needs to consider, treat, and educate the "pre-Charcot" patient, who can be defined as the patient with a loss of protective sensation detected by a 5.07 monofilament. Similarly, the patient who has diabetic neuropathy and has undergone surgery needs to be treated as a pre-Charcot patient and immobilized 59% longer than the sensate patient and with protective and monitored weight bearing once permitted.