

# Early Results of Using a Locking Intramedullary Nail for Charcot Reconstruction

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## Statement of Purpose

The primary aim for this review was to show the early results of using a new and novel locking intramedullary nail within the medial column for use in the reconstruction of Charcot arthropathy.

**Hypothesis:** The hypothesis for this study was that the utilization of the locking intramedullary nail would lead to successful fusion and stabilization with an acceptable reduction between the preoperative and post operative Meary's angles for the population.

## Literature Review

Charcot neuroarthropathy is a complicated condition that can rapidly cause severe destruction of the bony architecture in the foot resulting in gross instability and deformity. Conservative care is not always successful at maintaining a soft tissue envelope; therefore, surgical reconstruction is often attempted in an effort to salvage the limb.<sup>1</sup>

The challenge of successful Charcot reconstruction is made dramatically more challenging by the osteopenic bone, inelastic tissue, and decreased tensile strength of the connective tissues found in patients with Charcot arthropathy.<sup>2</sup>

Various forms of internal fixation devices from plates, screws, beams and bolts have been described for use in the setting of Charcot reconstruction.<sup>3</sup> Unfortunately, many of these have often been accompanied by complications such as nonunion, dehiscence, and implant failure.<sup>4</sup> The historical inadequacy of traditional internal fixation options have left a continual void in the realm of acceptable hardware options for use in the reconstruction of Charcot neuroarthropathy.<sup>5,6,7</sup>

A potential solution to the historical pitfalls of Charcot reconstructive hardware is using a locking intramedullary nail within the medial column that is evaluated in this study. It is a cannulated 8 mm intramedullary nail made from type 2 anodized titanium with internal compression along with an interlocking screw. The combination of being cannulated along with ease of insertion, strength, compression and preventing migration could potentially lead to improved outcomes and fusion with regards to the reconstruction of Charcot arthropathy.

## Methodology

**Study Design:** Level IV Retrospective Multi-Center Case Series

**Conflict of Interest:** Wright Medical Technology (JL,CJ,WD,AM)

**Population:** N = 14 patients, 12 month follow up.

**Inclusion Criteria:** All patients who underwent reconstruction of Charcot arthropathy using a locking intramedullary nail at the institutions.

**Exclusion Criteria:** Patients with less than 12 months of follow up at time of submission of this poster.

**Procedures:** Reconstruction of Charcot Arthropathy utilizing a locking intramedullary nail in the medial column.

**Primary outcome:** Primary outcomes for the study were : (1) fusion rates for the population; (2) Pre and Post operative Meary's angle reduction; (3) Average time for return to function (4) Adverse events.

**Methods:** Retrospective chart and radiographic review of all patients meeting the aforementioned inclusion criteria.

## Procedure: Complex Charcot Arthropathy Reconstruction



Figures: 58 y/o WF diabetic who developed an unstable painful midfoot Charcot deformity. She underwent a midfoot osteotomy with placement of a locking intramedullary nail within the medial column. Patient also had al subtalar and lateral column fusion. Patient went on to achieve fusion along the medial column in 14 weeks and return to weightbearing at 17 weeks. She maintained correction and fusion at 12 month follow up.

## Results: Primary and Secondary Outcomes

Table 1: Demographics

Variable	N
Patients	14
Gender	10 Males 4 Females
Average Age	62.8 years
Diabetic	12 patients
Smokers	0 patients
Ulceration Present Preoperatively	4 Patients

Table 2: Primary Outcomes

Primary Outcome	N
Fusion Rate	13/14 patients (93%)
Average Time for Fusion	13 weeks
Average Time to Weightbearing	15.3 weeks
Average Preoperative Meary's Angle	25°
Average Post Operative Meary's Angle	3.25°

Table 3: Secondary Outcomes

Secondary Outcome	N
Ulceration Recurrence	None (0%)
Adverse Events	3/14 (21.4%)
Intraoperative Complications	None (0%)
Average Size of IM Nail	8 mm x 130mm
Implant Failure	None (0%)
Need for Multiple Surgeries	2/14 (14%)



Figure 2: 8 mm Intramedullary Nail with Internal Compression Mechanism

## Analysis & Discussion

The 8 mm locking intramedullary nail was utilized within the medial column in the reconstruction of fourteen cases of Charcot arthropathy. Primary outcome measures confirmed the hypothesis by demonstrating an overall 93% (13/14) fusion rate along the medial column in the population. There was one instance of partial nonunion which manifested itself in a stable pseudoarthrosis. The average fusion time was 13 weeks, as confirmed on radiographs showing bony incorporation of 3 out of 4 cortices. The average preoperative Meary's angle was adequately reduced from an average of 25° to 3.25°. The average time for return to functional weightbearing in a brace was 15.3 weeks. The average length of the intramedullary nail was 130 mm within the medial column.

Analysis of the secondary outcome measures speaks to the safety and efficacy of the interlocking nail being used along the medial column. There were no intraoperative complications. Additionally, there was no instance of ulceration recurrence for those patient who had ulcerations preoperatively. There were no instance of hardware failure or limb loss in the case series.

There were three adverse events, all of which are to be considered major adverse adents that required operative intervention for resolution. There were two instances of wound dehiscence that required operative debridement. There was one instance of a stable partial nonunion along the medial column which was a braceable deformity.

Early results indicate that using the locking intramedullary nail within the medial column can be a potent tool that may be utilized in the reconstruction of the unstable Charcot deformity. This implant appears to be stronger and it provides controlled compression compared to beaming screw that has been commonly used. With the nail being cannulated it maintains the reduction of the deformity for ease of insertion, along with internal compression mechanism and the interlocking screw to prevent migration can lead to a stable medial column fusion. The implant appears to be strong enough to resist progression of deformity in regions subject to considerable stress, increasing the chances of successful surgical fusion in this challenging patient population. Our data shows the potential of the system to reduce the rate of hardware failure, nonunions and ultimately limb loss.

## References

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