Progressive Foot Deformity Evident in Neuropathic Charcot Arthropathy at One and Two Years

Foot & Ankle Category: Diabetes

Author(s):
Jeffrey E. Johnson, MD
Mary K. Hastings, PT, DPT, ATC
Michael J. Strube, PhD
Charles F. Hildebolt, DDS, PhD
Kay L. Bohnert, MS
Fred W. Prior, PhD
David R. Sinacore, PT, PhD, FAPTA

Introduction
Foot deformity associated with neuropathic Charcot arthropathy (NCA) contributes to joint instability, ulceration, and amputation. The purpose of this study was to follow patients with and without acute NCA for up to 2 years to examine the magnitude and timing of foot alignment changes.

Methods
We followed 15 subject with NCA (8 men, 7 women) and 19 subjects with diabetes mellitus (DM) and peripheral neuropathy (PN) without NCA (DMPN group) (8 men, 11 women) for one year. Eight NCA and five DMPN participants were followed for two years. Sixteen subjects without DM, PN, or NCA (8 men, 8 women) served as a baseline unimpaired comparison group. Bilateral weightbearing foot radiographs were completed at baseline for all 3 groups, repeated at 6 months for the NCA group, and year one and two for the NCA and DMPN groups. The following measures were obtained from radiographs: Meary’s angle, cuboid height, calcaneal pitch, and hindfoot-forefoot angle. Repeated measures analysis of variance (ANOVA) was used to assess the differences between NCA and DMPN groups, time points, and feet (involved and uninvolved). An ANOVA was used to assess the differences in baseline measures between groups.

Results
Meary’s angle, cuboid height, and calcaneal pitch were worse in NCA involved feet at baseline (p<.05), one year (p<.05), and two years (p<.02) compared with the NCA uninvolved and DMPN feet. Baseline Meary’s angle and cuboid height were worse in NCA involved feet compared to unimpaired comparison feet (p<.01) and Meary’s angle was worse in NCA uninvolved feet compared to unimpaired comparison feet (p=.03). NCA involved feet alignment worsened over year one as measured by Meary’s angle (p<.01), cuboid height (p<.01), and calcaneal pitch (p<.01) and cuboid alignment continued to worsen over year two (p=.01). The NCA involved feet, with six-month interval data during year one, had worsening of Meary’s angle during the first 6 months (p=.03) and remained stable for the remaining follow up period. The change in hindfoot-forefoot angle over one year was worse in the NCA involved feet compared to the NCA uninvolved (p=.02) and DMPN feet (p=.01).
Conclusion
Radiographic alignment measures demonstrate baseline foot deformity with progressive changes (“creep”) over the first and second year. Six-month interval data suggest worsening of alignment of the medial column prior to the lateral column. Repeat alignment measures provide useful information about foot alignment stability and changes our traditional understanding of the natural history of NCA. Radiographic evidence of worsening foot alignment indicates the need for aggressive intervention (conservative bracing or surgical fixation) to prevent limb threatening complications from severe deformity and joint instability. Funded by R21 DK079457, K12 HD055931, K30 RR022251, UL1 RR 024992, R01 DK059224.