Computed Tomography Analysis of Third Webspace Injections for Interdigital Neuroma

Foot & Ankle Category: Midfoot / Forefoot

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Introduction
Interdigital neuroma is one of the most common causes of forefoot pain. Local steroid injection can improve symptoms but can also be complicated by fat atrophy, altered cutaneous pigmentation, telangiectasia, and nerve injury. Inaccurate technique and fluid extravasation can increase the complication rate. The primary objective of this study was to determine the accuracy of injection for interdigital neuromas. Secondarily, we aimed to quantify and localize how much extravasation occurs in surrounding soft tissue. We hypothesized that extravasation occurs beyond what is predicted by the volume injected.

Methods
Two fellowship trained foot and ankle surgeons performed injections into the third webspace of 49 cadaveric specimens. Specimens were free of forefoot deformity or trauma and thawed at room temperature prior to injection. Palpable anatomic landmarks were used to guide injection. Group one included 29 specimens injected with a 2 ml solution (1 ml Omnipaque and 1 ml methylene blue). Group two included 20 specimens injected with a 1 ml solution (0.5 ml Omnipaque and 0.5 ml of methylene blue). The specimens were then frozen and computed tomography scans were obtained. A third fellowship trained foot and ankle surgeon analyzed the scans to determine accuracy of injection. Note was made if contrast had extravasated into the second or fourth webspaces or the third metatarsophalangeal joint. Maximal dimensions of contrast extravasation were determined.

Results
All injections in group one and group two were graded as accurate and none had contrast located within the third metatarsophalangeal joint. In group one, 72.4% and 48.3% of specimens had contrast present in the second and fourth webspaces, respectively. In group two, 75% and 30% of specimens had contrast present in the second and fourth webspaces, respectively. Average maximal dimensions of contrast extravasation in group one were 27.9 mm, 52.1 mm, and 25.2 mm for the medial to lateral, distal to proximal, and dorsal to plantar planes, respectively. Average maximal dimensions in group two were 23.7 mm, 40.4 mm, and 17.1 mm. Group one dimensions were larger than those of group two (p < 0.05). No differences were observed between surgeons.
Conclusion

This study proves our hypothesis that extravasation occurs beyond what is predicted by the volume of injected solution. The large amount of extravasation likely contributes to the high degree of injection accuracy. Given the presence of contrast in adjacent webspaces, steroid injections might not be useful for distinguishing pain in different webspaces. Contrarily, given the lack of contrast in the third metatarsophalangeal joint, steroid injections might be useful for distinguishing nerve and joint pain. Smaller volumes could potentially be used in the clinical setting to minimize complication rate while still maintaining accuracy.