Role of calcaneocuboid arthrodesis versus distal metatarsal osteotomy in treatment of recalcitrant lateral forefoot metatarsalgia

Edward Chen, DPM, MD; Janie Trinh, DPM(PGY-III); Tyson Schmidthuber, DPM(PGY-I); Praveen Vohra, DPM; Christopher Japour, DPM

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Purpose

The purpose of this case study was to explore a novel approach treating chronic lesser metatarsalgia with calcaneocuboid arthrodesis. A possible cause of the pathology was noted on 3D CT recognizing a displaced calcaneocuboid joint and forefoot supinatus position. This finding is not as easily recognized on other imaging modalities.

Literature Review

- Current literature does not provide insight on calcaneocuboid arthrodesis as a indicated procedure for treatment of lesser metatarsalgia.
- The biomechanical implications of calcaneocuboid displacement contributing to lateral metatarsalgia needs to be further studied.
- Isolated calcaneocuboid arthrodesis has little effect on subtalar joint, but limits talonavicular joint to 67% of its normal value[5]

Anatomy

- The calcaneocuboid joint is saddle-shaped joint between the anterior process of the calcaneus and the proximal cuboid and with the talonavicular joint makes up the midtarsal joint.
- The calcaneocuboid joint is supported by inferior calcaneocuboid ligament that has superficial and deep components, weaker dorsal calcaneocuboid ligament, and medial calcaneocuboid ligament (lateral limb of the bifurcate ligament) which may be absent in up to 40% of specimens[3]
- The calcaneus, cuboid, and fourth and fifth rays constitute the lateral column of the foot and behaves as a rigid lever.
- The midtarsal joint allows the foot to transition from being flexible to rigid from heel strike to propulsion.

Proposed Mechanism

- Calcaneocuboid displacement can result in a forefoot supinatus position and plantar flexed lateral metatarsals resulting in lateral metatarsal pain
- Ligamentous laxity resulting in a calcaneocuboid displacement can be caused from a prior forced inversion and plantarflexion injury

Fig 1: Pre-operative 3D CT of Right foot showing dorsal uncovering of the articular calcaneal surface and forefoot supinatus position causing plantarflexed lateral column

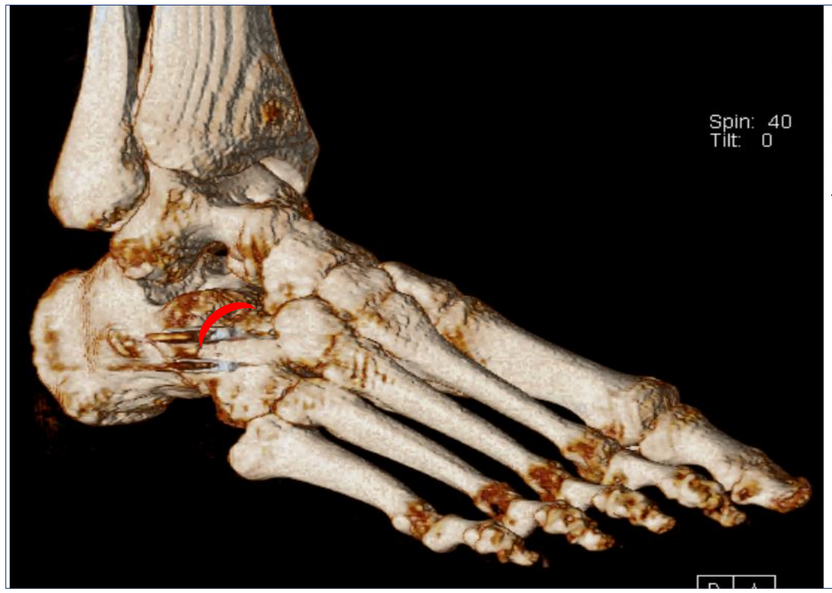

Fig 2: Post-operative 3D CT of Right foot showing realignment of calcaneocuboid joint.

Case Study

- 40 year old female veteran presented with chronic pain to the Right 3rd and 4th metatarsal heads with no inciting injury that she recalls. Prior treatment included corticosteroid injection by outside podiatrist. The pain is exacerbated with extended activity and with her sport. She is an active tennis player. Initial treatment included a rheumatological workup and MRI to evaluate pathology. MRI showed fluid accumulation between 3rd and 4th metatarsals and was treated as a transverse metatarsal ligament tear with dHACM injection leading to ligamentous healing seen on ultrasound. However, she had residual metatarsal joint pain that was treated with physical therapy, phontophoresis and orthotics. She returned with recalcitrant pain to the 3rd and 4th metatarsophalangeal joints and was considering surgical treatment.
- CT imaging with 3D rendering was performed on the Right foot due to negative findings on repeat MRI, ultrasound and xrays. 3D CT image revealed a displaced CC joint with dorsal uncovering of the articular calcaneal surface resulting clinically in a painful forefoot supinatus deformity. Visualization of the plantarflexed lateral column was also evident and consistent with previously visible plantarflexed metatarsal noted from the initially documented traditional three view radiography.
- Based on these findings, a calcaneocuboid arthrodesis was performed with the intent to lifting the lateral column to reduce lateral forefoot pressures.

Results

- The patient remained non-weightbearing in a cast for 6 weeks. At 4 weeks post-op patient had no pain to palpation to the third and fourth metatarsal heads or upon loading of the lateral column.

Discussion

- Lesser metatarsalgia is a condition traditionally attributed to plantarflexed deformity requiring metatarsal osteotomies. 3D CT image identified a more proximal deformity indicating calcaneocuboid arthrodesis as a possible treatment for this condition.
- CT imaging can be used to further identify a correlation between amount of calcaneocuboid joint displacement and lateral forefoot plantarflexion.
- Preliminary results are promising and long term surveillance will provide additional insight to efficacy and functional outcome of this approach

References

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