First Metatarsocuneiform Joint Fusion with Dorsiflexory Wedge Osteotomy for the Treatment of Chronic Submetatarsal Head One Plantar Ulceration(s)

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Introduction

Almost one-quarter of diabetic foot ulcerations occur at the plantar first metatarsal head.1 If infection develops, partial or complete first ray amputation may be necessary. This amputation has a 20-60% re-amputation rate to a more proximal level (additional digit, TMA, BKA).2,3 One method shown here to prevent/heal these chronic ulcers is to perform a first metatarsocuneiform joint fusion with dorsiflexory wedge osteotomy to elevate and shorten the plantarflexed or long first ray. After evaluating the pre-operative lateral Meary’s angle, first ray declination may be corrected to normal limits. This procedure can help prevent or cure ulceration by reducing and redistributing pressure, preventing ray (or even greater) amputation.

Case Presentation

Two male type-2 diabetic patients, aged 27 and 53 years old, presented to our clinic with sub-metatarsal head ulcerations greater than 2 months old. Initially the ulcers had fibrogranular bases with hyperkeratotic rims and appeared non-infected with a negative probe to bone test. The patients tried and failed local wound care therapies for over 1 month by the surgeon and surgery (first metatarsocuneiform joint fusion with dorsiflexory wedge osteotomy) was recommended. Pre-operative the patients had a lateral Meary’s angle of 21° and 11° respectively with post-operative correction to 14° and 5° respectively. The surgery consisted of a dorsally based bone wedge removed about the first metatarsal-medial cuneiform joint with joint fusion using interfragmentary screw and 4-screw plate fixation. One patient received a porcine small intestine submucosa graft while the other used baclofenig gel during the post-operative healing phase. After 4 weeks of non-weightbearing in a CAM boot both ulcers were less than 0.05cm. Once complete healing occurred in both patients at the 8 week mark, no recurrence of ulceration, ulcer-curettage lesion, or new transfer lesion has been noted at 10 months of follow-up.

Results

- Lateral Meary’s angle has a normal value of 5° (1°-9°; or ±4°).4
- The angle is between lines drawn from the centers of the longitudinal axes of the talus and the first metatarsal.
- The apex of our osteotomy is plantar with cuts made (1) proximally in a dorsal-proximal → plantar distal and (2) distally in a dorsal-distal → plantar-proximal orientation
- A dorsiflexory wedge procedure of the first ray (first metatarsal or first cuneiform cartilage) while the (2) distal cut is made distal-dorsal → plantar-proximal.
- **Angles drawn and measured by lead author using Bone Ninja application for iPad (LifeBridge Health, Sinai Hospital of Baltimore, Baltimore, MD)**
- 27M: (Top) Pre-Op XR with a Lateral Meary’s Angle of 21°. (Bottom) Post-Op XR with a Lateral Meary’s Angle of 14°. A plate with 4 locking screws and an additional interfragmentary screw was used to achieve fixation (compression) across the joint.
- 53M: (Top) Pre-Op XR with a Lateral Meary’s Angle of 11°. Note the ulceration seen plantar to the subcutaneous tissue as a loss of soft-tissue integrity. (Bottom) - Post-Op XR with a Lateral Meary’s Angle of 3°. A plate with 4 locking screws and an additional interfragmentary screw was used to achieve fixation (compression) across the joint.
- 53M: Pre-op, initial clinic encounter (1.45cm), (B) Post-op after 1 week of TCC with maceration (wound enlargement to 1.76cm), (C) 2 weeks post-op, (D) 8 weeks post-op (clinically healed at 0.01cm).

Discussion

• A dorsiflexory wedge procedure of the first ray (first metatarsal or first metatarsocuneiform with fusion) is described for correction of a plantarflexed first ray, indicated in structural, non-reducible deformities. These include forefoot valgus or cavovarus foot types, or the diabetic foot with ulcer or pre-ulcerative lesion.1-4

- The lateral Talo-1st Metatarsal Angle a.k.a. Lateral Meary’s Angle measures the apex of deformity in pes cavus or planus foot types. Normal Meary’s Angle is measured at ± 4° or has been described as parallel line.

- The first metatarsocuneiform joint fusion with dorsiflexory wedge osteotomy procedure removes a piece of bone about the first metatarsal-medial cuneiform joint. Dorsiflexion of the metatarsals is performed to reduce sub-metatarsal head one pressure.

- This cut can be made subjectively, as done here, or objectively on the field with C-arm assistance. Creating a pre-operative template to excise the correct amount of bone to achieve an angle within normal limits has been recommended. Geometry can be used to plan a wedge excision for desired sagittal plane correction.4

- After a 4 week period, a reduction in wound size less than 53% is a cutoff that predicts a poor healing outcome at 3 months.7 Considering this, surgery was ordered in the cases presented here to attempt to structurally unload the foot, correcting the etiology of the problem.

- Both ulcerations in the cases presented were healed to less than 0.05cm at 4 weeks with complete resolution at 8 weeks post-operation.

- No recurrence of ulceration, pre-ulcerative or callous lesion, or new transfer lesion has been noted at 10 months of follow-up due to the offloading achieved to the area and respect paid to the metatarsal parabola and adjacent metatarsals’ inclination angles.

- Additional therapies such as baclofenig gel and porcine small intestine submucosa grafting along with a non-weight-bearing post-operation protocol assisted in wound closure but structural correction to the underlying pathology appears to have prevented ulcer recurrence.

References