Introduction

Metatarsalgia is a broad term for pain under the metatarsal head, and can be caused by many things such as altered metatarsal parabolas, Freiberg’s infraction, or metatarsophalangeal joint dislocation. Non-surgical treatment such as metatarsal pads, orthoses, and custom shoes can be helpful to temporarily relieve symptoms.

There are several surgical options including dorsal soft tissue release with or without pinning, and silicone implants. When it is determined that metatarsal length is the pathological process, a metatarsal shortening osteotomy is indicated such as the Weil osteotomy of the commonly used Weil osteotomy. We present a case review of 12 patients evaluating the effectiveness of using the zero profile screw with a cylindrical resection osteotomy for a metatarsal shortening procedure. The purpose of the retrospective chart review was to evaluate the efficacy of the zero profile screw for less metatarsal shortening.

Methods

This is a retrospective chart and radiographic review of 12 patients with indications for a lesser metatarsal shortening procedure. All patients failed conservative treatments including padding and shoe gear modifications and requested definitive treatment.

All 12 patients underwent a lesser metatarsal columnar shortening with a zero profile screw.

Surgical Technique

A longitudinal incision was performed over the dorsal aspect of MTPJ. The incision was deepened through subcutaneous tissue taking care to identify and resect neurovascular structures. The long extensor was identified and freed and retracted out of the way. A dorsal capsulotomy was made over the second MTPJ. Care is taken to preserve lateral and medial soft tissue structures around the metatarsal head. The metatarsal neck was identified and the periosteum was reflected transversely several millimeters (Figure 1).

Next, a cylindrical wafer of bone is then cut with a sagittal saw and removed. The size of the bone cut was dependent upon the amount of shortening desired (Figure 2).

A guide pin was then placed for a 2.5 mm cannulated headless screw (Orthohelix Zero Profile; Medina, Ohio) through the metatarsal head across the osteotomy site, thus reducing it. The metatarsal was overdrilled utilizing the 2.0 and the 2.5 mm cannulated screw placed in. The screw is buried approximately 2 mm under the outer surface of the articular cartilage (Figure 3). The K-wire was subsequently pulled and the osteotomy site was checked for stability (Figure 4). Additional procedures were performed according to patients complete pathology including some toe PJF fusions. The incision site was flushed with normal saline and closed in layers utilizing 3-0 and 4-0 Vicryl and 4-0 Proline suture. Pre- and postoperative radiographs were compared for correction of paraesthesia (Figures 5-6).

Results

The described procedure was performed in 12 patients over a two-year period. Average follow up was nine months (range, 5-24 months). Seven of the 12 patients (58%) had an excellent result with no complications. Three of the patients (25%) experienced capsulitis or transfer metatarsalgia to adjacent metatarsals. All three were relieved with orthoses. Medial subluxation occurred in one patient (8%) but the patient was still satisfied with the result.

Dorsal skin contracture occurred in one patient (8%) and was relieved with v. p. skin plasty. All 12 patients reported that they were satisfied with the result and would be willing to have the procedure again.

Discussion

There are several surgical options for metatarsal shortening procedures including dorsal soft tissue release with pinning, silicone implants, Helal osteotomy and the Weil osteotomy. The Weil osteotomy is a procedure that is commonly performed on long metatarsals. This is an oblique osteotomy of the metatarsal neck and shaft that is as parallel to the ground as possible and is fixated internally by pins or screws. The Weil osteotomy is a viable option for treatment of lesser MTP joint dislocation. However, the Weil can be difficult to control shortening as well as lead to floating bone. O’Kane and Kilmin reported a 20% incidence of floating bone. Vandepitte et al. reported 15%, while Migues et al. reported a 28.5% incidence. According to Trnka, the Weil osteotomy leads to depression of the plantar fragment and this depression changes the center of rotation of the MTP joint (Figure 7). With depression of the fragment the internosal loses their mechanical advantage and become more dorsiflexion than plantarflexion. With the cylindrical shortening and ZP screw fixation there is no plantar hardware irritation under the metatarsal head. Placing fixation through the articular cartilage surface there is some cartilage damage. However with the buried zero profile screw the defect is minimal and is likely replaced quickly with fibrocartilage, similar to pinning with a K-wire.

Conclusion

Central metatarsalgia due to irregularity in metatarsal parabolas is a common problem and several surgical procedures have been introduced for treatment. We believe that the cylindrical osteotomy with buried zero profile screw fixation is an effective and viable option for central metatarsal shortening.

References