EFFECT OF MCGLAMRY ELEVATOR PLACEMENT ON THE PLANTAR PLATE ORIGIN: A RADIOGRAPHIC AND ANATOMIC ASSESSMENT

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Introduction: Lesser metatarsal phalangeal (MTP) joint plantar plate tears have been implicated in a variety of lesser toe pathologies, and plantar plate repair (PPR) through a dorsal approach has become increasingly popular as a treatment of lesser toe deformities and lesser MTP instability. With the aid of a McGlamry elevator, releasing the collateral ligaments and micro-suture passing techniques, the plantar plate is repaired under direct visualization. While this approach is seen as a reliable alternative, the consequence of this technique on local MTP joint anatomy is not yet well understood.

Purpose: The purpose of this study is to describe the proximal plantar plate attachment and to quantify the amount of soft tissue disruption of the lesser toe MTP joint anatomy with insertion of a McGlamry elevator.

Methods: Fresh frozen human cadaveric feet were dissected, and the proximal plantar plate attachment of the second, third, and fourth toe MTP joints (n=12) were examined, focusing on the relationship of structures connecting the distal metatarsal shaft and head to the plantar plate. The accessory collateral ligament insertions and proximal plantar plate attachments were measured using digital calipers. Next, the second, third, and fourth rays (n=6) of separate fresh frozen cadaveric specimens were isolated. An 11mm McGlamry elevator was then inserted in standard surgical fashion in both a more shallow (limited exposure) and deeper (greater exposure) position. Using mini C-arm fluoroscopy, radiographs were taken in both positions, and the depth of insertion along the metatarsal was measured.

Results: The most proximal plantar plate attachment to the metatarsal is most robust just proximal to lateral articular margin and this attachment extends an average of 10.42mm (SD=2.71mm) proximally along the metatarsal neck and shaft. In addition there are stout proximal plantar plate attachments at the bilateral insertion sites of the accessory collateral ligament (ACL) which are thick and broad with an average insertion length of 9.01mm (SD=1.35mm). Insertion of a McGlamry elevator resulted in stripping of the distal plantar soft tissues over an average of 21.58% of the total metatarsal length (SD=4.43%) for shallow placement and 34.87% (SD=4.40%) for deep placement with a significant difference of 7.67% between the two positions (p<.00001).

Conclusion: Current techniques of plantar plate repair through a dorsal approach require releasing collateral ligaments and proximal stripping of the plantar plate from the metatarsal for adequate visualization. We suggest that this significantly destabilizes the metatarsal from the plantar plate as it strips approximately the distal most one third of the metatarsal including all major proximal plantar plate attachments to the metatarsal. As surgical techniques evolve and improve, surgeons should consider avoiding the placement of a McGlamry elevator as this can destabilize the proximal attachment of the plantar plate to the metatarsal.