MedStar Georgetown University Hospital

Modified Extensor Digitorum Brevis Tendon Transfer for Revisional Reconstruction of Severe Multiplanar Lesser Metatarsophalangeal Joint Deformity: A Case Report

Jayson N. Atves, DPM, CO, AACFAS[1], Nam Tran, DPM[2], Caitlin S. Zarick, DPM, FACFAS[3]

1: Fellow - Pennsylvania Intensive Lower Extremity Fellowship, Malvern, PA, U.S.A. 2: PGY-3 Resident Physician - MedStar Washington Hospital Center 3: Attending Physician - MedStar Washington Hospital Center, Washington, D.C., U.S.A.

MedStar Washington Hospital Center

ABSTRACT

The extensor digitorum brevis (EDB) tendon transfer and its modifications are useful for deformity correction about the lesser metatarsophalangeal joints (MTPJ). The modified EDB tendon transfer with specialty suture supplementation provides powerful and lasting correction about the MTPJ including deformities of varying severity and in multiple planes. The purpose of this review and case report was to provide a detailed review and descriptor of a uniquely severe case of MTPJ deformity about the lesser MTPJ.

LITERATURE REVIEW

The EDB transfer, initially described as a selective treatment for second toe crossover, was found to be superior to flexor-to-extensor transfer in second toe deformity based on diminished postoperative stiffness and pain in EDB transfer versus flexor-to-extensor transfer. Authors noted, however, that in the case of rigid deformity, FDL transfer provides more postoperative stability and is therefore the preferred procedure[1].

Schwartz[2] originally described the first extensor tendon transfer for stabilization of a lesser MTPJ. In this preliminary study the author utilized the extensor digitorum longus (EDL) tendon harvested proximal to Lisfranc's joint level and routed through bone tunnels in the proximal phalanx and metatarsal neck and subsequently sutured the tendon to the surrounding soft tissues dorsal to the metatarsal to produce a static stabilizer to the MTPJ. This technique was performed on just eight patients in ten digits and only for deformity of the fifth MTPJ.

Haddad et al[3] described 2 techniques for lesser digit deformity correction, comparing the flexor digitorum longus (FDL) tendon transfer to the EDB tendon transfer. In the EDB transfer they proximally transected tendon and routed the distal portion lateral to the MTPJ and plantar to the transverse metatarsal ligament and then tied to the proximal portion via end-to-end repair. They demonstrated patients receiving EDB transfers reported less pain and stiffness and did note a higher rate of recurrence with increasing severity of deformity.

Lui et al[4] described a modification of the EDB tendon transfer by routing the distal stump of the EDL tendon to the lateral side of the proximal phalanx through the bone tunnel to eliminate the frontal plane supinatory force of the transfer. The EDL stump is then passed plantar to the intermetatarsal ligament and sutured to the proximal stump of the EDB tendon with side-to-side anastomosis.

Myers and Schon[1] described a modification utilizing a mini biotenodesis screw for tendon fixation into the metatarsal neck, but without the creation of a phalangeal bone tunnel. Rather, the EDB slip was routed deep to the extensor apparatus, and this was performed with a concomitant Weil osteotomy.

Finally, Hobizal et al[5] described the modified EDB tendon transfer wherein the tendon is harvested as proximal as possible and routed through bone tunnels in both the proximal phalanx and metatarsal neck and secured in place under corrective tension with the use of a biotenodesis screw in the metatarsal neck.

CASE REPORT

We present the case of a 49 year old Female with chronically recalcitrant severe multiplanar 4th and 5th digital deformities s/p previous 4th and 5th metatarsal head resections **(Figure 1)**. She presented with a history of Diabetes Mellitus Type 2 with Charcot's Neuroarthropathy and had undergone previous medial column fusion and partial digital #2 amputation, complete digital #3 amputation and metatarsal head resection #3, #4 and #5. Her chief complaint was her lack of ability to purchase the ground with digits #4 and #5 and an inability to successfully navigate appropriate shoegear.

The decision was made to pursue surgical reconstruction at MTPJ #4 and #5 with a modified Extensor Digitorum Brevis Tendon transfer. Considering the patients previous pedal amputations, it was theorized that there may be inadequate bone structure for corrective tunneling and there may be abnormal EDB tendon anatomy. Remaining EDB tendon was harvested proximally. Bone tunnels were created using the 1.5mm drill in a dorsal-proximal-medial to plantar-distal-lateral through the metatarsal and dorsal-medial to plantar-lateral through the proximal phalanx and the EDB and specialty suture tape were secure in place under reduction with suture button and Kirshner wire fixation **(Figure 2)**.

The patient was place non-weight bearing for a period of 4 weeks at which time the temporary K-wires were extracted and postoperative observation commenced. After a period of 14 months the patient maintained EDB and specialty suture fixation with excellent triplanar deformity correction **(Figure 3)**.

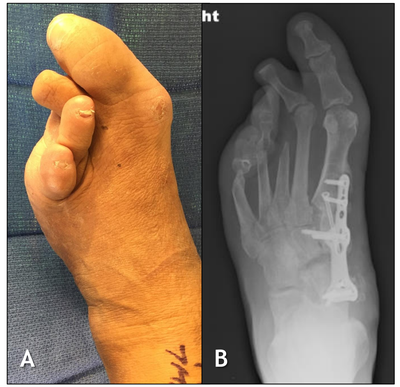

FIGURE 1A & 1B: Preoperative AP Clinical and Radiographic imaging, respectively. The patient's primary complaint was severe multiplantar deformities of digits #4 and #5.

FIGURE 2A & 2B: Postoperative AP Clinical and Radiographic imaging, respectively. Triplanar MTPJ deformity correction was attained via EDB tendon transfer with specialty suture supplementation with suture button and Kirschner wire fixation.

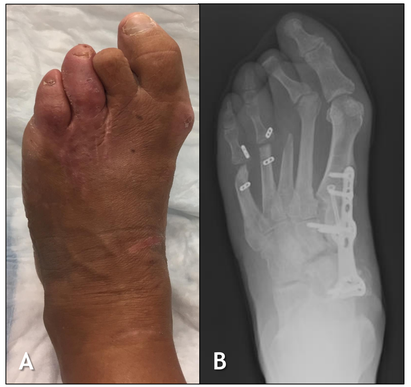

FIGURE 3A & 3B: Follow-up AP Clinical and Radiographic imaging, respectively, with maintenance of suture button fixation and excellent multiplanar deformity correction.

CONCLUSION

Multi-planar lesser metatarsophalangeal joint deformities are a common cause of forefoot pain and sequelae and afford a great deal of frustration to patients and surgeons alike. These deformities are caused by some alteration of the normal anatomic interaction of the static and dynamic stabilizers of the MTPJ. For those patients with severe lesser multiplanar metatarsophalangeal joint deformity who fail conservative treatment, the Extensor Digitorum Brevis tendon transfer with specialty suture supplementation provides impressive MTPJ deformity reduction, stability and a lasting functional correction without necessitating metatarsal osteotomy.

However, a thorough understanding of the anatomy and pathology of lesser metatarsophalangeal joint deformity is essential in determining the appropriate management course, achieving and maintaining correction in an individualized patient manner. As seen in this unique but isolated case report the EDB tendon transfer is a powerful and durable technique for severe multi-planar MTPJ deformity and may be a useful instrument of the foot and ankle surgeon's armamentarium.

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