



Development of Checkrein Deformity After Osteocutaneous Fibula Free Flap



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Statement of Purpose

To review a case in which a patient developed a checkrein deformity following harvest of vascularized free fibula flap.

Level of evidence: Level IV

Literature Review

Vascularized fibular osteocutaneous flaps are a "workhorse" flap for reconstruction of facial defects. Technique often involves stripping the fibula of muscular attachments prior to harvest. The flexor hallucis longus (FHL) is the only muscle with its sole origin on the fibula, making it most prone to disruption following flap harvest.

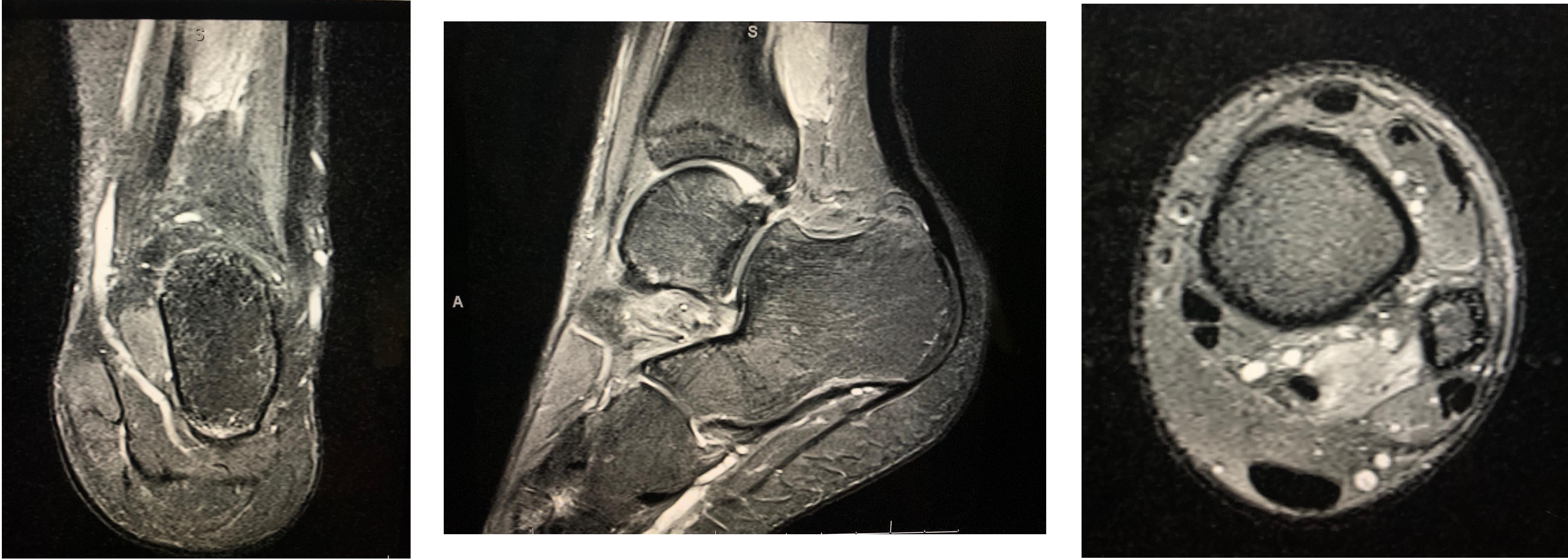
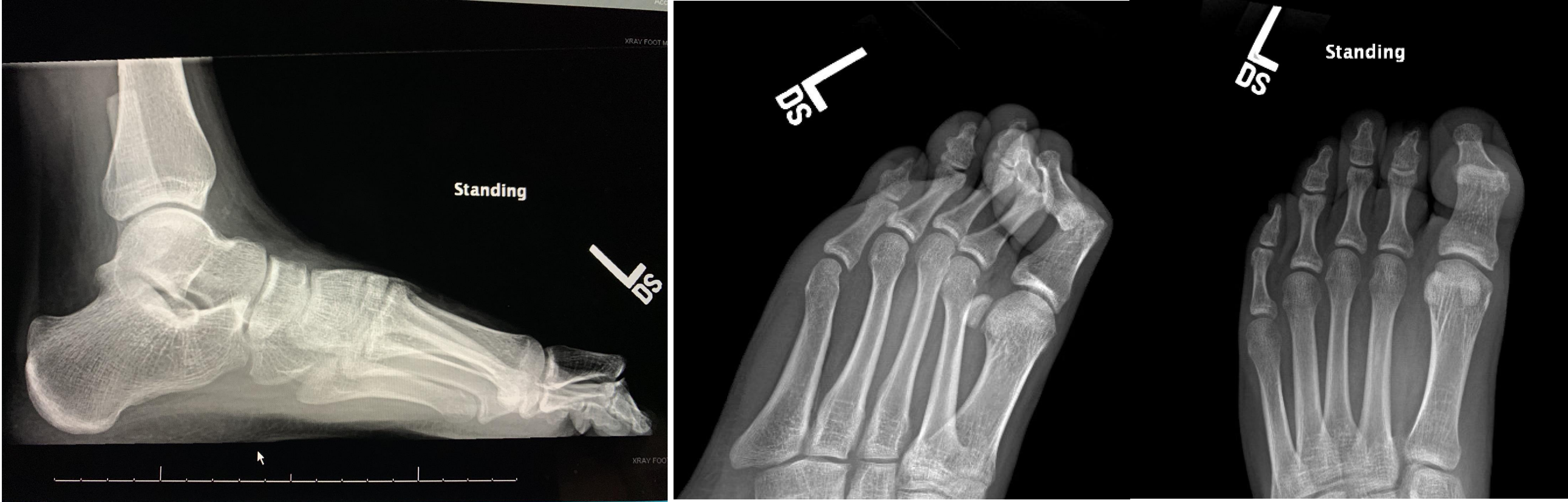
Standard technique generally describes resuspension of the FHL muscle belly to the interosseous membrane after harvest, however specifics on hallux positioning or tension during resuspension is rarely discussed. Post-operative course is generally limited to a short period of weight bearing in a controlled ankle motion boot.¹

Acquired flexion deformity may be due to tethering or contracture of the muscles of the deep posterior compartment of the leg. This produces a "fixed-length phenomenon" of the long toe flexors which may be described as a "checkrein" deformity.²

Case Study

- 17-year-old male presents to the UPMC Foot & Ankle office approximately 2 months after undergoing a free fibula flap for facial reconstruction status post maxillectomy for juvenile ossifying fibroma. His symptoms started 2-3 weeks after surgery.
- Chief complaint: Painful contracted hallux and second digit with dorsiflexion of the ankle during physical therapy. Pain is mostly at his hallux IPJ during ambulation.
- Physical exam revealed complete flexion and extension of all digits with full strength of FHL, EHL, FDL and EDL. Plantorflexory contracture of the hallux MTPJ and IPJ with ankle DF. Plantorflexory contracture of 2nd digit MTPJ, PIPJ and DIPJ with ankle DF. No contracture noted with ankle joint PF. No pain with MPTJ ROM, mild pain with HIPJ ROM.
- MRI revealed denervation edema and atrophy of the FHL muscle belly. FHL tendon was normal.
- Surgical intervention involved linear incision posterior and proximal to medial malleolus, Z-lengthening of FHL, FHL muscle biopsy and percutaneous 2nd digit flexor tenotomy.
- NWB 1 week, WBAT in a CAM boot 2-8 weeks, FWB after 2 months.
- Pathology: Chronic neurogenic changes to FHL muscle.
- Patient with complete resolution of symptoms at 1 year follow-up.

Case Study



Row 1: Clinical photos. Row 2: Films showing hallux contracture and fibular osteotomy. Row 3: MRI showing atrophy and edema of the FHL muscle belly.

Analysis and Discussion

Our patient's symptoms began shortly (<1 mo) after harvest of his fibula from the same extremity for facial reconstruction. When his ankle was plantarflexed, his deformity was flexible and correctible. Once the ankle was dorsiflexed to neutral, the deformity became rigid due to the "fixed-length phenomenon" of his long flexor tendon.²

MRI and muscle biopsy suggested denervation atrophy of his FHL muscle. Ischemic denervation is commonly seen after compartment syndrome. Volkmann first described these contractures in the upper extremity in 1881.³ Contracture of the long flexors has been reported as a sequela of compartment syndrome of the lower extremity.⁴ Subclinical compartment syndrome and long flexor contracture has been reported as a complication even in isolated ankle fractures.⁵

Feeny published a series of 10 patients with claw toes, all post-traumatic in etiology, treated with long flexor tendon lengthening via a retromalleolar approach. All patients had full correction of deformity without recurrence.⁶ Lee compared posterior approach with FHL adhesiolysis or midfoot approach with Z-lengthening, finding that the midfoot lengthening group had a lower recurrence rate.⁷

Another possible cause of acquired flexion deformity is soft tissue entrapment. Jahss noted that the hallux may become contracted after fractures of the foot and ankle due to tethering of the FHL at the flexor retinaculum.² He advocated for retromalleolar adhesiolysis, tendon lengthening, and even interphalangeal joint fusion for deformity correction. Leitschuh described a case of checkrein deformity following fixation of a fibular fracture. Upon operative intervention, adhesions of the FHL muscle belly to the fracture callus were noted.⁸

Cases of checkrein deformity following fibular flap harvest continue to appear in contemporary literature.⁹ Rates of this complication vary, and there is limited literature evaluating donor site morbidity in these patients. Ling performed a systematic review of 42 articles and found a 6.1% rate of claw toe deformity.¹⁰ López-Arcas reviewed 15 years of free fibula patients and found a 19.8% rate of claw toe deformity.¹¹

Our patient underwent an FHL tendon lengthening at retromalleolar level as well as a percutaneous 2nd digit flexor tenotomy with excellent results at final follow up. FHL tendon contracture is a relatively common donor site complication after free fibular flap. This study explores a relatively minor surgical correction which allowed our patient to continue his recovery from major facial reconstruction.

References

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