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Deltoid-Spring Ligament Reconstruction in Stage IIB Adult Acquired Flatfoot Deformity with Spring Ligament Tear

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Category: Hindfoot

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Introduction/Purpose: Spring ligament tear is often present in advanced stages of the Adult Acquired Flatfoot Deformity (AAFD). Previous anatomic studies have demonstrated that the superficial deltoid ligament blends with the superomedial spring ligament to provide both medial tibiotalar and talonavicular stability. They form a large confluent ligament, the tibiocalcaneonavicular ligament, (TCNL) which is the most consistently found component of the deltoid ligament. For surgical reconstruction of advanced stage AAFD with large spring ligament tears, adding allograft TCNL reconstruction to osseous correction has suggested to augment medial peritalar stability. We aimed to investigate the clinical and radiographic outcomes of the novel TCNL reconstruction for stage IIB AAFD with spring ligament tear.

Methods: Twelve feet in 11 patients (7 female, 4 male, mean age 56.1 years) who underwent osseous correction and TCNL reconstruction for stage IIB AAFD were employed. TCNL reconstruction was indicated in the presence of large spring ligament tears (1.5-3cm) and when inadequate reduction remained after osseous corrections. All 12 feet underwent gastrocnemius recession, medializing calcaneal osteotomy, lateral column lengthening and Cotton or Lapidus procedures. Bone tunnels were made in the tibia (7mm), sustetaculum tali (6mm) and navicular (6mm) for tendon allograft passage for TCNL reconstruction (Figure 1). Subjects were evaluated at mean of 24 months (range, 12-33 months) after surgery. Pre- and post-operative clinical outcomes were assessed by administrating FAAM_ADL, SF-36 PF and Pain, Patient Reported Outcome Measurement Information System (PROMIS) Physical Function (PF) and Pain Interference (PI) domains using Computerized Adaptive Testing. Correction of forefoot abduction and sagittal arch were measured from weight bearing radiographs of the foot.

Results: The FAAM_ADL improved from 69.3 to 90.1 ($p = 0.001$). SF-36 PF and Pain subscales both improved significantly (39.4 to 87.8, 44.6 to 93.1, respectively, $p < 0.001$ for each). PROMIS PF improved from 38.2 to 46.8 ($p = 0.002$) and PI 62.6 to 50.1 ($p = 0.003$). All but one patient were satisfied with the result. Radiographic measures showed improved AP talo-first metatarsal angle of 24.7° to 11.8° ($p < 0.001$) and talonavicular coverage angle of 47.4° to 23.1° ($p < 0.01$). The talar head uncoverage improved from 56.1% to 32.5% ($p < 0.01$). Improved Meary's angle of 29.7° to 12.5° ($P < 0.001$) and calcaneal pitch angle of 11.7° to 16.9° ($p = 0.14$) were noted in the lateral view.

Conclusion: The current study demonstrates that TCNL reconstruction is a viable surgical treatment option for augmentation of medial peritalar stability in advanced stage AAFD with spring ligament tear. This is the first short term clinical investigation to report the clinical and radiographic outcomes of the novel TCNL reconstruction. Considering the anatomic characteristic of the deltoid-spring ligament complex, the TCNL reconstruction may play a significant role in maintaining surgical correction of deformity.

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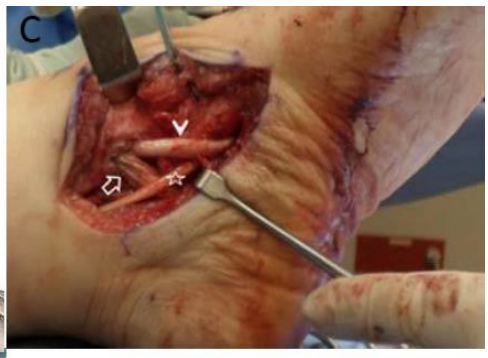




Figure 1: Illustration of TCNL reconstruction

A: Bone tunnels are made in the distal medial malleolus intercolliculus (7mm), navicular (6mm) and sustentaculum tali (6mm)

B: The folded portion of the tendon allograft is fixed at the tibia tunnel. The tibionavicular limb of the TCNL is passing through the navicular tunnel from plantar to dorsal direction.

C: The FDL tendon(star) and tibionavivcular limb (arrow head) have passed through the navicular tunnel. The tibiocalcaneal limb (arrow) has passed through the sustetaculum tali tunnel.

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