Deltoid and Spring Ligament Injuries and Reconstruction

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1. Indications

- Medial ankle ligament reconstruction is indicated for persistent, symptomatic mechanical instability, as it may be the case in valgus foot. As the involved ligaments are usually found to be elongated or disrupted, but present, primary reconstruction might be possible in most cases. Direct, late repair has the advantage of preserving normal anatomy and avoiding morbidity associated with autologous tendon grafts. The disadvantage of this technique is that it relies on good quality tissue for a strong repair.

- If the injured ligament structures are of poor quality, reinforcement by a free plantaris tendon graft might be considered. It may, however, not be indicated in view of better correcting a long-standing and advanced foot deformity.

- Posterior tibial (TP) tendon shortening may be advised in the case of long-standing pronation deformity that has led to degeneration and/or elongation of the tendon.

- TP tendon reconstruction may be considered in the case of partial or complete rupture as long as the muscular elasticity is preserved (as seen when pulling on proximal tendon stump). In most instances, a flexor digitorum longus (FDL) transfer is advised to reinforce the reconstructed TP tendon, or, in the case of not possible TP tendon reconstruction, to replace it.

- Lateral column lengthening osteotomy may be considered in the case of long-standing pronation deformity with abduction of the forefoot.

2. Contraindications

- In the case of a long-standing pronation deformity and valgus alignment that may have provoked complex changes on other structures of the foot, such as muscular imbalance, tendon dysfunction, and ligament and capsular distension, however, an isolated reconstruction of the medial ankle ligaments might not sufficiently address the problem.

- Surgical reconstruction of TP tendon is not advised if its muscular is scarred.
• A fixed valgus-pronation deformity of the foot
• Charcot neuroarthropathic deformity

3. Technique

• Medial ankle ligaments - proximal tear: The anterior border of the medial malleolus is exposed by a short longitudinal incision between the tibiocalcaneal ligaments and tibiospring ligaments, where usually a small fibrous septum without adherent connective fibers between the two ligaments is present. After roughening of the medial aspect of the medial malleolus, an anchor (Mitek®) is placed 6 mm above the tip of the malleolus and serves for refixation of the tibionavicular and tibiospring ligaments to the medial malleolus, and to shorten both, the tibionavicular and tibiospring ligaments. Additional 0 resorbable sutures are used to close the interval between tibiocalcaneal and tibiospring ligaments.

• Medial ankle ligaments - intermediate tear: After having separated the tibiospring and tibionavicular ligaments, the tibiospring ligament is sharply dissected from its insertion on medial malleolus. A longitudinal incision is made to divide the tibionavicular ligament into 2 parts of which the cranial part includes about 2 third of the whole ligament. The cranial part is prepared for being tightened and refixed to the navicular bone by an anchor; whereas, the caudal part is prepared for being tightened and refixed together with the tibiospring ligament to the medial malleolus, as described above.

• Medial ankle ligaments - distal tear: A distal rupture and/or attenuation of the tibionavicular ligament is consistently combined with a rupture of the spring ligament; whereas, the tibiospring ligament is intact. The tibionavicular ligament is prepared to be tightened and refixed to the navicular bone by using an anchor. Additional 2 resorbable sutures are used to repair the tear of the spring ligament.

• Medial ankle ligaments - free plantaris graft augmentation: If the injured ligament structures are of poor quality, the reconstruction of tibiospring and tibionavicular ligaments is reinforced by a free plantaris tendon graft. Two converging holes of 3.2 mm are drilled into the anterior border of the medial malleolus, 2 to 8 mm proximal to the tip of the malleolus. One arm of a forceps is introduced into the cranial and one into the distal hole and a tunnel is made by swivelling the forceps. Analogously a tunnel is created on navicular bone. The plantaris tendon graft is introduced from cranially to caudally into the tunnel of the malleolus, and again from cranially to caudally into the tunnel of the navicular bone. While the foot is kept in neutral position, the ends of the transplanted tendon are sutured under slight tension with resorbable 0 threats. The still existing ligaments are sutured to the transplant, thereby creating a strong repair of the tibiospring and tibionavicular ligaments.

• TP tendon reconstruction: The TP tendon is debrided and the prepared for reattachment. In the case of an elongated tendon, a Z-shaped incision is made, preserving the plantar aspect of distal TP tendon intact. A bony anchor is inserted into tuberosity of navicular bone. The TP tendon is reattached by a strong suture while the foot is held in supination position.

• FDL tendon transfer: The tendon sheath is open and the FDL tendon exposed distally till the level of navicular tuberosity. The distal stump of TP tendon is devided into 2 slips. In its center, a bony anchor is fixed into tuberosity of navicular bone. While the foot is held in supination, the FDL tendon is attached to the tuberosity. Additional sutures are made to fix both stumps of TP tendon to the transfer FDL tendon, resulting in a strong attachment.
• Lateral column lengthening: The neck of calcaneus is exposed through the sinus tarsi. One Hohmann retractor is positioned in the sinus tarsi, and a second one at lateral side to protect the peroneal tendons. The osteotomy is done along the anterior border of posterior facet of subtalar joint, and the Hintermann distractor is used to open the osteotomy until the foot has taken its normal position, e.g. the forefoot abduction is seen to be disappeared. An wedge shaped autologous bone graft from iliac crest, or an allograft is inserted into the gap of osteotomy, and a screw is used to further stabilize the osteotomy.

4. Potential Risks & Complications

• Infection: If superficial, intravenous or oral antibiotics are applied. If deep, the wound is opened and revised, and, based on the results of the culture and sensitivity, specific antibiotics are applied.

• Stiffness of ankle and/or subtalar joints: If all conservative measures fail, arthroscopic or open arthrotomy may be necessary.

• Excessive tension of the restored ligaments: If pain and restriction of subtalar motion persist, open revision is advised.

5. Literature

• Deland JT, de Asla RJ, Sung IH, Ernberg LA, Potter HG. Posterior tibial tendon insufficiency: which ligaments are involved? Foot Ankle Int. 2005 Jun;26(6):427-35


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• Myerson MS, Badekas A, Schon LC. Treatment of Stage II Posterior tibial tendon deficiency with flexor digitorum longus tendus transfer and calcaneal osteotomy. Foot Ankle Int 2004;25(7):445-450.


