**Peroneus Longus Tendoscopy at the Sole**

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**Abstract:** Different pathologies can occur in the peroneus longus tendon at the sole. Many of them can be dealt with by peroneus longus tendoscopy of the sole. The purpose of this Technical Note is to describe the details of this minimally invasive approach to the peroneus longus tendon of the sole. This has the advantages of better cosmesis, less soft tissue dissection, less postoperative pain, and less peritendinous fibrosis.

Peroneal tendons are known as the active stabilizer in acute ankle sprain, whereas an intact ankle mortise and intact lateral ligaments are required for the passive stability of the ankle joint.\(^1\) Recently, the peroneal longus tendon has been shown to have a substantial effect on the passive stability of the ankle in the presence of lateral ligament deficiency.\(^1\)

Furthermore, the peroneus longus is also an important stabilizer of the first tarsometatarsal joint.\(^2\) Deficiency of the peroneus longus can contribute to the development of metatarsus primus varus and hallux valgus.\(^2,3\)

Reported pathologies of the peroneus longus tendon include traumatic injury, inflammation of the tendon or its sheath, subluxation, acute or chronic tears, and avulsion fractures at the base of the first metatarsal or through the os peroneum.\(^4-8\) The peroneal longus tendon can sublux or dislocate around the lateral malleolus, peroneal tubercle, or the cuboid tunnel. Symptoms can include pain, swelling, and ankle instability. The peroneus longus is also postulated to play a major role in the deformities occurring in Charcot-Marie-Tooth (hereditary sensory and motor neuropathy types 1 and 2) disease.\(^4,9\) Many of the pathologies can occur at the peroneus longus tendon at the sole. Some pathologies are unique to the part of the peroneus longus tendon, for example, isolated avulsion fracture at the plantar lateral base of the first metatarsal without injuries of the tarsometatarsal joint and painful os peroneum syndrome. Painful os peroneum syndrome that presents as plantar lateral foot pain results from a spectrum of conditions including one or more of the following: (1) an acute os peroneum fracture or a diastasis of a multipartite os peroneum, either of which may result in a discontinuity of the peroneus longus tendon; (2) chronic (healing or healed) os peroneum fracture or diastasis of a multipartite os peroneum with callus formation, either of which results in a stenosing peroneus longus tenosynovitis; (3) attrition or partial rupture of the peroneus longus tendon; (4) frank rupture of the peroneus longus tendon with discontinuity proximal or distal to the os peroneum; and/or (5) the presence of a gigantic peroneal tubercle on the lateral aspect of the calcaneus that entraps the peroneus longus tendon and/or the os peroneum during tendon excursion.\(^10\)

Classically, this deep portion of the peroneus longus tendon is approached openly with extensive soft tissue dissection. Peroneus longus tendoscopy at this sole has been described to provide a minimally invasive approach to this deep-seated portion of the tendon.\(^11\) The purpose of this Technical Note is to describe the technical details of peroneus longus tendoscopy at the sole. It is indicated for synovectomy in peroneus longus tenosynovitis,\(^12\) debridement of longitudinal tears of the tendon, repair of complete rupture of the peroneus longus with or without fracture of the os peroneum,\(^13,14\) screw fixation of isolated avulsion fracture at the plantar lateral base of...
the first metatarsal without injuries of the tarsometatarsal joint, excision of painful nonunion fragment at the plantar lateral base of the first metatarsal without injuries of the tarsometatarsal joint, excision of os peroneum in case of painful os peroneum syndrome, release or lengthening of the peroneus longus tendon in case of neuropathic ulcer under the first metatarsal head or claw hallux deformity, or claw hallux deformity. Although whether peroneus longus tendon subluxation in the cuboid tunnel is pathological or not is still controversial, endoscopic groove deepening of the cuboid tunnel can be indicated if symptomatic tendon subluxation over the cuboid tuberosity is present. It is contraindicated if the symptoms are not corresponding to the pathologies of the peroneus tendon at the sole. Preoperative magnetic resonance imaging is important for identification of the pathology and surgical planning. Computed tomogram is indicated if avulsion fracture at the base of the first metatarsal is suspected.

The patient can be placed in the lateral, supine, or prone position depending on the concomitant procedures planned. A thigh tourniquet is applied to provide a bloodless operative field. Fluid inflow is by gravity and no arthro-pump is used. A 2.7-mm 30° arthroscope (Henke Sass Wolf, Tuttlingen, Germany) is used for this procedure.

**Portal Placement**

For the sake of tendoscopy, the peroneal tendons are divided into 3 zones. The zone 1 tendon sheath consists of both peroneus longus and brevis tendons from the musculotendinous junction to the peroneal tubercle. Zone 2 tendon sheaths are at the level of the peroneal tubercle. Separate tendoscopy is required for individual tendon sheaths of this zone. The zone 3 tendon sheath is at the sole and contains the peroneus longus tendon. This procedure is started with zone 2 peroneal tendoscopy via the proximal and distal portals along the peroneal tendon proximal and distal to the peroneal tubercle, respectively. The plantar lateral portal of zone 3 peroneal tendoscopy is identified via zone 2 peroneal tendoscopy and approximately 1 cm proximal and 1 cm plantar to the fifth metatarsal tubercle. The distal portal can be located under

**Table 1. Indications and Contraindications of Peroneus Longus Tendoscopy at the Sole**

| Indications                                                                 | Contraindications                                                                 |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| (1) Synovectomy in peroneus longus tenosynovitis                            | (1) If the symptoms are not corresponding to the pathologies of the peroneus tendon at the sole |
| (2) Debridement of longitudinal tears of the tendon                          | (2) Surgical correction of the cavovarus foot deformity in Charcot-Marie-Tooth disease |
| (3) Repair of complete rupture of the peroneus longus with or without fracture of the os peroneum |                                                                                  |
| (4) Screw fixation of isolated avulsion fracture at the plantar lateral base of the first metatarsal without injuries of the tarsometatarsal joint |                                                                                  |
| (5) Excision of the painful nonunion fragment at the plantar lateral base of the first metatarsal |                                                                                  |
| (6) Excision of the os peroneum in case of painful os peroneum syndrome     |                                                                                  |
| (7) Release or lengthening of the peroneus longus tendon in case of neuropathic ulcer under the first metatarsal head or claw hallux deformity |                                                                                  |
| (8) Endoscopic groove deepening of the cuboid tunnel if symptomatic tendon subluxation over the cuboid tuberosity is present |                                                                                  |

**Technique**

**Preoperative Planning and Patient Positioning**

The patient usually complains of deep sole pain especially on walking. Clinical diagnosis of the painful os peroneum syndrome can be facilitated by the single stance heel rise and varus inversion stress test as well as by resisted plantar flexion of the first ray, which can localize tenderness along the distal course of the peroneus longus tendon at the cuboid tunnel. There is no pathognomonic sign for pathology of the peroneus longus tendon at the sole. Preoperative magnetic resonance imaging is important for identification of the pathology and surgical planning. Computed tomogram is indicated if avulsion fracture at the base of the first metatarsal is suspected.

The patient can be placed in the lateral, supine, or prone position depending on the concomitant procedures planned. A thigh tourniquet is applied to provide a bloodless operative field. Fluid inflow is by gravity and no arthro-pump is used. A 2.7-mm 30° arthroscope (Henke Sass Wolf, Tuttlingen, Germany) is used for this procedure.

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![Fig 1. Peroneus longus tendoscopy at the sole of the right foot. The patient is in the lateral position. The arthroscope and shaver are advanced distally along the peroneus longus tendon till the tendon turns at the cuboid tunnel. (DP, distal portal; LM, lateral malleolus; PP, proximal portal; PT, peroneal tendons.)](image-url)
endoscopic guidance and is at the plantar medial side of the first tarsometatarsal joint.

**Zone 2 Peroneal Tendoscopy**

The proximal portal is made 2 cm proximal to the lateral malleolar tip and the distal portal 2 cm distal to the lateral malleolar tip.²¹ The proximal portal is the viewing portal. The tendon sheath of the zone 2 peroneus longus tendon sheath is perforated with a hemostat via the distal portal under endoscopic guide. Zone 2 peroneal tendoscopy is performed, and the tears of the peroneus longus tendon are debrided with an arthroscopic shaver (Dyonics, Smith & Nephew, Andover, MA) via the distal portal. The arthroscope and shaver can advance distally along the peroneus longus tendon till the tendon turns at the cuboid tunnel.

**Fig 2.** Peroneus longus tendoscopy at the sole of the right foot. The patient is in the lateral position. (A) The plantar lateral portal is identified under tendoscopic guide. (B) The proximal portal is the viewing portal. Tendoscopic view shows the zone 2 peroneus longus tendon down to its turning at the cuboid tunnel. The plantar lateral portal is made at this point. (DP, distal portal; LM, lateral malleolus; PB, peroneus brevis tendon; PL, peroneus longus tendon; PLP, plantar lateral portal; PP, proximal portal; PT, peroneal tendons; S, septum between peroneus brevis and longus tendons at the level of peroneal tubercle.)

**Fig 3.** Peroneus longus tendoscopy at the sole of the right foot. The patient is in the lateral position. (A) The plantar lateral portal is the viewing portal. (B) The plantar medial portal is the working portal. (C) Tendoscopic view shows the os peroneum and the peroneus longus tendon at the sole. (LM, lateral malleolus; OP, os peroneum; PL, peroneus longus tendon; PLP, plantar lateral portal; PMP, plantar medial portal; PT, peroneal tendons.)
tunnel (Fig 1). Any scar tissue or synovium that obscured the endoscopic view is debrided. The plantar lateral portal is at the point where the peroneus longus tendon turns at the cuboid tunnel (Fig 2). Because the tendon runs dorsally and distally at the sole, the plantar lateral portal is made slightly more plantar and proximal to the turn of the tendon. This makes easier passage of the arthroscope to the zone 3 tendon sheath via the plantar lateral portal and reduces the risk of injury to the lateral plantar nerve.

### Zone 3 Peroneal Tendoscopy

The arthroscope is switched to the plantar lateral portal and advances medially along the zone 3 tendon sheath. The os peroneum and peroneus longus tendon at the sole are examined. The plantar medial portal is identified and confirmed with a needle under endoscopic guide. The plantar medial skin portal is made at the plantar medial side of the first tarsometatarsal joint. The subcutaneous tissue is bluntly dissected with a hemostat down to the plantar side of base of the first metatarsal. The hemostat goes along the lateral surface of the first metatarsal to the insertion of the peroneus longus tendon. The tendon sheath is then perforated by the tip of the hemostat. The plantar medial portal is made medial rather than directly over the tendon insertion. This can reduce the risk of injury to the medial plantar nerve. The scar tissue and tendon tears are debrided with an arthroscopic shaver via the plantar medial portal (Fig 3, Video 1, Table 2).

Postoperatively, the patient is advised on non-weight-bearing for 2 weeks, and free ankle and foot mobilization is allowed.

### Discussion

Many pathologies of the peroneal tendons can be detected and managed by the tendoscopic technique. Classically, peroneal tendoscopy is performed via the lateral portals and allows access to the zone 1 and 2 peroneal tendon sheaths. The development of the zone 3 peroneal tendoscopy via the plantar portals allows access of the peroneus longus tendon at the sole. Cadaver studies have confirmed the safety of the plantar portals. The use of lateral and plantar portals allows comprehensive assessment of the peroneal tendons from the musculotendinous junctions to their insertions. Moreover, release of the zone 3 peroneal tendon sheath at its proximal and distal edges allows access to the other zones of the sole.

The advantages of the peroneus longus tendoscopy at the sole (zone 3 peroneal tendoscopy) include better cosmesis, less soft tissue dissection, less postoperative pain, and less peritendinous fibrosis. The potential risks of this procedure include injury to the sural nerve, medial and lateral plantar nerve, and injury to the peroneal tendons (Table 3). This is not a technically demanding procedure and can be attempted by averaged foot and ankle arthroscopists.

### Table 2. Pearls and Pitfalls of Peroneus Longus Tendoscopy at the Sole

| Pearls | Pitfalls |
|--------|----------|
| (1) The plantar lateral portal is at the turn of the peroneus longus tendon at the cuboid tunnel and can be identified tendoscopically. | (1) Instrument via the plantar lateral portal should not go plantar to the zone 3 peroneal tendon sheath to avoid damage to the lateral plantar nerve. |
| (2) The plantar lateral skin portal is made slightly more plantar and proximal than the turn of the peroneus longus tendon at the cuboid tunnel. | (2) Release of the lateral end of the zone 3 peroneal tendon sheath should not be performed at its plantar surface to avoid damage to the lateral plantar nerve. |
| (3) The plantar medial portal is medial to the peroneus longus insertion and arthroscopic instrument should slide along the plantar lateral surface of the first metatarsal before entering the zone 3 peroneal tendon sheath. | (3) Plantar medial portal should not be placed directly plantar to the metatarsal insertion of the peroneus longus tendon. Otherwise, instrumentation via this portal will injure the medial plantar nerve. |

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