

Supraligamentous Approach of Lateral Release in Endoscopic Lateral Soft Tissue Procedure



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Abstract: Many surgical methods are available for hallux valgus, but consensus regarding the best management has yet to be established. Minimally invasive techniques are gaining popularity with the potential advantages of better cosmetic outcome, less postoperative pain, and decreasing recovery time because surgical exposure and deep soft tissue dissection are less extensive and possibly gentler. Recently, techniques of the endoscopic distal soft tissue procedure have been reported, in which an endoscopic approach of the classic distal soft tissue procedure is described. The intermetatarsal ligament, adductor hallucis insertion, and the lateral capsuloligamentous complex of the first metatarsophalangeal joint is released during the endoscopic lateral release. However, the intermetatarsal ligament does not contribute to development of the hallux valgus deformity, and release of the ligament is not necessary for correction of the deformity. Instead, preservation of the intermetatarsal ligament may protect the interdigital nerve and reduce the risk of nerve injury during endoscopic lateral release. In this technical note, the technical details of supraligamentous approach of lateral release in endoscopic lateral soft tissue procedure (or EDSTP) is described. This approach can help to reduce the risk of injury to the interdigital nerve during endoscopic lateral release.

Introduction

Surgical correction of hallux valgus is one of the most common procedures performed by foot and ankle surgeons, and it aims at rebalancing soft tissue pulls on the first metatarsal and correcting the various features of the deformity.¹ Although many well-established surgical methods are available for hallux valgus, consensus regarding the best management has yet to be established.¹ Minimally invasive techniques are gaining popularity with the potential advantages of better cosmetic outcome, less postoperative pain, and decreased recovery time because surgical exposure and deep soft tissue dissection are less extensive and

possibly gentler.¹⁻³ Arthroscopic hallux procedures, as one form of minimally invasive surgery, also have the advantages of minimizing pain, swelling, and disability.⁴ Certain conditions, such as synovitis, loose bodies, and early-grade hallux rigidus, are even better addressed arthroscopically.⁴ Recently, techniques of endoscopic distal soft tissue procedure have been reported, which is an endoscopic approach of the classic distal soft tissue procedure.⁵⁻¹² The intermetatarsal ligament, adductor hallucis insertion, and the lateral capsuloligamentous complex of the first metatarsophalangeal joint is released during the endoscopic lateral release. However, study has shown the sesamoid subluxation in hallux valgus is due to medial shifting of the first metatarsal and the lateral sesamoid retains its relationship to the second metatarsal in the transverse plane. Therefore, the intermetatarsal ligament does not contribute to development of the hallux valgus deformity, and release of the ligament is not necessary for correction of the deformity.¹³ Instead, preservation of the intermetatarsal ligament may protect the interdigital nerve and reduce the risk of nerve injury during endoscopic lateral release. The purpose of this technical note is to describe the details of supraligamentous approach of the lateral release in endoscopic lateral soft tissue procedure. It is indicated for symptomatic hallux valgus recalcitrant to conservative treatment. It is

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Table 1. Indications and Contraindications of Supraligamentous Approach of Lateral Release in Endoscopic Lateral Soft Tissue Procedure

Indications	Contraindications
1. Symptomatic hallux valgus is recalcitrant to conservative treatment.	1. Hallux valgus is due to bony deformity.
	2. The intermetatarsal space cannot be closed up manually.

contraindicated in patients with hallux valgus due to bony deformity, or the intermetatarsal space cannot be closed up manually (Table 1).

Surgical Technique

Preoperative Planning and Patient Positioning

The patient is in a supine position with the legs spread. An ipsilateral thigh tourniquet is used to provide a bloodless surgical field. Fluid inflow is driven by gravity, and an arthro-pump is not used. A 2.7-mm, 30° arthroscope (Henke Sass Wolf, Tuttlingen, Germany) is used for this procedure.

Portal Placement

The procedure is performed via the toe web and plantar portals. The toe web portal is at the dorsal surface of the toe web between the great toe and the second toe. The plantar portal in the sole between the first and second metatarsals is located at the level of first tarsometatarsal joint (Fig 1). The plantar portal is established by inside-out approach. A 3-mm longitudinal skin incision is made at the dorsal surface of the

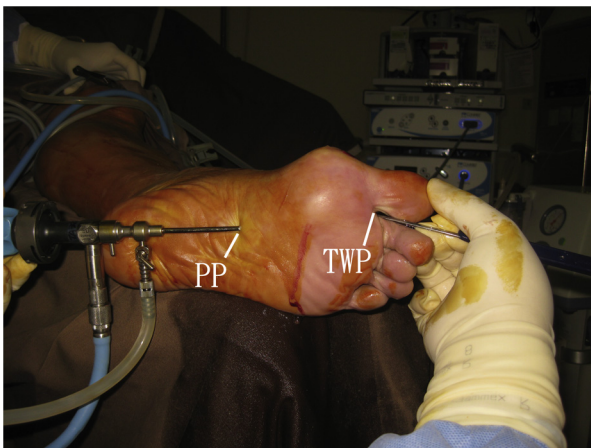


Fig 1. Supraligamentous approach of lateral release in the endoscopic lateral soft tissue procedure (EDSTP) of the left foot. The patient is in the supine position with the legs spread. The toe web portal is at the dorsal surface of the toe web between the great toe and the second toe. The plantar portal in the sole between the first and second metatarsals is located at the level of first tarsometatarsal joint. PP: plantar portal; TWP: toe web portal.

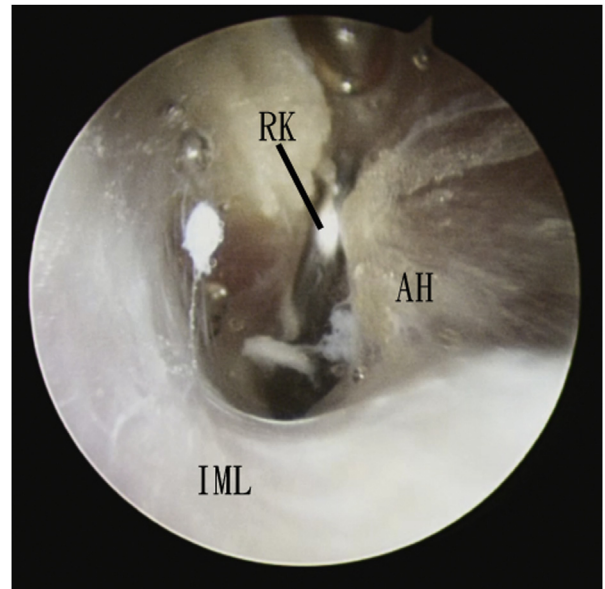


Fig 2. Supraligamentous Approach of Lateral Release in Endoscopic Lateral Soft Tissue Procedure (EDSTP) of the left foot. The patient is in supine position with the legs spread. The plantar portal is the viewing portal, and the toe web portal is the working portal. The adductor hallucis muscle is cut from its proximal edge distally with the retrograde knife. AH, adductor hallucis; IML, intermetatarsal ligament; RK, retrograde knife.

first toe web. The subcutaneous tissue is bluntly dissected down to the intermetatarsal ligament by a

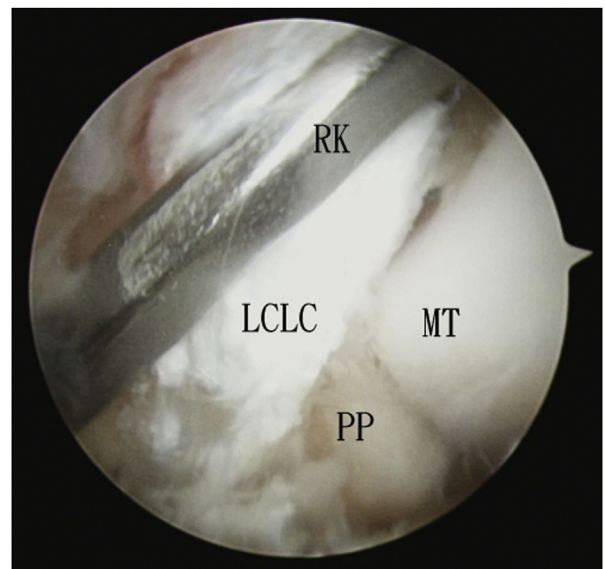


Fig 3. Supraligamentous approach of lateral release in the endoscopic lateral soft tissue procedure (or EDSTP) of the left foot. The patient is in the supine position with the legs spread. The plantar portal is the viewing portal, and the toe web portal is the working portal. The lateral capsuloligamentous complex of the first metatarsophalangeal joint is released by the retrograde knife. LCLC, lateral capsuloligamentous complex; MT, metatarsal head; PP, proximal phalanx; RK, retrograde knife.

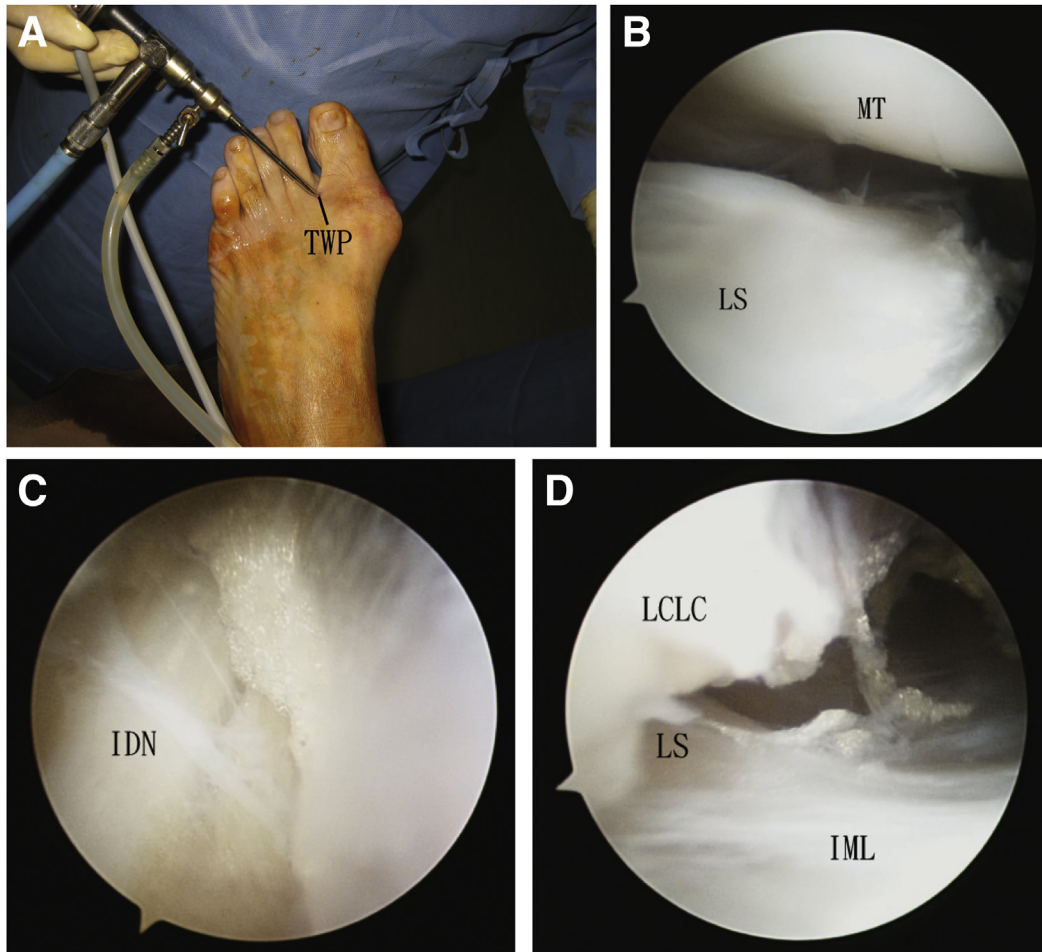


Fig 4. Supraligamentous approach of lateral release in the endoscopic lateral soft tissue procedure (EDSTP) of the left foot. The patient is in the supine position with the legs spread. The toe web portal is the viewing portal. (A) The arthroscope is inserted into the metatarsos sesamoid compartment through the toe web portal. (B) The condition of the metatarsos sesamoid compartment is examined. (C) The integrity of the interdigital nerve is examined. (D) The intact intermetatarsal ligament covers the interdigital nerve. IDN, interdigital nerve; IML, intermetatarsal ligament; LCLC, lateral capsuloligamentous complex; LS, lateral sesamoid bone; MT, metatarsal head; TWP, toe web portal.

hemostat. The dorsal surface of the ligament is cleared from the surrounding soft tissue by means of the hemostat. An arthroscope-trocar (Henke Sass Wolf) is introduced via the toe web portal and advanced proximally along the dorsal surface of the ligament to the plantar aponeurosis. The aponeurosis is pierced by the trocar at the level of first tarsometatarsal joint. A 3-mm longitudinal skin incision is then made over the trocar tip. This creates the plantar portal. The trocar is further advanced proximally through the plantar portal. The arthroscope-cannula is introduced along the trocar via the plantar portal and advanced distally to pass through the toe web portal. The trocar is then removed, and the arthroscope is incorporated into the cannula. The arthroscope is withdrawn and guides the advancement of the retrograde knife (Smith & Nephew) via the toe web portal into the intermetatarsal space.

Release of the Adductor Hallucis Insertion

The plantar portal is the viewing portal, and the toe web portal is the working portal. The adductor hallucis muscle is then in view and is traced proximally to its proximal edge. The muscle is then cut from its proximal edge distally with the retrograde knife (Fig 2). The cut muscle fibers will contract and retract to expose the lateral part of the first metatarsophalangeal joint and the lateral sesamoid bone.

Release of the Lateral Capsuloligamentous Complex of the First Metatarsophalangeal Joint

The plantar portal is the viewing portal, and the toe web portal is the working portal. The arthroscope is rotated 90° toward the first metatarsophalangeal joint. The lateral capsuloligamentous complex of the joint, including the suspensory ligament of the lateral sesamoid bone is released by the retrograde knife. The release is

Table 2. Pearls and Pitfalls of Supraligamentous Approach of Lateral Release in the Endoscopic Lateral Soft Tissue Procedure

Pearls	Pitfalls
<ol style="list-style-type: none"> 1. The plantar portal must be placed at the level of first tarsometatarsal joint. 2. Passing the arthroscope and instruments through the intermetatarsal space should be gentle in order to minimize the risk of injury to the interdigital nerve 3. The plantar aponeurosis should be pierced at the level of first tarsometatarsal joint in order to have adequate interportal distance for the release. 4. The retrograde knife may need to be shifted a bit laterally to be cleared from the proximal phalanx during release of the most distal part of the capsuloligamentous complex. 	<ol style="list-style-type: none"> 1. Too proximal placement of the plantar portal will lead to limitation of arthroscope manipulation due to hindrance by the heel pad. 2. Too distal placement of the plantar portal will result in inadequate interportal distance for the release. 3. Failure to release the most distal part of the capsuloligamentous complex will fail to reduce the sesamoid bones.

from proximal to distal. The release is just dorsal to the lateral sesamoid bone. The distal release may be hindered as the knife hitting the base of the proximal phalanx in case of severe hallux valgus deformity. In this situation, the knife is moved laterally a bit and away from the proximal phalanx, in order to cut the most distal portion of the ligamentous complex (Fig 3).

Arthroscopic Examination of the Metatarsosesamoid Compartment and the Interdigital Nerve

After completion of the lateral release, the arthroscope is switched to the toe web portal and enters the metatarsosesamoid compartment. The condition of this compartment is examined. The arthroscope is withdrawn to the intermetatarsal space and then advanced proximally to examine the interdigital nerve. The nerve is traced proximally until it is covered by the intermetatarsal ligament (Fig 4, Video 1, Table 2).

Discussion

There are two issues that need to be considered during endoscopic lateral release: adequacy of lateral release and risk of injury to the interdigital nerve. Lateral release should include release of the adductor hallucis and the lateral capsuloligamentous complex. Release of the intermetatarsal ligament is not essential but can improve the endoscopic visualization view for release of the adductor hallucis and the lateral capsuloligamentous complex.¹⁴ However, as the interdigital nerve is just plantar to the intermetatarsal ligament, there is potential risk of nerve injury during release of the intermetatarsal ligament. When the surgeon starts to practice endoscopic

lateral release, release of the intermetatarsal ligament is recommended in order to ensure complete release of the adductor hallucis and the lateral capsuloligamentous complex. As the surgeon becomes familiar to this technique and can steadily position the arthroscope in the intermetatarsal space, this supraligamentous approach is recommended in order to reduce the risk of injury to the interdigital nerve.

This minimally invasive technique has the advantage of less soft tissue trauma, better cosmetic result, less wound complications, and less risk of injury to the interdigital nerve. The potential risks of this technique include inadequate lateral release and interdigital nerve injury (Table 3).

This is technically demanding and reserved to the experienced foot and ankle arthroscopists.

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Table 3. Advantages and Risks of Supraligamentous Approach of Lateral Release in the Endoscopic Lateral Soft Tissue Procedure

Advantages	Risks
<ol style="list-style-type: none"> 1. Less soft tissue trauma 2. Better cosmetic result 3. Less wound complications 4. Less risk of injury to the interdigital nerve 	<ol style="list-style-type: none"> 1. Inadequate lateral release 2. Injury to the interdigital nerve

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