

Endoscopic Ganglionectomy of the Tarsal Tunnel: A Medial Approach



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Abstract: A ganglion inside the tarsal tunnel can compress the tibial nerve, leading to posterior tarsal tunnel syndrome. Classically, the ganglion is resected with an open approach. This requires release of the flexor retinaculum and dissection around the tibial neurovascular bundle, which may induce fibrosis around the tibial nerve. Endoscopic resection of a tarsal tunnel ganglion via a posterior approach has been reported. The purpose of this Technical Note is to describe the medial approach of endoscopic ganglionectomy of the tarsal tunnel. This is indicated for tarsal tunnel ganglia compressing the tibial nerve and extending to the flexor retinaculum. It is contraindicated if there is other pathology of the tarsal tunnel that demands open surgery; the ganglion compresses the tibial nerve from its deep side and does not extend to the flexor retinaculum; or in the presence of intraneural ganglion of the tibial nerve.

Posterior tarsal tunnel syndrome refers to damage to the tibial nerve underneath the flexor retinaculum at the medial side of the ankle.¹ It can be idiopathic due to various lesions leading to direct trauma to the nerve or compression of the nerve by various space-occupying lesions within the tarsal tunnel, including osteophytes, exostosis, tenosynovitis, rheumatoid arthritis, schwannoma tumors, ganglia, convoluted vessels, hypertrophic or accessory muscles, and tendons.¹⁻³ A ganglion arising from the adjacent joints or tendon sheaths is the cause of tarsal tunnel syndrome in up to 8% of the cases.^{1,4,5} Surgical treatment is indicated if the symptoms are intractable and the diagnosis is well established.¹ Although the operative outcome of tarsal tunnel syndrome caused by space-occupying lesions is more favorable than those caused by other reasons,⁶ recent studies

show that the results are less favorable than expected.⁷⁻¹⁰ The reported complications of open ganglionectomy of the tarsal tunnel include recurrence,^{4,5} tibial nerve injury,^{9,10} and fibrosis around the nerve.⁶ Techniques of endoscopic tarsal tunnel release have been reported to minimize the surgical trauma and reduce fibrosis around the tibial nerve.¹¹ However, the presence of a space-occupying lesion is generally considered as a contraindication of the endoscopic tarsal tunnel release.

With advances in endoscopic foot and ankle surgery, endoscopic ganglionectomy of the tarsal tunnel ganglion has become feasible.^{12,13} This can be performed via posterior or medial approach. In this report, we describe the technical details of the medial approach of endoscopic ganglionectomy of the tarsal tunnel. It is indicated for symptomatic tarsal tunnel ganglia arising from the adjacent joints or tendon sheaths compressing the tibial

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Table 1. Indications and Contraindications of the Endoscopic Ganglionectomy of Tarsal Tunnel: Medial Approach

Indications	Contraindications
Symptomatic tarsal tunnel ganglia that arise from the adjacent joints or tendon sheaths compressing the tibial nerve and extending to the flexor retinaculum.	Other pathology that demands open surgery.
	The ganglion compresses the tibial nerve from its deep side and does not extend to the flexor retinaculum.
	Intraneural ganglion of the tibial nerve.

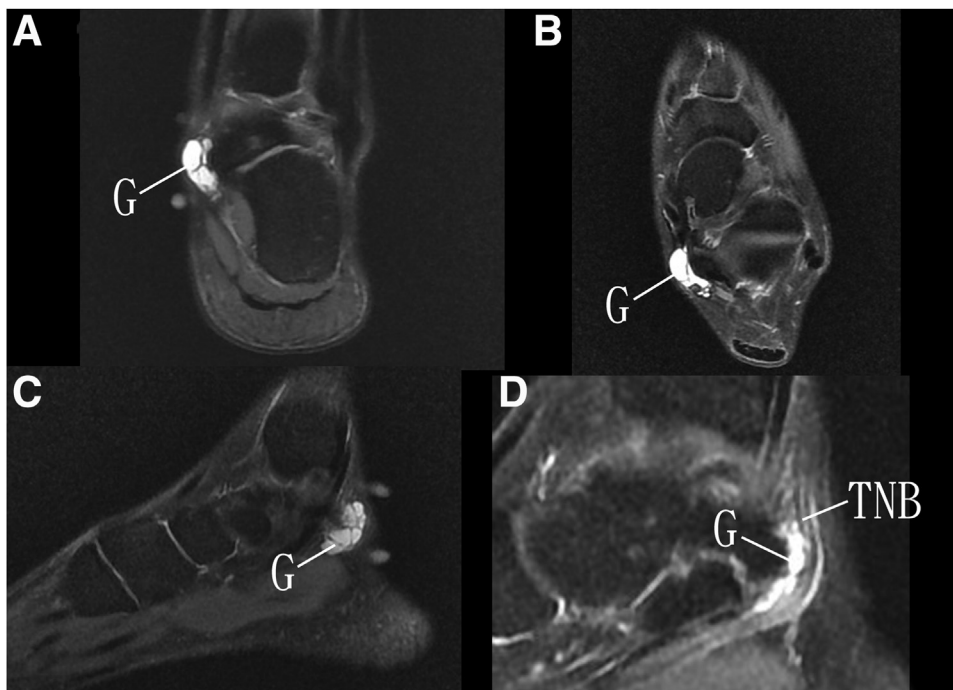


Fig 1. Endoscopic gangliectomy of the left tarsal tunnel: medial approach. The patient is in the supine position with the legs spread. Magnetic resonance imaging of the illustrated case showed the tarsal tunnel ganglion compressing the tibial neurovascular bundle and extending to the flexor retinaculum. (A) Coronal view; (B) transverse view; (C-D) sagittal views. (G, ganglion; TNB, tibial neurovascular bundle.)

nerve and extending to the flexor retinaculum. It is contraindicated if there is another pathology that demands open surgery or if the ganglion compresses the tibial nerve from its deep side and does not extend to the flexor retinaculum, which requires the posterior approach of endoscopic gangliectomy.¹² Intra-neural ganglion of the tibial nerve is another contraindication of endoscopic gangliectomy (Table 1).¹⁴⁻¹⁶

Surgical Technique (With Video Illustration)

Preoperative Assessment

The patient should present with symptoms of posterior tarsal tunnel syndrome.¹³ Any associated hindfoot deformity should be noted.¹³ The diagnosis of posterior tarsal tunnel syndrome can be confirmed by neurophysiological study.¹ The tinea sign can be elicited over the ganglion. Preoperative magnetic resonance imaging is important to study the anatomical relationship between the ganglion and the tibial nerve, the origin of the ganglion, and the presence of any associated pathology (Fig 1).

Patient Positioning and Portal Placement

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

The ganglion and the posterior tibial tendon are outlined on the skin with a marker. The endoscopic

procedure is performed via the proximal and distal portals, which are on the posterior side of the posterior tibial tendon and at the proximal and distal ends of the ganglion, respectively. Three- to four-millimeter skin incisions are made at the portal sites. The subcutaneous tissue is bluntly dissected to the flexor retinaculum with a hemostat. The subcutaneous layer between the portals is freed from the flexor retinaculum with the hemostat. This is the initial endoscopic working space. During the procedure, the distal portal is the viewing portal and the proximal portal is the working portal (Fig 2).

Fenestration of Flexor Retinaculum

Fenestration of the flexor retinaculum is performed with an arthroscopic shaver (DYONICS; Smith & Nephew, Andover, MA) via the proximal portal. This should be started just posterior to the posterior tibial tendon, which is a readily palpable surface landmark. Once the flexor retinaculum is perforated by the shaver, the fenestration should be enlarged by cutting from the deep side out. This can reduce the risk of injury of the deep structures. The flexor digitorum longus tendon is then exposed and can be confirmed by its motion with passive mobilization of the little toe. The fenestration is then extended posteriorly to expose the ganglion (Fig 3).

Resection of Tarsal Tunnel Ganglion

The interval between the tibial neurovascular bundle and the ganglion is gently dissected with scissors via the proximal portal. The ganglion is then resected with the shaver. Because the tibial neurovascular bundle and the flexor digitorum longus tendon run diversely from

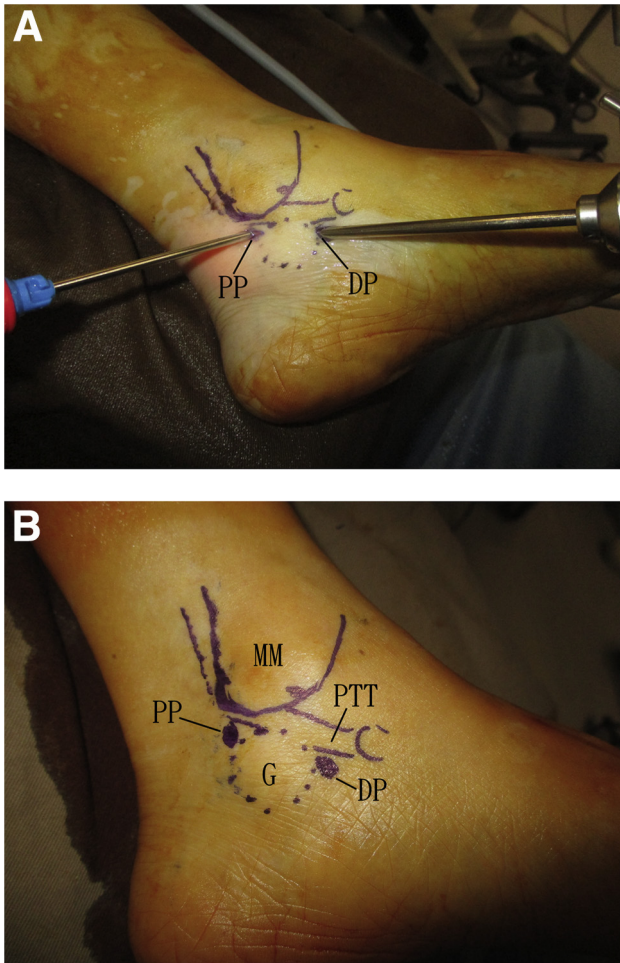


Fig 2. Endoscopic ganglionectomy of the left tarsal tunnel: medial approach. The patient is in supine position with the legs spread. (A) The ganglion and the posterior tibial tendon are outlined on the skin with a marker. The endoscopic procedure is performed via the proximal and distal portals, which are at the posterior side of the posterior tibial tendon and at the proximal and distal ends of the ganglion, respectively. (B) During the procedure, the distal portal is the viewing portal and the proximal portal is the working portal. (DP, distal portal; G, ganglion; MM, medial malleolus; PTT, posterior tibial tendon; PP, proximal portal.)

proximal to distal, it is safer to start the dissection distally and proceed proximally. The shaver blade should face away from the tibial neurovascular bundle and the suction should be kept to a minimum. Manipulation to the neurovascular bundle should be kept to a minimum. The entire procedure should be performed under strict endoscopic visualization (Fig 4).

Tracing to Flexor Digitorum Longus Tendon, Flexor Hallucis Longus Tendon, and Posterior Part of the Ankle Joint

After resection of the ganglion, the flexor hallucis longus tendon and the posterior part of the ankle joint

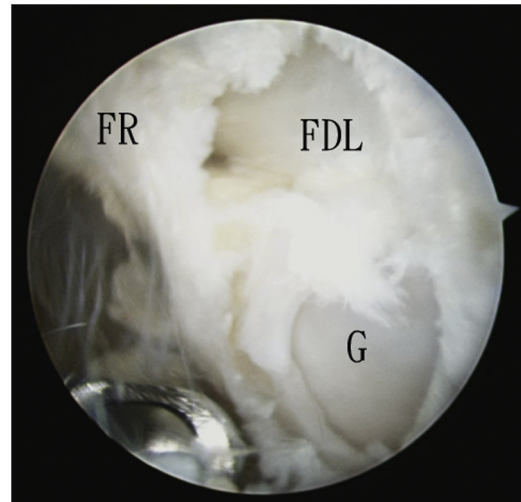


Fig 3. Endoscopic ganglionectomy of the left tarsal tunnel: medial approach. The patient is in the supine position with the legs spread. The distal portal is the viewing portal and the proximal portal is the working portal. Fenestration of the flexor retinaculum (FR) is performed to expose the flexor digitorum longus (FDL) tendon and the ganglion (G).

are examined for any underlying pathology, e.g., synovitis, which should be treated accordingly. The flexor hallucis longus tendon can be confirmed by its motion with passive mobilization of the great toe and the presence of muscle belly posterior to the ankle joint. With slight withdrawal of the arthroscope, the flexor digitorum longus tendon and the tibial neurovascular bundle can be seen. The tibial neurovascular bundle is examined for any residual compression

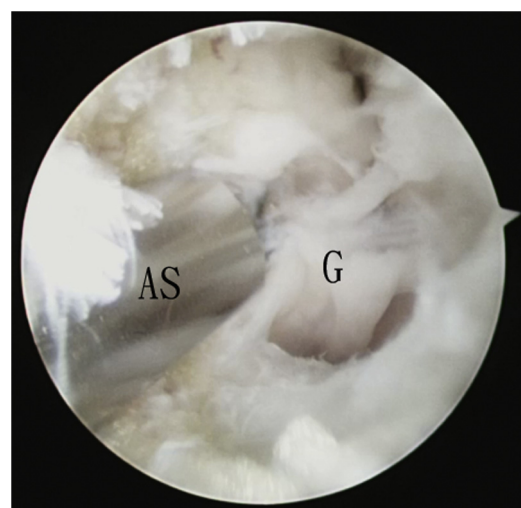


Fig 4. Endoscopic ganglionectomy of the left tarsal tunnel: medial approach. The patient is in the supine position with the legs spread. The distal portal is the viewing portal and the proximal portal is the working portal. Resection of the ganglion (G) is performed with an arthoscopic shaver (AS).

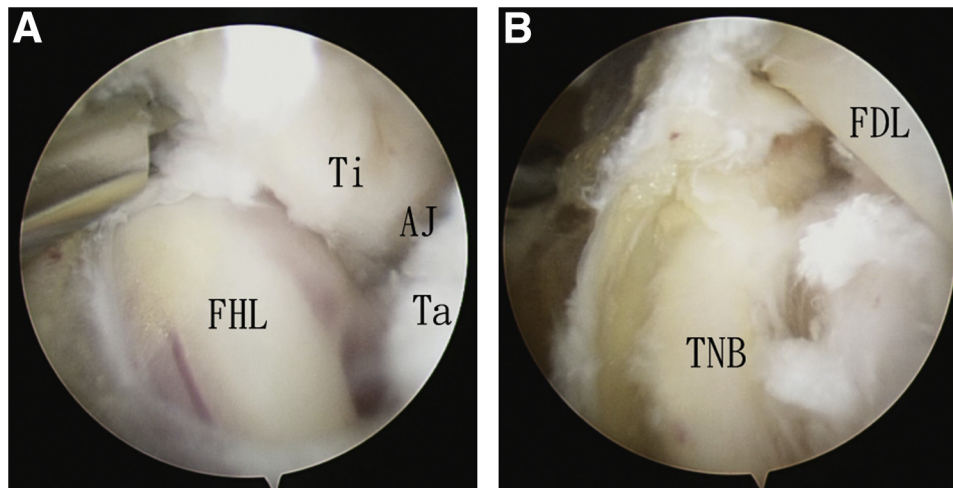


Fig 5. Endoscopic ganglionectomy of the left tarsal tunnel: medial approach. The patient is in the supine position with the legs spread. The distal portal is the viewing portal and the proximal portal is the working portal. (A) After resection of the ganglion, the flexor hallucis longus tendon and the posterior part of the ankle joint is examined for any underlying pathology. (B) With slight withdrawal of the arthroscope, the flexor digitorum longus tendon and the tibial neurovascular bundle can be seen. The tibial neurovascular bundle is examined for any residual compression. (AJ, ankle joint; FDL, flexor digitorum longus tendon; FHL, flexor hallucis longus tendon; Ta, talus; Ti, tibia; TNB, tibial neurovascular bundle.)

(Fig 5, Video 1, Table 2). After the procedure, the wounds are closed with simple sutures and the patient is allowed immediate weight-bearing walking and ankle mobilization.

Discussion

Open resection of the tarsal tunnel ganglion requires extensive dissection of the tarsal tunnel and may induce fibrosis around the tibial nerve. Endoscopic ganglionectomy has the advantage of minimal soft-tissue dissection and less soft-tissue trauma around the nerve.¹³ However, to choose the appropriate

endoscopic approach, preoperative magnetic resonance imaging is essential for studying the anatomical relationship between the ganglion and the adjacent structures, especially the tibial neurovascular bundle. Because the endoscopic procedure is performed close to the tibial neurovascular bundle, the surgeon should have a clear spatial image of the local anatomy before performing this procedure.

This endoscopic technique has the potential advantages of small incisions and better cosmetic result; minimal dissection and reduced risk of perineural fibrosis; and examination of the site of origin of the ganglion and arthroscopic treatment of any associated pathology. The potential risks of this technique include injury to the tibial neurovascular bundle, injury to the flexor hallucis longus or flexor digitorum longus tendon, and recurrence of the ganglion (Table 3).

Table 2. Pearls and Pitfalls of the Endoscopic Ganglionectomy of Tarsal Tunnel: Medial Approach

Pearls	Pitfalls
Preoperative magnetic resonance imaging is essential for operative planning.	Manipulation of the tibial neurovascular bundle should be kept to a minimum.
Fenestration of the flexor retinaculum should be started over the flexor digitorum longus tendon.	Dissection of the tibial neurovascular bundle should be avoided.
The flexor retinaculum should be cut from deep side out.	
Ganglionectomy should be started from distal proximally.	
Suction should be kept to a minimum.	
The shaver blade should be faced away from the tibial neurovascular bundle.	

Table 3. Advantages and Risks of the Endoscopic Ganglionectomy of the Tarsal Tunnel: Medial Approach

Advantages	Risks
Small incisions and better cosmetic results.	Injury to the tibial neurovascular bundle.
Minimal dissection and reduced risk of perineural fibrosis.	Injury to the flexor hallucis longus or flexor digitorum longus tendon.
The site of origin of the ganglion can be examined and any associated pathology can be treated.	Recurrence of the ganglion.

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