

# Endoscopic Resection of Horseshoe Ganglion of the Great Toe



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**Abstract:** Twelve percent of the foot ganglion cysts occur on the toes, and they are often symptomatic and recurrent. When conservative treatment failed, surgical excision is recommended, which is classically an open resection of the ganglion cyst. However, communicating lesions between ganglion cysts and the interphalangeal joint or tendon sheath make it difficult to prevent a recurrence. Techniques of arthroscopic or endoscopic toe ganglionectomy have been reported, which is either arthroscopic/endoscopic internal drainage to the adjacent joint or tendon sheath or endoscopic resection of the ganglion cyst. Difficulty in identifying the communicating valvular lesion and high incidence of multiloculated lesions make endoscopic internal drainage not always feasible for toe ganglion. The purpose of this Technical Note is to describe the details of endoscopic resection of horseshoe ganglion of the great toe. This minimal invasive approach may help to reduce the risk of recurrence.

A ganglion cyst is a common soft cystic lesion with a thin wall and mucinous content.<sup>1,2</sup> Around 11% of ganglion cysts occur on the foot and ankle, mostly overlying the ankle joint or the lateral side of foot dorsum, originated from the adjacent tendon sheaths or joints.<sup>1,3,4</sup> Twelve percent of the foot ganglion cysts occur on the toes, and they are often symptomatic and recurrent.<sup>4</sup> Toe ganglion cyst can cause pain due to shoe compression or pressure during walking.<sup>4</sup> Furthermore, they can present as repeated rupture, infection, and continuous discharge.<sup>4</sup>

The initial treatment of a ganglion is nonsurgical, including aspiration, steroid injection after aspiration, and sclerotherapy with a recurrence rate of 33% to 63%.<sup>4</sup> When conservative treatment fails, surgical excision is recommended, which is classically an open resection of the ganglion cyst.<sup>1,2</sup> However, communicating lesions between ganglion cysts and the

interphalangeal joint or tendon sheath make it difficult to prevent a recurrence.<sup>4,5</sup> Techniques of arthroscopic or endoscopic toe ganglionectomy have been reported, which is either arthroscopic/endoscopic internal drainage to the adjacent joint or tendon sheath or endoscopic resection of the ganglion cyst.<sup>2,6-9</sup> Difficulty in identifying the communicating valvular lesion and high incidence of multiloculated lesions make endoscopic internal drainage not always feasible for toe ganglion.<sup>6</sup> In this report, we describe the technical details of endoscopic resection of horseshoe ganglion of the great toe. It is indicated for symptomatic horseshoe ganglion at the medial or lateral side of the great toe. It is contraindicated if horseshoe ganglion is at the dorsal or plantar side of the great toe abutting both the medial and lateral digital arteries. It is also contraindicated if the great toe is ischemic or the contralateral digital artery is occluded, as shown in a digital Allen test. It may be relatively contraindicated in case of monocular toe ganglion communicated with the adjacent joint or flexor tendon sheath, in which endoscopic internal drainage is a simpler and safer approach (Table 1).

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## Technique

### Preoperative Assessment

A digital Allen test is important for confirmation of patency of the contralateral digital artery. Preoperative magnetic resonance imaging is important to confirm the diagnosis and whether the ganglion is multiloculated or not. It can provide information about the

**Table 1.** Indications and Contraindications of the Endoscopic Resection of horseshoe Ganglion of the Great Toe

Indications	Contraindications
1. Symptomatic horseshoe ganglion at medial or lateral side of the great toe.	1. Horseshoe ganglion at the dorsal or plantar side of the great toe abutting both the medial and lateral digital arteries. 2. The great toe is ischemic. 3. The contralateral digital artery is occluded as shown in digital Allen test. 4. Relatively contraindicated in case of monolocular toe ganglion communicated with the adjacent joint or flexor tendon sheath.

anatomic relationship between the ganglion and the extensor and flexor tendons, the underlying joints, and the digital neurovascular bundles and detect any associated pathology of the tendons or joints (Fig 1).

#### Patient Positioning and Portal Placement

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

The endoscopic procedure is performed via the dorsal and plantar portals, which are at the proximal dorsal and distal plantar corners of the ganglion, respectively. Three- to 4-mm skin incisions are made at the portal sites. The subcutaneous tissue is bluntly dissected with a

hemostat down to the ganglion. A cannula-trocar can pass through both portals, and these portals are coaxial portals (Fig 2).

#### Resection of Plantar Half of the Horseshoe Ganglion

The dorsal portal is the viewing portal and the plantar portal is the working portal. The fibrotic ganglionic tissue of the plantar half of the horseshoe ganglion is resected with an arthroscopic shaver (Dyonics; Smith & Nephew) until the flexor hallucis longus tendon is identified (Fig 3). Then, the remaining fibrotic ganglionic tissue is resected with the shaver until the subcutaneous tissue is seen.

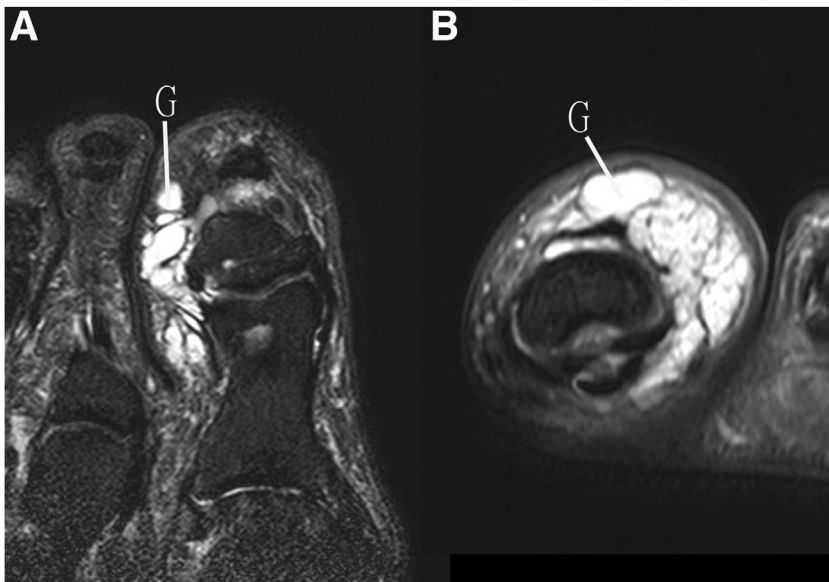
#### Resection of Dorsal Half of the Horseshoe Ganglion

The plantar portal is the viewing portal and the dorsal portal is the working portal. The fibrotic ganglionic tissue of the dorsal half of the horseshoe ganglion is resected with the shaver until the extensor hallucis longus tendon is identified (Fig 4). Then, the remaining fibrotic ganglionic tissue is resected with the shaver until the subcutaneous tissue is seen (Video 1, Table 2).

After the procedure, the portal incisions are closed with simple sutures and compression dressing is applied for 2 to 4 weeks.

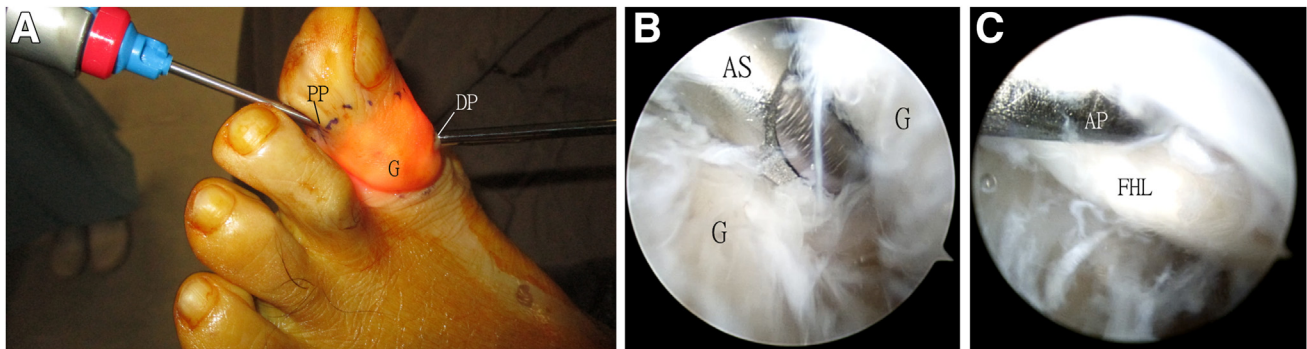
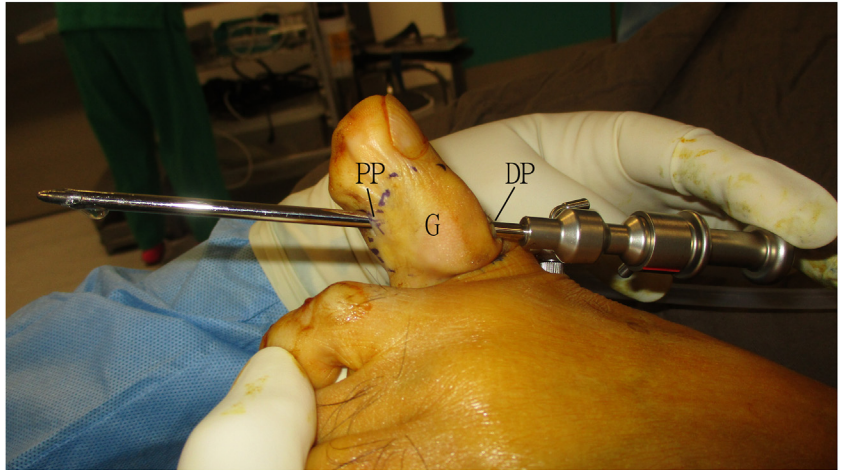
#### Discussion

In this reported technique, the plantar portal is located at the distal end of the ganglion to minimize the risk of injury to the digital neurovascular bundle. Moreover, making the dorsal and plantar portals at the proximal dorsal and distal plantar corners of the ganglion, respectively, can maximize the distance between the portals and increase the endoscopic working area.

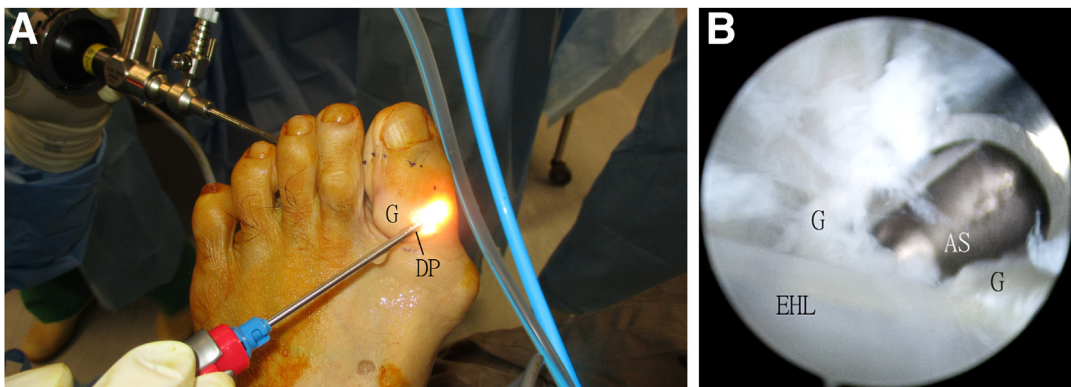


**Fig 1.** Endoscopic resection of horseshoe ganglion of the left great toe. The patient is in a supine position with the legs spread. Magnetic resonance imaging of the illustrated case shows a horseshoe multiloculated ganglion at the lateral side of the great toe. (A) Coronal image. (B) Transverse image. (G, ganglion.)

**Fig 2.** Endoscopic resection of horseshoe ganglion of the left great toe. The patient is in a supine position with the legs spread. The endoscopic procedure is performed via the dorsal and plantar portals, which are at the proximal dorsal and distal plantar corners of the ganglion, respectively. Three- to 4-mm skin incisions are made at the portal sites. The subcutaneous tissue is bluntly dissected with a hemostat down to the ganglion. A cannula-trocar can pass through both portals, and these portals are coaxial portals. (DP, dorsal portal; G, ganglion; PP, plantar portal.)



**Fig 3.** Endoscopic resection of horseshoe ganglion of the left great toe. The patient is in a supine position with the legs spread. (A) The dorsal portal is the viewing portal, and the plantar portal is the working portal. (B) The fibrotic ganglionic tissue of the plantar half of the horseshoe ganglion is resected with an arthroscopic shaver (Dyonics; Smith & Nephew). (C) The flexor hallucis longus tendon is identified after resection of the fibrotic ganglionic tissue. (AP, arthroscopic probe; AS, arthroscopic shaver; DP, dorsal portal; FHL, flexor hallucis longus tendon; G, ganglion; PP, plantar portal.)



**Fig 4.** Endoscopic resection of horseshoe ganglion of the left great toe. The patient is in a supine position with the legs spread. (A) The plantar portal is the viewing portal and the dorsal portal is the working portal. (B) The fibrotic ganglionic tissue of the dorsal half of the horseshoe ganglion is resected with the shaver until the extensor hallucis longus tendon is identified. (AS, arthroscopic shaver; DP, dorsal portal; EHL, extensor hallucis longus tendon; G, ganglion.)

**Table 2.** Pearls and Pitfalls of Endoscopic Resection of Horseshoe Ganglion of the Great Toe

Pearls	Pitfalls
1. The plantar portal is located at the distal end of the ganglion to minimize the risk of injury to the digital neurovascular bundle.	1. If the contralateral digital artery is occluded, the great toe is at risk of gangrene after this procedure.
2. Making the dorsal and plantar portals at the proximal dorsal and distal plantar corners of the ganglion respectively can maximize the distance between the portals and increase the endoscopic working area.	2. If this procedure is performed for horseshoe ganglion at the plantar or dorsal side of the great toe, both the medial and lateral digital arteries may be damaged.
3. Resection of the ganglion instead of internal drainage of the ganglion into the interphalangeal joint or the flexor tendon sheath can reduce the risk of recurrence.	3. Internal drainage of a multiloculated ganglion into adjacent joint or tendon sheath has a high chance of recurrence.

To further reduce the risk of recurrence, preoperative magnetic resonance imaging should be carefully studied for any synovial fluid accumulation in the metatarsophalangeal or interphalangeal joint or the flexor hallucis longus tendon sheath, which may supply the ganglion cyst of the great toe.<sup>5</sup> Any satellite lesion along the tendon sheath should also be examined.<sup>5</sup> These associated lesions, if present, should be treated accordingly.

This endoscopic technique has the potential advantages of small incisions and better cosmetic result,

**Table 3.** Advantages and Risks of Endoscopic Resection of Horseshoe Ganglion of the Great Toe

Advantages	Risks
1. Small incisions and better cosmetic result	1. Injury to the digital neurovascular bundle
2. Minimal dissection and less scar formation	2. Injury to the collateral ligament of the interphalangeal joint
	3. Injury to the flexor and extensor tendon of the great toe

minimal dissection, and less scar formation. The potential risks of this technique include injury to the digital neurovascular bundle, collateral ligament of the interphalangeal joint, and the flexor and extensor tendon of the great toe (Table 3). This procedure is not technically demanding and can be attempted by average foot and ankle arthroscopists.

## Disclosures

All authors (R.J.H., T.H.L.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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