

Endoscopic En-Bloc Resection of Neurilemmoma of the Foot Dorsum



Yu Hei Choi, M.B.Ch.B, and
Tun Hing Lui, M.B.B.S. (HK), F.R.C.S. (Edin), F.H.K.A.M., F.H.K.C.O.S.

Abstract: Neurilemmoma (schwannoma) is a benign, slow-growing, encapsulated tumor originating from the Schwann cells of the peripheral nerve sheath. The purpose of this technical note is to describe the technique of endoscopic en-bloc resection of neurilemmoma of the foot dorsum. This has the advantage of better cosmetic result and less postoperative perineural fibrosis.

Neurilemmoma (schwannoma) is a benign, slow-growing, encapsulated tumor originating from the Schwann cells of the peripheral nerve sheath.¹ It constitutes 8% of all soft-tissue tumors and 4% of soft tissue tumors in the foot and ankle region.^{2,3} It can involve any nerve of the foot and ankle.^{1,4-16} These tumors are usually asymptomatic unless an increase in size or disruption of the nerve causes pain.^{6,9} The symptoms of neurilemmoma on the foot and ankle are mainly related to pressure effects on the associated nerve (weakness and paresthesia) or pressure areas (e.g., at the sole).³ The differential diagnoses should include any soft tissue mass that can cause a compressive effect on the neurovascular bundle.¹ These include neurogenic tumors and tumors or tumor-like lesions originating from any structure near the neurovascular bundle such as a blood vessel (arterial aneurysm, deep venous thrombosis, and varicosity), and abnormalities of the tendon sheath (giant cell tumor, tenosynovitis, and ganglion cyst) can mimic schwannomas.¹

Surgical excision of neurilemmoma is the treatment of choice with excellent outcome. Extreme care needs to be taken to dissect the tumor from associated nerves to preserve or restore nerve functions to a maximal level.⁴ Recurrence is extremely rare unless the tumor tissue is incompletely excised.¹ Traditionally, the tumor is resected by an open approach. Recently, techniques of endoscopic-assisted resection of the neurilemmoma have been reported.^{4,17-19} This technical note describes the technique of endoscopic en-bloc resection of neurilemmoma of the foot dorsum. This is indicated for symptomatic neurilemmoma of the foot dorsum. This is contraindicated if the neurilemmoma originates from branches of the plantar nerve and extends via the intermetatarsal space to the foot dorsum. This is also contraindicated in malignant neurilemmoma, vascular lesions, or neurofibroma (Table 1).

Technique

Preoperative Planning and Patient Positioning

Magnetic resonance imaging is an important preoperative investigation because it can give information about the nature and the anatomical site of the tumor

Table 1. Indications and Contraindications of Endoscopic En-Bloc Resection of Neurilemmoma of the Foot Dorsum

Indication	Symptomatic neurilemmoma of the foot dorsum.
Contraindications	The neurilemmoma is originating from branches of plantar nerve and extended via the intermetatarsal space to the foot dorsum.
	Malignant neurilemmoma
	Vascular lesions
	Neurofibroma

From the Department of Orthopaedics and Traumatology, Prince of Wales Hospital (Y.H.C.); and the Department of Orthopaedics and Traumatology, North District Hospital (T.H.L.), Hong Kong, China.

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Address correspondence to Tun Hing Lui, Department of Orthopaedics and Traumatology, North District Hospital, 9 Po Kin Road, Sheung Shui, NT, Hong Kong SAR, China. E-mail: luithderek@yahoo.co.uk

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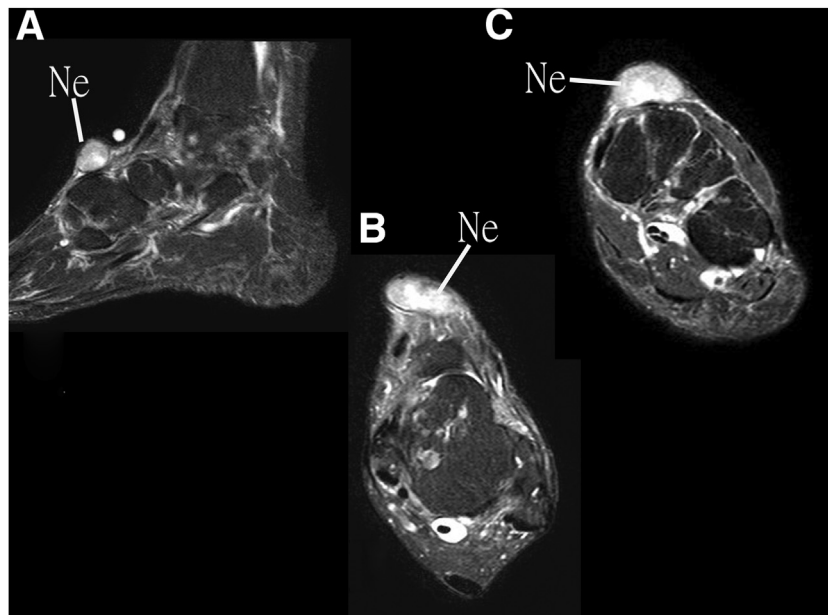


Fig 1. Magnetic resonance images of the illustrated case show a neurilemmoma at the foot dorsum. (A) Sagittal view. (B) Transverse view. (C) Coronal view. Ne, neurilemmoma.

(Fig 1), which is essential for preoperative planning. The patient is in the 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, Tuttlingen, Germany) is used. Fluid inflow is driven by gravity, and no arthropump is used.



Fig 2. This procedure is performed via the medial and lateral portals, which are at the medial and lateral corners of the tumor, respectively. MP, medial portal; LP, lateral portal; Ne, neurilemmoma.

Portal Placement

This procedure is performed via the medial and lateral portals, which are at the medial and lateral corners of the tumor, respectively (Fig 2). Incisions measuring 3 mm are made at the portals, and these portals are interchangeable as the viewing and working portals.

Dissection of the Superficial Surface of the Neurilemmoma

The lateral portal is the viewing portal, and the medial portal is the working portal. The surrounding soft tissue is bluntly dissected from the superficial surface of the neurilemmoma with a hemostat (Fig 3). This forms the initial endoscopic working area for the procedure.

Dissection of the Nerve From the Neurilemmoma

In this illustrated case, the associated nerve is at the medial side of the neurilemmoma. The lateral portal is the viewing portal, and the medial portal is the working portal. The associated nerve is dissected from the neurilemmoma by means of the hemostat (Fig 4).

Dissection of the Deep Surface of the Neurilemmoma

The lateral portal is the viewing portal, and the medial portal is the working portal. The medial side of the deep surface of the neurilemmoma is dissected from the surrounding soft tissue with an arthroscopic shaver (Dyonics; Smith & Nephew, Andover, MA). The

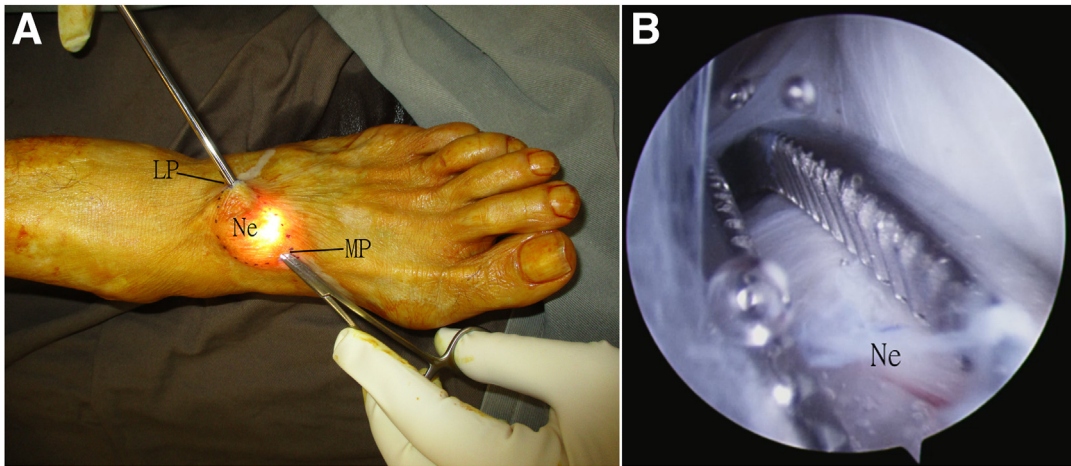


Fig 3. The lateral portal is the viewing portal, and the medial portal is the working portal. The surrounding soft tissue is bluntly dissected from the superficial surface of the neurilemmoma with a hemostat. (A) Clinical photo. (B) Endoscopic photo. MP, medial portal; LP, lateral portal; Ne, neurilemmoma.

arthroscope and the shaver are inserted between the neurilemmoma and the underlying structures. This can create a working space for dissection of the deep surface of the neurilemmoma. The round-tip shaver can serve as a blunt end dissector, and the fibrous bands can be resected by the shaver (Fig 5). The arthroscope can be switched to the medial portal, and the lateral side of the deep surface of the neurilemmoma can be dissected with the shaver via the lateral portal (Fig 6). It is

important not to injure the underlying extensor tendons and the surrounding nerve(s).

Excision of the Neurilemmoma

The medial portal incision is enlarged, and the neurilemmoma is squeezed out (Fig 7, Video 1, Table 2). The wounds are closed with simple sutures.

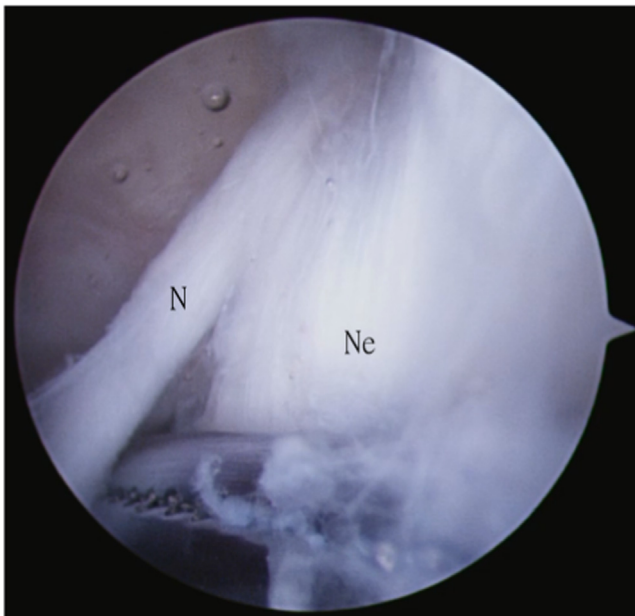


Fig 4. In this illustrated case, the associated nerve is at the medial side of the neurilemmoma. The lateral portal is the viewing portal, and the medial portal is the working portal. The associated nerve is dissected from the neurilemmoma by means of the hemostat. N, nerve; Ne, neurilemmoma.

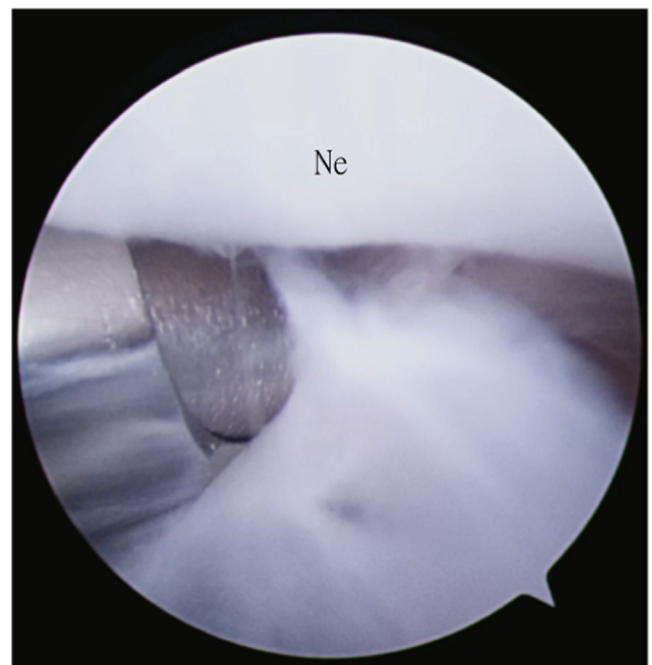


Fig 5. The lateral portal is the viewing portal and the medial portal is the working portal. The medial side of the deep surface of the neurilemmoma is dissected from the surrounding soft tissue with an arthroscopic shaver. Ne, neurilemmoma.

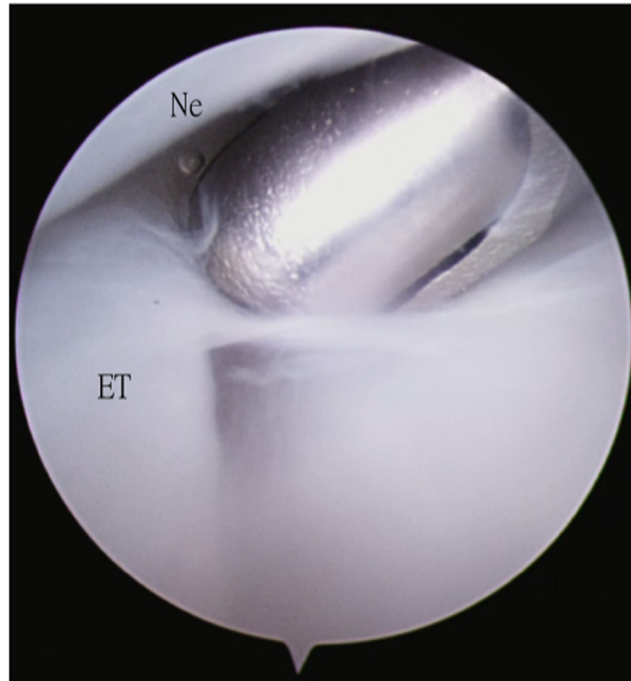


Fig 6. The medial portal is the viewing portal and the lateral portal is the working portal. The lateral side of the deep surface of the neurilemmoma is dissected from the surrounding soft tissue with an arthroscopic shaver. Ne, neurilemmoma; ET, extensor tendon.

Discussion

Neurilemmoma is usually enucleable, and intracapsular resection can minimize the risk of nerve injury.^{20,21} Resection of the tumor can be performed under a microscope; however, the risk of injury cannot be totally eliminated. In comparison with the microscopic view, endoscopic visualization could achieve a

better differentiation between the tumor mass and its capsule.^{4,21} However, the nerves at the foot dorsum are small, intracapsular resection may not be possible, and injury to the nerve fascicles may not be avoidable. The patient should be well informed about this risk.

The advantages of this minimally invasive technique include better cosmetic results and minimal soft tissue dissection with less postoperative perineural fibrosis and fewer wound complications. The potential risk of this technique includes incomplete resection, injury to the associated nerve, dorsalis pedis artery, or the extensor tendons (Table 3). This technique is not



Fig 7. The medial portal incision is enlarged and the neurilemmoma is squeezed out. MP, medial portal; LP, lateral portal; Ne, neurilemmoma.

Table 2. Pearls and Pitfalls of Endoscopic En-Bloc Resection of Neurilemmoma of the Foot Dorsum

Pearls

- Use of portals at the medial and lateral sides of the tumor allows better mobility of the arthroscope and arthroscopic instruments.
- The arthroscopic shaver can be used as a round tip dissector to free the neurilemmoma from the surrounding soft tissue.

Pitfalls

- Preoperative assessment to exclude neurofibroma or malignant tumor is essential
- Use of portals proximal and distal to the tumor may affect the instrumental mobility. The mobility of instrumentation via the proximal portal may be hindered by the distal leg and mobility of instrumentation via the distal portal may be hindered by the forefoot dorsum.

Table 3. Advantages and Risks of Endoscopic En-Bloc Resection of Neurilemmoma of the Foot Dorsum

Advantages
Better cosmetic result
Minimal soft tissue dissection with less postoperative perineural fibrosis
Fewer wound complications
Risks
Incomplete resection
Injury to the associated nerve
Injury to the dorsalis pedis artery
Injury to the extensor tendons

technically demanding and can be attempted by averaged foot and ankle arthroscopists.

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