

Endoscopic En Bloc Resection of Giant Cell Tumor of Tendon Sheath of Anterior Ankle



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Abstract: Giant cell tumor of the tendon sheath (GCTTS) originates from the synovial cells of the tendon sheath. It is one of the most common benign soft-tissue tumors of the foot and ankle affecting the joints, bursae, and tendon sheaths and can behave in a locally aggressive manner. Complete surgical resection with long-term follow-up is the preferred treatment. Because GCTTS is a benign condition, the equilibrium between the quality of the surgical margins and functional preservation should be considered. If more aggressive resection is applied, the outcome may negatively affect quality of life, whereas incomplete resection may lead to recurrence. The purpose of this technical note is to describe the details of endoscopic en bloc resection of GCTTS of the anterior ankle. This endoscopic approach can provide a magnified view of the operative site, allowing accurate surgical assessment to ensure complete resection of the lesion without damage to the adjacent normal structures.

Giant cell tumor of the tendon sheath (GCTTS) originates from the synovial cells of the tendon sheath.¹⁻⁶ It is one of the most common benign soft-tissue tumors of the foot and ankle affecting the joints, bursae, and tendon sheaths and can behave in a locally aggressive manner.¹⁻⁶ It is predominately found in the hand, followed by the foot and ankle.⁷ When compared with GCTTS of the hand, GCTTS of the foot and ankle may be more destructive owing to the constrictive ligamentous nature of the region, preventing outward growth.⁷

GCTTS frequently presents as a solid, slow-growing, multilobular, nontender mass, located adjacent to the tendon sheath or periarticular soft tissues of small joints.^{3,4} The clinical course is often unpredictable, and symptoms including pain, stiffness, swelling, and

limitation in range of joint motion can occur.^{2-4,7} Patients with pain on presentation and those with erosive changes on magnetic resonance imaging are more likely to have persistent postoperative pain.¹ The pathology of GCTTS is unclear and may involve both neoplastic and inflammatory processes.^{3,4,7}

Treatment of GCTTS involves early surgical resection to limit articular destruction and the risk of recurrence.⁸ Complete surgical resection with long-term follow-up is the preferred treatment.^{1,3,5,7,9-11} Because GCTTS is a benign condition, the equilibrium between the quality of the surgical margins and functional preservation should be considered.^{3,7,12} If more aggressive resection is applied, the outcome may negatively affect quality of life, whereas incomplete resection may lead to recurrence.³ An endoscopic approach can provide a magnified view of the operative site, allowing accurate surgical assessment to ensure complete resection of the lesion without damage to the adjacent normal structures. Endoscopic piecemeal resection of GCTTS of the hindfoot has been found to be effective, with fewer

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Table 1. Indications and Contraindications of Endoscopic En Bloc Resection of GCTTS of Anterior Ankle

Indications
Extra-articular GCTTS of anterior ankle
Contraindications
Intra-articular tumor
Tumor encasing adjacent nerve
GCTTS, giant cell tumor of tendon sheath.

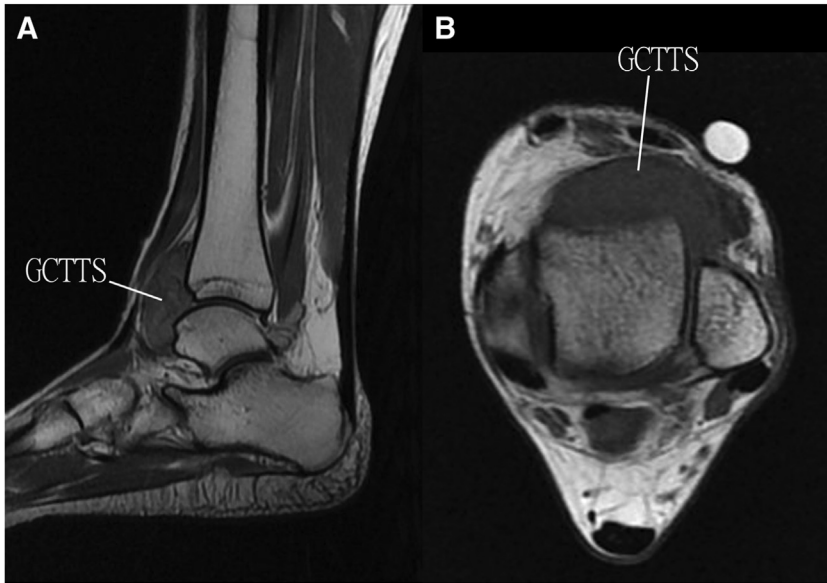


Fig 1. Endoscopic en bloc resection of giant cell tumor of tendon sheath (GCTTS) of left anterior ankle. The patient is in the supine position with the hip of the operative lower limb internally rotated. Magnetic resonance imaging in the illustrated case shows the tumor at the anterior ankle: sagittal view (A) and transverse view (B).

postoperative wound complications by avoiding extensive soft-tissue dissection.^{7,8,13-15}

The purpose of this technical note is to describe the details of endoscopic en bloc resection of GCTTS of the anterior ankle. This procedure is indicated for extra-articular GCTTS of the anterior ankle. It is contraindicated for intra-articular tumor or tumor encasing adjacent nerves (Table 1).

Technique

Preoperative Assessment and Patient Positioning

To prevent disease recurrence, accurate evaluation of lesion location and careful operative planning are

mandatory. Preoperative magnetic resonance imaging of the foot and ankle is essential to delineate the extent of the lesion and plan the operation (Fig 1).

The patient is placed in the supine position with the hip of the operative lower limb internally rotated. A 2.7-mm, 30° arthroscope (Henke Sass Wolf, Tuttlingen, Germany) is used for the procedure. A thigh tourniquet is applied to provide a bloodless operative field. Fluid inflow is driven by gravity, and no arthro-pump is used.

Portal Placement

The procedure is performed via the proximal and distal portals, which are at the proximal lateral and distal lateral corners of the tumor, respectively (Fig 2).

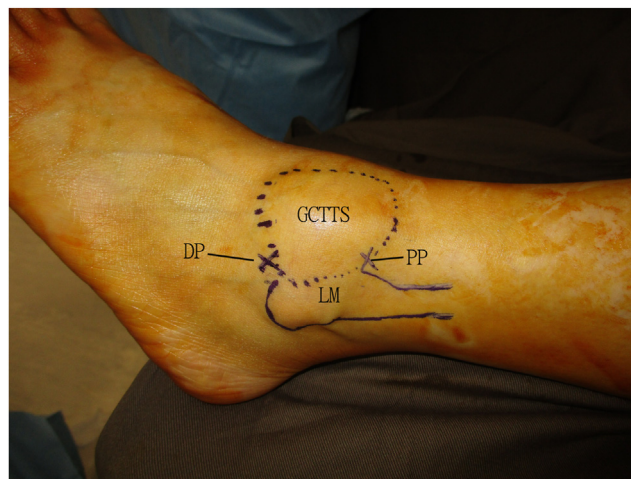


Fig 2. Endoscopic en bloc resection of giant cell tumor of tendon sheath (GCTTS) of left anterior ankle. The patient is in the supine position with the hip of the operative lower limb internally rotated. The procedure is performed via the proximal portal (PP) and distal portal (DP), which are at the proximal lateral and distal lateral corners of the tumor, respectively. (LM, lateral malleolus.)

Fig 3. Endoscopic en bloc resection of giant cell tumor of tendon sheath (GCTTS) of left anterior ankle. The patient is in the supine position with the hip of the operative lower limb internally rotated. (A) The distal portal (DP) is the viewing portal, and the proximal portal (PP) is the working portal. (B) The proximal half of the tumor is dissected from the surrounding tissue, and any intervening fibrous adhesions are released by SuperCut scissors (S). (IS, inflamed synovium.)

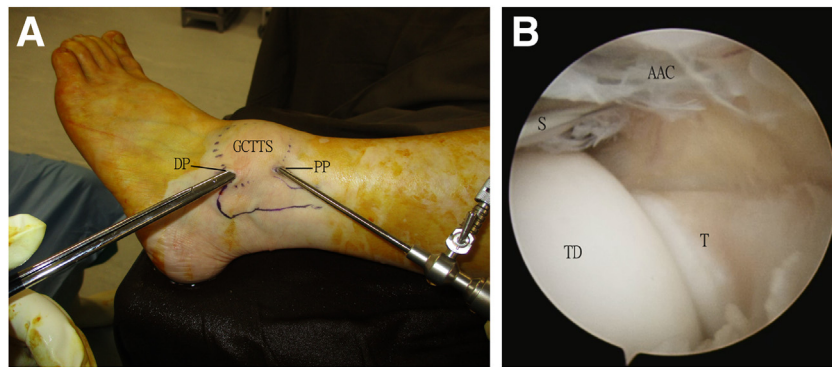
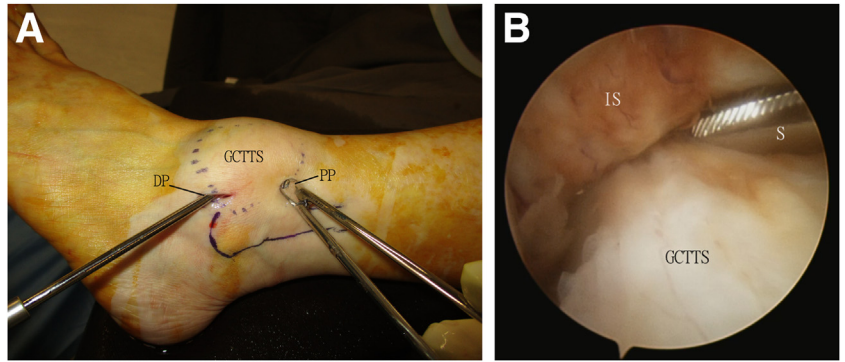


Fig 4. Endoscopic en bloc resection of giant cell tumor of tendon sheath (GCTTS) of left anterior ankle. The patient is in the supine position with the hip of the operative lower limb internally rotated. (A) The proximal portal (PP) is the viewing portal, and the distal portal (DP) is the working portal. (B) The distal half of the tumor is dissected from the surrounding tissue, and any intervening fibrous adhesions are released by SuperCut scissors (S). In the illustrated case, the tumor is adhered to the anterior ankle capsule (AAC). The adhered capsule is resected together with the tumor by means of SuperCut scissors. (T, tibia; TD, talar dome.)

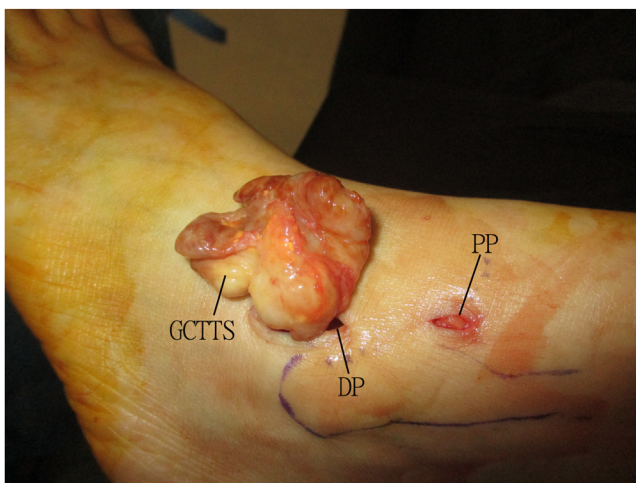


Fig 5. Endoscopic en bloc resection of giant cell tumor of tendon sheath (GCTTS) of left anterior ankle. The patient is in the supine position with the hip of the operative lower limb internally rotated. After complete dissection of the tumor, the distal portal (DP) incision is enlarged and the tumor is squeezed out. (PP, proximal portal.)

Five-millimeter incisions are made at the portal sites. The underlying subcutaneous tissue is bluntly dissected down to tumor by a hemostat. The deep fascia is perforated by the hemostat tip.

Dissection of Proximal Half of GCTTS

The distal portal is the viewing portal, and the proximal portal is the working portal. The surrounding inflamed synovium undergoes biopsy and is resected with an arthroscopic shaver (Dyonics; Smith & Nephew, Andover, MA). The proximal half of the tumor is dissected from the surrounding tissue, and any intervening fibrous adhesions are released by SuperCut scissors (Stille, Lombard, IL) (Fig 3).

Dissection of Distal Half of GCTTS

The proximal portal is the viewing portal, and the distal portal is the working portal. The surrounding inflamed synovium is resected with the arthroscopic shaver. The distal half of the tumor is dissected from the surrounding tissue, and any intervening fibrous

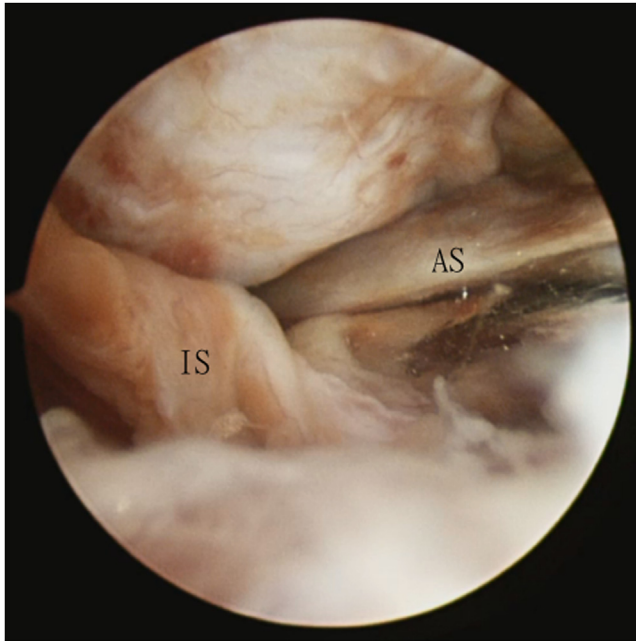


Fig 6. Endoscopic en bloc resection of giant cell tumor of tendon sheath of left anterior ankle. The patient is in the supine position with the hip of the operative lower limb internally rotated. The distal portal is the viewing portal, and the proximal portal is the working portal. After tumor resection, the remaining inflamed synovium (IS) at the operative site is resected. (AS, arthroscopic shaver.)

adhesions are released by SuperCut scissors. In the illustrated case, the tumor is adhered to the anterior ankle capsule. The adhered capsule is resected together with the tumor by means of SuperCut scissors (Fig 4).

En Bloc Resection of GCTTS

After complete dissection of the tumor, the distal portal incision is enlarged and the tumor is squeezed out (Fig 5).

Endoscopic Synovectomy

The proximal and distal portals are interchangeable as the viewing and working portals. After tumor resection,

Table 2. Pearls and Pitfalls of Endoscopic En Bloc Resection of GCTTS of Anterior Ankle

Pearls

- Careful study of preoperative MRI scans is essential for planning of the operation.
- Larger portal incisions and fluid inflow by gravity can avoid excessive fluid extravasation and minimize the risk of seeding diseased tissue to the surrounding structures.
- Complete endoscopic synovectomy of the operative site after tumor resection can minimize the risk of recurrence of the lesion.

Pitfalls

- Forceful dissection of tumor that is adhered to the ankle capsule may result in incomplete resection of the lesion.
- Excessive inflow pressure can cause excessive fluid extravasation, fluid dissection of adjacent soft-tissue planes, and disease spread.

GCTTS, giant cell tumor of tendon sheath; MRI, magnetic resonance imaging.

Table 3. Advantages and Risks of Endoscopic En Bloc Resection of GCTTS of Anterior Ankle

Advantages

- Small incisions and better cosmetic outcomes
- Minimal soft-tissue trauma and less scar formation
- Accurate control of extent of tumor resection under magnified endoscopic visualization

Risks

- Injury to extensor tendons
- Injury to articular cartilage
- Injury to dorsalis pedis artery
- Injury to branches of superficial peroneal nerves
- Injury to deep peroneal nerve
- Incomplete resection of tumor

GCTTS, giant cell tumor of tendon sheath.

the operative site including the ankle joint is examined for any residual synovitis. The remaining inflamed synovium is resected (Fig 6, Video 1, Table 2).

Discussion

Owing to its unrelenting growth pattern, GCTTS has the propensity to invade surrounding soft tissue and bone, as well as metastasize to the lungs, making early diagnosis and surgical resection of the tumor of utmost importance to avoid long-term sequelae.⁷ In the reported technique, the tumor is resected en bloc rather in a piecemeal manner. This can reduce the risk of seeding of the diseased tissue to the surrounding structures. Moreover, resection of the surrounding inflamed synovium is important to minimize the risk of recurrence. Excessive inflow pressure must be avoided to prevent fluid dissection of adjacent soft-tissue planes and disease spread.

Systemic treatment is indicated for unresectable or refractory cases.^{4,5,11,16} However, side effects are commonly experienced, and relapse may occur once treatment has ceased.⁵ To lessen recurrence rates, (neo) adjuvant external beam radiation therapy and radiosynoviorthesis can be considered, but their benefit is not validated for foot and ankle disease.⁵ Radiotherapy is also related to adverse events such as fibrosis, joint stiffness, and skin necrosis, as well as an increased risk of radiation-induced sarcoma, and is not favorable for benign tumors such as GCTTS.⁵

The advantages of our technique include small incisions and better cosmetic outcomes, minimal soft-tissue trauma, less scar formation, and accurate control of the extent of tumor resection under magnified endoscopic visualization. The potential risks of this technique include injury to the extensor tendons, articular cartilage, dorsalis pedis artery, and branches of the superficial peroneal nerves and deep peroneal nerve, in addition to incomplete resection of the tumor (Table 3). This technique is not technically demanding and should be attempted by average foot and ankle arthroscopists.

Disclosures

Both authors (W.K.S., 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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