Endoscopic Decompression of Olecranon Tophus

Sui Kit Chan, M.B.B.S.(HK), 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: The olecranon bursa is very commonly involved in tophaceous gout because of the tendency of monosodium urate crystals to deposit in superficial structures with low temperatures. Surgery is indicated if the olecranon tophus is recalcitrant to medical treatment. Open surgery requires a long incision over the tophus and may lead to wound complications. Endoscopic debridement of the tophus can reduce the risk of wound complications. In this Technical Note, the technical details of endoscopic decompression of an olecranon tophus are described. This endoscopic technique also allows debridement of tophus infiltration of the triceps tendon.

Gout is an inflammatory metabolic disorder that occurs in conjunction with hyperuricemia and is a result of the deposition of monosodium urate monohydrate crystals within the periarticular soft tissues.1,2 Gout may cause bursitis, and the olecranon bursa is one of the most affected bursas. The olecranon bursa is very commonly involved in tophaceous gout because of the tendency of monosodium urate crystals to deposit in superficial structures with low temperatures.3 Medical treatment including lifestyle and dietary modifications and drug therapy remains the mainstay of treatment. Without proper and timely treatment, tophi develop approximately 10 years after the onset of the disease.4 The process of tophaceous deposition advances progressively and leads to numerous problems. The overlying skin of the tophus can ulcerate, and secondary infection will occur. The large tophus can cause local ischemia to the surrounding skin and affect ulcer healing. Moreover, this can lead to wound complications after open resection of the tophus.4

Table 1. Indications and Contraindications of Endoscopic Decompression of Olecranon Tophus

| Indications                                      |
|-------------------------------------------------|
| Symptomatic olecranon tophus                    |
| Impending rupture of tophus                      |
| Repeated ulceration                              |
| Persistent tophaceous discharge                  |
| Recalcitrance to medical treatment               |
| Metabolic reasons for lowering of total body urate level |
| Cosmetic restoration                             |
| Tophaceous invasion of underlying triceps tendon |

| Contraindications                               |
|------------------------------------------------|
| Suspicion of neoplasm                           |

Tophaceous material may present in a liquid, pasty, or chalky and/or granular state.1 Treatment may be as simple as aspirating the liquid or squeezing out pasty tophaceous material. However, open debridement is needed for tophi in the chalky and/or granular state. Open surgery for tophaceous gout requires a long incision directly over the tophus and is associated with a relatively high rate of wound complications, for example, symptomatic scar adhesion of the underlying structures and overlying skin necrosis.1 Techniques of endoscopic debridement of the tophus have been described.1,4,5 These minimally invasive techniques allow resection of the gouty tophus through small incisions away from the lesion and minimize the risk of wound dehiscence and persistent tophaceous discharge.5

The purpose of this Technical Note is to describe the details of endoscopic decompression of an olecranon tophus. This technique is indicated for a symptomatic olecranon tophus, impending rupture of the tophus, repeated ulceration, or persistent tophaceous discharge that is recalcitrant to medical treatment. It is also...
indicated for lowering of the total body urate level (metabolic reasons) or cosmetic restoration. Tophaceous invasion of the underlying triceps tendon is another indication for surgery. The endoscopic procedure is contraindicated in patients in whom neoplasm is suggested. The red-flag signs suggestive of neoplastic pathology include a rapidly expanding growth, failure of initial treatment, weight loss, and history of neoplasia (Table 1).6

Fig 1. Endoscopic decompression of olecranon tophus in right elbow with patient in prone position. A preoperative radiograph of the elbow shows the soft-tissue swelling at the olecranon, which is calcified. (T, calcified tophus.)

Technique

Preoperative Planning and Patient Positioning

Preoperative radiographs of the involved elbow can show the soft-tissue swelling at the olecranon, which may be calcified (Fig 1). Preoperative magnetic resonance imaging is useful for confirmation of the diagnosis and exclusion of other pathology. It is also useful for study of the relation between the tophus and the surrounding structures. It is especially important if clinically, the mass is overlying the triceps tendon. Magnetic resonance imaging can be used to evaluate the condition of the triceps tendon and detect any invasion of the tophus into the tendon (Fig 2).

The patient is placed in the prone position with an arm support to keep the shoulder in 90° of abduction and the elbow in 90° of flexion. An ipsilateral arm tourniquet is used to provide a bloodless surgical field. Fluid inflow is driven by gravity, and an arthro-pump is not used. A 4.0-mm, 30° arthroscope (Dyonics; Smith & Nephew, Andover, MA) is used for this procedure.

Portal Placement and Creation of Initial Endoscopic Working Space

The procedure is performed via the proximal portal and distal radial portal. The proximal portal is at the junction between the proximal edge of the tophus and the midline of the posterior elbow. The distal radial portal is at the distal radial corner of the tophus (Fig 3). We avoid placement of the distal portal over the ulnar side of the tophus to reduce the risk of injury to the ulnar nerve and to prevent an ulnar scar, which may be painful when the patient rests the elbow on a table. Placement of the distal portal over the midline should also be avoided because a painful scar may be formed over the proximal ulnar bone.

Five-millimeter skin incisions are made at the portal sites. The subcutaneous tissue is bluntly dissected down

Fig 2. Endoscopic decompression of olecranon tophus in right elbow with patient in prone position. Preoperative magnetic resonance imaging of the elbow shows tophus infiltration of the triceps tendon. (A) Transverse image at level of olecranon (Ol) bone. (B) Transverse image at level of triceps tendon (Tr). (T, tophus.)
to the tophus with a hemostat. A trocar-cannula (Dyonics; Smith & Nephew) is introduced via both portals and is passed through the tophus as superficially as possible. This tract between the 2 portals forms the initial endoscopic working space (Fig 4).

**Debridement of Deep Part of Tophus**

The proximal and distal radial portals are interchangeable as the viewing and working portals. The part deep to the initial endoscopic working space is usually adhered to the underlying bone and triceps tendon and is relatively immobile. This facilitates debridement with an arthroscopic shaver (Dyonics; Smith & Nephew) and arthroscopic punch forceps (Acufex; Smith & Nephew) (Fig 5). Debridement of the medial edge of the tophus should be performed under direct endoscopic visualization, and the instrument should not go far beyond the boundary of the tophus to avoid injury to the ulnar nerve.

**Debridement of Superficial Part of Tophus**

The proximal and distal radial portals are interchangeable as the viewing and working portals. The superficial part of the tophus is usually adhered to the overlying skin and is mobile. The tophus can be held by the assistant and pushed toward the instrument to facilitate debridement by the arthroscopic shaver and arthroscopic punch forceps (Fig 6).

**Debridement of Triceps Tendon**

The distal radial portal is the viewing portal, and the proximal portal is the working portal. The tophaceous

---

**Fig 3.** Endoscopic decompression of olecranon tophus in right elbow with patient in prone position. The portals used for the endoscopic procedure are shown: distal radial portal (DRP) and proximal portal (PP). (T, tophus; Tr, triceps tendon; UN, ulnar nerve.)

**Fig 4.** Endoscopic decompression of olecranon tophus in right elbow with patient in prone position. (A) A trocar-cannula is introduced via both the proximal portal (PP) and distal radial portal (DRP) and passes through the tophus as superficially as possible. This tract between the 2 portals forms the initial endoscopic working space. (B) Endoscopy of the tophus is performed via the 2 portals. The PP is the viewing portal, and the DRP is the working portal.
material superficial to the triceps tendon is removed with the arthroscopic shaver and arthroscopic punch forceps. Thereafter, the triceps tendon is exposed. The tendon can be cut longitudinally with a No. 15 surgical scalpel blade to expose the intratendinous tophaceous deposits, which undergo debulking with the arthroscopic shaver and arthroscopic punch forceps (Fig 7, Video 1, Table 2). After the operation, the wounds are closed with simple sutures, and elbow mobilization is started on the second postoperative day.

**Discussion**

Tophaceous deposition of tendons has been reported, including the flexor and extensor tendons of the hand, distal biceps tendon, Achilles tendon, quadriceps tendon, patellar tendon, tibialis anterior tendon, and peroneal tendons. Tophi generally envelop the tendon or there is no relation between them. Rarely, tophi can also be found at the insertion site of the tendon, can cause extrinsic compression, or can be located inside the tendon. In the case illustrated in this article, the olecranon tophus infiltrated into the triceps tendon, which—to our knowledge—has not been reported in the English-language literature. This tophus infiltration into the tendon may cause local anatomic deformities with consequent limitation or loss of articular movements. Previously, it was believed that gouty tophi did not lead to tendon destruction. However, there are many reports of tendon ruptures with tophaceous deposition intra-tendinously and paratendinously, and it is now accepted that gouty tophi may play a role in tendon destruction. Monosodium urate crystals can directly interact with tenocytes to reduce cell viability and function, which may result in spontaneous ruptures of involved tendons. The inflammatory response to urate deposits is associated
with connective tissue damage accompanied by collagen lysis and cystic changes. Inflammatory compromise of connective tissue integrity, loss of tendon tensile strength, and fibrinous exudation of active tophi may also lead to tendon tears and ruptures. For those cases of tophus infiltration into the tendon, it is possible to indicate clinical treatment to reduce the dimensions of the tophi to avoid rupture of the tendon.

**Table 2. Pearls and Pitfalls of Endoscopic Decompression of Olecranon Tophus**

**Pearls**
- Medial portals should be avoided.
- Debridement of the medial edge of the tophus should be performed under strict direct endoscopic visualization.
- Holding of the tophus by the assistant can aid debridement of the superficial part of the tophus.
- The triceps tendon can be cut longitudinally to assess the degree of intratendinous deposition of tophaceous material.

**Pitfalls**
- Excessive debridement of the triceps tendon may increase the risk of tendon rupture.
- Excessive debridement of the superficial edge of the tophus may result in skin necrosis.

**Table 3. Advantages and Risks of Endoscopic Decompression of Olecranon Tophus**

**Advantages**
- Less soft-tissue trauma
- Better cosmetic results
- Fewer wound complications

**Risks**
- Ulnar nerve injury
- Compartment syndrome of forearm due to excessive extravasation
- Triceps tendon injury
- Skin necrosis
- Wound dehiscence and persistent tophaceous discharge

The described minimally invasive technique has the advantages of less soft-tissue trauma, better cosmetic results, and fewer wound complications. The potential risks of this technique include ulnar nerve injury, compartment syndrome of the forearm due to excessive extravasation, triceps tendon injury, skin necrosis, wound dehiscence, and persistent tophaceous discharge (Table 3). This technique is not technically demanding and can be attempted by the average elbow arthroscopist.

**References**

1. Lui TH. Endoscopic decompression of a gouty tophus at the hand dorsum. *Arthrosc Tech* 2017;6:e827-e832.
2. de Ávila Fernandes E, Sandim GB, Mitraud SAV, Kubota ES, Ferrari AJL, Fernandes ARC. Sonographic description and classification of tendinous involvement in relation to tophi in chronic tophaceous gout. *Insights Imaging* 2010;1:143-148.
3. Özdemir G, Deveci A, Andıç K, Yaşar NE. Bilateral olecranon tophaceous gout bursitis. *Case Rep Med* 2017;2017:3514796.
4. Lui TH. Endoscopic resection of the gouty tophi of the first metatarsophalangeal joint. *Arch Orthop Trauma Surg* 2008;128:521-523.
5. Lui TH. Endoscopic resection of gouty tophus of the patellar tendon. *Arthrosc Tech* 2015;4:e379-e382.
6. Blackwell JR, Bruce A, Hay BA, Alexander M, Bolt AM, Hay SM. Olecranon bursitis: A systematic overview. *Shoulder Elbow* 2014;6:182-190.
7. Fairhurst RJ, Schwartz AM, Rozmaryn LM. Gouty tenosynovitis of the distal biceps tendon insertion complicated by partial rupture. First case and review of the literature. *Hand (N Y)* 2017;12:NP1-NP5.
8. Chhana A, Callon KE, Dray M, et al. Interactions between tenocytes and monosodium urate monohydrate crystals: Implications for tendon involvement in gout. *Ann Rheum Dis* 2014;73:1737-1741.