

Arthroscopic Decompression for Medial Ankle Impingement After Total Ankle Arthroplasty



Hoi Yan Lam, M.B.B.S. (HK), M.R.C.S.Ed., F.R.C.S.Ed. (Orth), F.H.K.C.O.S., F.H.K.A.M.,
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: Total ankle arthroplasty (TAA) is gaining in popularity, with the main objective to restore a pain-free mobile and stable ankle and is hoped to solve the long-term problems associated with ankle arthrodesis. Residual pain is not uncommon after TAA, and most is located at the medial gutter with bony impingement as the frequent cause. In this Technical Note, the technical details of arthroscopic decompression for medial ankle impingement after total ankle arthroplasty is described. It has the advantage of earlier weightbearing, faster recovery and less risk of periprosthetic infection.

Total ankle arthroplasty (TAA) is a challenging procedure, with the main objective to restore a pain-free mobile and stable ankle and is hoped to solve the long-term problems associated with ankle arthrodesis, such as accelerated degeneration of adjacent joints, alterations in gait mechanics, limitations in activity, and painful nonunion of the arthrodesis site.^{1,2}

Despite high satisfaction rates reported in the literature, the percentage of patients complaining of residual pain after TAA ranges between 23% and 60%, and incident of impingement after TAA is about 11%.¹ Impingement can be defined as subjective pain in the ankle gutter with deep local tenderness and radiographic evidence of bone between the prosthesis and the malleolus.³ Independent of the type of TAA prosthesis, the pain is usually localized medially and frequently referred to as the “medial pain syndrome.”¹

It can be soft tissue or osseous impingement or both, although in most cases, it is due to bony impingement.^{1,2,4} Medial impingement can be a result of medially placed tibial prosthesis, oversized prosthesis, loosened or subsident prosthesis, inadequate/no prophylactic gutter resection, persistent hindfoot valgus or varus mal-alignment, heterotopic bone formation, and residual ankle instability.² Dynamic impingement can occur if appropriate ligamentous balancing is not achieved during surgery.⁵ However, development of bony impingement can occur in patients with accurate positioning of the implant components and absence of any hindfoot deformity.¹ Because the symptoms generally start during the first 2 years after implantation, one hypothesis could be that a slow and progressive impaction of both metallic components takes place until they are tightly fitted and incorporated. During this process, small microtraumas occur in that specific area as the medial malleolus approaches the talar neck.¹ Medial pain syndrome has been classified into type I medial impingement/contracture of medial ligaments, type II valgus deformity, type III varus deformity, and type IV combined varus-valgus deformity.⁶

Often, nonoperative management is not successful in the setting of impingement after TAA; thus surgery is often pursued.⁵ This can be either open or arthroscopic, and both techniques have been shown to be safe and effective in treating the pain and disability associated with impingement after TAA.⁵ Whereas open procedures may allow direct visualization of the gutters, arthroscopy allows more rapid mobilization and earlier weight bearing and may allow a quicker recovery.³ The success rate of arthroscopic debridement in patients

From the Department of Orthopaedics and Traumatology, North District Hospital, Hong Kong (T.H.L.) and the Department of Orthopaedics and Traumatology, Alice Ho Miu Ling Nethersole Hospital, Hong Kong (H.Y.L.), China.

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

Received January 6, 2021; accepted February 4, 2021.

Address correspondence to Tun Hing Lui, M.B.B.S. (HK), F.R.C.S. (Edin), F.H.K.A.M., F.H.K.C.O.S., 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

© 2021 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2212-6287/2133

<https://doi.org/10.1016/j.eats.2021.02.001>

Table 1. Indications and Contraindications of Arthroscopic Decompression for Medial Ankle Impingement After TAA

Indications	
Persistent symptomatic soft tissue or osseous medial gutter impingement as presented with mechanical pain localized to the medial gutter with or without evidence of bony impingement on radiographs	
Contraindications	
Presence of prosthesis loosening, subsidence, incorrect implant sizing, inadequate polyethylene insert size or bone infection requiring open procedures.	
Presence of complications (e.g. deep periprosthetic infection) requiring revision TAA.	
Ankle ankylosis is a relative contraindication	
The pain is caused by extra-articular posteromedial and anteromedial pain syndromes rather than the intra-articular impingement.	

TAA, total ankle arthroplasty.

with persistent pain caused by bony impingement varies from 80% to 100%.¹

The purpose of this Technical Note is to describe the details of arthroscopic decompression for medial ankle impingement after TAA. Before proceeding to arthroscopic debridement, the prosthesis must be assessed critically to determine whether there is prosthesis loosening, subsidence, incorrect implant sizing, inadequate polyethylene insert size with lack of gutter expansion and prosthesis, or bone infection.⁴ If the prosthesis is stable and in acceptable alignment and no clinical infection is present, arthroscopic debridement is indicated for persistent symptomatic soft tissue or bony medial gutter impingement as presented with mechanical pain localized to the medial gutter with or without evidence of bony impingement on radiographs.^{2,4,5}

If any of the causative factors are present, then a simple debridement of the offending bone and soft tissue will not address the underlying index cause.⁴ In all of these cases, polyethylene insert exchange, component exchange, or complete removal should be considered concomitantly with the gutter debridement, and in these cases, arthroscopic debridement is contraindicated.⁴ Arthroscopic debridement is also contraindicated in the presence of complications (e.g., deep periprosthetic infection) requiring revision TAA.² It is contraindicated in patients with ankle ankylosis or if the pain is caused by extra-articular posteromedial and anteromedial pain syndromes rather than the intra-articular impingement (Table 1).^{1,2} The posteromedial pain syndrome is caused by impingement of the posterior tibial tendon by oversized tibial prosthesis.² In anteromedial pain syndrome, pain is located in the anterior-medial soft tissues, outside of the ankle joint itself and can radiate proximally into the medial malleolus. This pain is probably related to increased medial soft tissue tension.² Ligamentous imbalance may not be a contraindication of arthroscopic

debridement because deltoid ligament release and lateral ligamentous repair/reconstruction can be performed arthroscopically together with the arthroscopic medial gutter debridement.

Technique

Preoperative Planning and Patient Positioning

Preoperative anteroposterior, mortise, and lateral weight-bearing radiographs may show bone in the medial gutter with the prosthesis immediately adjacent to the medial malleolus.^{1,5} Computed tomography (CT), especially weightbearing CT, can further analyze the location of bony impingement. However, the soft-tissue impingement cannot be appreciated in plain radiographs and CT.^{2,4}

The patient is in the supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. An ipsilateral thigh tourniquet is used to provide a bloodless surgical field. Fluid inflow is driven by gravity, and an arthro-pump is not used. 2.7 mm 30° arthroscope (Henke Sass Wolf GmbH), 4.0 mm, 30° arthroscope (Dyonics; Smith and Nephew) and 4.0 mm 70° arthroscope (Dyonics) is used for this procedure. Continuous ankle distraction is not necessary. The 2.7 mm arthroscope is used at the start of the procedure, and the 4.0 mm arthroscope is used for better visualization and increased flow after the release of the intra-articular adhesions and the joint space is increased. A 70° arthroscope is always helpful to view the deep part of the medial gutter.²

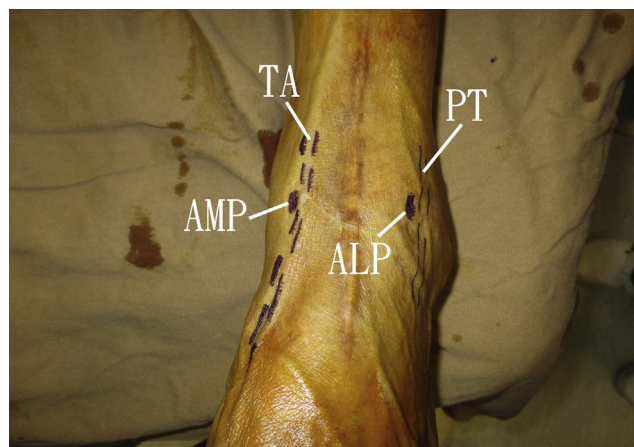


Fig 1. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. The procedure is performed via the anteromedial and anterolateral portals. The anteromedial portal is at the medial side of the tibialis anterior tendon and the anterolateral portal is at the medial side of the peroneus tertius tendon. (ALP, anterolateral portal; AMP, anteromedial portal; PT, peroneus tertius tendon; TA, tibialis anterior tendon.)

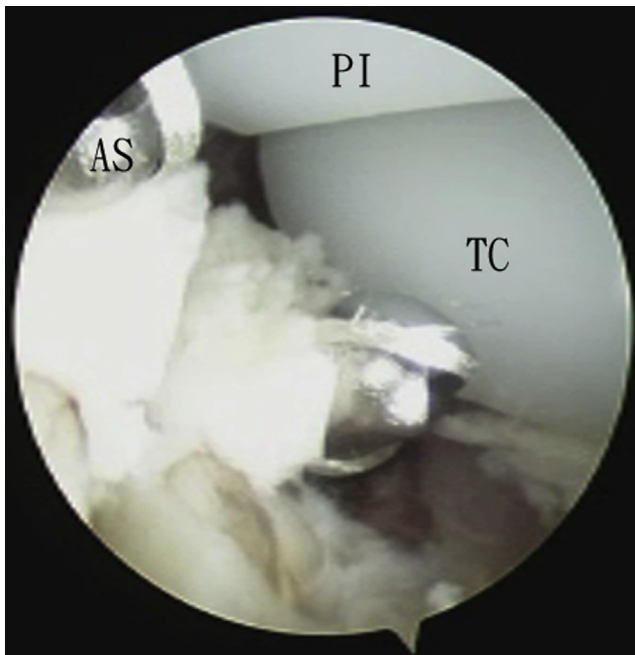


Fig 2. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The metallic talar resurfacing component is highly reflective and can lead to some confusion when trying to orient the arthroscopic instruments and intra-articular structures. (AS, arthroscopic shaver; PI, polyethylene insert; TC, talar component.)

Portal Placement

The procedure is performed via the anteromedial and anterolateral portals. The anteromedial portal is at the medial side of the tibialis anterior tendon, and the anterolateral portal is at the medial side of the peroneus tertius tendon (Fig 1). The level of the portals corresponding to the location of the polyethylene inlay should be confirmed under fluoroscopy.^{1,2}

Ankle Arthroscopy

Skin incisions of 5 mm are made at the portal sites. The subcutaneous tissue is bluntly dissected with a hemostat, and the joint capsule is perforated with the tip of the haemostat. Once intra-articular, the hemostat is advanced into the anterior gutter, and the intra-articular fibrous adhesions are broken up by the hemostat.⁵ In the subsequent steps of the procedure, introduction of arthroscope and arthroscopic instrument should aim at the anterior gutter, and instrumentation between the articular surfaces should be avoided.²

The anterolateral portal is the viewing portal, and the anteromedial portal is the working portal. The anteromedial ankle and medial gutter are assessed. The surgeons should notice that the ankle prostheses (the

metallic base plate affixed to the tibia, the metallic talar resurfacing component) are highly reflective and can lead to some confusion when trying to orient the arthroscopic instruments and intra-articular structures (Fig 2). On the other hand, the reflective surfaces can act as mirrors and help locating the arthroscopic instrument, which is outside the visualization field of the arthroscope (Fig 3). It is useful to remember that the weightbearing surface of the talar component acts like a convex mirror, whereas the medial surface of the talar component and the metallic base plate act like a flat mirror. Touch sensation through the tip of the arthroscopic instruments can help with identification of the intra-articular structures and orientation of the arthroscopic view.² However, touch of the prosthesis by the instrument should be gentle to minimize scuffs and scratches on the metal prosthesis, which can potentially lead to abrasive or third-body wear of the polyethylene.⁵

Resection of Fibrous Tissue and Synovium

The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The fibrous tissue and synovium is resected with an arthroscopic shaver (Dyonics) and Kerrison rongeur. The fibrous tissue can be dissected from the prosthesis with an

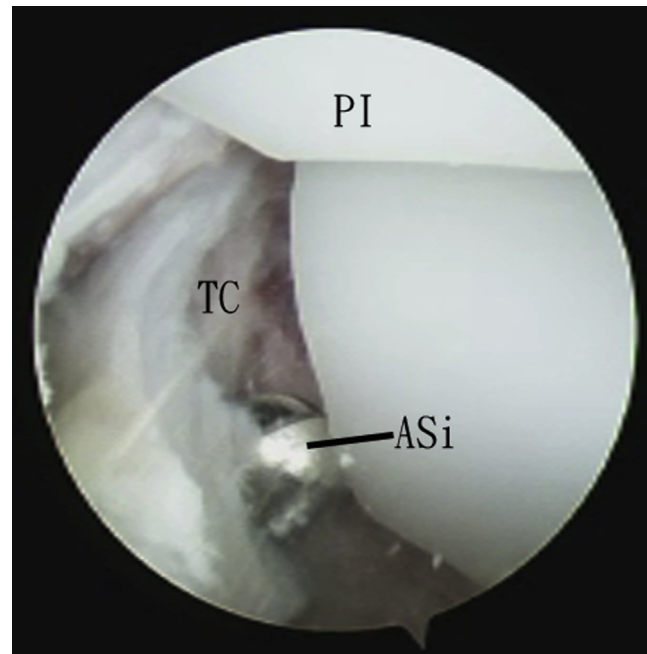


Fig 3. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The image of the arthroscopic shaver on the reflective surface of the talar component indicated that the shaver is at the level of the proximal part of the polyethylene insert. (ASi, image of arthroscopic shaver; PI, polyethylene insert; TC, talar component.)

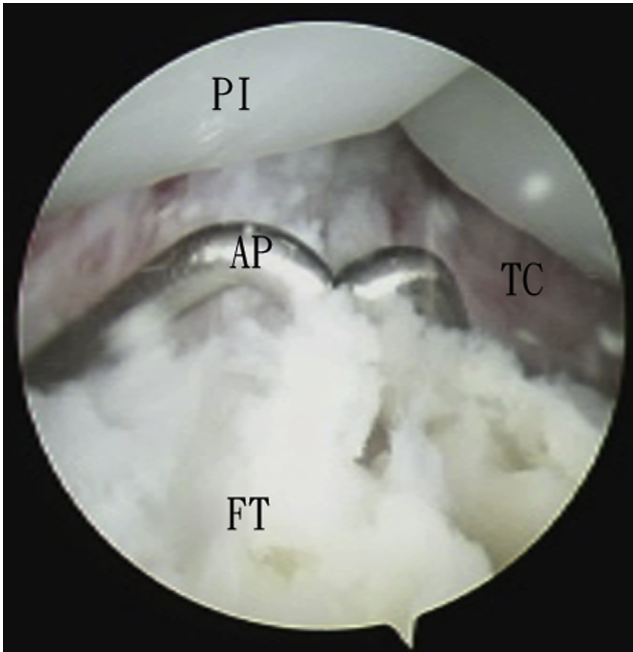


Fig 4. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The fibrous tissue is dissected from the prosthesis with an arthroscopic probe. (AP, arthroscopic probe; FT, fibrous tissue; PI, polyethylene insert; TC, talar component.)

arthroscopic probe (Acufex, Smith and Nephew, Andover, MA) before resection with the shaver (Fig 4). The cutting blade of the shaver should be faced away from the prosthesis to prevent damage to the metal and polyethylene of the TAA prosthesis.

Resection of the pathological soft tissue can eliminate the component of soft tissue impingement and expose the underlying bony impingement. The aim of arthroscopic debridement is adequate debridement of the medial malleolar gutter without too much bone resection resulting in risk of destabilization of the prosthesis or periprosthetic fracture.⁵

In this illustrated case, the patient had left Scandinavian total ankle replacement done and suffered from medial impingement pain. The arthroscopic debridement is performed in 3 zones: (1) Debridement of impingement between the tip of the medial malleolus and the medial talus. (2) Debridement of impingement between the medial malleolus and the mobile polyethylene insert and talar component. (3) Debridement around the metallic back plate affixed to the tibia.

Debridement of Impingement Between the Tip of the Medial Malleolus and the Medial Talus

The anterolateral portal is the viewing portal, and the anteromedial portal is the working portal. The tip of the

medial malleolus and the bony prominence at the medial talar facet are resected with an arthroscopic acromionizer (Dyonics) (Fig 5). If needed, ankle traction may be helpful to get a space at the malleolar tip for beginning of bone resection.²

After bone resection, the deltoid ligament is exposed. Surgical release of the deltoid ligament is indicated for recalcitrant anteromedial pain syndrome. The deep deltoid fibers can be transected with caution to preserve the feeding vessels to the medial facet of the talus that is just underneath the deep deltoid ligament. Excision of the tip of the medial malleolus can minimize the risk of damage to the medial talar feeding vessels.² If required, superficial deltoid fibers can also be released. Excision of the medial malleolar tip can provide a clear view of the span of the tibial insertion of the ligament and allow the release of the ligament in a more proximal point.² The release is sufficient when the ankle opens up symmetrically on the lateral and medial sides under axial distraction.²

Debridement of Impingement Between the Medial Malleolus and the Mobile Polyethylene Insert and Talar Component

The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The medial malleolus is debulked with the acromionizer (Fig 6). If the talus or the polyethylene insert cannot be shifted

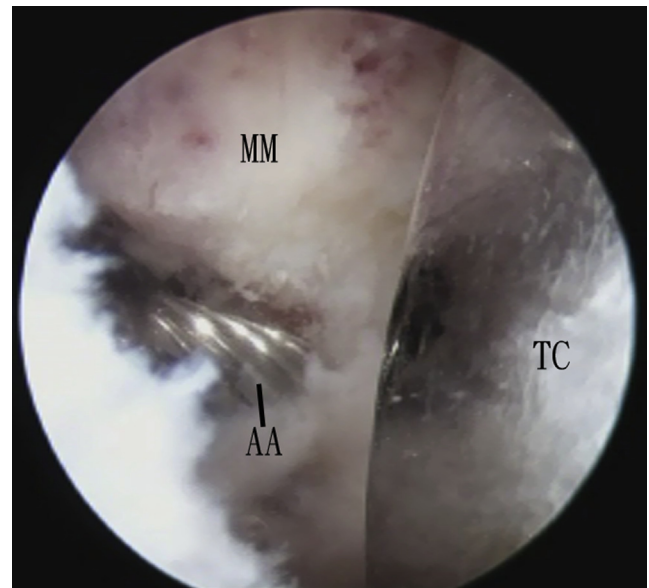


Fig 5. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The tip of the medial malleolus and the bony prominence at the medial talar facet is resected with an arthroscopic acromionizer. (AA, arthroscopic acromionizer; MM, medial malleolus; TC, talar component.)

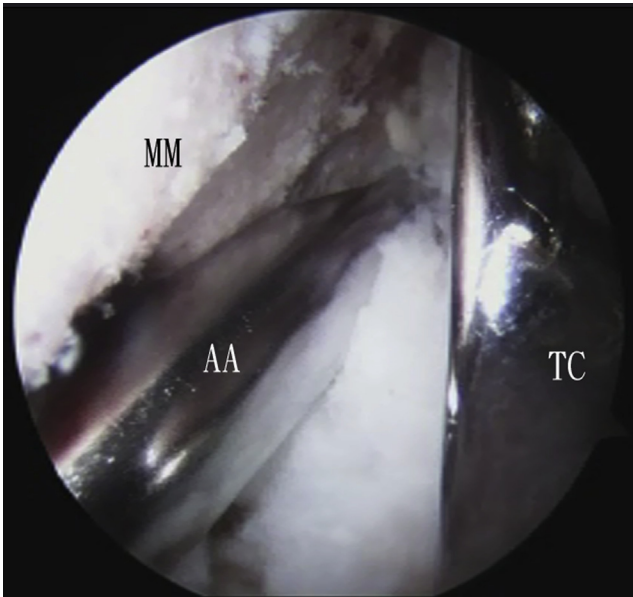


Fig 6. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The medial malleolus is debulked with the acromionizer. (AA, arthroscopic acromionizer; MM, medial malleolus; TC, talar component.)

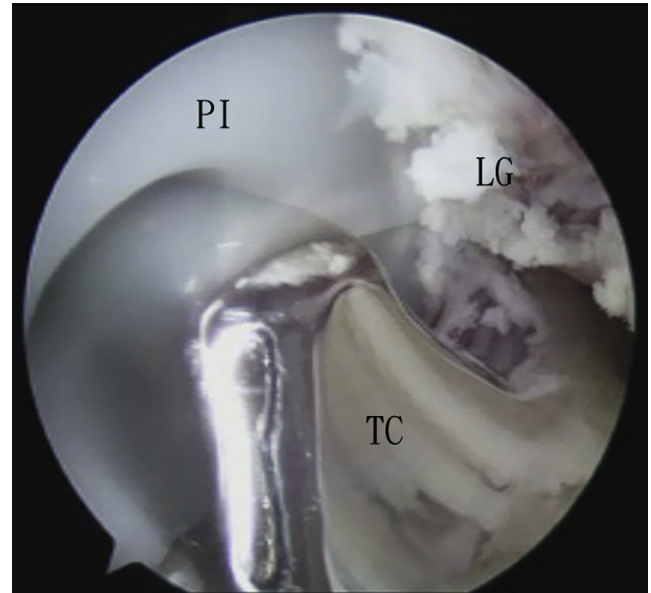


Fig 8. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. Anteromedial portal is the viewing portal. The total ankle arthroplasty and lateral ankle gutter are examined. (LG, lateral gutter; PI, polyethylene insert; TC, talar component.)

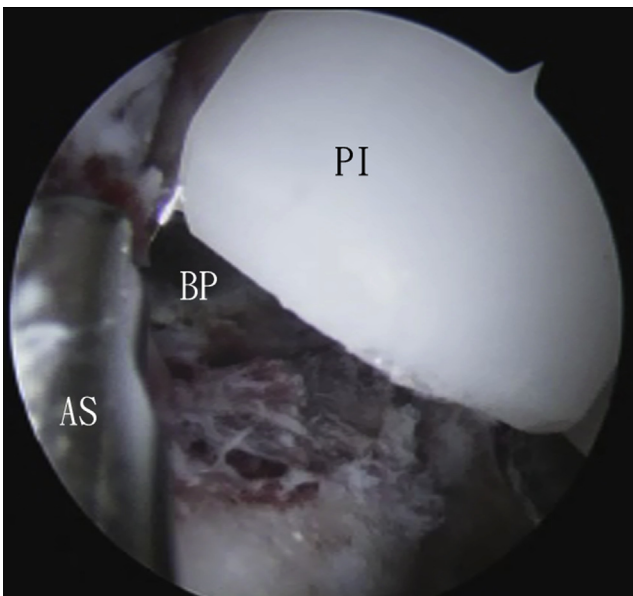


Fig 7. Arthroscopic decompression for medial ankle impingement after total ankle arthroplasty of left ankle. The patient is in supine position with a triangular supporting frame (Innomed) under the knee to keep the knee flexed. The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The heterotopic bone and fibrous tissue around the back plate is resected. (AS, arthroscopic shaver; BP, back plate; PI, polyethylene insert.)

laterally to create a safe zone for debridement of the gutter, the lateral gutter can be debrided first to create a space for lateral shift of the talus.² During the bone resection, the hood of the acromionizer is immediately adjacent to the talus to avoid excessive bone resection of the medial malleolus or damage to the prosthesis.⁵

The bone resection is from anterior to posterior, and the overlying fibrous tissue can be dissected out with an arthroscopic probe. Once most of the impinging bone has been removed from the malleolus, the remaining shelf of posterior bone can be penetrated with a drill bit,

Table 2. Pearls and Pitfalls of Arthroscopic Decompression for Medial Ankle Impingement After Total Ankle Arthroplasty

Pearls

- The anterolateral portal is placed medial to the peroneus brevis tendon.
- The fibrous tissue over the TAA can be freed by an arthroscopic probe before resection
- Touch sensation through the tip of the arthroscopic instruments can help identification of the intra-articular structures and orientation of the arthroscopic view.
- Touch of the prosthesis by the instrument should be gentle to minimize scuffs and scratches on the metal prosthesis
- During debulking of the medial malleolus, the hood of the acromionizer is immediately adjacent to the talus

Pitfalls

- Introduction of instruments should be into the anterior gutter.
- Instrumentation between the articular surfaces should be avoided
- The reflective surfaces of the metallic component of TAA can cause disorientation.

TAA, total ankle arthroplasty.

Table 3. Advantages and Risks of Arthroscopic Decompression for Medial Ankle Impingement After Total Ankle Arthroplasty

Advantages
Less soft tissue trauma
Less wound complications
Less postoperative pain
Quicker recovery
Faster return to function
Less chance of periprosthetic infection.
Risks
Nerve injury
Prosthesis damage
Vascular injury to talus if deep deltoid ligament is released
Inadequate bone resection with persistent symptoms
Recurred symptoms if the underlying causes have not been tackled
Excessive bone resection causing malleolar fracture or destabilization of the prosthesis

which is less likely to injure the soft tissue posteriorly than a burr and the bone can be curetted out.^{2,5}

After adequate decompression, the posterior tibial tendon can be seen.^{2,5} Intraoperative fluoroscopy is used to verify adequate debridement of all areas of osseous impingement and can be used to evaluate the amount of bone resected.^{2,5}

Debridement Around the Metallic Back Plate Affixed to the Tibia

The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The heterotopic bone and fibrous tissue around the back plate are dissected out with an arthroscopic probe and resected (Fig 7). After completion of debridement, the bone surface surfaces may be sealed with bone wax, if feasible, to prevent hematoma and new bone formation.

Examination of the Rest of the TAA

The anteromedial portal is the viewing portal and the anterolateral portal is the working portal. The remaining part of the TAA and the lateral gutter can be examined (Fig 8, Video 1, Table 2).

After surgery, the patient is allowed immediate weightbearing with a rocker boot. At 2 weeks, the sutures are removed, and the patient is allowed to perform range-of-motion activities.

Discussion

It is therefore important that before considering debridement, the origin of the impingement be identified and addressed; otherwise, there will be insufficient

pain relief and recurrence.¹ The varus or valgus hindfoot deformity should be corrected. The presence of hindfoot deformity is not a contraindication of arthroscopic medial gutter decompression because arthroscopic debridement of the medial ankle gutter can be coupled with calcaneal realignment osteotomy.²

To achieve complete decompression, all 3 zones of the medial malleolus should be debrided. Anterolateral portal medial to peroneus tertius tendon, and the use of 70° arthroscope can ensure clear visualization of the medial gutter, especially its posterior part, which is essential for adequate decompression. It is important to note and the patient should be well informed that arthroscopic debridement in the presence of painful ankylosis, with or without impingement syndrome, will only partially relieve the pain and will not improve the range of motion.¹

This minimally invasive technique has the advantage of less soft tissue trauma, fewer wound complications, less postoperative pain, quicker recovery, faster return to function, and less chance of periprosthetic infection. The potential risks of this technique include nerve injury, prosthesis damage, vascular injury to talus if deep deltoid ligament is released, inadequate bone resection with persistent symptoms, recurred symptoms if the underlying causes have not been tackled or excessive bone resection causing malleolar fracture or destabilization of the prosthesis (Table 3). This is not technically demanding and can be attempted by averaged ankle arthroscopists.

References

1. Bevernage BD, Deleu PA, Birch I, Gombault V, Maldague P, Leemrijse T. Arthroscopic debridement after total ankle arthroplasty. *Foot Ankle Int* 2016;37:142-149.
2. Lui TH, Roukis TS. Arthroscopic management of complications following total ankle replacement. *Clin Podiatr Med Surg* 2015;32:495-508.
3. Gross CE, Adams SB, Easley M, Nunley JA 2nd, DeOrto JK. Surgical treatment of bony and soft-tissue impingement in total ankle arthroplasty. *Foot Ankle Spec* 2017;10:37-42.
4. Overley BD Jr, Beideman TC. Painful osteophytes, ectopic bone, and pain in the malleolar gutters following total ankle replacement. management and strategies. *Clin Podiatr Med Surg* 2015;32:509-516.
5. Gross CE, Neumann JA, Godin JA, DeOrto JK. Technique of arthroscopic treatment of impingement after total ankle arthroplasty. *Arthrosc Tech* 2016;5:e235-e239.
6. Barg A, Suter T, Zwicky L, Knupp M, Hintermann B. Medial pain syndrome in patients with total ankle replacement. *Orthopade* 2011;40:991-992. 994-999.