Endoscopic Resection of Dorsal Boss of the Second and Third Tarsometatarsal Joints

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Abstract: Dorsal boss of the foot also known as "tarsal boss," "dorsal exostosis," and "humped bone" is a bone spur that grows from one of the intertarsal or tarsometatarsal joints. It can occur with or without arthritis of the underlying joints. Surgery is indicated if the symptoms do not respond to conservative treatment. Excision of the dorsal boss with or without fusion of the underlying joint is the operative treatment of choice. We report an arthroscopic approach of resection of the dorsal exostosis. Arthroscopic arthrodesis if indicated can be performed through the same portals.

Dorsal boss of the foot also known as "tarsal boss," "dorsal exostosis," and "humped bone" is a bone spur that grows from one of the intertarsal or tarsometatarsal joints. It can occur with or without arthritis of the underlying joints. Footwear can press on and rug against the dorsal boss and cause pain, blisters, or corn. Secondary findings commonly associated with this deformity include ganglion cysts, adventitious bursitis, and extensor tendonitis.[1] Sometimes, the dorsal boss can cause impingement of the cutaneous nerve.[2,3] The associated arthritis of the underlying joint is another source of pain. Dorsal boss can usually be managed conservatively. The conservative measures include loosening of the shoe laces, soft padding between the dorsal boss and the top of the shoe, and stiff-soled shoe to decrease stress to the arthritic midfoot joints. Surgery is indicated if the symptoms do not respond to conservative treatment. Excision of the dorsal boss with or without fusion of the underlying joint is the operative treatment of choice. Fusion of the underlying joint is indicated if there is a significant arthritic change and causes pain when the patient walks barefoot. The purpose of this technical note is to describe a minimally invasive approach of resection of the dorsal boss of the tarsometatarsal joint and assessment of the underlying joint. Arthroscopic tarsometatarsal arthrodesis, if indicated, can be performed through the same approach.[4] This technique is indicated if the symptomatic dorsal boss does not respond to conservative treatment. It is contraindicated if there is active infection over the planned portal sites. It is also contraindicated if the surgeon is not familiar to the small joint arthroscopy of the foot and ankle (Table 1).[5]

Technique

Preoperative Planning and Patient Positioning

Detailed history taking and physical examination can differentiate whether the pain is coming from the degenerated joint, impingement as a result of the dorsal boss or impingement of the cutaneous nerve. Occasionally, an intra-articular injection test is helpful to

Table 1. Indications and Contraindications of Endoscopic Resection of the Dorsal Boss of the Foot

Indications	Contraindications
1. The symptomatic dorsal boss does not respond to conservative treatment	1. Active infection over the planned portal sites
	2. The surgeon is not familiar to the small joint arthroscopy of the foot and ankle

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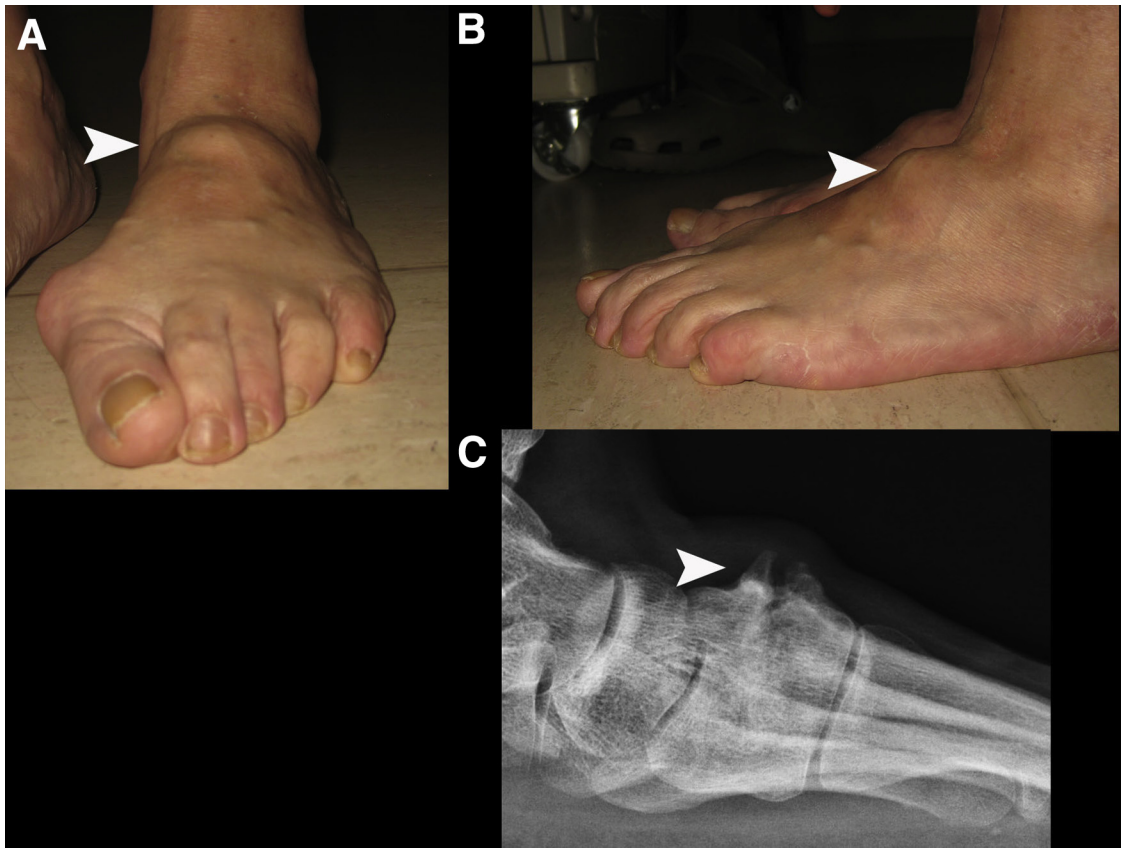

Fig 1. Endoscopic resection of the dorsal boss of the left foot. Anteroposterior (A) and lateral (B) clinical photographs and lateral foot radiograph (C) showed the dorsal boss (arrow).

differentiate the source of pain. The location and extent of the lesion should be noted. Standard dorsoplantar, lateral, and oblique radiographs are usually sufficient for the diagnosis and detection of any underlying joint degeneration (Fig 1). Computed tomogram is rarely needed.

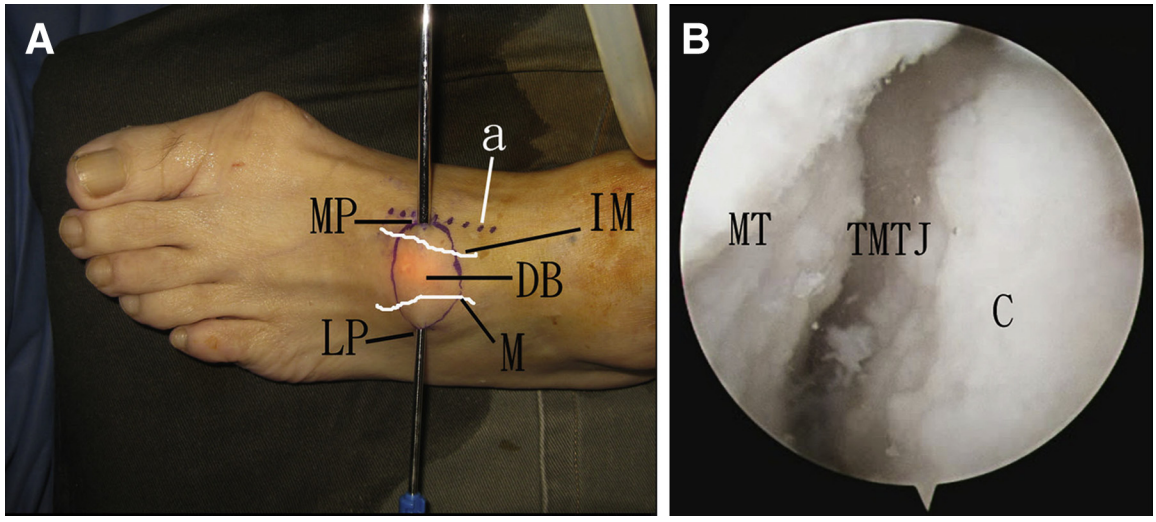

Fig 2. Endoscopic resection of the dorsal boss of the left foot. (A) Lisfranc arthroscopy is performed though the medial (MP) and lateral (LP) portals at the medial and lateral side of the dorsal boss (DB). (B) Arthroscopic view of the tarsometatarsal joint (TMTJ) showed a degenerative change. The lateral portal is the viewing portal. (a, dorsalis pedis and deep peroneal nerve; C, cuneiform bone; IM, intermediate dorsal cutaneous branch of the superficial peroneal nerve; M, medial dorsal cutaneous branch of the superficial peroneal nerve; MT, metatarsal.)

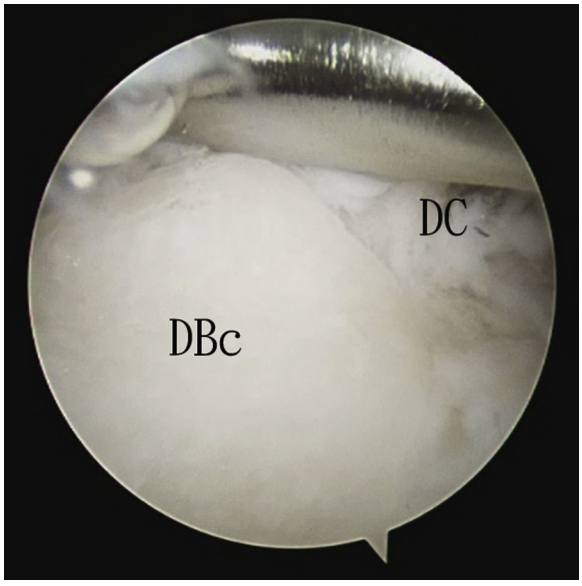

Fig 3. Endoscopic resection of the dorsal boss of the left foot. The lateral portal is the viewing portal. Stripping of the dorsal capsule (DC) away from the working portal is blocked by the cuneiform dorsal boss (DBc) close to the working portal.

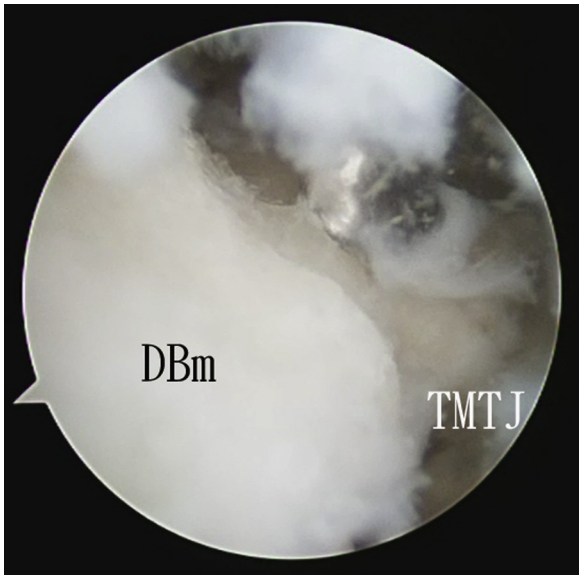

Fig 5. Endoscopic resection of the dorsal boss of the left foot. The lateral portal is the viewing portal. The dorsal boss at the base of the metatarsal (DBm) is resected by an arthroscopic burr via the medial portal. (TMTJ, tarsometatarsal joint.)

The patient is in supine position with a thigh tourniquet to provide a bloodless surgical field. The hip and knee of the operated leg are flexed and supported by a triangular supporting frame (Innomed, Savannah, GA). A 2.7-mm 30° arthroscope (Henke Sass Wolf GmbH, Germany) is used for this procedure.

Placement of the Portals

The dorsal boss is outlined and the deep peroneal nerve, medial and intermediate dorsal cutaneous branches of the superficial peroneal nerve, and dorsalis pedis are marked. The portals are located at the medial and lateral ends of the dorsal boss and over the underlying joint, which is the tarsometatarsal joint in the illustrated case. Fluoroscopy is sometimes needed to ensure proper placement of the portals because the joint is immobile and palpation of the joint line is blocked by the presence of the dorsal boss.

Tarsometatarsal Arthroscopy

Skin incisions of 3 to 4 mm are made at the medial and lateral portals. The subcutaneous tissue is bluntly

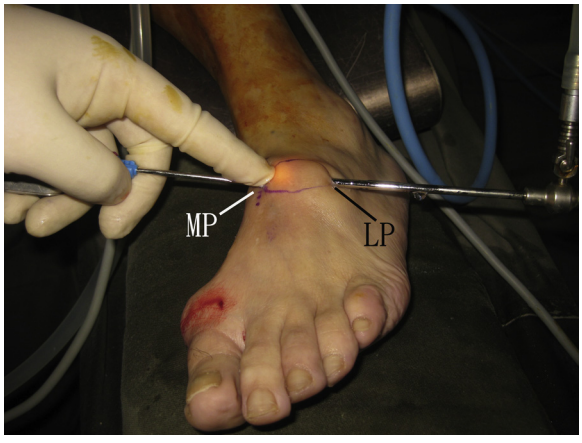

Fig 4. Endoscopic resection of the dorsal boss of the left foot. The burr can be stabilized by supporting the handpiece to the foot during bone resection. (LP, lateral portal; MP, medial portal.)

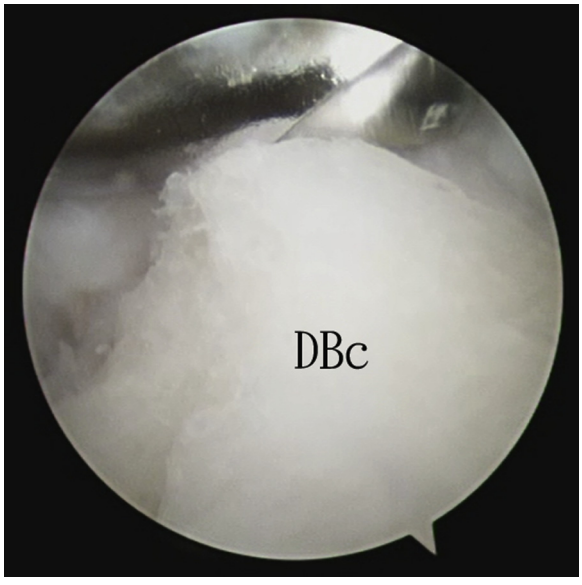

Fig 6. Endoscopic resection of the dorsal boss of the left foot. The lateral portal is the viewing portal. The dorsal boss at the base of the cuneiform bone (DBc) is resected by an arthroscopic burr via the medial portal.

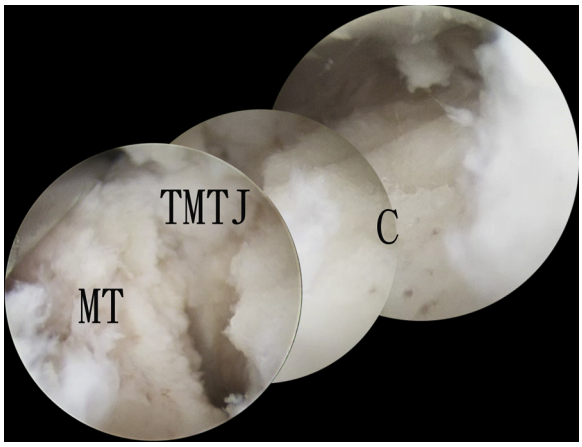

Fig 7. Endoscopic resection of the dorsal boss of the left foot. The lateral portal is the viewing portal. The bone surfaces are flush after resection of the dorsal boss. (C, cuneiform bone; MT, metatarsal; TMTJ, tarsometatarsal joint.)

dissected down to the dorsal capsule of the tarsometatarsal joint. The dorsal capsule is pierced by the tip of the hemostat. These 2 portals are interchangeable as the viewing and working portals. Tarsometatarsal arthroscopy is performed through these 2 portals and the condition of the joint is studied (Fig 2). Arthroscopic synovectomy is performed if there is inflamed synovium. If tarsometatarsal arthrodesis is indicated for symptomatic degeneration of the joint, arthroscopic arthrodesis can also be performed through these 2 portals.

Stripping of the Dorsal Capsule

The lateral portal is the viewing portal. The dorsal capsule is stripped from the metatarsal and cuneiform bones by an arthroscopic shaver (Dyonics, Smith & Nephew, Andover, MA) via the medial portal. This can expose the dorsal boss before excision. The presence of the dorsal boss may block stripping of the dorsal capsule at the point away from the working portal (Fig 3). This can be solved by exchanging the viewing and working portals. Another solution is resection of the part of the dorsal boss close to the working portal before stripping of the capsule farther away from the working portal.

Resection of the Dorsal Boss of the Base of Metatarsal

The lateral portal is the viewing portal. The dorsal boss at the base of the metatarsal is resected by an arthroscopic burr (Dyonics, Smith & Nephew) via the medial portal. The burr can be stabilized by supporting the handpiece to the foot during bone resection (Fig 4). Resection should be started at the distal end of the dorsal boss and proceed toward the tarsometatarsal joint (Fig 5). The arthroscope can be switched to the medial portal and the lateral part of the dorsal boss can be resected via the lateral portal.

Resection of the Dorsal Boss of the Cuneiform

The lateral portal is the viewing portal. The dorsal boss at the cuneiform bone is resected by an arthroscopic burr via the medial portal. Resection should be started at the proximal end of the dorsal boss and proceed toward the tarsometatarsal joint (Fig 6). The arthroscope can be switched to the medial portal and the lateral part of the dorsal boss can be resected via the lateral portal.

Confirmation of Completeness of Resection

Completeness of resection can be confirmed by arthroscopic visualization (Fig 7) showing that the bone surfaces on either side of the deformity are flush. This can also be checked under intraoperative fluoroscopy (Fig 8, Video 1). The dorsal bony prominence should not be palpable anymore (Table 2).

Fig 8. Endoscopic resection of the dorsal boss of the left foot. Postoperative lateral radiograph shows complete resection of the dorsal boss. Endoscopically assisted hallux valgus correction has also been performed in the illustrated case and a positioning screw was inserted across the bases of the first and second metatarsals.

Table 2. Pearls and Pitfalls of Endoscopic Resection of the Dorsal Boss of the Foot

Pearls	Pitfalls
1. Fluoroscopy can help precise localization of the portals	1. Huge exostosis may prevent localization of the Lisfranc joint line by palpation
2. The debridement should be subcapsular	2. Resection of the medial and lateral edges of the exostosis can be difficult if the portals are too close to the exostosis
3. Resection of the exostosis should start at the back of the spur toward the joint	
4. The dorsal boss close to the working portal should be resected before stripping of dorsal capsule away from the working portal	

Table 3. Advantages and Risks of Endoscopic Resection of the Dorsal Boss of the Foot

Advantages	Risks
1. Resection of the exostosis through 2 small incisions regardless of the span of the exostosis	1. Cutaneous nerve injury including the deep peroneal nerve and medial and intermediate dorsal cutaneous branches of the superficial peroneal nerve
2. Better cosmetic result	2. Incomplete resection of the exostosis
3. Less soft tissue trauma	3. Excessive resection of the exostosis
4. The underlying joint can be assessed	
5. Reduced risk of traction neuritis	
6. Arthroscopic Lisfranc arthrodesis can be performed through the same portals	

Discussion

Open resection of the dorsal boss of the tarsometatarsal joints appears to be an effective option for treating patients with this deformity.[1] However, complications including traction neuritis, regrowth of the dorsal exostosis, Lisfranc joint pain, and wound infection have been reported.[1] Moreover, part of the extensor retinaculum may need to be incised to expose the deformity.[1] In case of dorsal exostosis involving more than one tarsometatarsal exostosis, extensive traction of the longitudinal incision may cause traction neuritis of the cutaneous nerve.[1] The arthroscopic approach allows resection of the exostosis through 2 small incisions regardless of the span of the exostosis. This has the advantages of better cosmetic result, less soft tissue trauma, assessment of tarsometatarsal joint, and reduced risk of traction neuritis. Arthrodesis of the Lisfranc joint is indicated if there is significant joint damage and the patient has preoperative joint pain.[1] Arthroscopic Lisfranc arthrodesis can be performed through the same arthroscopic approach.

There is still risk of cutaneous nerve injury (including the deep peroneal nerve and medial and intermediate dorsal cutaneous branches of the superficial peroneal nerve) during the establishment of the portal sites and during debridement along the portal tract between the 2 portals. To reduce the risk of nerve injury, the portals should be established by the nick and spread technique after the skin incisions. Moreover, the procedure should start with Lisfranc arthroscopy that allows easier arthroscopic orientation as compared with the pure endoscopic approach. The dorsal capsule is then stripped to expose the exostoses. The bone resection is deep to the dorsal joint capsule and the cutaneous nerve and extensor tendons will be protected by the capsule. Other risks of this technique include inadequate resection of the exostosis and excessive removal of bone. Excessive removal of bone may destabilize the involved joints and reduced areas of the articular surfaces will accelerate the degenerative process of the joints (Table 3).

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