

Naviculocuneiform Arthroscopy



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Abstract: Surgical interventions at the naviculocuneiform joint are not uncommon to deal with various pathologies of the joint and correction of different foot deformities. To minimize the soft tissue dissection, naviculocuneiform arthroscopy has been described. The purpose of this Technical Note is to report the details of this arthroscopic approach.

The naviculocuneiform joint is composed of the navicular proximally and the 3 cuneiforms distally.¹ It has the medial, middle, and lateral naviculocuneiform articulations sharing the same capsular envelope.¹ The medial articulation is typically the largest, followed by the middle and lateral articulations.¹ It has multiple ligamentous attachments and tendons that either attach to or course across its articulation.

Surgical interventions at this joint is not uncommon for many pathologic foot etiologies, including primary arthritis of the naviculocuneiform joint, degenerative joint disease secondary to pes planovalgus and pes cavus, avascular necrosis of the navicular, Muller-Weiss disease, naviculocuneiform dislocations, dislocation of the navicular, symptomatic coalition, dorsal boss, synovial chondromatosis, or Charcot reconstruction.¹⁻¹¹ Arthrodesis of the naviculocuneiform joint is used for the correction of medial column insufficiency or realignment of forefoot varus.¹ Patients with planovalgus feet, cavovarus feet, and degenerative arthritis who also have an apex of deformity at the naviculocuneiform joints are

indicated for naviculocuneiform fusion.^{3,12} Sag at this joint is an important component of the flatfoot deformity.¹³ Failure to address medial column instability could lead to continued deformity and poor patient outcomes. Naviculocuneiform arthrodesis is an important piece of the armamentarium to address all aspects of flatfoot deformity.^{6,13} Naviculocuneiform arthroscopy has been described to provide a minimally invasive approach to this joint.¹⁴ The purpose of this Technical Note is to report the technical details of naviculocuneiform arthroscopy. It is indicated for excision of symptomatic medial coalition or dorsal boss of the joint, synovectomy, and arthrodesis in synovial chondromatosis with joint destruction.¹⁰ Arthroscopic arthrodesis of this joint is indicated in arthrosis of the joint or as a surgical component to stabilize the medial column in correction of the cavus or adult acquired flatfoot deformity. This arthroscopic approach can be combined with tendoscopy of distal tibialis anterior¹⁵ to deal with distal tibialis anterior tendinosis or bursitis associated with chondral thinning and/or osteophyte formation at the medial naviculocuneiform joint.¹⁶ It is contraindicated in correction of symptomatic flexible flatfoot in adolescents. Hoke or Miller procedure should be combined with osteoperiosteal flap advancement, and an open approach is preferred.¹⁷ Symptomatic coalition at the plantar side of the naviculocuneiform articulations is a contraindication as the lesion cannot be reached arthroscopically. Necrosis of the navicular is a relative contraindication if extensive bone resection is needed or the bone is collapsed. It requires strut graft reconstruction and cannot be performed arthroscopically.^{18,19} Synovial chondromatosis without joint destruction is also a contraindication as complete synovectomy without removal of the cartilage is not possible with this arthroscopic approach (Table 1).²⁰

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Table 1. Indications and Contraindications of Naviculocuneiform Arthroscopy

Indications	Contraindications
1. Symptomatic medial coalition	1. Symptomatic flexible flatfoot in adolescents
2. Symptomatic dorsal boss	2. Symptomatic coalition at the plantar side of the naviculocuneiform articulations
3. Synovial chondromatosis with joint destruction	3. Extensive necrosis of the navicular
4. Symptomatic arthrosis	4. Synovial chondromatosis without joint destruction
5. Correction of cavus or adult acquired flatfoot deformity	
6. Distal tibialis anterior tendinosis or bursitis associated with chondral thinning and/or osteophyte formation at the medial naviculocuneiform joint	

Technique

Preoperative Planning and Patient Positioning

The source of pain should be determined at the naviculocuneiform joint during preoperative assessment. Detailed history taking and clinical examination are essential to define the problem. Radiographs, computed tomography, and magnetic resonance imaging are useful investigations to confirm the diagnosis.

The patient is in 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, Tuttlingen, Germany) is used for this procedure. Fluid inflow is by gravity, and no arthropump is used.

Portal Placement

Three portals are used for the naviculocuneiform arthroscopy: the medial portal at the plantar medial corner of the medial naviculocuneiform joint; the middle portal at the dorsal junction between the medial and middle naviculocuneiform joints; and the dorso-lateral portal at the dorsolateral corner of the lateral naviculocuneiform joint. The cuneiform and navicular bones are outlined and the portals are marked under fluoroscopic guide (Fig 1).

Medial Naviculocuneiform Arthroscopy

Three- to 4-mm incisions are made at the medial and middle portals. The subcutaneous tissue is first bluntly dissected down to the bones by a hemostat. Next, the subcutaneous tissue between the portals is bluntly dissected from the underlying bone. This creates the initial working space for medial naviculocuneiform arthroscopy.

Clearance of Dorsal Bone Surfaces and Synovectomy. The medial and middle portals are interchangeable as the viewing and working portals. The medial portal is chosen as the viewing portal in this case,

and the dorsal capsuloligamentous tissue is resected with an arthroscopic shaver (Dyonics; Smith & Nephew, Andover, MA) via the middle portal. Any inflamed synovium if present is resected (Fig 2). After clearance of soft tissue from the lateral half of the dorsal surface of the medial naviculocuneiform joint, the arthroscope is switched to the middle portal, and the capsuloligamentous tissue of the medial half of the dorsal surface of the medial naviculocuneiform joint is resected with the shaver via the medial portal.

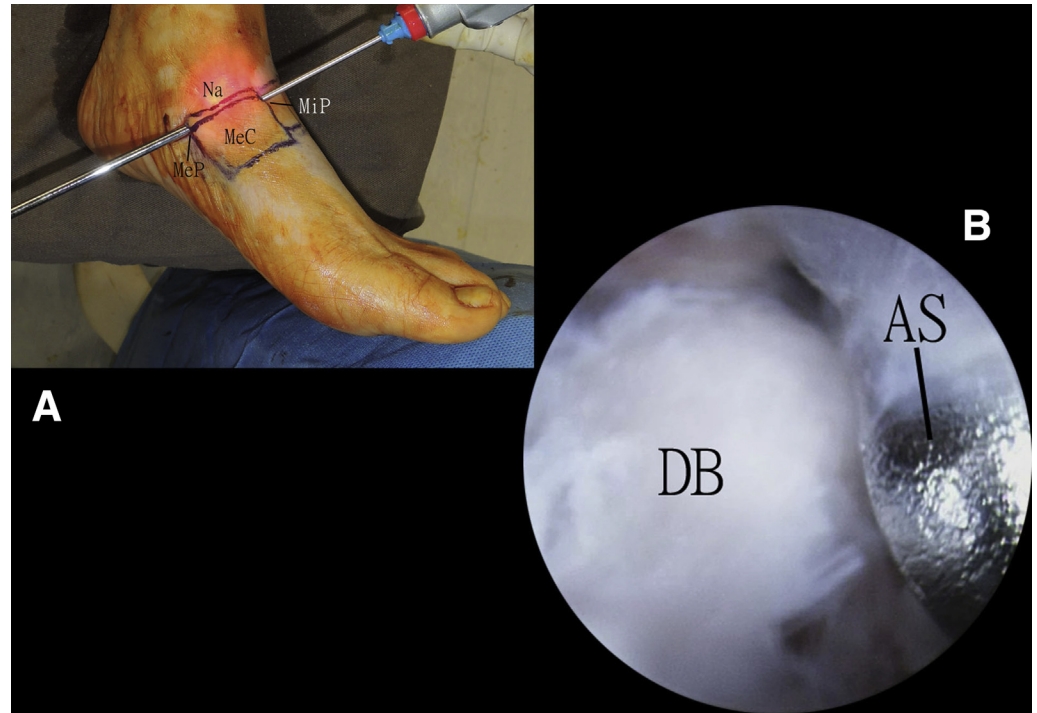
Resection of Dorsal Boss or Osteophytes. The presence of dorsal boss or osteophytes may obscure the dorsal joint line. These should be resected if they cause impingement symptoms. Resection of the bone spur can also expose the joint space and facilitate subsequent preparation of fusion surfaces in case of naviculocuneiform arthrodesis.

The medial and middle portals are interchangeable as the viewing and working portals. The medial portal is chosen as the viewing portal in this case. The bone spurs should be cleared from overlying soft tissue with the arthroscopic shaver and should be completely exposed from their apex to the flat bone surfaces of the medial cuneiform and navicular bone away from the medial naviculocuneiform joint. The bone spurs are resected with an arthroscopic burr (Dyonics; Smith & Nephew) via the middle portal. Resection of the spurs should be started from flat bone surfaces of the medial cuneiform and navicular bone toward the joint to



Fig 1. Naviculocuneiform arthroscopy of the left foot. The patient is in supine position with the legs spread. Three portals are used for the naviculocuneiform arthroscopy. The medial portal is at the plantar medial corner of the medial naviculocuneiform joint. The middle portal is at the dorsal junction between the medial and middle naviculocuneiform joints. The dorso-lateral portal is at the dorsolateral corner of the lateral naviculocuneiform joint. The cuneiform and navicular bones are outlined, and the portals are marked under fluoroscopic guide. (DLP, dorso-lateral portal; LC, lateral cuneiform; MeC, medial cuneiform; MeP, medial portal; MiC, middle cuneiform; MiP, middle portal; Na, navicular.)

Fig 2. Naviculocuneiform arthroscopy of the left foot. The patient is in supine position with the legs spread. (A) The medial portal is the viewing portal. (B) The dorsal capsuloligamentous tissue is resected with an arthroscopic shaver (Dyonics; Smith & Nephew) via the middle portal. The underlying dorsal boss is exposed. (AS, arthroscopic shaver; DB, dorsal boss; MeC, medial cuneiform; MeP, medial portal; MiP, middle portal; Na, navicular.)



ensure complete removal of the spurs (Fig 3).¹¹ After resection of the bone spurs at the lateral part of the joint, the arthroscope is switched to the middle portal, and the bone spurs at the medial part of the joint are resected with the arthroscopic burr via the medial portal.

Identification of the Joint Surfaces. After clearance of soft tissue and bone spurs, the joint space is exposed. The articular cartilage can be examined for any degeneration (Fig 4). This can be facilitated by plantarflexion of the forefoot. If medial naviculocuneiform arthrodesis is indicated, the medial

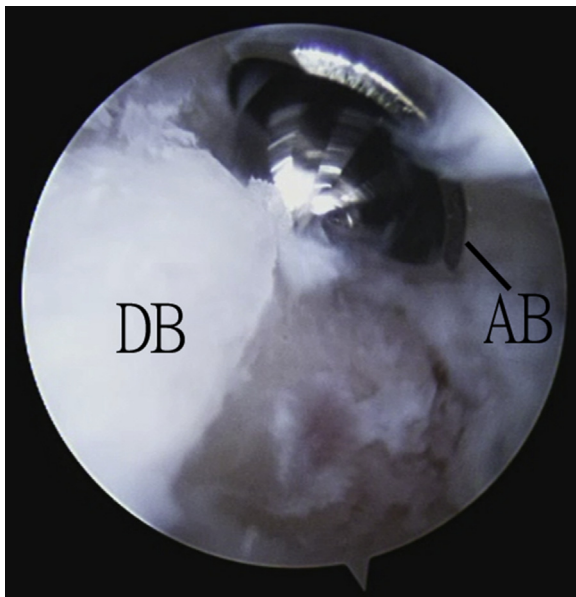


Fig 3. Naviculocuneiform arthroscopy of the left foot. The patient is in supine position with the legs spread. The medial portal is the viewing portal. The dorsal boss of the medial cuneiform is resected by an arthroscopic burr. (AB, arthroscopic burr; DB, dorsal boss.)

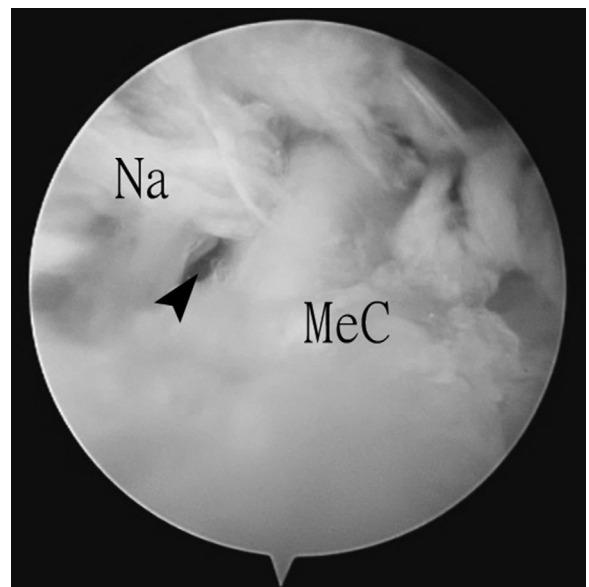


Fig 4. Naviculocuneiform arthroscopy of the left foot. The patient is in supine position with the legs spread. The medial portal is the viewing portal. The medial naviculocuneiform joint (arrowhead) is examined. (MeC, medial cuneiform; Na, navicular.)

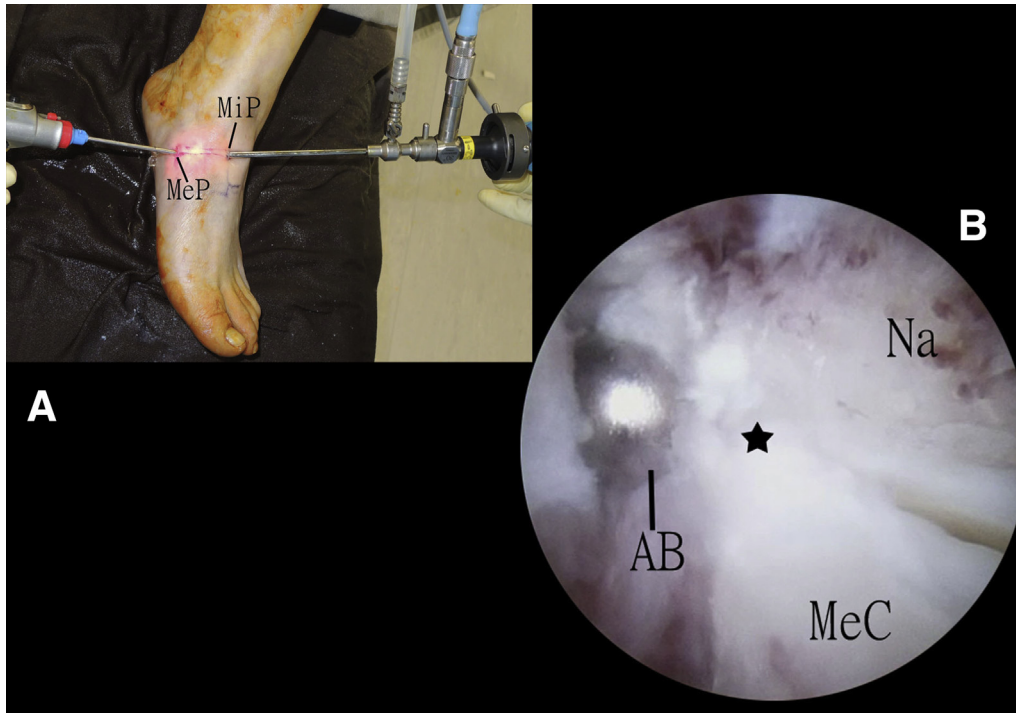


Fig 5. Naviculocuneiform arthroscopy of the left foot. The patient is in supine position with the legs spread. (A) The middle portal is the viewing portal, and the medial portal is the working portal. (B) The degenerated part of the joint (star) is resected by an arthroscopic burr. (AB, arthroscopic burr; MeC, medial cuneiform; MeP, medial portal; MiP, middle portal; Na, navicular.)

and middle portals are interchangeable as the viewing and working portals for the arthrodesis procedure. The articular cartilage is denuded by means of a small arthroscopic osteotome (Acufex; Smith & Nephew) and an arthroscopic shaver. Micro-fracture of the subchondral bone is then performed with an

arthroscopic awl (Acufex, Smith & Nephew). If dorsiflexion of the first ray is indicated for correction of cavus deformity, a dorsally based wedge arthrodesis of bone can be resected at the joint level by means of a 2-mm Isham straight-flute Shannon burr (Vilex, McMinnville, TN) via the portals.^{21,22}

Fig 6. Naviculocuneiform arthroscopy of the left foot. The patient is in supine position with the legs spread. (A) The middle portal is the viewing portal, and the dorsolateral portal is the working portal. (B) The lateral naviculocuneiform joint (arrow-head) is exposed. (DLP, dorsolateral portal; LC, lateral cuneiform; MiP, middle portal; Na, navicular.)

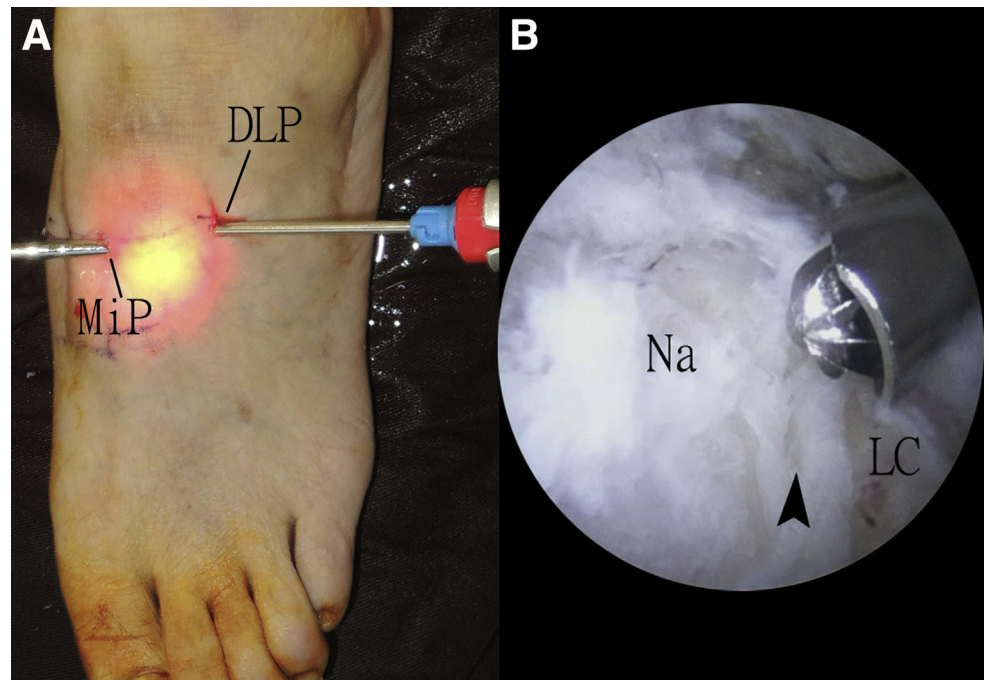


Table 2. Pearls and Pitfalls of Naviculocuneiform Arthroscopy

Pearls	Pitfalls
1. Blunt dissection of soft tissue down to the bone after making the portals	1. Surface landmarks should not be relied on for placement of the portals and should be checked under fluoroscopy.
2. Stay of arthroscopic instruments at the surface of the bones	2. In case of naviculocuneiform arthrodesis, the screws should be inserted from the cuneiforms to the navicular to avoid malposition of the screws.
3. Checking the position of the arthroscopic instruments if in doubt	

Resection of the Degenerated Medial Part of the Medial Naviculocuneiform Joint. The medial portion of the medial naviculocuneiform joint is carefully examined if the patient experienced medial foot pain at the level of naviculocuneiform joint. The middle portal is the viewing portal, and the medial portal is the working portal. The presence of an inflamed bursa of the tibialis anterior tendon or any bone spur from the medial naviculocuneiform joint impinging the tendon can be identified and resected.¹⁵ In this illustrated case, there is degeneration of the most medial part of the medial naviculocuneiform joint. The degenerated part of the joint is resected by an arthroscopic curette (Acufex; Smith & Nephew) and arthroscopic burr (Fig 5).

Middle and Lateral Naviculocuneiform Arthroscopy

The dorsolateral portal is the viewing portal. The medial naviculocuneiform joint line is identified and traced laterally to locate the middle naviculocuneiform joint. The middle naviculocuneiform joint line is exposed by resection of the overlying capsuloligamentous tissue, synovium, and bone spurs with arthroscopic shaver and burr via the middle portal.

After identification of the middle naviculocuneiform joint line, the arthroscope is switched to the middle portal. The middle naviculocuneiform joint line is traced laterally to locate the lateral naviculocuneiform joint. The lateral naviculocuneiform joint line is exposed by resection of the overlying capsuloligamentous tissue, synovium, and bone spurs with arthroscopic shaver and burr via the dorsolateral portal (Fig 6, Video 1, Table 2).

Postoperatively, the patient can have weight bearing walking as pain tolerated with a wooden-based sandal. In case of naviculocuneiform arthrodesis, the foot is protected in a short leg cast for 6 weeks and the patient is instructed on non-weight bearing walking during this period.

Discussion

Many surgical procedures of the naviculocuneiform joint are indicated for management of various pathologies of the joint and correction of different foot deformities. Many of the procedures can be performed

Table 3. Advantages and Risks of Naviculocuneiform Arthroscopy

Advantages	Risks
1. Fewer wound complications	1. Injury to the branches of the deep or superficial peroneal nerve
2. Less soft tissue trauma	2. Injury to the dorsalis pedis
3. Better cosmesis	3. Injury to the tibialis anterior tendon
4. Preservation of the plantar ligamentous structures	4. Injury to the extensor hallucis longus tendon
5. Preservation of the vasculature of the joint	5. Injury to the extensor digitorum longus tendon

in a minimally invasive manner through the described arthroscopic approach. In case of arthroscopic arthrodesis of the naviculocuneiform joint, percutaneous screw fixation is used for stabilization of the fusion site. It should be noted that the cuneiforms are wedge shaped and create a keystone arch appearance in cross section. Appreciation of this relationship is of paramount importance for successful placement of internal fixation owing to the small surface area on the plantar aspect of the bones.¹

The advantages of this minimally invasive approach include better cosmesis, less soft tissue dissection, fewer wound complications, preservation of the plantar ligamentous structures, and vasculature of the joint. The potential risk of this procedure includes injuries to the branches of the deep or superficial peroneal nerve, dorsalis pedis, tibialis anterior tendon, extensor hallucis longus tendon, and extensor digitorum longus tendons (Table 3). Blunt dissection of soft tissue down to the bone after making the portals and stay of arthroscopic instruments at the surface of the bones are the main precautions for reducing the risk of complications. The arthroscopic approach is not technically demanding. Because of the immobility of the joint and lack of clear surface landmark, checking the position of the arthroscopic instruments by fluoroscopy is recommended when in doubt.^{23,24}

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