Arthroscopic Evaluation of the Subtalar Joint: Does Sinus Tarsi Syndrome Exist?

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ABSTRACT
This is a retrospective review of 49 subtalar arthroscopies performed between 1989 and 1996. Patients were evaluated in the following areas: (1) preoperative diagnosis, (2) preoperative tests and clinical evaluation, (3) intraoperative findings, (4) postoperative diagnosis, (5) complications, and (6) clinical outcome. Particular attention was paid to the accuracy of the preoperative diagnosis, subtalar instability, intraoperative findings in sinus tarsi syndrome, and clinical outcome. Overall, this study demonstrated a success rate of 94% good and excellent results in the treatment of various types of subtalar pathologic conditions with arthroscopic techniques. The Workers' Compensation cases reported 90% good and excellent results. The complication rate was low, with five minor complications reported. The most common complication was a transient neuropraxia involving branches of the superficial peroneal nerve.

Of the 14 feet that had a preoperative diagnosis of sinus tarsi syndrome, all the diagnoses were changed at the time of arthroscopy. The postoperative diagnoses included 10 interosseous ligament tears, two cases of arthrofibrosis, and two degenerative joints. Based on these findings, "sinus tarsi syndrome" seems to be an inaccurate term that should be replaced with a specific diagnosis. Arthroscopy is the tool that will allow the orthopaedic surgeon to make a more accurate diagnosis.

MATERIALS AND METHODS
A retrospective review was performed of all patients who had undergone subtalar arthroscopy between 1989 and 1996. Inclusion criteria for the study included having had a subtalar arthroscopy by the primary author (C.C.F.) as well as adequate postoperative follow-up. A total of 45 patients (49 subtalar arthroscopies) made up the study population. For each patient, the preoperative diagnoses, operative findings, postoperative diagnoses, and outcome were recorded. This information was obtained from a review of initial histories and physicals, operative reports, office notes from follow-up visits, and radiographic studies (plain films, bone scans, magnetic resonance imaging (MRI), and computed tomography scans). In 21 of 35 ankles that had stress radiographs of the ankle, the subtalar joint was also visualized. Instability of the subtalar joint was assessed from the anterior drawer view when there was anterior translation of the posterior facet of the calcaneus on the talus. On the varus stress view, subtalar instability was indicated

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Fig. 1. A, Division of the subtalar joint into anterior and posterior portions by the sinus tarsi and the tarsal canal. B, Contents of the tarsal canal include the cervical ligament, talocalcaneal ligament, and medial root of the inferior extensor retinaculum, fat pad and blood vessels.

when a loss of parallelism was noted of the posterior facet of the calcaneus and the talus. All perioperative complications were noted. Any additional procedures performed at the time of surgery were also recorded.

The arthroscopic technique followed the initial description of Parisien. An anterior, posterior, and middle portal were used. The middle portal is essential for the evaluation of the sinus tarsi and its contents. Local, general, spinal, or epidural anesthesia were used for this procedure. The patient was placed in the lateral decubitus position with the operative extremity up (Fig. 2A & B). In addition to padding between the legs, a bolster was placed distally under the operative extremity to suspend the foot and the leg. A tourniquet was used for hemostasis.

The three portals were available for visualization and instrumentation of the subtalar joint. The anterior portal was placed 2 cm anterior and 1 cm distal to the tip of the lateral malleolus. The posterior portal was placed 1 cm proximal to the tip of the fibula and anterior to the Achilles tendon. The middle portal was placed under direct visualization, using an 18-gauge needle with outside-in technique. A 2.7-mm 30° oblique arthroscope and an arthroscopic pump were used for the procedure.

RESULTS

The overall demographics of this patient group were as follows. The average age was 35 years (range, 17–66). There were 26 men and 19 women. Twenty-eight (57%) of the subtalar joints involved Workers’ Compensation cases, and 21 (43%) did not. The mechanism of injury was a twisting injury to the foot and ankle (usually inversion) in 32 feet (62%), direct blow or crush injury in 10 feet (21%), overuse injury (such as climbing or walking on uneven ground) in five feet (12%), and congenital (fibrous coalition) in two
feet (5%). The average follow-up was 54 months (12–88 months). No patient who entered into the study was lost to follow-up.

Preoperatively, the diagnoses included interosseous ligament injury in 26 feet (53%), sinus tarsi syndrome in 14 feet (29%), fibrous coalition in four feet (8%), arthrofibrosis in three feet (6%), and osteochondral fracture of the posterior subtalar joint in two feet (4%). Diagnosis of sinus tarsi syndrome was made on primarily subjective findings that included pain over the sinus tarsi, feelings of instability in the hindfoot, and pain relief after injection of local anesthetic into the sinus tarsi. The MRI in sinus tarsi syndrome may show findings consistent with scar, ganglion cyst, or interosseous ligament disruption. The diagnosis of interosseous ligament injury was made when the same subjective findings were present as in sinus tarsi syndrome, but in addition, the MRI showed disruption of the interosseous ligament. The interosseous ligaments are seen best on sagittal and coronal views. It should be noted that the diagnosis of interosseous ligament tears were made in later cases after the radiologist and the surgeon had gained more experience in reading the MRIs and comparing them to intraoperative findings. Only one case of interosseous ligament injury was noted to have instability of the subtalar joint, preoperatively, as demonstrated by stress views of the subtalar joint (Fig. 3).

Fibrous coalition was a diagnosis based on the presence of a subtalar joint with limited range of motion but not after trauma or long term immobilization. MRI findings were suggestive for a fibrous coalition. In addition, x-rays showed either a squaring off of the borders of the calcaneonavicular articulation on an oblique view of the foot or an obliquity of the medial facet of the subtalar joint on Harris views. Arthrofibrosis was a diagnosis based on the clinical findings of a joint with limited range of motion, which usually existed after trauma or immobilization. The patients with arthrofibrosis did not have findings on MRI or x-rays to suggest a tarsal coalition.

Postoperatively, the following diagnoses were made: interosseous ligament injury in 36 feet (74%), arthrofibrosis in seven feet (14%), degenerative joint disease in four feet (8%), and fibrous coalition of the calcaneonavicular joint in two feet (4%). Of the 36 feet with interosseous ligament tears, 27 feet demonstrated scar formation and gross hyalinization of the torn ligament ends and subsequent impingement of this material into the anterior aspect of the posterior subtalar joint. This is referred to by the authors as the subtalar impingement lesion (STIL) (Fig. 4).

Postoperatively, the diagnosis was changed or clarified in 17 feet (35%). The diagnosis was changed postoperatively in all cases of sinus tarsi syndrome, in all cases of osteochondral fractures, and in two cases of fibrous coalition.

Of the 14 feet that had a preoperative diagnosis of sinus tarsi syndrome, the following postoperative diagnoses were made: interosseous ligament tear in 10 feet, arthrofibrosis in two feet, and degenerative joint disease in two feet.

Of the 36 cases that demonstrated injury to the interosseous ligaments, only one case demonstrated instability by stress radiographs, preoperatively. Intraoperatively, seven feet demonstrated subtalar instability; six of these feet had a 75% tear of the interosseous ligament and one had a complete tear. It should be noted, again, that although seven cases demonstrated subtalar instability, intraoperatively, only one demonstrated instability on preoperative stress radiographs. However, of 29 feet without demonstrable subtalar instability, the following extent of injury was documented: three had a 25% tear, 17 had a 50%
Fig. 4. Hyalinization of the torn ends of the interosseous ligament ends and subsequent impingement of this material into the anterior aspect of the posterior subtalar joint is referred to as the subtalar impingement lesion (STIL). A, Demonstration of a form of the STIL before much hyalinization. B, Artist’s version of that lesion. C, Floor of the sinus tarsi after a thorough debridement. D–F, Artist’s version of the STIL before, during, and after debridement.
Subtalar instability is demonstrated arthroscopically as the posterior facet of the calcaneus glides laterally out from under the talus as the subtalar joint is stressed in varus. A, Before stress. B, After stress. C and D, Artist's version of the arthroscopic stress test.

Fig. 5. Subtalar instability is demonstrated arthroscopically as the posterior facet of the calcaneus glides laterally out from under the talus as the subtalar joint is stressed in varus. A, Before stress. B, After stress. C and D, Artist's version of the arthroscopic stress test.

tear, and nine had a 75% tear of the interosseous ligaments. It should be noted that the authors found it difficult to demonstrate subtalar instability by exerting a varus stress to the hindfoot and measuring the amount of lateral joint opening. Rather, it seemed that the major arthroscopic finding was a medial glide of the calcaneus out from under the talus (Fig. 5).

A subjective scale was designed to evaluate postoperative results. Excellent results indicated no pain and no lifestyle restrictions. Good results indicated improvement but some pain or lifestyle restrictions. Poor results indicated that the patient had not improved or was worse. The average follow-up was 4 years and 9 months (range, 1 year-7 years and 9 months). Twenty-three feet (47%) had excellent results, 23 feet (47%) had good results, and three feet (6%) had poor results. Of patients with poor results, all subsequently had a successful subtalar fusion. When evaluating only those 36 feet with a postoperative diagnosis of interosseous ligament tear, the following results were noted: 21 excellent (58%), 13 good (36%), and two poor (6%). Twenty-eight of the feet were Workers' Compensation cases. Of these cases, there were 10 (36%) excellent results, 15 (54%) good results and three (11%) poor results.

There were five reported complications, including three cases of neuritis involving branches of the superficial peroneal nerve, one case of sinus tract formation, and one case of a superficial wound infection which occurred in the patient with the sinus tract formation. The three cases of neuritis were treated successfully with cortisone injections and physical therapy. The patient with the sinus tract formation and the superficial wound infection was treated successfully with antibiotics, wound care, and subsequent total contact casting.

Twenty cases had ankle arthroscopy performed at the same time as the subtalar arthroscopy. Eleven of these cases had injury to the lateral collateral ligaments or lateral capsule without ankle instability, but necessitating debridement of the lateral gutter. Nine cases had injury to the lateral collateral ligaments with ankle instability that required reconstruction of the ligaments. Of these cases, there were 10 (50%) excel-
lent results, seven (35%) good results, and three (15%) poor results.

DISCUSSION

This study demonstrated a success rate of 94% good and excellent results in treating various types of subtalar pathologic conditions with arthroscopic techniques. Workers’ Compensation cases reported 90% good and excellent results, but all of the poor results were in this group. It was interesting to note that of 20 patients who had concurrent ankle arthroscopy, 85% excellent and good results were reported. However, all of the poor cases were also in this group. It may be that the patients who required both ankle and subtalar arthroscopy had more severe injuries, which required more surgery and had a higher risk of poor results (although the number of poor results still remains relatively small).

The complication rate was low and was represented by five minor complications, which resolved with nonsurgical treatment. As seen in ankle arthroscopy, the most common complication was a transient neuropraxia involving branches of the superficial peroneal nerve.

In this study, sinus tarsi syndrome was a common preoperative diagnosis. However, sinus tarsi syndrome remains a vague term in the orthopaedic literature. It has been defined as pain in the sinus tarsi region of the subtalar joint that responds to injection and is associated with a feeling of instability in the hindfoot.2,15,18 Despite years of clinical attention, however, its cause remains poorly understood. To date, there exists no pathognomonic history, physical examination findings, or set of tests that can be relied on in making the diagnosis. It is interesting that some of these patients often improve with various forms of surgical debridement of the sinus tarsi.

Sinus tarsi syndrome is an inaccurate term which should be dropped and replaced with a more accurate diagnosis, when possible. Arthroscopy is a tool that will allow the orthopaedic surgeon to make a more accurate diagnosis. The authors noted in this study that, of 14 feet that had a preoperative diagnosis of sinus tarsi syndrome, all diagnoses were changed at the time of arthroscopy. The postoperative diagnoses included 10 interosseous ligament tears, two cases of arthrofibrosis, and two degenerative joints. With the more accurate diagnosis that can be made arthroscopically, the general term, sinus tarsi syndrome, can be dropped in most cases. As a result, treatment plans can become more exact and outcomes will hopefully improve.

Subtalar instability was also evaluated in this study. Although subtalar instability is most commonly associated with ankle instability, it can exist on its own. There have been multiple techniques reported for evaluating subtalar instability, including stress tomograms, specific subtalar stress radiographs, fluoroscopy, and subtalar arthrograms.3,4,7,14,18 Subtalar arthroscopy and direct visualization of the joint may be the most accurate way of evaluating the unstable joint. Because motion occurs in a screw-like fashion9 about an axis of rotation that forms an angle of 10° to 15° with the sagittal plane and an angle of 45° with the horizontal plane of the foot,17 it may be that evaluating the joint with varus stress, as done in the above radiographic tests, is not accurate. What was seen at arthroscopy was a glide of the posterior calcaneal facet, medially, from under the talus. This may represent one part of the screw-like motion of the subtalar joint.13 Although only one preoperative radiographic technique was used for evaluating instability of the subtalar joint in this study, it is the technique which is most available to orthopaedic surgeons. Regardless, instability of the subtalar joint was noted in only one foot, preoperatively, but was thought to exist in seven feet at the time of arthroscopic evaluation. Further experience with observing normal motion of the subtalar joint during arthroscopy may lead to greater confidence in recommending arthroscopic stress tests in the evaluation of subtalar instability in the future.

Possible indications for arthroscopy of the subtalar joint and sinus tarsi include the following: (1) removal of loose bodies, (2) evaluation of chondral and osteochondral fractures, (3) excision of intra-articular adhesions, (4) appraisal of articular cartilage damage after calcaneal or talar body fractures, and (5) possible arthrodesis. Subtalar arthroscopy is also useful in the diagnosis and treatment of chronic hindfoot pain, subtalar instability, chronic pain in the sinus tarsi, interosseous ligament injuries, synovitis, osteoarthritis, and possibly for removal of fibrous or cartilagenous talar coalitions.

The major advantages of arthroscopic versus open surgery for pathologic conditions in the subtalar joint and sinus tarsi include decreased morbidity and a rapid rehabilitation. Open approaches to the subtalar joint can involve excision of the fat pad, detachment of the extensor digitorum brevis from the sinus tarsi, and transection of the ligaments in the sinus tarsi and tarsal canal. Although the exact morbidity of this dissection is unknown, there are obvious theoretical advantages to preserving normal anatomy.

Subtalar arthroscopy fills the gap that exists in the treatment of subtalar disease between treatment of pathologic conditions with a UCBL (University of California, Biomechanical Laboratories) orthotic device.
and a subtalar fusion. Arthroscopy of the subtalar joint and sinus tarsi is a valuable tool in the investigation of hindfoot pathologic conditions when nonsurgical treatment fails, and a subtalar fusion is not indicated.

REFERENCES