Postoperative Complications of Posterior Ankle and Hindfoot Arthroscopy

Florian Nickisch, MD, Alexej Barg, MD, Charles L. Saltzman, MD, Timothy C. Beals, MD, Davide E. Bonasia, MD, Phinit Phisitkul, MD, John E. Femino, MD, and Annunziato Amendola, MD

Investigation performed at the University of Utah Orthopaedic Center, Salt Lake City, Utah, and the University of Iowa Hospitals and Clinics, Iowa City, Iowa

Background: Posterior ankle and hindfoot arthroscopy, performed with use of posteromedial and posterolateral portals with the patient in the prone position, has been utilized for the treatment of various disorders. However, there is limited literature addressing the postoperative complications of this procedure. In this study, the postoperative complications in patients treated with posterior ankle and hindfoot arthroscopy were analyzed to determine the type, rate, and severity of complications.

Methods: The study included 189 ankles in 186 patients (eighty-two male and 104 female; mean age, 37.1 ± 16.4 years). The minimum duration of follow-up was six months, and the mean was 17 ± 13 months. The most common preoperative intra-articular diagnoses were subtalar osteoarthritis (forty-six ankles), an osteochondral lesion of the talus (forty-two), posterior ankle impingement (thirty-four), ankle osteoarthritis (twenty), and subtalar coalition (five). The most common extra-articular diagnoses were painful os trigonum (forty-six), flexor hallucis longus tendinitis (thirty-two), and insertional Achilles tendinitis (five).

Results: The most common intra-articular procedures were osteochondral lesion debridement (forty-four ankles), subtalar debridement (thirty-eight), subtalar fusion (thirty-three), ankle debridement (thirty), and partial talectomy (nine). The most common extra-articular procedures were os trigonum excision (forty-eight), tenolysis of the flexor hallucis longus tendon (thirty-eight), and endoscopic partial calcanectomy (five). Complications were noted following sixteen procedures (8.5%); four patients had plantar numbness, three had sural nerve dysesthesia, four had Achilles tendon tightness, two had complex regional pain syndrome, two had an infection, and one had a cyst at the posteromedial portal. One case of plantar numbness and one case of sural nerve dysesthesia failed to resolve.

Conclusions: Our experience demonstrated that posterior ankle and hindfoot arthroscopy can be performed with a low rate of major postoperative complications.

Level of Evidence: Therapeutic Level IV. See Instructions for Authors for a complete description of levels of evidence.

Posterior ankle and hindfoot arthroscopy has become an important diagnostic and therapeutic procedure since its development in the late 1990s. Numerous indications for this surgical procedure have been described, including a variety of intra-articular and extra-articular procedures and disorders: debridement and microfracture of osteochondral

Disclosure: None of the authors received payments or services, either directly or indirectly (i.e., via his or her institution), from a third party in support of any aspect of this work. One or more of the authors, or his or her institution, has had a financial relationship, in the thirty-six months prior to submission of this work, with an entity in the biomedical arena that could be perceived to influence or have the potential to influence what is written in this work. No author has had any other relationships, or has engaged in any other activities, that could be perceived to influence or have the potential to influence what is written in this work. The complete **Disclosures of Potential Conflicts of Interest** submitted by authors are always provided with the online version of the article.

A commentary by Richard D. Ferkel, MD, is linked to the online version of this article at jbjs.org.

J Bone Joint Surg Am. 2012;94:439-46 • http://dx.doi.org/10.2106/JBJS.K.00069

TABLE I Distribution of Primary Diagnoses in the 189 Ankles That Underwent Posterior Ankle and Hindfoot Arthroscopy

Intra-Articular		Extra-Articular	
Diagnosis	No.	Diagnosis	No.
Subtalar osteoarthritis*	46	Painful os trigonum	46
Osteochondral lesion of talus	42	FHL† tendinitis	32
Posterior ankle impingement	3	Insertional Achilles tendinitis	5
Ankle osteoarthritis	20	Peroneal tendon impingement	4
Subtalar coalition	5	Sural neuritis	1
Osteonecrosis of talus	4		
Displaced intra-articular calcaneal fracture	4		
Nonunion of tuberosity of calcaneus	1		
Subtalar nonunion	1		

*Three of these patients had this status after ankle fusion. †FHL = flexor hallucis longus.

lesions[1], debridement of posterior ankle impingement with or without excision of the os trigonum and release of the flexor hallucis longus tendon[2-15], subtalar fusion[16-21], arthroscopic management of posttraumatic arthrofibrosis of the ankle[22,23], debridement for chronic Achilles tendinitis[10,24], endoscopic calcaneoplasty for Haglund deformity[10,25,26], excision of a Stieda process of the talus[27], percutaneous treatment of an intra-articular calcaneal fracture[28], removal of an intraosseous talar ganglion[29], and tibiotalocalcaneal arthrodesis[30].

Arthroscopy of the foot and ankle has many potential advantages compared with open surgical procedures, including decreased morbidity, less scarring and injury to the surrounding soft tissues, and possibly quicker recovery in the early postoperative phase[15]. However, although anterior ankle arthroscopy has become a widely accepted method of treatment in orthopaedic surgery[31-33], posterior ankle and hindfoot arthroscopy has been approached with greater caution and less enthusiasm, particularly because of concern regarding potential postoperative neurological complications. Although anatomical studies have shown the safety of portal placement for posterior ankle and subtalar arthroscopy[34-38], there appears to be a potential for nerve injury, with a reported prevalence of between 0% and 20% in small published case series (see Appendix).

To further evaluate the potential for nerve injury associated with posterior ankle and hindfoot arthroscopy, we analyzed the postoperative complications in patients who underwent this procedure. The objectives of our study were (1) to determine the prevalence of postoperative complications in patients undergoing posterior ankle and hindfoot arthroscopy, (2) to characterize the patients with postoperative neurological complications, and (3) to determine the risk factors for postoperative neurological complications.

Materials and Methods

A retrospective review of the charts of 186 consecutive patients who had undergone 189 posterior ankle and hindfoot arthroscopies was performed. (All three patients who required bilateral surgery underwent bilateral posterior ankle arthroscopy during the same anesthesia session.) The study was approved by Institutional Review Boards of the University of Iowa and the University of Utah. All arthroscopic procedures were performed between September 2001 and December 2009 in the Orthopaedic Department of the University of Iowa (125 procedures, 66.1%) or of the University of Utah (sixty-four procedures, 33.9%). The surgical procedures were perfomed by six orthopaedic surgeons with two to twenty-two years of practice experience following a foot and ankle fellowship. The patients had a mean duration of follow-up (and standard deviation) of 17 ± 13 months (median, 13 months; range, six to eighty-three months); seventy-five (40.3%) of the 186 patients had less than twelve months of follow-up. The chart reviews and data analysis were performed by two independent reviewers (A.B. and D.E.B.) who did not operate on any of the patients.

Eighty-two (44.1%) of the patients were male (eighty-four ankles) and 104 (55.9%) were female (105 ankles). The mean age of the patients at the time of the arthroscopy was 37.1 ± 16.4 years (median, 36.7 years; range, 13.1 to 87.8 years). The intra-articular and extra-articular diagnoses are summarized in Table I. One hundred and fifteen ankles (60.8%) had only intra-articular diagnoses and fifty-one (27.0%) had only extra-articular diagnoses. Twenty-three of the 138 ankles with intra-articular diagnoses and seventeen of the seventy-four with extra-articular diagnoses had more than two abnormal conditions. In forty-five patients (24.2%), both intra-articular and extra-articular diagnoses were the indication for surgery.

Surgical Technique

An outpatient setting was utilized in the treatment of 159 ankles (84.1%), and spinal anesthesia was used in 144 of these cases (76.2% of the total). General anesthesia was utilized in the treatment of the remaining forty-five ankles (23.8%). The patient was positioned prone on a regular operating table and a thigh tourniquet was applied. In procedures in which minimally invasive distraction was performed with use of a tensioned wire placed transversely through the calcaneus, the knee was positioned just cephalad to the break in the table, the contralateral knee was flexed 90°, and the leg was secured to a padded post. After distraction was applied, the foot of the operating table was lowered to allow easy access by a mini-c-arm fluoroscopy unit[39]. In procedures performed without distraction, two sterile towel bumps were placed under the leg so that the foot could be moved freely and a lateral fluoroscopic image of the ankle could be obtained if required. A prophylactic dose of intravenous antibiotics was administered to all patients within thirty minutes prior to the start of surgery.

We routinely used a mini-c-arm fluoroscopy machine to guide portal placement, as the height of the ideal portal position varies slightly depending on

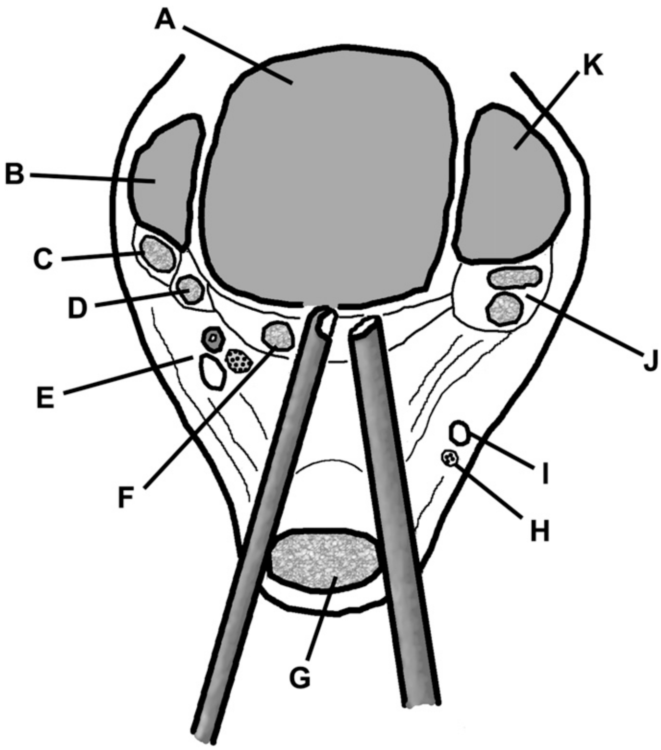

Fig. 1

Axial diagram showing a cross-section of the ankle joint at the level of the arthroscopes. A = talus, B = medial malleolus, C = posterior tibial tendon, D = flexor digitorum longus, E = tibial nerve and vessels, F = flexor hallucis longus tendon, G = Achilles tendon, H = sural nerve, I = lesser saphenous vein, J = peroneal tendons, and K = lateral malleolus.

the procedure being performed. A slightly lower portal facilitates entry into the ankle joint during intra-articular ankle procedures, such as debridement and microfracture of a posterior talar osteochondral defect.

For intra-articular ankle procedures, the posterolateral portal (Fig. 1) was established first, just lateral to the Achilles tendon and approximately at the level of the tip of the lateral malleolus. An incision was made through only the skin with a number-15 blade to avoid injury to the sural nerve[36]. The subcutaneous tissue was then spread with a straight mosquito clamp. Under fluoroscopic control, a 4.5-mm arthroscope sheath with a blunt trocar was then advanced in line with the first web space toward the posterior process of the talus. For intra-articular ankle procedures, the trocar was advanced into the ankle joint and then exchanged for a 4.0-mm or 2.7-mm 30° arthroscope. The medial portal (Fig. 1) was then established in similar fashion at the same level and just medial to the Achilles tendon. The subcutaneous tissue was spread with a straight mosquito clamp. Again under fluoroscopic control, the clamp and the trocar were advanced into the ankle joint in line with the third web space and aimed just medial to the midline to avoid injury to the tibial neurovascular structures. The clamp was then exchanged for a 3.5-mm full-radius shaver, an arthroscopic curet, or a microfracture instrument. In patients with a posterolateral osteochondral lesion of the talus, the arthroscope was introduced through the medial portal and the working instrument was introduced through the lateral portal in a similar fashion.

For extra-articular hindfoot procedures and subtalar joint procedures, we followed the technique described by van Dijk et al.[40]. The portals were established as described above. A mosquito clamp was inserted through the medial portal and advanced in line with the third web space toward the posterior process of the talus until it rested on bone. This clamp was then exchanged for a 4.0-mm 30° arthroscope. The arthroscope was directed laterally, and a mosquito clamp was introduced through the lateral portal and directed toward the arthroscopic sheath. Once the tip of the mosquito clamp was in contact with the sheath, the clamp was advanced along the sheath until it could be seen in the arthroscopic field. The clamp was then exchanged for a 3.5-mm or 5.0-mm full-radius shaver. The arthroscopic visualization was often initially limited and careful debridement of some adipose tissue of the Kager fat pad lateral to the lateral tubercle of the posterior process of the talus was necessary to create more space to aid visualization. Further debridement of scar tissue or adipose tissue was then carried out in a lateral-to-medial direction to facilitate visualization of the posterior tibiofibular ligament, the posterior tibiotalar and subtalar joint capsule, the os trigonum, and finally the flexor hallucis longus tendon. In patients with posterior impingement or with painful os trigonum syndrome due to a large os trigonum, the safest way to proceed with the debridement was close to the bone. The proximity to the flexor hallucis longus tendon was judged by periodically moving the great toe while directing the arthroscope medially. The tissue surrounding the flexor hallucis longus tendon will move with passive motion of the great toe. Once the os trigonum was freed from all of the surrounding soft tissues, it could be either debrided in situ with a 4-mm arthroscopic burr or detached from the posterior process of the talus and then retrieved through the working portal. Once the flexor hallucis longus tendon was identified, its sheath could be opened and released to the level of the sustentaculum, always taking care to remain on the lateral aspect of the tendon. The thin posterior joint capsule of the subtalar joint could be opened and a portion of the posterior facet of subtalar joint could be visualized. A posterior arthroscopic arthrodesis of the subtalar joint could be performed as described by Amendola et al.[16].

No distraction was used during the posterior ankle and hindfoot arthroscopy in 126 (66.7%) of the ankles, the calcaneal minimally invasive distraction technique[39] was used in sixty (31.7%), and the noninvasive distraction technique[41] was used in three (1.6%). The type of distraction used depended on surgeon preference and the date of the surgery.

Statistical Analysis

All data are presented as the mean and standard deviation accompanied by minimum and maximum values. Logistic regression analysis was performed to identify factors associated with neurological complications after surgery. The characteristics considered included age (more than fifty years), sex, surgeon experience (less than twelve procedures during the study period), type of surgical procedure, operative time (more than 120 minutes), distraction use, tourniquet use, and tourniquet time (more than ninety minutes). Odds ratios and accompanying 95% confidence intervals were estimated.

Source of Funding

There was no external source of funding for this study.

Results

The procedures performed in this patient cohort are shown in Table II. Simultaneous arthroscopy of the anterior portion of the ankle and the subtalar joint was performed in twenty-five (13.2%) of the ankles. The mean operative time was 91 ± 55 minutes (median, 78 minutes; range, seventeen to 233 minutes). The operative time was longer than ninety minutes in seventy-nine (41.8%) of the ankles and longer than 120 minutes in forty-three (22.8%). Because of the retrospective nature of the study, data regarding tourniquet use, tourniquet time, and tourniquet pressure were available in only 165 (87.3%) of the ankles. Tourniquet use was documented in 125 (66.1%) of the 189 ankles. The mean tourniquet time was 86 ± 23 minutes (range, forty-two to 120 minutes). The tourniquet pressure was known to be 300 mm Hg in eighty-eight (46.6%) of the 189 procedures and 280 mm Hg in thirty-seven (19.6%).

TABLE II Distribution of Primary Procedures in the 189 Ankles That Underwent Posterior Ankle and Hindfoot Arthroscopy

Intra-Articular		Extra-Articular	
Procedure	No.	Procedure	No.
Debridement of osteochondral lesion of talus	44	Excision of os trigonum	48
Subtalar debridement	38	Tenolysis of FHL tendon*	38
Subtalar fusion	33	Endoscopic partial calcanectomy	5
Ankle debridement	30		
Partial talectomy	9		
Fixation of calcaneal fracture	4		
Revision of subtalar nonunion	1		

*FHL = flexor hallucis longus.

There were no intraoperative complications such as fracture or instrument breakage associated with use of the invasive distraction technique. Sixteen postoperative complications were recorded, resulting in an overall complication rate of 8.5% (Table III). However, because of the retrospective study design, only complications noted in the patients' charts were analyzed in this study and the total number of postoperative complications may therefore have been underestimated.

Seven of the complications (representing 44% of the recorded complications and 3.7% of the ankle and hindfoot arthroscopies) were neurological (see Appendix). Four of these complications involved postoperative plantar numbness and three involved sural nerve dysesthesia. Logistic regression analysis did not identify any demographic or surgical parameters that were significantly associated with the occurrence of neurological complications (Table IV).

Two of the four patients who experienced postoperative plantar numbness had undergone complex procedures for posttraumatic arthritis of the ankle and subtalar joints, including extensive arthroscopic debridement, percutaneous Achilles tendon lengthening, lateralizing calcaneal osteotomy, and distraction arthroplasty with a thin wire external fixator. Both of these patients had also undergone multiple previous surgical procedures. Two of the four patients with postoperative plantar numbness returned to the operating room; one was treated with a tarsal tunnel release that resulted in complete normalization of plantar sensation, and the other (who had undergone a tarsal tunnel release at the time of the index procedure) underwent adjustment of the thin wire external fixator, with release of the distraction and valgus-directed force, that resulted in only partial resolution of the symptoms. The latter patient regained sensation to light touch but continued to have paresthesias at the time of the latest follow-up. In the other two patients with altered plantar sensation postoperatively, the symptoms were not as profound and resolved completely without any further intervention.

Two of the three patients with postoperative sural nerve dysesthesia were managed with oral administration of gabapentin and experienced resolution of symptoms without any further intervention. The third patient had persistent symptoms and was offered operative exploration of the sural nerve but declined further intervention. Two of the three patients with postoperative sural nerve dysesthesia had undergone posterior arthroscopic subtalar arthrodesis with use of a third (accessory posterolateral) portal[16].

Postoperative infection with prolonged wound-healing was observed following two (1.1%) of the procedures. One patient was treated with intravenous antibiotics for seven days and the other patient required operative irrigation and debridement. The infection resolved in both cases.

TABLE III Distribution of the Sixteen Postoperative Complications in the 189 Ankles That Underwent Posterior Ankle and Hindfoot Arthroscopy

Complication	No.	% of All Procedures	% of All Complications	Resolved *(no. [%])*
Plantar numbness	4	2.1	25	3 (75)
Sural nerve dysesthesia	3	1.6	19	2 (66)
Postoperative infection	2	1.1	12	2 (100)
Achilles tendon tightness	4	2.1	25	4 (100)
Posteromedial portal cyst	1	0.5	6	1 (100)
Complex regional pain syndrome	2	1.1	12	2 (100)

TABLE IV Logistic Regression Analysis of Potential Risk Factors for Postoperative Neurological Complications

Parameter	Yes *(no. [%])*	No *(no. [%]*	OR (95% CI)*	P Value
Age ≥ 50 yr	1 (0.5)	46 (24.3)	0.49 (0.06-4.20)	0.493
Female sex	3 (1.6)	102 (54.0)	0.94 (0.20-4.30)	0.931
<12 procedures performed by the surgeon†	1 (0.5)	21 (11.1)	1.28 (0.15-11.14)	0.824
Surgery				
Excision of os trigonum	1 (0.5)	47 (24.9)	0.48 (0.06-4.08)	0.500
Tenolysis of flexor hallucis longus	1 (0.5)	37 (19.6)	0.65 (0.08-5.59)	0.653
Operative time ≥ 120 min	3 (1.6)	40 (21.2)	2.66 (0.57-12.39)	0.212
Distraction	2 (1.1)	61 (32.3)	0.79 (0.15-4.21)	0.786
Tourniquet use	6 (3.2)	119 (63.0)	3.18 (0.37-26.97)	0.290
Tourniquet time ≥ 90 min	4 (2.1)	61 (32.3)	2.65 (0.57-12.19)	0.212

*OR = odds ratio, and CI = confidence interval. †During the 8.3-year study period.

Complex regional pain syndrome (CRPS) was diagnosed during the early postoperative period following two (1.1%) of the procedures with use of the diagnostic criteria of the International Association for the Study of Pain[42]. The complication was successfully treated in both cases with a multidisciplinary therapeutic approach including intensive physiotherapy, the administration of gabapentin and corticosteroids, and repetitive local anesthetic blocks or lidocaine injections.

Postoperative Achilles tendon tightness resulting in a substantial decrease in the range of motion was reported following four (2.1%) of the procedures. The mean decrease was approximately 30%, resulting in dorsiflexion of 16° and plantar flexion of 37° compared with 25° and 48° on the contralateral side. Three of these four patients had undergone extra-articular procedures. All symptoms resolved after intensification of the physiotherapy rehabilitation program. The mean range of ankle motion at the time of the latest follow-up was 24° of dorsiflexion and 46° of plantar flexion.

The distribution of procedures among the six surgeons was not equal, with four, seven, eleven, thirty-seven, forty-four, and eighty-six procedures per surgeon. However, we did not observe any correlation between the complication rate and the level of surgeon experience. We divided the 189 procedures into a "less experienced surgeon" group (twenty-two procedures performed by three surgeons whose experience involved four, seven, and eleven procedures during the study period) and an "experienced surgeon" group (167 procedures performed by the other three surgeons). The complication rates in these groups were comparable ($p = 0.824$), equaling 9.1% (two of twenty-two) in the first group and 8.4% (fourteen of 167) in the second. There was no tendency toward a decrease in the complication rate over time ($p = 0.119$) (see Appendix).

With the numbers studied, the rate of postoperative complications did not differ significantly with regard to either the use or the type of intraoperative joint distraction. No complications inherent to minimally invasive calcaneal pin distraction were noted.

Discussion

Although anterior ankle arthroscopy has experienced remarkable progress in the diagnosis and treatment of ankle disorders[31,33], there is limited literature addressing the postoperative complications of posterior ankle and hindfoot arthroscopy.

The prevalence of neurological complications in our patient cohort was 3.7%. The plantar numbness or sural nerve dysesthesia resolved in five of the seven cases. Most previous studies addressing the clinical outcome in patients who underwent posterior ankle and hindfoot arthroscopy reported no neurological complications. However, most of these studies were preliminary reports of a novel technique or studies addressing the outcome of specific surgical procedures in patient cohorts that typically contained fewer than twenty patients.

Keeling and Guyton described endoscopic release of the flexor hallucis longus tendon as a procedure that is associated with a substantial risk to the local neurovascular structures[43]. However, in our study, flexor hallucis longus release was not identified as a significant risk factor for postoperative neurological complications.

Abramowitz et al. reported the occurrence of sensory neurapraxia of the sural nerve in eight (20%) of forty-one patients, which represents the highest reported rate of neurological complications[2]. Consequently, these authors recommended identifying, retracting, and protecting the sural nerve when a posterolateral portal is used[2]. Noguchi et al. treated twelve patients with posterior ankle impingement arthroscopically and reported transient sural nerve neurapraxia in one patient[11]. Although the symptoms resolved within four weeks, the authors advocated blunt dissection of the subcutaneous tissue to avoid nerve injury. Additionally, they noted the need for special attention during excision of impinged ossicles lying behind the flexor hallucis longus tendon[11]. Horibe et al. recommended creating an accessory posterolateral portal just posterior to the peroneal tendon sheath by means of blunt dissection through the subcutaneous tissues[7]. Lee et al. described an alternative approach in which the portals are placed close to the edge of the Achilles tendon[20]. The flexor hallucis longus tendon may serve as a boundary marker for safe exposure of the ankle and subtalar joints when the patient is in the prone position. Lee et al. noted that placement of the posterior portals is more challenging when the patient is in the supine or lateral position because there is a tendency for the surgeon to place these portals more anteriorly under these circumstances, which may increase the risk of neurovascular injury[21]. Finally, Carro et al. stated that identification of the flexor hallucis longus tendon as an important landmark may significantly decrease the risk of intraoperative damage to the neurovascular bundle[18].

To minimize the risk of neurological injury, we recommend consideration of the following technical points. In accordance with the literature[10,14,43-46], our study confirmed the sural nerve to be at risk for injury during posterior ankle and hindfoot arthroscopy. The sural nerve has been reported to cross the lateral border of the Achilles tendon in the subcutaneous adipose tissue a mean of 9.8 cm (range, 6.5 to 16 cm) proximal to the Achilles tendon insertion[47]. As the majority of reported sural nerve problems following posterior ankle and hindfoot arthroscopy resolved over time, this suggests that neurapraxia resulting from the proximity of the nerve to the posterolateral portal was the likely cause. Extreme care must therefore be taken when creating the posterolateral portal. Only the skin should be incised with a number-15 scalpel blade, without any sharp dissection into the subcutaneous tissue. Blunt dissection with a small hemostat is recommended to deepen the portal into the retrocalcaneal space toward the ankle or subtalar joint. Repetitive exchange of instruments such as shavers, burrs, and arthroscope sheaths should be minimized and done carefully. We recommend fluoroscopy to ensure optimal portal placement and to minimize excessive torque on the arthroscopic instruments, which can stretch the subcutaneous nerves. Although the data in the present study did not identify posterior arthroscopic subtalar arthrodesis as an independent risk factor for sural nerve complications, two of the three patients who experienced sural nerve dysesthesia had undergone this procedure with use of an accessory posterolateral portal[16]. The creation of this portal theoretically carries an additional risk of injury to the sural nerve. For extra-articular hindfoot and ankle procedures, identification of the flexor hallucis longus tendon is paramount to avoid injury to the posterior tibial neurovascular structures. The deep dissection is performed carefully in a lateral-to-medial direction with an arthroscopic shaver. Any dissection medial to the flexor hallucis longus tendon should be avoided. As the flexor hallucis longus tendon plays an important role as an anatomic landmark, surgeons should be aware of possible anatomic variations[48]. In a previous study, Phisitkul and Amendola reported two cases in which the presence of the peroneocalcaneus internus muscle imitated the flexor hallucis longus[48]. Finally, for intra-articular ankle procedures, we prefer advancing the arthroscopic instruments directly into the ankle joint under fluoroscopic guidance without any dissection in the retrocalcaneal space.

The true etiology of the four tibial nerve injuries in our study population is difficult to identify. The only injury that did not completely resolve over time, despite release of the tarsal tunnel, occurred in a twenty-seven-year-old patient with posttraumatic arthritis of the ankle and subtalar joint following a talar fracture with a concomitant equinovarus deformity. In addition to arthroscopic debridement of both joints, she underwent a lateralizing calcaneal osteotomy, percutaneous Achilles tendon lengthening, and distraction arthroplasty with a thin wire external fixator; all of these procedures pose a certain risk of injury to the tibial nerve[49]. The three remaining patients recovered completely. One of these three patients required a tarsal tunnel release after undergoing surgical debridement of the ankle and subtalar joint in conjunction with percutaneous Achilles tendon lengthening for posttraumatic arthritis and arthrofibrosis. Although the sample size was too small to demonstrate a significant association, the scenarios in these two cases suggest that patients with arthritis, stiffness, and deformity following prior major ankle and hindfoot trauma may be at increased risk for nerve injury during posterior ankle and hindfoot arthroscopy.

Most studies addressing clinical outcomes after posterior ankle and hindfoot arthroscopy have indicated no deep or superficial wound infections. Two patients in our study (1.1%) experienced delayed wound-healing and infection, and one of these required surgical treatment; this finding is comparable with those observed in patients undergoing anterior ankle arthroscopy[32]. A single dose of cefazolin had been administered to all patients in our study within thirty minutes prior to skin incision.

CRPS is a major postoperative complication that has been reported after anterior ankle arthroscopy[32,33]. However, only one case has previously been reported after posterior ankle arthroscopy. That patient experienced partial resolution of symptoms by one year postoperatively, with some symptoms remaining at a follow-up visit at twenty-seven months[2]. In our patient cohort, type-I CRPS was diagnosed in two patients. Both patients reported relief of symptoms within six months after surgery following appropriate multimodal treatment including intensive physiotherapy and sympathetic blockade.

Four patients in our cohort reported postoperative Achilles tendon tightness and objectively had decreased ankle and hindfoot motion, and all four reported substantial improvement of the symptoms after intensification of the physiotherapy rehabilitation program. Three of these patients had undergone extra-articular procedures. We could not identify any published studies noting Achilles tendon tightness as a possible postoperative complication of posterior ankle and hindfoot arthroscopy, although Horibe et al. did discuss possible damage to the Achilles tendon when using a trans-Achilles portal[7].

The variability in the use and mode of joint distraction in our study population arose because our early use of posterior ankle arthroscopy was complicated by relatively limited access to the articular surface of the talus in some patients. To improve access, we developed a minimally invasive distraction technique that utilized a tensioned wire placed through the calcaneal tuberosity[39].

The present study has some limitations. First, the study was retrospective in nature, and the true prevalence of complications may therefore have been underestimated. Second, the patient population was relatively heterogeneous, having undergone a variety of surgical procedures for several different conditions. Third, the surgical procedures were performed by six different surgeons at two university orthopaedic centers. However, all surgical procedures were performed by surgeons with foot and ankle fellowship training and experience in posterior ankle and hindfoot arthroscopy. Fourth, the regression analysis of possible risk factors for neurological injury should be interpreted with caution. It cannot adjust for all unidentified risk factors, which could have different frequencies in the two groups. Logistic regression is also sensitive to the number of explanatory variables and the total number of patients. It is possible that some risk factors did not reach significance because the sample size of the patient cohort with neurological complications was insufficient.

In summary, our initial experience has demonstrated that posterior ankle and hindfoot arthroscopy can be performed with a low rate of postoperative complications.

Appendix

eA Tables presenting a review of the literature, details regarding the seven patients with neurological complications, and the time distribution of complications seen in the study are available with the online version of this article as a data supplement at jbjs.org. ■

Florian Nickisch, MD
Alexej Barg, MD
Charles L. Saltzman, MD
Timothy C. Beals, MD
Department of Orthopaedics,
University of Utah Orthopaedic Center,
590 Wakara Way, Salt Lake City, UT 84108

Davide E. Bonasia, MD
Phinit Phisitkul, MD
John E. Femino, MD
Annunziato Amendola, MD
Department of Orthopaedics and Rehabilitation,
University of Iowa Hospitals and Clinics,
200 Hawkins Drive, Iowa City, IA 52242.
E-mail address for A. Amendola: ned-amendola@uiowa.edu

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