Arthroscopic Assisted Joint Arthrodesis, a Retrospective Case Series

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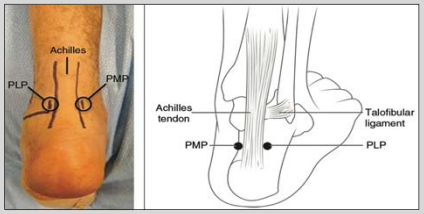
Purpose

The purpose of this case review is to demonstrate that arthroscopically assisted arthrodesis (AAA) is a viable technique with reproducible fusion rates comparable to the traditional open approach.

Figure 1: landmarks for posterior ankle and subtalar joint scope.



Literature Review

Ankle and rearfoot arthrodesis is a common procedure in patients with severe deformity and/or arthritis. A traditional open approach requires extensive soft tissue exposure for visualization, joint preparation, and placement of internal fixation. Arthroscopic assisted arthrodesis allows excellent visualization and access with significantly less soft tissue trauma. Potential benefits include preservation of local blood supply, less post-operative pain and swelling, and more efficient rehabilitation.

To be a reliable alternative to an open approach, the fusion rates must be comparable. This has been found to be the case for both subtalar and ankle arthrodesis.

Proper patient selection is essential to success. The amount of deformity to be corrected is a major factor. Tasto et. al state that any varus or valgus deformity greater than 15 degrees should be performed as an open procedure. [1] These severe deformities can be challenging to correct arthroscopically due to the contractures and soft tissues restraints. Another factor is the ability to access the joint arthroscopically, which in severely arthritic joints can be challenging due to osteophyte formation.

Figure 2: Pre-Operative Radiographs of patient with severe degenerative joint disease of the ankle. Incongruent valgus deformity deformity to the ankle with subchondral cysts. Spurring to the lateral and medial malleolus with a large steida's process. Tibiotalar angle 64 degrees.

Methods and Materials

A retrospective review of 5 patients (2 tibiotalocalcaneal (TTC) and 2 subtalar joint (STJ), and 1 ankle) joint arthrodesis was performed at our institution. Inclusion criteria were isolated subtalar arthrodesis or arthrodesis of the ankle and/or subtalar joint with minimal deformity. Exclusion criteria included patients who needed revisional procedures or patients with significant bone deformity. The most common preoperative diagnosis was posttraumatic and primary osteoarthritis. Patients with any significant varus or valgus malalignment were excluded. The minimal follow up was 9 months.

We evaluated radiographic time to fusion and union rate, patient satisfaction (very satisfied, satisfied and not satisfied), VAS pain score at the last postoperative visit, and postoperative complications. Radiographic union in our study was defined as osseous trabeculation at the site of arthrodesis seen on 2 orthogonal views. Clinical union was defined as lack of motion at the arthrodesis site and no pain with examination, ambulation and functions of daily life.

Technique

Isolated subtalar and tibial-talo-calcaneal (TTC) fusions were approached with the patient in the prone position. One subtalar fusion was approached medially. The ankle arthrodesis from standard anterio medial and anterior lateral portals. Cartilage was removed with a combination of an arthroscopic bur and currettes. The subchondral plate was removed with the bur as well and perforated with awls or a 2.0 mm drill. The joints were manually reduced into the desired position and temporarily fixated with cannulated screw guide pins or k-wires. The TTC fusions were fixated with an IM nail. The remainder were fixated with percutaneous cannulated screws.

Patients were instructed to be non-weightbearing for 6-8 weeks followed by 4 weeks weight-bearing in a pneumatic fracture boot. All patients underwent post-op rehabilitation.

Figure 3: (top left, top right): Intra-operative setup of posterior ankle and subtalar arthroscopy of patient with severe degenerative joint disease.

(bottom left, bottom right): Post-operative radiographs of a posterior arthroscopic TTC arthrodesis with intramedullary nail.

Results

All patients experienced less pain and swelling compared an open approach. There were no incidences of nonunion, malunion, nerve dysfunction or skin dehiscence. All 5 patients had 100% clinical and radiographic union rate with no hardware complications. Average time for radiographic union was 8 weeks. With the exception of one patient with a VAS of 3/10, all patients reported 0/10. One patient continued to wear a brace post operatively secondary to prior club foot deformity.

Figure 4 A: Post operative pictures 2 weeks s/p arthroscopic assisted STJ arthrodesis

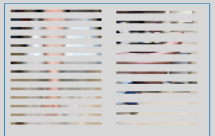


Figure 4 B: Post operative pictures 2 weeks s/p arthroscopic assisted TTC arthrodesis.

Analysis & Discussion

The arthroscopic arthrodesis procedures became popularized due to the primary advantage of being a minimally invasive procedure. In addition, the arthroscope assisted procedure also allows for greater visibility when prepping the subtalar joint or the posterior ankle joint when approached through the standard anterior incision and vice versa when approaching the ankle joint through the posterior incision.

Arthroscopic fusions of the subtalar joint alone or in combination with the ankle joint are being performed with increased efficiency. TTC arthrodesis offers an alternative for patients with end-stage arthritis, post-traumatic arthritis, neuropathic hindfoot deformities, failed ankle arthrodesis, failed total ankle replacements for a pain-free rectus hindfoot for ambulation. [2-4] We chose to fixate with an intramedullary rod as this provides a load-sharing benefit while providing rigid internal fixation with reproducible results. Both of our patients have been fixated with an intramedullary locking rod which provide excellent stability with a high fusion rate. [5] The foot and ankle surgeon will have to adhere to the same core principles as the open procedure while fixating with the arthroscopic assisted arthrodesis.

In order to achieve a stable union, the four essential components needed for fusion must be satisfied; bone coaptation, compression, secure fixation and viable bone. [6] Arthroscopic assisted fusions help to maintain maximum bone length by controlling the amount of bone resection down to the level of the subchondral plate and allows to visualize optimal bone to bone contact for correct positioning prior to fixation. This results in a direct correlation to the union rate. For the subtalar joint alone, the arthroscopic approach results in healing rate of an average of 97% and a healing time of an average of 11 weeks as reported by Murano and Carvajal. [7]

Analysis & Discussion

As comfort with arthroscopy has expanded as have the applications. Arthrscopically assisted arthrodesis allows for greater visibility with less soft tissue trauma and preservation of blood supply to the fusion site. An open case can also be augmented with arthroscopy allowing for greater visibility in hard to visualize areas. For isolated subtalar fusions from the prone position, alignment and placement of fixation is easier and arguable more reproducible. With the arthroscopic approach, this major blood supply can be preserved aiding in healing the arthrodesis site. It is also hypothesized that this approach preserves foot proprioception. [7] In addition, the perioperative morbidity is also noted to be lower when compared to the open approach. [7]

In order to be a reasonable alternative to an open arthrodesis, fusion rates must be comparable. The average union rates for arthroscopic ankle arthrodesis are comparable or slightly better at 94% (range 70-100%) vs. 89% (range:64%-100%). [8] For arthroscopic assisted subtalar fusions, fusion rates average of 97% and a healing time of an average of 11 weeks as reported by Murano and Carvajal. [7]

The authors recognize that there are limitations for arthroscopic assisted fusions when there is a severe deformity or malalignment at the joint. [9,10] Even in such instances, a modified open approach augmented with arthroscopy allows for great visualization of the entire joint surface. In our study, all five patients had a 100% union rate at each arthrodesis site. At final follow-up, all patients were satisfied with their results and remained pain free. We found that with the use of arthroscopic assisted arthrodesis, there were minimal complications, fewer nonunions and patients has a more efficient rehabilitation. This case series demonstrates that the arthroscopic assisted hindfoot arthrodesis is a technique for patients with osteoarthritis who want a reliable fusion, minimal complications and faster recovery. The hindfoot deformity can be addressed with this minimally invasive procedure while providing patient satisfaction.

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Complete list available upon request.

Financial Disclosures

Chandana Halaharvi, Jacob Russell Hagenbucher – none
Michael Gentile – Flower Orthopedics – intellectual property, surgeon advisory board, consultant; Tyber Orthopedics – surgeon advisory board, consultant; Depuy/Synthes - consultant