Extensile anteromedial approach for modified pantalar arthrodesis

Jason R. Miller, DPM, FACFAS, FAPWCA1, Mark J. Capuzzi, DPM, AACFAS2, Weiyuan Tian, DPM3

1 - Residency Director, Tower Health/Phoenixville Hospital, PMSR/RRA; Adjunct Assoc. Professor, Dept. of Surgery, Temple University; Director, PA Intensive Lower Extremity Fellowship Program; Foot & Ankle Surgery, Premier Orthopedics/Pennsylvania Orthopaedic Center
2 - Fellow, PA Intensive Lower Extremity Fellowship Program; Foot & Ankle Surgery, Premier Orthopedics/Pennsylvania Orthopaedic Center
3 - PGY-1, Bryn Mawr Hospital Podiatric and Surgical Residency Program, PMSR/RRA

The aim of this paper is to present a case report of an alternative surgical approach for the anteromedial incision for a modified pantalar arthrodesis. After recent literature supporting an anteromedial approach for a total ankle replacement (TAR), with the incision extending from the ankle joint to the talonavicular joint [1], the decision was made by the principal investigator to use this approach for a modified pantalar arthrodesis. This surgical principle is based on the understanding that the safest incision placement generally lies between angiosomes [2]. This approach splits the angiosome between the anteromedial blood supply from the posterior tibial artery and the anterior and lateral blood supply from the dorsalis pedis artery. Currently, no data regarding incision complications can be found with this approach with respect to a modified pantalar arthrodesis.

Keywords: anteromedial approach, pantalar, arthrodesis, arthritis

Ankle and hindfoot instability, deformity, painful joint degeneration/destruction, avascular necrosis of the talus, and arthritis (inflammatory and osteoarthritis) are all widely acceptable indications for a pantalar arthrodesis given failure of conservative treatments [3]. Although the indications are broad, a vast array of complications should be kept in mind, including malunion, osteoarthritis of adjacent joints, neurovascular injury, and poor wound healing. In some instances, wound complication rates are reported to be as high as 28 to 41 percent [4,5]. The aim of this paper is to present a case report of an alternative surgical approach for the anteromedial incision of a modified pantalar arthrodesis.

Case Description

A 78 year-old male presented to the office with a chief complaint of right foot and ankle pain ongoing for approximately five years duration. Patient is retired, and in his spare time is an avid bird hunter. Past medical history includes Type 2 DM, with a most recent A1c of 6.6%, HTN, DJD, Lyme disease, A-fib, GERD, and prior alcohol abuse. Physical examination revealed pain localized to the anterolateral ankle, sinus tarsi, and along the course of the posterior tibial tendon. Patient was unable to perform a single or double limb heel rise. Standing examination revealed a valgus ankle deformity with hindfoot valgus of 12 degrees and positive too many toes sign. Ankle ROM was limited to 3 degrees of DF and PF limited to 16 degrees with a hard end feel and crepitus. The patient had failed several CMO’s, MAFO, Arizona braces, and injection therapy for four years. It was then determined that surgical intervention was to be performed. Secondary to the severity of the deformity and Stage 4 PTID, a modified pantalar arthrodesis was the definitive and most reliable surgical option. Patient was consented for and amenable to surgical intervention. The principal author prefers to spare the lateral column and the calcaneocuboid joint when at all possible, therefore we call this a “modified” pantalar arthrodesis.

Radiographic Evaluation

Radiographic evaluation of the right foot revealed talar head uncoverage of 75%, increase in Mearry’s and Simmons angles, decreased calcaneal pitch, decreased medial cuneiform floor height, significant subtalar and talonavicular joint arthrosis. Three views of the right ankle revealed ankle valgus and talar tilt of 16 degrees with lateral gutter impingement and arthrosis noted. Figures 1A-D.
Operative Technique

Step 1

Attention was directed to the anterior aspect of the right ankle, where a 10 cm angiosomal approach via an anteromedial curvilinear incision was made. The incision was made along the medial border of the anterior angiosome fed by anterior tibial artery and dorsalis pedis. A full thickness lateral flap is created by dissecting through the extensor retinaculum, along the course of the anterior tibial tendon. The full thickness flap was then retracted laterally with the anterior neurovascular bundle. The interval between the anterior tibial tendon and the lateral flap was used to expose the joint, see Figure 2A-F. Adequate and full exposure of the distal tibia and ankle joint is achieved. The incision is additionally extended 1 cm medially to expose the talonavicular joint. A key elevator was used to reflect the periosteum from the ankle joint and talonavicular joint.

Step 2

Through the incision, a reciprocating power burr was introduced within the ankle joint and used to denude cartilage of the tibia and talus articulating surfaces. Excellent joint preparation was achieved. All cartilage was removed and the healthy subchondral bone plate was fenestrated in a fish scale fashion to allow for adequate fusion. Through the same incision, cartilage resection was performed at the talonavicular joint with excellent preparation noted.

Step 3

A separate incision was then made overlying the subtalar joint from the tip of the lateral malleolus toward the 4th metatarsal base, in standard fashion. Incision was deepened through subcutaneous tissue with care being taken to retract all vital structures. An osteotome was used to expose the posterior facet of the subtalar joint. A reciprocating power burr was used to denude all cartilage of the adjoining surfaces of the calcaneus and talus within the subtalar joint. Excellent preparation was noted. All cartilage was removed and the healthy subchondral bone plate was fenestrated in a fish scale fashion to allow for adequate fusion.
Augment bone substitute was then placed within all prepped fusion sites. We chose to spare the CCJ from fusion to preserve some function of the lateral column, as there was limited evidence of arthrosis pre-operative at that joint.

**Step 4**

Following preparation of the above-mentioned joints, an entry reamer for the hindfoot nail was inserted from the plantar aspect of the calcaneus through the talus and into the medullary canal of the tibia. Anterior posterior and lateral radiographs revealed excellent position of the entry wire. Remaining started at 7.0 mm and was continued to 11.5 mm. Chatter was noticed and therefore an 11 x 210 mm nail was decided upon. The nail was prepared through the jig on the back table. Prior to insertion of the nail of the fibula that had been prepared via the bone mill on the back table was inserted across the ankle joint, calcaneocuboid joint and talonavicular joint. The nail was advanced per manufacture and proper AO technique. The 2 calcaneal locking screws were inserted per manufacture technique. Next, through small medial stab incisions, the proximal locking screw holes were filled with 2 screws respectively. Lastly, through a lateral stab incision the talar screw was inserted. Excellent positioning of the tibial talocalcaneal arthrodesis was noted. Excellent compression was noted.

**Step 5**

Attention was then brought back to the talonaviculac joint where an entry wire for a 7.0 millimeter screw was inserted. The screw was then drilled. A 7.0 x 45 mm headless compression screw was placed across the talonavicular joint. Excellent compression was noted. Final AP and lateral radiographs revealed excellent positioning of the hindfoot and ankle joint. A negative pressure wound VAC was placed over the anterior medial incision.

**Figure 2A-F** Cadaveric incisional approach (A-B); Full thickness incisional flap and interval between the anterior tibial tendon and the lateral flap was used to expose the joint (C-D); Free elevator marking the ankle joint (E), and the Talonavicular joint (F).
At 20 weeks, there was confirmed radiographic healing and union, see Figure 3A-C, and no reported symptoms or pain on physical examination of the right ankle. The last follow-up was at the 6 months date, the patient was back to all of his pre-operative activities, and just finished a weeklong pheasant hunting trip.

**Discussion**

The foot and ankle are distinctly supplied by 3 major vessels, the posterior tibial artery, peroneal artery, and anterior tibial artery. The anterior tibial artery supplies the anterior ankle and then becomes the dorsalis pedis artery that supplies both the medial and lateral aspects of the dorsal foot through anterior medial and anterior lateral malleolar branches. The posterior tibial artery further branches into the posterior medial malleolar artery which connects with the anterior medial malleolar branch from the dorsalis pedis [2]. This gives an important linkage as they provide dual arterial support to a portion of the described anteromedial incisional approach in this case report. Although there are no large cohort studies detailing the complication rates specifically regarding incision dehiscence/non-healing in pantalar arthrodesis, it is however widely documented that skin infections, dehiscence, and delayed and non-healing of incisions can occur [5,6]. When performing this operation, foot and ankle surgeons should create thick skin flaps, in order to avoid skin complications [7].

**Conclusion**

The anteromedial incisional approach is beginning to gain popularity for TAR with good postoperative complication rates. To date, there is no detailed documentation of incision complications with an anteromedial incisional approach to pantalar arthrodesis. Given the high rate of standard pantalar arthrodesis procedures being performed, complication rates as high as 28 to 41 percent, efforts should be made to further investigate all facets of the procedure to achieve better post-surgical outcomes [4,5]. We offer this case report for further training and advancements in approaches to the ankle joint.

---

**Figure 3A-C** Preoperative AP and Lateral foot and ankle radiographs.

**Results**

The patient remained non-weight bearing postoperatively in a splint for 2 weeks, followed by a CAM walker with the assistance of a knee scooter for 4 weeks. At 6 weeks, he transitioned to partial-weight bearing up to 50% of his normal body weight in a CAM boot with the assistance of crutches. At 10 weeks, he was allowed full-weight bearing in a CAM boot. He was given a prescription for physical therapy to increase strength and for gait assistance. He was able to return to normal activity at 12 weeks with full-weight bearing in a supportive sneaker with an accommodative extra depth shoe and insole.
References


