Posterior Bone Block Distraction Arthrodesis of the Subtalar Joint: A Review of 22 Cases

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Twenty-two patients underwent a posterior bone block distraction arthrodesis of the subtalar joint between 1999 and 2006. The indication for surgery was loss of heel height, subtalar joint arthrosis, decreased talar declination with associated tibiotalar impingement, insufficient Achilles tendon function, malalignment of the rear foot, and pain with ambulation. There were 11 male and 11 female patients with a mean age of 46.7 years (range 20 to 71). The mean follow-up period was 27.3 months (range 12 to 63.9 months). Radiographic analysis revealed a mean increase in heel height of 6.09 mm (P = .0001), 5.83° (P = .12) of lateral talocalcaneal angle, 5.5° (P = .06) of talar declination, and 5.23° (P = .07) of calcaneal inclination. The talo-first metatarsal angle increased an average of 4.5° (P = .18). There was a 95.5% union rate. Postoperative complications included nonunion in 1 patient, subsidence of graft (collapse) in 1 patient, wound dehiscence in 3 patients, painful hardware in 7 patients, sural neuritis in 1 patient, superior cluneal nerve dysfunction in 1 patient and one mild varus malunion. Posterior bone block distraction arthrodesis can be successfully used to restore heel height, realign the foot, and decrease the morbidity associated with late complications of calcaneal fractures, as well as, nonunion and/or malunion following subtalar joint arthrodesis, Charcot neuroarthropathy, and avascular necrosis of the talus. Level of Clinical Evidence: 4. (The Journal of Foot & Ankle Surgery 47(3):191–198, 2008)

Key Words: calcaneal fracture, subtalar, arthrodesis, bone block distraction, posterior

Posterior subtalar bone-block distraction arthrodesis has been described to address late complications of neglected displaced intra-articular calcaneal fractures (1–9). The pathoanatomic features of these complications include subtalar incongruity and arthritis, loss of calcaneal height, lateral wall expansion, anterior tibiotalar impingement, varus or valgus malalignment of the hindfoot, and a weakened Achilles lever arm. Consequent symptoms range from subfibular abutment with peroneal tendon/sural nerve irritation to poor propulsion, anterior ankle pain, shoe gear difficulty, and suprastructural dysfunction. (1–9). An in situ arthrodesis does not address the associated pathology and outcomes will be compromised (10). Therefore, the goals of the procedure are restoration of heel height, decompression of the anterior ankle joint, elimination of subtalar arthrosis, and correction of hindfoot malalignment.

However, similar features can also be observed from other etiologies including nonunion or malunion following subtalar arthrodesis, Charcot neuroarthropathy of the hindfoot, and avascular necrosis of the talus with subsequent collapse. Patients with these problems can also benefit from posterior distraction subtalar arthrodesis (11, 12). In addition, this procedure has also been advocated for the acute management of severely comminuted calcaneal fractures (12).

In the presence of hindfoot malalignment and significant loss of heel height, an in situ arthrodesis does not address the associated pathology and outcomes will be compromised (10). Therefore, the goals of the procedure are restoration of heel height, decompression of the anterior ankle joint, elimination of subtalar arthrosis, and correction of hindfoot malalignment.

The technique for posterior distraction subtalar arthrodesis has been described by numerous authors (1–4, 6–7, 9, 11–13); however there is little consistency of surgical technique throughout these reports (7). In particular, there is controversy with regard to fixation of the fusion site (5). Chan and Alexander (5) modified their surgical technique after the first 3 patients, with 1 failure. First, in place of a single interposition bone graft, 2 grafts were used, and second, a single partially threaded screw was used instead of a fully threaded screw. They believed these modifications

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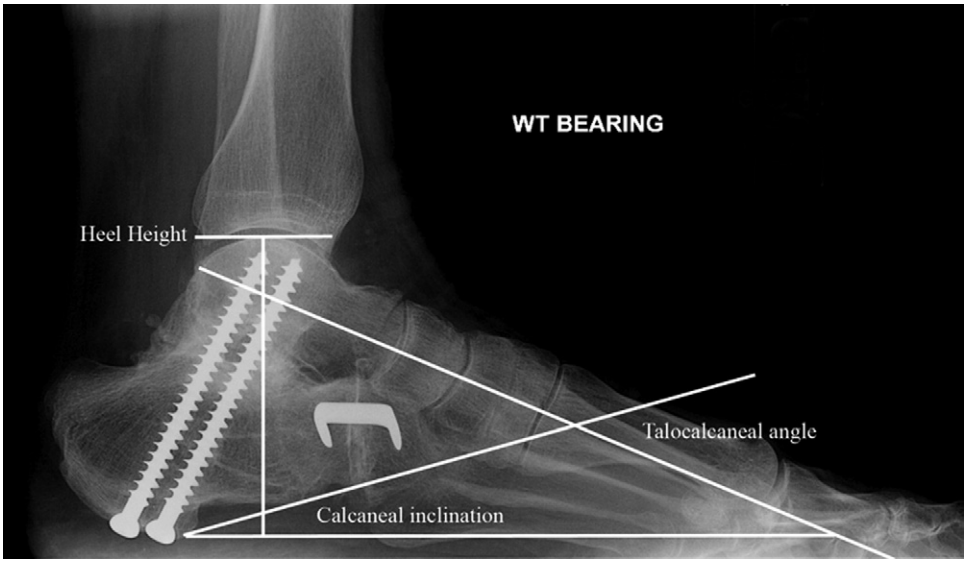

FIGURE 1 Radiographic measurements.

would allow for compression by the periarticular soft tissues and facilitate incorporation of the graft. Seven patients were completely satisfied and 2 were satisfied with reservation secondary to persistent pain with a mean follow-up of 6 years 2 months.

Carr et al (3) first reported on the results of 8 subtalar bone-block fusions using iliac crest autograft and fully threaded screw internal fixation to regain the talocalcaneal relationship and lost hindfoot height. Although their study cohort was small, the results were promising. Later, Myerson and Quill (8) reported on the results of 14 subtalar distraction bone-block arthrodesis for late complications of calcaneal fractures. The results were good in 7 patients, fair in 3, and poor in 4. The poor results in 2 patients were due to a varus malunion of 10 and 15 degrees respectively, and 2 patients had persistent pain from tibial nerve entrapment. Amendola and Lammens (1) reported on a series of 15 patients of which 11 were satisfied with the procedures. They noted 4 failures due to transverse tarsal joint arthritis, overcorrection, and reflex sympathetic dystrophy.

Clare and associates (7) reported on the intermediate to long-term results of a treatment protocol for calcaneal fracture malunions. They reported on 30 patients who underwent a lateral calcaneal wall exostectomy, peroneal tenolysis, and subtalar bone-block arthrodesis and an additional 10 patients who underwent the same operation with a calcaneal osteotomy. The average duration of follow-up was 5.3 years. Eleven (24%) patients had delayed wound healing of which 8 were smokers. There were 3 nonunions, all in smokers. One major difference in the surgical technique was the use of the previously excised lateral wall fragment as the source of autograft versus iliac crest or allograft.

The purpose of this study is to present the intermediate-term results of a relatively large series of patients following subtalar bone block arthrodesis by a single surgeon (J.M.S.). In addition, we sought to analyze and compare the preoperative and postoperative radiographic parameters. Last, this paper will serve as a technique guide and provide guidance for logical and consistent execution of the procedure based on specific patient presentation.

Methods

Medical charts, serial radiographs, and electronic databases were retrospectively reviewed for 22 patients who consecutively underwent posterior bone block subtalar joint arthrodesis from February 1999 through August 2006. All cases were performed by the senior author (J.M.S.) and all radiographic measurements were made by the second author (J.D.P.). The minimum follow-up period was 12 months.

Radiographic Evaluation

Standardized lateral weight-bearing projections were used to assess radiographic correction (14). Heel height was measured from the most superior aspect of the talar dome to a line parallel to the plane of support at the most inferior aspect of the calcaneus (Figure 1). The angle formed by plantar border of the calcaneus to the bottom border of the film determined calcaneal inclination. Talar declination was measured by the longitudinal bisection of the talus and the plane of support. Lateral talocalcaneal angle was formed by the longitudinal bisection of the talus and plantar border of the calcaneus. The lateral talo-first metatarsal angle was formed by the longitudinal bisection of the talus and the longitudinal bisection of the first metatarsal.

For the purpose of this study, union was defined as unequivocal radiographic trabeculation at both the talar-graft and calcaneal-graft interfaces. Nonunion was deter-