CHAPTER 2

SUBTALAR JOINT ARTHRODESIS: A Retrospective Study

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Traditionally, triple arthrodesis is the procedure of choice for the correction of a severely pronated foot secondary to a variety of etiologies (i.e. tarsal coalition, osseous trauma, and tibialis posterior tendon pathology). Triple arthrodesis affords multiplanar correction of deformity and will provide improved or optimal function if osseous union is achieved in an acceptable position. Postoperative function, or more specifically, unlimited, pain-free ambulation is the main goal when treating patients with this condition. Astute preoperative evaluation, proper procedure selection and execution, and attentive postoperative management are mandatory in order to insure long-term success.

The main objectives when treating a severely pronated foot are to decrease deformity, to increase stability, and to decrease pain. Elimination of pain is achieved predominately by the arthrodesis. Stability and deformity are addressed by the selected position of fusion. Optimal results can be consistently achieved by osseous union with the subtalar joint in a neutral position. Thus, if nonunion or malunion (successful fusion in an inappropriate position) occur, then recurrence of instability, deformity, and/or pain is probable.

Throughout the literature, triple arthrodesis is utilized to address the pain, instability, and deformity associated with a severely pronated rearfoot complex. However, triple arthrodesis is a technically demanding procedure, and in some instances, presents a formidable challenge to even the experienced surgeon. Triple arthrodesis is a very definitive procedure which can be quite unforgiving if performed incorrectly. Even if the procedure is executed to perfection, postoperative sequelae are common due to the extensive dissection, number of fusion sites, amount and placement of fixation materials, operative time, and postoperative convalescence. In the absence of significant midfoot arthritis or a rigid midfoot deformity, isolated subtalar joint arthrodesis can be an effective alternative procedure with less potential short- and long-term complications. The balance of this paper represents a preliminary report on the effectiveness of an isolated subtalar arthrodesis in the restoration of neutral position of the rearfoot complex.

MATERIALS AND METHODS

A retrospective study of 19 patients (21 feet) was compiled by the residency program at the Mt. Sinai Medical Center in Cleveland, Ohio. The patients included in the study were examined and diagnosed by the senior author. All charts and pre- and postoperative radiographs were utilized to generate results and formulate conclusions. All radiographic parameters were drawn and measured by the same investigators (CSS & JES). All patients in the study had to meet the criteria which included a painful pes valgo planus deformity secondary to posterior tibial dysfunction, tarsal coalition, or trauma. The methods and results of every case were reviewed by the senior author.

The patient population consisted of 11 females and 8 males. Two patients who had isolated subtalar joint fusions were excluded from the study because they did not meet the criteria (chondrobastoma of the talus; malunion of a calcaneal fracture). The age of the patients ranged from 16-77 years, with an average of 42.7 years. The follow-up ranged from 2 months to 46 months, and averaged 20 months.

The preoperative diagnoses assigned by the senior author included posterior tibial tendon dysfunction (14 patients), collapsing pes valgo planus

deformity (16 patients), tarsal coalition (4 patients), peroneal spastic flatfoot (2 patients), ankle equinus (4 patients), os tibiale exturnum (2 patients), degenerative joint disease (3 patients), ankle joint synovitis (1 patient), and painful digital contractures (1 patient).

All of the patients underwent a subtalar joint fusion with internal fixation via a 6.5-mm or 7.0-mm cancellous screw. The technique employed utilized the curettage method which has been previously described by the senior author. In addition to the primary fixation, 12 of the 19 procedures included a secondary point of fixation. This included a STA-PIN (5), 4.0-mm cancellous screw (1), both (2), a 4.0-mm cancellous screw with a bone graft (2), or two 4.0-mm cancellous screws with a bone graft (2). In addition, 14 of the 19 cases included ancillary procedures including a tibialis posterior tendon repair (4), coalition resection (1), peroneus brevis tendon lengthening (1), gastrocnemius recession (3), tendo-achilles lengthening (1), modified-Kidner procedure (5), ankle arthroplasty (2), ankle joint synovectomy (1), and digital corrections (1).

Preoperative and postoperative weight-bearing radiographs were reviewed. These included anteroposterior (AP) and lateral radiographs. The radiographic parameter used on the AP film included the talocalcaneal (T-C) congruity. The lateral radiographic parameters studied were the talar-declination (T-D) angle, talar-1st metatarsal (T-1st met) angle, talocalcaneal (T-C) angle, calcaneal inclination angle (CIA), and navicular height. Direct measurements were recorded from both the pre- and postoperative films, and the difference between the two were calculated and recorded.

RESULTS

The results from the AP films were as follows. The T-C angle on the preoperative film ranged from 16-37° with an average of 23.6°, the postoperative range was 7-18° with an average of 12.3°, and the range in change was 2-21° with an overall average of 11.3°. The C-C angle on preoperative films ranged from 8-41° with an average of 23.1°, the postoperative range was 2-32° with an average 15-50% with an average change of 31.8%.

The results from the lateral films were as follows. The T-D angle on the preoperative film ranged from 20-47° with an average of 35.2°, the postoperative range was 3-27° with an average of 16.8°, and the change ranged from 6-30° with an overall average of 18.3°. The T-1st-met angle preoperatively ranged from 2-40° with an average of 24.7°, the postoperative range was negative 8-15° with an average of 2.7°, and the range in change was negative 7-33° with an average of 20.7°. The T-C angle preoperatively ranged from 38-66° with an average of 50.7°, the postoperative range was 21-45° with an average of 34.3°, and the change ranged from negative 3-29° with an average of 15.4°. The CIA on preoperative film ranged from 0-27° and averaged 15.3°, the postoperative range was 8-32° with an average of 18.4°, and the change ranged from 3-8° with an average of 3.4°. The preoperative navicular height ranged from 13-39 mm with an average of 19.6 mm, the postoperative height ranged from 19-45 mm and averaged 31 mm, and the change ranged from 0-20 mm with an average increase in navicular height of 12 mm.

DISCUSSION

The time-honored procedure for the correction of severe pes valgo planus deformity in the adult population is a triple arthrodesis. This is particularly true in conditions of flatfoot deformity with significant symptoms unresponsive and recalcitrant to conservative modalities. The effectiveness of this procedure to alleviate symptomatology and to provide structural correction is well-known to the orthopedic and podiatric community.

However, in many situations, the joints may be spared of significant arthritic changes. In those cases, it may be considered unfortunate to perform a procedure which destroys three major intertarsal joints of the rearfoot complex. It has always been easier to accept the fate of a triple arthrodesis when degenerative arthritis accompanies significant malalignment as evidenced by subluxation or luxation of the subtalar and midtarsal joints.

Although some literature strongly suggests that isolated subtalar joint arthrodesis is likely to result in degenerative changes of the midtarsal joint necessitating subsequent fusion, the authors have found this not to be true, and in fact, strongly believe that the benefits of an isolated subtalar joint arthrodesis over a triple arthrodesis are worthwhile.

Consequently, a subtalar joint arthrodesis should be employed in lieu of a triple arthrodesis. Our limited retrospective evaluation suggests that restoration of the subtalar joint into its neutral position is capable of correcting multiple planes of deformity. Significant changes in the talar declination angle, talocalcaneal angle, talo-1st metatarsal angle, and talonavicular congruity can be expected. The closer the position of fusion to neutral, the less likely the development of degenerative arthritic changes in the joint more distal or proximal to the fusion site. Likewise, failure to achieve neutral position at the time of the fusion is likely to be associated with greater symptomatology, and one can also expect to see the progression of degenerative changes on conventional radiographs.

The technique of arthrodesis should emphasize positioning of the talocalcaneal joint. The authors have in all cases utilized the curettage technique for resection of the joint surfaces, thereby preserving maximum height to the subtalar joint complex, and with minimal distortion of the normal architecture of the facets. This technique removes the cartilage at the subchondral bone plate, and accurately aligns the joint in its neutral position prior to the insertion of the fixation devices. The primary mode of fixation is one large cancellous screw. It was not uncommon to place a second point of fixation to resist rotary movement which would result in subtle or gross changes in position, if there should be inadvertent weight bearing in the first several weeks postoperatively. This may include the use of a large cancellous screw, Steinmann pin, or allogenic corticocancellous bone graft in the sinus tarsi, all of which serve the same purpose. Ancillary procedures may be necessary, and include a tendo-achilles lengthening, repair of the tibialis posterior tendon, and medial column stabilizations.

The authors wish to emphasize that the triple arthrodesis continues to play an important role in the correction of patients with severe collapsing pes valgo planus deformity. It is considered the procedure of choice in cases where there is severe rigidity to the deformity, significant alteration to the normal architecture of the bones, or arthritic changes involving the midtarsal and subtalar joint complexes. The preoperative neutral position antero–posterior and lateral radiographs are very helpful in assessing these factors, and thus in the determination of whether a subtalar joint fusion will suffice in lieu of a triple arthrodesis.

SUMMARY

This initial retrospective evaluation provides encouraging support and evidence that an isolated subtalar joint arthrodesis can be an extremely effective procedure for the restoration of a neutral rearfoot complex in patients with severe collapsing pes valgo planus. While success of the procedure is dependent on many variables, the most important one appears to be restoration of the joint to its neutral attitude. Postoperative complications do not appear to be any different or more common than those encountered with any major rearfoot arthrodesis procedure. The authors feel that subtalar joint arthrodesis should be considered in lieu of triple arthrodesis in patients with severe but flexible collapsing pes valgo planus in the absence of degenerative arthritic changes.