

# TREATMENT OF THE ADULT FLEXIBLE FLATFOOT: Long-Term Follow-Up of the MBA Arthroereisis Implant

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## DEFINITION/DESCRIPTION

Flatfoot, as seen in the adult, is a complex disorder with many different terms applied to it throughout the literature, whether it is flexible or rigid. Although there is little agreement on a precise complex definition, adult flatfoot can be defined simply as a condition of the foot that persists or occurs after cessation of osseous growth, identified by partial or complete loss (collapse) of the longitudinal arch.

There have been many terms used in the literature to describe the flexible flatfoot. Flexible flatfoot has been defined as a pedal deformity that, through pronatory compensation, exhibits one or more of the following characteristics, best seen in the relaxed calcaneal stance position: eversion of the heel, abduction of the forefoot on the rearfoot, collapse of the medial column, medial talar bulge or ptosis, and flexibility of the foot with reducibility of the deformity.<sup>1</sup>

Due to its flexibility and loss of architecture on weightbearing, a more descriptive and universally acceptable term for the adult flexible flatfoot is "collapsing pes valgo planus" (CPVP). In its late stages of progression it may lose various amounts of flexibility to arthrosis, degenerative arthritis or full ankylosis. These adaptive changes are what differentiate the adult flexible flatfoot from that of the child and thereby delineate treatment specific to the adult.

Pathology and symptoms develop due to tension and stretching forces along the medial foot and plantar arch, as well as collapse through the midfoot and impingement along the lateral column and rearfoot. "Peritalar subluxation" defines the pathologic malalignment of the talus about the subtalar and midtarsal joints.<sup>2,3</sup>

Although there is controversy in the literature in concluding that a flatfoot is benign or physiologic versus pathologic, the important differentiation relative to clinical significance is whether or not the flatfoot is associated with symptoms, since adult flatfoot that is not creating symptoms generally requires no treatment - unless predictive factors indicate that symptoms or disability are likely to develop later in life, eg. family history, occupational risk, anatomical deformity, evidence of joint degeneration, etc.

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Information from the initial evaluation and diagnostic tests is correlated into a diagnosis. If the flatfoot is asymptomatic then no treatment is necessary. Patient education and observation criteria are communicated. The patient can be advised of the prognosis if left untreated.

### Conservative Treatment

Conservative therapy is directed at supporting the deformities and preventing uncontrolled pronatory compensation. No correction of the deformities should be anticipated with this line of treatment. Ankle equinus should also be treated initially as well because of its powerful influence on perpetuating and worsening the flexible flatfoot. Achilles stretching exercises and heel lifts are available approaches.

Initial treatment options for adult flexible flatfoot include one or more of the following: activity modifications, shoe gear modifications, immobilization, weight-loss, anti-inflammatory medications, orthotics (prefabricated or custom), physical therapy, ice and heat, or bracing. If the response to non-surgical treatment is good, then those methods should be continued. If such options fail to gain adequate relief and return to acceptable function, surgical intervention may be considered as an additional treatment alternative.

There is some controversy as to the exact indications for surgical intervention in the adult flatfoot. It has been proposed that surgical treatment should meet at least one of the four following criteria.<sup>4</sup>

1. The foot or leg continues to experience pain or uncontrolled fatigue or aching in spite of attempts at mechanical control.
2. Progression. The deformity of the foot is such that the very act of normal walking and standing must be expected to increase the deformity of the foot in spite of attempts at mechanical control.
3. Instability. The deformity of the foot creates such instability as to ensure abnormal stress

transfer to the joints proximal and distal to the rearfoot, with resulting deformities or deterioration of these joints.

4. Deformity. The deformity is sufficiently severe as to make it impossible or impractical to attempt conservative control.

## SURGICAL OPTIONS

As already discussed, the adult flexible flatfoot has had time to undergo various adaptive changes, so correction usually requires the implementation of several procedures to achieve adequate reconstruction unique to each foot.

### Soft Tissue Procedures

For the correction of symptomatic flexible flatfeet with only moderate deformity, soft tissue procedures can be considered. These include, but are not limited to the Kidner posterior tibial tendon advancement, the flexor digitorum longus tendon transfer, the Young tendosuspension, or the medial arch reconstruction combination.

### Osseous Procedures

Various osteotomy procedures for the correction of the adult flatfoot have been implemented and studied. The main advantage of these procedures is that they preserve the joints of the foot. They include: the Evans procedure to lengthen the lateral column and realign the midtarsal joint primarily and the subtalar joint secondarily; the Dwyer medial closing wedge or the Koutsogiannis medial displacement osteotomy of the calcaneus; and, the Cotton osteotomy through the medial cuneiform to plantarflex the medial column.

Arthrodesis procedures to correct adult flexible flatfoot can be used alone or in combination with other joint arthrodeses and/or other reconstructive techniques. Single or multiple joints can be fused along the medial column to stabilize and plantarflex it. The calcaneocuboid joint can be fused by inserting a bone graft to lengthen the lateral column, while the subtalar joint can be fused as an isolated corrective procedure. When the whole rearfoot needs to be stabilized, the triple arthrodesis can be implemented.

### Extraarticular Arthroereisis

Several implant devices have been designed to limit pronatory motion by blocking movement between the talus and calcaneus.<sup>5-7</sup> They include the custom carved silicone polymer block,<sup>8-10</sup> the silicone sphere<sup>11,12</sup> the Viladot "umbrella",<sup>5</sup> the Pisani screw,<sup>5</sup> the Valenti screw,<sup>13-15</sup> the

STA-PEG implant,<sup>7,16-20</sup> the Sgarlato "mushroom",<sup>5</sup> the subtalar MBA titanium screw,<sup>5,21-25</sup> and the Kalix endorthe-sis (France).

The mechanics of this procedure have been well-described.<sup>7,26-28</sup> Silicone polymer as a material is discouraged due to the high incidence of reactive dentritic synovitis. However, the STA-PEG arthroereisis procedure has been well-studied and there have been remarkably few complications among largely successful long-term results.<sup>7,17,29-33</sup>

In the adult, the arthroereisis procedure is seldom implemented as an isolated procedure. Due to the long-term compensation and adaptation of the foot and adjunctive structures for flatfoot function, other ancillary procedures are usually necessary for appropriate stabilization.<sup>25</sup> The purpose of this study is to look at the results of treatment of the adult flexible flatfoot in a significant cohort of patients over an extended time period in order to assess the tolerance to the MBA implant as well as the success of treatment. The use and success of adjunctive procedures was also analyzed.

## RESULTS AND EXPERIENCE

This study is an extension of an earlier review of 13 MBA implantations and ancillary procedures.<sup>25</sup> Although the initial goal was to conduct the study prospectively, the final data was collected and analyzed retrospectively by chart review. These were patients treated from 1996 to 2002. There were 34 implants placed in 26 patients ranging in age from 17-78 years, the average being 52. Three patients were male and 23 were female and overall 16 devices were implanted in left feet and 18 in right feet. The indications for surgery were the same as those outlined in the previous paper.<sup>25</sup>

The average time that all the implants were in were in place was 46.3 months (range 1-72 months). Sixteen implants (47%) were removed an average of 20.8 months (range 6-40 months) from the time of implantation, usually due to persistent sinus tarsi pain that was recalcitrant to conservative treatment, although 3 were removed because of the patient feeling inversion instability. In the 3 patients with rheumatoid arthritis only one required the implant to be removed (33.3%).

The remaining 18 implants (53%) have been in place for an average of 48 months, 49 months for those left in males and 41.7 months for those left in females. Three patients are still reporting pain at the sinus tarsi. There was only one wound complication at the implant site. That consisted of a transient cellulitis which was treated promptly with antibiotics to protect the patient.

Adjunctive procedures that were performed included Achilles tendon lengthenings on 28 feet, one of which was unplanned and conducted on the table due to residual equinus which developed subsequent to the flat-foot correction procedures. Nine feet had tendon reinforcement procedures involving the tibialis posterior and/or tibialis anterior tendons along the medial arch while a flexor digitorum longus tendon was transferred into the tibialis posterior tendon on one foot. For osseous correction there were 9 fusions of the talonavicular joint, one of the medial naviculocuneiform joint, and 7 of the first metatarsocuneiform joint, 3 of which were Lapidus hallux valgus repairs. Four feet had DMO bunionectomies and there was two Cotton osteotomies of the medial cuneiform to plantarflex the medial column. In only 3 feet (2 patients) was the arthroereisis implanted as an isolated procedure, and from all three the devices had to be removed.

Of the 16 implants removed from 14 patients, five continued to have pain in the sinus tarsi after explantation, one in both feet. In one patient persistent painful symptoms warranted subtalar joint fusion in both feet. The successful anatomical reconstruction of the feet remained in all cases after implant removal.

Although all patients were informed preoperatively that the implants might have to be removed some time after surgery, it is disconcerting that almost half required a second surgery. And of those, almost half again continue to experience persistent symptoms at the sinus tarsi. On the other hand, it is very important to note that the anatomical reconstruction remained stable and intact in virtually all cases, even after the implant had been removed.

There did not appear to be a specific reason or adjunctive procedure to correlate with implant removal. Some factors that may have contributed to the failures included placing the implant too deeply or too far anterior in the sinus tarsi, locking the subtalar joint in the vertical or slightly inverted neutral stance position, using too large an implant, or implantation in the foot that has too much closed chain abductory compensation.

There has been only one other paper published to date that evaluates a number of adult flatfoot patients who have undergone the MBA implant procedure but those dealt specifically with posterior tibial dysfunction in 23 patients.<sup>23</sup> They were evaluated an average of 19 months and 3 weeks (range 2-54 months) from the date of implantation. In this group only two implants were removed and they were replaced with larger implants. At the time of the study, none had to be removed permanently. Several of the adjunctive procedures were

talonavicular joint fusions, primarily to control transverse plane instability. This study did not help determine whether the talonavicular joint arthrodesis was more or less successful when done in conjunction with the MBA implant arthroereisis.

The data from these two studies is somewhat conflicting, particularly with regard to implant removal. Its value as a temporary adjunctive procedure or even as a temporary stabilizer has not been established. Larger studies, more data, comparative analyses and prospective designs will help surgeons better understand the place of the MBA implant arthroereisis procedure in reconstruction of the adult flexible flatfoot.

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