

## Medical Policy



### Title: Subtalar Arthroereisis

#### **Professional**

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Populations	Interventions	Comparators	Outcomes
Individuals: • With flatfoot	Interventions of interest are: • Subtalar arthroereisis	Comparators of interest are: • Alternative surgical procedures	Relevant outcomes include: • Symptoms • Functional outcomes • Quality of life
Individuals: • With talotarsal joint dislocation	Interventions of interest are: • Subtalar arthroereisis	Comparators of interest are: • Alternative surgical procedures	Relevant outcomes include: • Symptoms • Functional outcomes • Quality of life

### **DESCRIPTION**

Arthroereisis is a surgical procedure that purposely limits movement across a joint. Subtalar arthroereisis (STA) or extraosseous talotarsal stabilization is designed to correct excessive talar displacement and calcaneal eversion by reducing pronation across the subtalar joint. Extraosseous talotarsal stabilization is also being evaluated as a treatment

of talotarsal joint dislocation. It is performed by placing an implant in the sinus tarsi, which is a canal located between the talus and the calcaneus.

### **Objective**

The objective of this evidence review is to determine whether subtalar arthroereisis improves the net health outcome in individuals who have flatfoot or talotarsal joint dislocation.

### **Background**

#### **Flatfoot**

Flexible flatfoot is a common disorder, anatomically described as excessive pronation during weight bearing due to anterior and medial displacement of the talus. It may be congenital or it may be acquired in adulthood due to posterior tibial tendon dysfunction, which in turn may be caused by trauma, overuse, inflammatory disorders, and other factors. Symptoms include dull, aching and throbbing, cramping pain, which in children may be described as growing pains. Additional symptoms include refusal to participate in athletics or walking long distances.

#### **Treatment**

Conservative treatments include orthotics or shoe modifications. Surgical approaches for painful flatfoot deformities include tendon transfers, osteotomy, and arthrodesis. Arthroereisis with a variety of implant designs has also been investigated.

Subtalar arthroereisis has been performed for more than 50 years, with a variety of implants designs and compositions. The Maxwell-Brancheau Arthroereisis (MBA) implant is the most frequently reported, although other devices such as the HyProCure, subtalar arthroereisis peg and Kalix are also described in the medical literature. The MBA implant is described as reversible and easy to insert, with the additional advantage that it does not require bone cement. In children, insertion of the MBA implant may be offered as a stand-alone procedure, although children and adults often require adjunctive surgical procedures on bone and soft tissue to correct additional deformities.

#### ***Flatfoot***

Arthroereisis is the limitation of movement across a joint. Subtalar arthroereisis (also called extraosseous talotarsal stabilization) is designed to correct excessive talar displacement and calcaneal eversion by reducing pronation across the subtalar joint.

#### ***Talotarsal Joint Dislocation***

Extraosseous talotarsal stabilization is also being evaluated as a treatment of talotarsal joint dislocation. The stabilization procedure is performed by placing an implant in the sinus tarsi, which is a canal located between the talus and the calcaneus.

## Regulatory Status

A number of implants have been cleared for marketing by the U.S. Food and Drug Administration's (FDA) through the 510(k) process and are summarized in Table 1. In general, these devices are indicated for insertion into the sinus tarsi of the foot, allowing normal subtalar joint motion while blocking excessive pronation.

**Table 1. Representative Subtalar Implant Devices Cleared by FDA<sup>a</sup>**

Device	Manufacturer	Date Cleared	510(k) No.
Subtalar MBA®	Integra LifeSciences	07/96	K960692
OsteoMed Subtalar Implant System	OsteoMed	08/03	K031155
BioPro Subtalar Implant	BioPro	09/04	K041936
HyProCure Subtalar Implant System	Graham Medical Technologies	09/04	K042030
MBA <sub>resorb</sub> Implant	Kinetikos Medical	09/05	K051611
Metasurg Subtalar Implant	Metasurg	05/07	K070441
Subtalar Implant	Biomet Sports Medicine	07/07	K071498
Arthrex ProStop Plus Arthroereisis Subtalar Implant	Arthrex	01/08	K071456
Trilliant Surgical Subtalar Implant	Trilliant Surgical	02/11	K103183
Metasurg Subtalar Implant	Metasurg	08/11	K111265
NuGait™ Subtalar Implant System	Ascension Orthopedic	08/11	K111799
Disco Subtalar Implant	Trilliant Surgical	12/11	K111834
OsteoSpring FootJack Subtalar Implant System	OsteoSpring Medical	12/11	K112658
IFS Subtalar Implant	Internal Fixation Systems	12/11	K113399
The Life Spine Subtalar Implant System	Life Spine	0616	K160169

FDA: Food and Drug Administration.

<sup>a</sup> FDA 510(k) database search product code HWC (03/08/18).

## POLICY

Subtalar arthroereisis is considered **experimental / investigational**.

## RATIONALE

The evidence review was updated with searches of the MEDLINE database. The most recent literature update was performed through February 5, 2018.

Evidence reviews assess the clinical evidence to determine whether the use of a technology improves the net health outcome. Broadly defined, health outcomes are length of life, quality of life, and ability to function—including benefits and harms. Every clinical condition has specific outcomes that are important to patients and to managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of a technology, 2 domains are examined: the relevance and the quality and credibility. To be

relevant, studies must represent one or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. Randomized controlled trials are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

Literature searches on subtalar arthroereisis (STA) have identified few published studies, primarily consisting of single-institution case series and individual case reports, reporting on success rates following this procedure. There is a small controlled trial that has compared STA with alternative treatments.

### **Flatfoot**

Chong et al (2015) reported on a small prospective nonrandomized trial that compared STA with lateral column calcaneal lengthening for the treatment of 24 painful flatfeet in children.<sup>1</sup> Seven children (13 feet) enrolled at a children's medical center were treated with arthroereisis and 8 children (11 feet) enrolled at another children's hospital were treated with lateral column lengthening. Children who underwent STA received a subdermal implant and were placed in below-knee walking casts for 3 weeks. Children treated with lateral column lengthening had an opening wedge osteotomy with the insertion of a wedge of cadaveric bone and were placed in non-weight-bearing casts for 1 month and "walker boots" for another month. Outcomes at a mean of 12.7 months after surgery included radiographs, foot pressure, kinematic analysis and the Oxford Ankle-Foot Questionnaire for Children. The two groups showed similar improvements in the lateral talo-first metatarsal angle and talonavicular coverage and kinematics. Both groups showed statistically significant lateralization of the hindfoot and midfoot center of pressure ( $p < 0.01$ ). There were no between-group differences for any clinical or functional outcomes. On within-group comparison, only the STA group had a statistically significant reduction in time on the hindfoot ( $p = 0.01$ ). Both groups had improvements in the parental and child scores on the Oxford questionnaire, but only the STA group had a statistically significant improvement in this small sample. There were 2 complications in each group, with the removal of the hardware in 1 patient and removal of the implant in 2 patients. The improvement in pain and foot position was retained following implant removal.

Metcalfe et al (2011) published a systematic review of the literature on STA for pediatric flexible flatfoot.<sup>2</sup> Seventy-six case series (none controlled) or case reports were identified. Ten of the studies (756 feet) provided a clinician-based assessment of the surgical result graded from "excellent to poor" with follow-up between 36 and 240 months. Six studies (212 feet) included estimates of overall patient satisfaction using nonvalidated outcome measures, while 1 study (16 feet) found significant improvement using a validated foot-specific patient outcome measure. Data from 15 studies that reported radiographic values were combined for analysis. Although 8 of 9 radiographic parameters showed statistically significant improvements following arthroereisis procedures, the relation between radiographic and clinical outcomes is uncertain. The procedure was associated with a number of complications including sinus tarsi pain, device extrusion, and undercorrection. Complication rates ranged from 4.8% to 18.6%, with unplanned removal rates

between 7.1% and 19.3% across all device types. The influence of adjunctive procedures on outcomes was not addressed in this review.

Graham et al (2012) published a case series that was not confounded by adjunctive procedures and had a relatively long follow-up.<sup>3</sup> This study reported mean 51-month follow-up of talotarsal stabilization in 117 feet using the HyProCure device. Patients who received adjunctive procedures affecting the talotarsal joint were excluded from analysis. Adults who met the inclusion and exclusion criteria were invited to participate in the study. Eighty-three patients gave consent to participate, and 78 completed the Maryland Foot Score Questionnaire; 5 patients did not complete questionnaire because they had 7 (6%) implants removed. There were 16 revision surgeries with HyProCure; nine of the surgeries called for the repositioning of a partially displaced device, or a change in the size of the device altogether. Of the patients who retained the device, 52% reported complete alleviation of foot pain, 69% had no limitations in their foot functional abilities, and 80% reported complete satisfaction with the appearance of their feet. This case series is notable for its assessment of functional outcomes at medium-term follow-up in patients who did not have adjunct procedures.

Other case series have generally not excluded the use of other adjunctive treatments. For example, Vedantam et al (1998) reported on a series of 78 children (140 feet) with neuromuscular disease who underwent STA with an STA-peg.<sup>4</sup> The stem of this implant is placed into the calcaneus with the collar abutting the inferior surface of the lateral aspect of the talus, thus limiting motion. All but five of the children had additional procedures to balance the foot. Satisfactory results were reported in 96.4% of patients, although the contribution of the STA-peg cannot be isolated. Nelson et al (2004) reported on 37 patients (67 feet) who received a Maxwell-Brancheau Arthroereisis (MBA) implant and had an average of 18.4 months of follow-up.<sup>5</sup> While this study reported various improvements in anatomic measurements, there were no data on improvement in symptoms. In another series, Needleman (2006) reported significant improvements in pain and function in 78% of patients (23 patients, 28 feet) with use of a subtalar implant as a component of reconstructive foot and ankle surgery.<sup>6</sup> However, because results were not compared with controls receiving reconstructive surgery without STA, the contribution of the implants to these outcomes is unclear. Also, Needleman (2006) reported an overall complication rate of 46%, with surgical removal of 39% of the implants due to sinus tarsi pain; and that postoperative sinus tarsi pain was unpredictable.

Cicchinelli et al (2008) reported on radiographic outcomes in a retrospective analysis of 28 feet in 20 pediatric patients treated with STA combined with gastrocnemius recession or with STA combined with gastrocnemius recession and medial column reconstruction.<sup>7</sup> Lucaccini et al (2008) analyzed clinical and radiographic results of 14 patients (16 feet) with hallux valgus in abnormal pronation syndrome treated with distal osteotomy of the first metatarsal bone and STA performed in 1 stage.<sup>8</sup> Scharer et al (2010) conducted a retrospective radiographic evaluation of 39 patients (68 feet) who had received the MBA implant to treat painful pediatric flatfoot deformities.<sup>9</sup> Patients' average age at the time of surgery was 12 years (range, 6-16 years). Additional procedures included 12 (18%) gastrocnemius recessions, 6 (9%) Achilles tendon lengthening and 4 (6%) Kidner procedures. At an average 24-month follow-up (range, 6-61 months), there had been 10 (15%) complications requiring reoperation, including implant migration, undercorrection, overcorrection, and persistent pain. The implants were exchanged for a larger or a smaller implant. None of these case series permitted comparison with nonsurgical interventions or with other surgical interventions.

An example of a case series with longer follow-up is the retrospective study by Brancheau et al (2012), which reported on a mean 36-month follow-up (range, 18-48 months) in 35 patients (60 feet) after use of the MBA implant with adjunct procedures.<sup>10</sup> Patients' mean age was 14.3 years (range, 5-46 years). Significant changes were observed in radiographic measures (talocalcaneal angle, calcaneocuboid angle, first to second intermetatarsal angle, calcaneal inclination angle, talar declination angle). Seventeen percent of patients reported that 9 (15%) implants were removed after the initial surgery. Of the 24 (68.6%) patients who answered a subjective questionnaire (in person or by telephone at a mean of 33 months postoperatively), 95.8% reported resolution of the chief presenting complaint, and 79.2% said they were 100% satisfied with their surgical outcome. The contribution of the MBA implant to these results cannot be determined by this study design.

### **Section Summary: Flatfoot**

The evidence evaluating the use of STA for treatment of flatfoot consists mainly of single-arm case series and a small nonrandomized controlled trial comparing STA with lateral column calcaneal lengthening. The small nonrandomized comparative trial (N=24 feet) is considered preliminary, and interpretation of the case series evidence is limited by the use of adjunctive procedures in addition to STA, creating difficulties in determining the extent to which each modality contributed to the outcomes. Another limitation of the published data is the lack of long-term outcomes, which is of particular importance because the procedure is often performed in growing children. Also, some studies have reported high rates of complications and implant removal.

### **Talotarsal Joint Dislocation**

Bresnahan et al (2013) reported on a prospective study of talotarsal stabilization using HyProCure in 46 feet of 35 patients diagnosed with recurrent and/or partial talotarsal joint dislocation.<sup>11</sup> No procedures besides insertion of the HyProCure device were performed to address the talotarsal joint dislocation. At 1 year postoperatively, scores on the Maryland Foot Score (/100) for 30 patients had improved from 69.53 preoperatively to 89.27 postoperatively. Foot pain decreased by 37.0%, foot functional activities improved by 14.4%, and foot appearance improved by 29.5%. Implants were removed from 2 feet with no unresolved complications.

### **Section Summary: Talotarsal Joint Dislocation**

The current evidence on the use of STA for treatment of talotarsal joint dislocation is insufficient to draw conclusions about treatment efficacy with certitude.

### **Adverse Events**

Complications are frequently reported in the literature. Scher et al (2007) reported on 2 cases of extensive implant reaction in 2 children 2 years after a STA-peg procedure.<sup>12</sup> Due to the commonly seen complication of severe postoperative pain with failure to reconstitute the longitudinal arch on weight-bearing and a residual flatfoot deformity, the authors do not recommend STA in the treatment of painful flatfoot in children. In a radiographic study, Saxena and Nguyen (2007) evaluated a bioabsorbable STA and found poor outcomes in 3 of 6 patients who met the inclusion criteria and consented to additional imaging.<sup>13</sup> Two patients requested implant removal; a third patient had persistent pain but refused explantation. Radiographic measurement (magnetic resonance imaging or computed tomography) found that these 3

patients had smaller tarsal canal widths than the diameter of the inserted interference screw. The authors noted that the implant length also had to be reduced before implantation.

Cook et al (2011) conducted a retrospective case-control study to identify factors that might contribute to failure (explantation) of titanium arthroereisis implants.<sup>14</sup> All patients who required removal of a self-locking wedge-type STA (n=22) were compared in a 1:2 ratio (n=44) with patients with nonexplanted arthroereisis who were treated during the same period. Subjects were matched for preoperative radiographic measurements, age, sex, presenting diagnosis, and length of follow-up. Multivariate logistic regression showed no significant effect of age, sex, implant size, shape, length of follow-up, implant position, surgeon experience, or concomitant procedures. Patients who required explantation had slightly greater odds of radiographic undercorrection (odds ratio, 1.175) or residual transverse plane-dominant deformities (odds ratio, 1.096). The percentage of explantations in this retrospective analysis was not described.

### **Summary of Evidence**

For individuals who have flatfoot or talotarsal joint dislocation who receive STA, the evidence includes mainly single-arm case series and a small nonrandomized controlled trial comparing STA with lateral column calcaneal lengthening. Relevant outcomes are symptoms, functional outcomes, and quality of life. The small nonrandomized comparative trial (N=24 feet) is considered preliminary, and interpretation of the case series evidence is limited by the use of adjunctive procedures in addition to STA, creating difficulties in determining the extent to which each modality contributed to the outcomes. Another limitation of the published data is the lack of long-term outcomes, which is of particular importance because the procedure is often performed in growing children. Also, some studies have reported high rates of complications and implant removal. The evidence is insufficient to determine the effects of the technology on health outcomes.

### **Clinical Input From Physician Specialty Societies and Academic Medical Centers**

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

#### **2012 Input**

In response to requests, input was received through 2 physician specialty societies and 2 academic medical centers while this policy was under review in 2012. Input was mixed, with most reviewers considering this procedure to be investigational.

#### **2009 Input**

In response to requests, input was received through 1 physician specialty society (3 reviews) and 5 academic medical centers while this policy was under review in 2009. Input was mixed regarding the medical necessity of arthroereisis.

### **Practice Guidelines and Position Statements**

#### **National Institute for Health and Care Excellence**

Guidance from the National Institute for Health and Care Excellence (2009) concluded that current evidence on the safety and efficacy of sinus tarsi implant insertion for mobile flatfoot was inadequate in quality and quantity.<sup>15</sup>

### **American College of Foot and Ankle Surgeons**

The American College of Foot and Ankle Surgeons (ACFAS) published practice guidelines for the diagnosis and treatment of pediatric and adult flatfoot in 2004 and 2005 (neither is included in the ACFAS library of current clinical practice guidelines).<sup>16,17</sup>

ACFAS guidelines on adult flatfoot have stated:

“In the adult, arthroereisis is seldom implemented as an isolated procedure. Because of the long-term compensation and adaptation of the foot and adjunctive structures for flatfoot function, other ancillary procedures are usually used for appropriate stabilization. Long-term results of arthroereisis in the adult flexible flatfoot patient have not been established. Some surgeons advise against the subtalar arthroereisis procedure because of the risks associated with implantation of a foreign material, the potential need for further surgery to remove the implant, and the limited capacity of the implant to stabilize the medial column sag directly.”

ACFAS guidelines on pediatric flatfoot have stated: “proponents of this procedure (arthroereisis) argue that it is a minimally invasive technique that does not distort the normal anatomy of the foot. Others have expressed concern about placing a permanent foreign body into a mobile segment of a child’s foot. The indication for this procedure remains controversial in the surgical community.”

### **U.S. Preventive Services Task Force Recommendations**

Not applicable.

### **Ongoing and Unpublished Clinical Trials**

A search of ClinicalTrials.gov in March 2018 did not identify any ongoing or unpublished trials that would likely influence this review.

### **CODING**

**The following codes for treatment and procedures applicable to this policy are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.**

#### CPT/HCPCS

0335T	Insertion of sinus tarsi implant
0510T	Removal of sinus tarsi implant
0511T	Removal and reinsertion of sinus tarsi implant
S2117	Arthroereisis, subtalar

- There is a specific HCPCS S code for this procedure: S2117.
- There is a category III code for insertion of the HyProCure® device: 0335T.

#### DIAGNOSES

Experimental / investigational for all diagnoses related to this policy.

**REVISIONS**

01-27-2009	Updated Description section and Coding section.
	Added Rationale section.
	First published on www.bcbsks.com.
02-10-2010	Updated Rationale section with 2009 Update.
10-26-2010	Description Section updated.
	Rationale Section updated.
	References Section updated.
12-27-2012	Description Section updated.
	Rationale Section updated.
	In Coding section <ul style="list-style-type: none"> <li>▪ Added the Diagnoses sub-section and phrase "Experimental / investigational for all diagnoses related to this policy." which is reflected in BCBSKS experimental / investigational policies, but was inadvertently not included on this policy.</li> </ul>
	References Section updated.
12-14-2015	Description section updated
	Rationale section updated
	In Coding section: <ul style="list-style-type: none"> <li>▪ Added CPT Code – 0335T</li> </ul>
	References updated
05-23-2018	Description section updated
	Rationale section updated
	In Coding section: <ul style="list-style-type: none"> <li>▪ Coding notations updated</li> </ul>
	References updated
01-01-2019	In Coding section: <ul style="list-style-type: none"> <li>▪ Added CPT Codes: 0510T, 0511T</li> <li>▪ Revised CPT Code: 0335T</li> </ul>

**REFERENCES**

1. Chong DY, Macwilliams BA, Hennessey TA, et al. Prospective comparison of subtalar arthroereisis with lateral column lengthening for painful flatfeet. *J Pediatr Orthop B*. Jul 2015;24(4):345-353. PMID 25856275
2. Metcalfe SA, Bowling FL, Reeves ND. Subtalar joint arthroereisis in the management of pediatric flexible flatfoot: a critical review of the literature. *Foot Ankle Int*. Dec 2011;32(12):1127-1139. PMID 22381197
3. Graham ME, Jawrani NT, Chikka A. Extraosseous talotarsal stabilization using HyProCure(R) in adults: a 5-year retrospective follow-up. *J Foot Ankle Surg*. Jan-Feb 2012;51(1):23-29. PMID 22196455
4. Vedantam R, Capelli AM, Schoenecker PL. Subtalar arthroereisis for the correction of planovalgus foot in children with neuromuscular disorders. *J Pediatr Orthop*. May-Jun 1998;18(3):294-298. PMID 9600551
5. Nelson SC, Haycock DM, Little ER. Flexible flatfoot treatment with arthroereisis: radiographic improvement and child health survey analysis. *J Foot Ankle Surg*. May-Jun 2004;43(3):144-155. PMID 15181430
6. Needleman RL. A surgical approach for flexible flatfeet in adults including a subtalar arthroereisis with the MBA sinus tarsi implant. *Foot Ankle Int*. Jan 2006;27(1):9-18. PMID 16442023
7. Cicchinelli LD, Pascual Huerta J, Garcia Carmona FJ, et al. Analysis of gastrocnemius recession and medial column procedures as adjuncts in arthroereisis for the correction of pediatric pes planovalgus: a radiographic retrospective study. *J Foot Ankle Surg*. Sep-Oct 2008;47(5):385-391. PMID 18725117

8. Lucaccini C, Zambianchi N, Zanotti G. Distal osteotomy of the first metatarsal bone in association with sub-talar arthroereisis, for hallux valgus correction in abnormal pronation syndrome. *Chir Organi Mov.* Dec 2008;92(3):145-148. PMID 19082522
9. Scharer BM, Black BE, Sockrider N. Treatment of painful pediatric flatfoot with Maxwell-Brancheau subtalar arthroereisis implant a retrospective radiographic review. *Foot Ankle Spec.* Apr 2010;3(2):67-72. PMID 20400415
10. Brancheau SP, Walker KM, Northcutt DR. An analysis of outcomes after use of the Maxwell-Brancheau Arthroereisis implant. *J Foot Ankle Surg.* Jan-Feb 2012;51(1):3-8. PMID 22196453
11. Bresnahan PJ, Chariton JT, Vedpathak A. Extraosseous talotarsal stabilization using HyProCure(R): preliminary clinical outcomes of a prospective case series. *J Foot Ankle Surg.* Mar-Apr 2013;52(2):195-202. PMID 23313499
12. Scher DM, Bansal M, Handler-Matasar S, et al. Extensive implant reaction in failed subtalar joint arthroereisis: report of two cases. *HSS J.* Sep 2007;3(2):177-181. PMID 18751791
13. Saxena A, Nguyen A. Preliminary radiographic findings and sizing implications on patients undergoing bioabsorbable subtalar arthroereisis. *J Foot Ankle Surg.* May-Jun 2007;46(3):175-180. PMID 17466243
14. Cook EA, Cook JJ, Basile P. Identifying risk factors in subtalar arthroereisis explantation: a propensity-matched analysis. *J Foot Ankle Surg.* Jul-Aug 2011;50(4):395-401. PMID 21708340
15. National Institute for Health and Care Excellence (NICE). Sinus Tarsi Implant Insertion for Mobile Flatfoot [IPG305]. 2009; <https://www.nice.org.uk/guidance/IPG305>. Accessed March 7, 2018.
16. Harris EJ, Vanore JV, Thomas JL, et al. Clinical Practice Guideline Pediatric Flatfoot Panel: American College of Foot and Ankle Surgeons (ACFAS). Diagnosis and treatment of pediatric flatfoot. *J Foot Ankle Surg.* Nov-Dec 2004;43(6):341-373. PMID 15605048
17. Lee MS, Vanore JV, Thomas JL, et al. Clinical Practice Guideline Adult Flatfoot Panel: American College of Foot and Ankle Surgeons (ACFAS). Diagnosis and treatment of adult flatfoot. *J Foot Ankle Surg.* Mar-Apr 2005;44(2):78-113. PMID 15768358