

MemoStep™ (Off-Set Step) Technology

In Fixation of Reconstructive Foot Surgery: Uses in a Total Flatfoot Reconstruction

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INTRODUCTION

Despite extensive conservative treatment attempts for collapsing pes plano valgus deformity, whether in children or adults, at times it becomes necessary to surgically reconstruct the foot in order to provide not only a viable arch and hindfoot alignment, but concomitant improvement in posterior tibial tendon function. A significant number of these deformities require triplanar correction to fully address the complete spectrum of pathology. One way of achieving correction for a severe collapsing pes plano valgus foot is via a lateral opening wedge calcaneal osteotomy, in conjunction with a medial calcaneal slide osteotomy, talonavicular arthrodesis, and tendo-Achilles lengthening. Fixation of this procedure for the talonavicular joint is typically via two crossing screws. The opening wedge calcaneal osteotomy many times does not require fixation due to inherent compression forces at the osteotomy site. Lastly, the medial calcaneal slide fixation is typically via one or two screws plantar posterior to dorsal anterior in adults, but can become very troublesome in children with open growth plates, necessitating Kirschner



20mm EasyClip™ SI



MemoStep Off-Set Device

wire fixation which then may lead to further complications, not to mention pain in a small child when removal is necessary. With the advent of memory metal technology such as the EasyClip™ SI and MemoStep™ step implants from MMI (A Memometal Technologies, Inc. Company), the fixation process is greatly simplified even with difficult alignment and open growth plates. This fixation device may be utilized in a variety of positional arrangements to ensure a rigid construct with no micromotion thus enabling

complete arthrodesis and/or union of osteotomy site. Ultimately, this simplification of the fixation process produces consistent results with decreased surgical time.

PATIENT PROFILE

JL is an otherwise healthy and active 11 year old male who suffered from severe collapsing pes plano valgus deformity which had significantly caused pain in the hindfoot and anterior tibial region due to malalignment. He experienced difficulty with running and quite simply, this severely limited his activities of daily living. He presented with severe pes plano valgus changes with extensive talar head uncovering and marked abduction deformity of the forefoot. In essence, the entire midfoot medial column had substantial collapse with talonavicular joint sag and shortening of the lateral column. He related pain along posterior tibial tendon and during ambulation, there was severe abduction of forefoot. The calcaneus was in severe in valgus in relaxed calcaneal stance position and there was noted difficulty with heel raise independently with limited inversion of heel on single leg toe raise. Lastly, the patient presented with gastrocnemius equinus with limited dorsiflexion of the ankle joint due to taut Achilles tendon, not corrected with knee joint flexion. There was no evidence of coalition with adequate subtalar, calcaneocuboid, and talonavicular joint motion.

Because of the severity of his condition, and past failure with conservative measures, including bracing and orthoses, the decision was made to perform a triplane flatfoot reconstruction including a lateral opening wedge calcaneal osteotomy, a medial calcaneal slide osteotomy, and talonavicular arthrodesis. In addition, a percutaneous tendo-Achilles lengthening would be employed to correct the equinus deformity.

SURGICAL METHOD

Incision line placement is per standard technique for two calcaneal osteotomies. Deep dissection was utilized to identify the calcaneal body. Using a power saw, an opening lateral wedge calcaneal osteotomy was performed

in order to accommodate a 10mm tapered to 6mm trapezoidal tricortical iliac strut graft which provided transverse plane correction via lengthening of the lateral column. A second calcaneal osteotomy was performed posteriorly with a power saw, significantly away from the open growth plates, allowing the calcaneus to slide medially 8mm. This provided frontal plane correction due to the change in vector force of Achilles tendon pull. Lastly, a curvilinear medial incision was performed from the anterior medial talotibial joint to the navicular body. Deep dissection was used to identify the talonavicular joint. Using rongeur and rasp technique, along with power saw resection of a small plantar based opening wedge, the talonavicular joint was prepared for arthrodesis fixation. This would provide sagittal plane correction of the medial column.

Fixation of the flatfoot reconstruction was performed in 2 distinct steps. The opening lateral calcaneal wedge osteotomy was determined to be stable after the bone graft was tamped into place without any motion or loosening. Immediately, the lateral column appeared corrected. The medial calcaneal slide osteotomy is typically a problematic fixation issue in children as discussed previously. In this



Post-Op X-Ray

situation, the MemoStep™ was the perfect fixation device. The offset implant allowed accommodation of the entire medial slide with excellent purchase and fixation without any disruption to the growth plate. The placement is confirmed away from the growth plate with intraoperative fluoroscopy. Then, the talonavicular arthrodesis site was addressed with three EasyClip™ SI devices utilized, allowing a gentle amount of plantarflexion and excellent correction of the medial column. Lastly, a percutaneous tendo-Achilles lengthening resolved the equinus deformity.

OUTCOME

The patient progressed very well. He maintained non-weight bearing in a compressive dressing and posterior splint as he recovered. Clinically, upon loading the foot, there was excellent correction of the pes plano valgus deformity with hindfoot in only slight valgus and forefoot in rectus alignment in relation to the hindfoot. Upon follow-up, he had a very visible medial arch with loading of the foot and was experiencing no pain at any of the three surgical areas of concern. He began ambulating in a fracture boot after eight weeks post-operatively, and then transitioned to athletic type shoe gear four weeks after that time point.

DISCUSSION

This type of surgical procedure lends itself very well to the use of the EasyClip™ SI and MemoStep™ fixation device. Once satisfactory anatomical alignment is achieved, a drill guide is used to drill the two holes for the device's legs, a depth gauge is used to measure each hole, and the correct staple configuration is selected. The EasyClip™ SI is then loaded into the supplied forceps, distracted such that each prong is straight (90 degree angle), inserted in the pre-drilled holes, and released from the forceps. Once released, immediate compression is noted.

The obvious advantage is a rapidly placed fixation device across a joint with excellent compression and stability. But, in a case such as this where an open growth plate further complicates fixation, the MemoStep™ in conjunction with the EasyClip™ SI become the perfect solution. Whereas standard screw fixation risks damage to the growth plate, and K-wire fixation is fraught with complications and discomfort, the MemoStep™ provides fixation and compression without damage to the open growth plate with a low-profile design which is not irritating to the adjacent tissue. Both devices accomplish this with rapid placement time which ultimately, reduces overall implantation time by at least third and improved patient healing.



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