Next Generation Z-Plasty™ Procedure for Flatfoot Deformity

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BACKGROUND

As detailed by Johnson and Strom, the four stages of adult-acquired flatfoot deformity (AAFD) start with stage I, categorized as mild posterior tibial tendon (PTT) dysfunction and no deformity.[1] At stage II, flexible deformity and PTT degeneration are introduced.[1] Stage III progresses to a rigid deformity with PTT disruption and is followed by stage IV, which is defined by a fixed deformity in the ankle and foot with tibiotalar valgus.[1,2]

Regardless of the stage presented, operative treatments come with inherent risks, ranging from neurovascular complications at the operative site to the possibility of the need for another surgical intervention at a later time, which must be weighed against the potential benefit to the patient.

TREATMENT OPTIONS

While operative methods are available for the treatment of flatfoot deformity, there are non-operative routes that may be utilized, depending on the stage of deformity; these range from the use of custom orthotics, to the implementation of structured physical therapy, with success and satisfaction rates indicating that a non-operative approach is an effective method for treatment of stage I or II AAFD.[3,4] As the severity increases from stage II to III, and beyond, and if conservative, non-operative treatment options fail, surgical corrections including arthroereisis, osteotomies, and arthrodesis may be considered.

Arthroereisis presents a minimally invasive option for the correction of a flexible deformity, in which an implant is placed in the sinus tarsi of the subtalar joint.

In2Bones offers the PitStop® Subtalar Implant (**Figure 1**), made of radiolucent, biocompatible PEEK material and featuring an anatomical shape designed to improve stress distribution while facilitating the correction of pes plano valgus deformity.

Medializing displacement calcaneal osteotomies (MDCOs) are frequently employed to correct hindfoot valgus deformity.[3] For this procedure, the osteotomy is placed through a lateral approach, after which the posterior segment is shifted medially (**Figure 2**).

The lateral column lengthening (LCL) osteotomy (**Figure 3**), first described in 1975,[5] is one of the most commonly utilized osteotomies for the correction of AAFD.

Designed to lengthen the lateral column and result in correction through the talonavicular joint,[6] the LCL may be used with the MDCO but often is powerful enough to be used by itself. In some long-standing flatfoot cases, the forefoot will adapt to the flattened hindfoot posture. Once the hindfoot is addressed by the LCL, an additional medial column procedure, such as a Cotton osteotomy at the medial cuneiform or a Lapidus fusion of the 1st TMT joint, may be performed to correct residual forefoot supination deformity.

Alternatively, a Z-type, step-cut, LCL osteotomy, as first detailed by Vander Griend,[7] is utilized with the CoLink Cfx Z-Plasty™ Plate (**Figure 4**).

This procedure provides the powerful correction of the traditional LCL with the greater inherent stability of the "Z" style osteotomy. In addition, the low-profile design of the Z-Plasty Plate can provide fixation and reduce soft tissue irritation from hardware prominence.

Through the use of the CoLink Cfx Z-Plasty™ Cutting Guide, which references the calcaneocuboid joint,

Figure 1. PitStop® Subtalar Implant

Figure 2. MDCO with CoLag® Screws

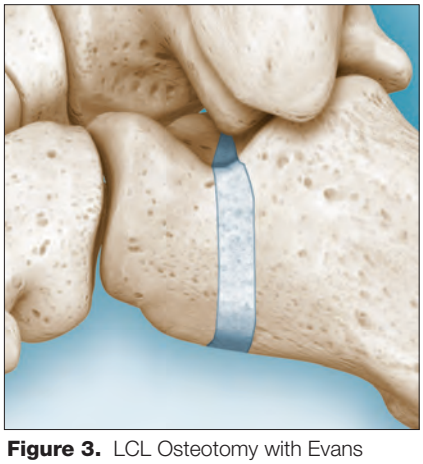

Figure 3. LCL Osteotomy with Evans Wedge

Figure 4. In2Bones CoLink Cfx Z-Plasty™ Plate with wedges

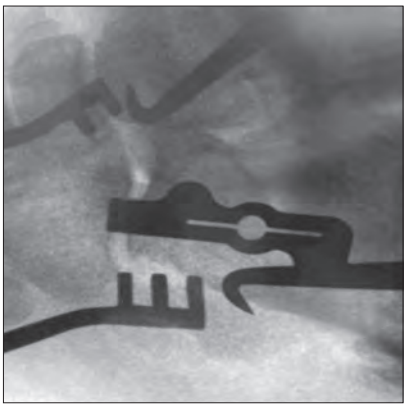

Figure 5. Placement of CoLink Cfx Z-Plasty Guide

Figure 6. CoLink Cfx Z-Plasty Plate in-situ

the placement and execution of the Z-osteotomy are guided for proper alignment (**Figure 5**).

Once completed, the osteotomy is spread using a dedicated instrument and filled with bone graft prior to the assembly of the plate to the bone to complete the operation (**Figure 6**).

WHAT DOES THE LITERATURE SAY?

The Z-osteotomy is a more current iteration of the LCL and has promising results from existing research, which compares directly with other LCL osteotomy procedures. Among the results of those studies, the following data emerged:

- Smaller graft needed[8,9]
- Reduced healing time[8]
- Reduced non-union rate[8]
- Reduced reoperation rate[8,9]
- Potential for greater correction
- Improvement in talonavicular coverage[8]

In two separate studies, which followed patients undergoing procedures involving the utilization of a Z-osteotomy, the post-operative union rates were noted to be 100% for the cohorts,[10,11] while one indicated that the talonavicular coverage significantly improved following the procedure.[11]

Demetracopoulos et al. also documented significantly improved FAOS pain, FAOS Quality of Life, and SF-36 scores, when using a Z-osteotomy for lateral column lengthening and flatfoot deformity correction, as well as no instances of delayed union or bone graft collapse.[10]

KEY FEATURES OF THE COLINK CFX Z-PLASTY SYSTEM

- Guided placement of osteotomy through a captured cutting slot
- Spreader instrument for wedge placement
- Side specific (left/right) graft spanning plate design
- Low-profile construct
- Compatible with 3.5mm locking and non-locking cortical screws, as well as 4.0mm cancellous non-locking screws
- Pre-sterilized plates and screws

CONCLUSIONS

Guiding the Z-osteotomy placement by referencing the patient's native anatomic structures, the In2Bones CoLink Cfx Z-Plasty is designed to provide a reproducible procedure for the treatment and correction of flatfoot deformities while using an anatomically designed plate.

As an alternative to other existing osteotomy techniques, the Z-step osteotomy has demonstrated the ability to result in reduced non-union[8] and delayed union[10] rates, as well as provide the potential for greater correction[8] and improved pain scores.[10]

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