CASE STUDY

Medial Column Correction in Stage II Flexible Flatfoot Deformity with Procedure – Specific Anatomic Titanium Wedge

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FEATURED PRODUCT: TITAN 3-D™ Cotton Osteotomy Wedge

INTRODUCTION

Surgical correction of flatfoot deformity is most often multi-planar and requires a step-wise, multi-procedure approach. When the deformities are reducible and absent of significant arthritic change (Stage II), periarticular correction is recommended. This may include a variety of hindfoot osteotomies and tendinous advancement, lengthening and/or transfer procedures based on the involved surgeon's treatment algorithm and patient specific pathology. Frequently, once the hindfoot deformities are reduced, residual forefoot varus deformity persists. If forefoot varus is ignored, impending failure of attempted correction is predictable and persistent pain with progressive ankle valgus can result. Residual forefoot varus is often corrected via plantarflexory first tarsometatarsal arthrodesis or Cotton osteotomy.

Various fixation constructs exist for Cotton osteotomy including autograft or allograft wedge, wedge plate, and porous titanium wedge. The novel TITAN 3-D™ Wedge System employs P28's proprietary Precision® Guide technology to help ensure accurate placement of a positional screw following wedge insertion to secure the TITAN 3-D™ wedge (Figure 1). This also helps bolster the deformity correction, while limiting adjacent soft tissue irritation often precipitated by prominent plate fixation (Figure 2).

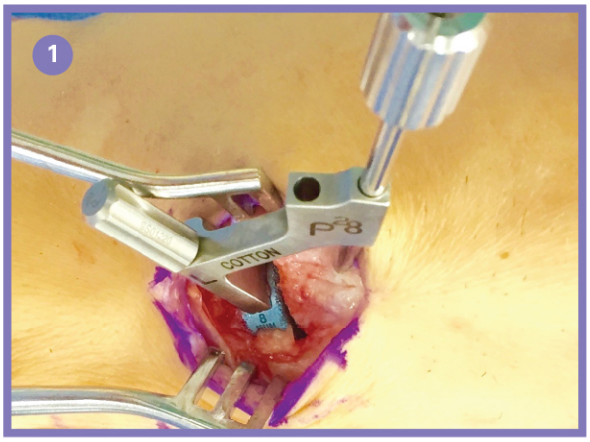

Figure 1:
Precision Guide assisted cannulated positional screw fixation of Cotton osteotomy wedge.

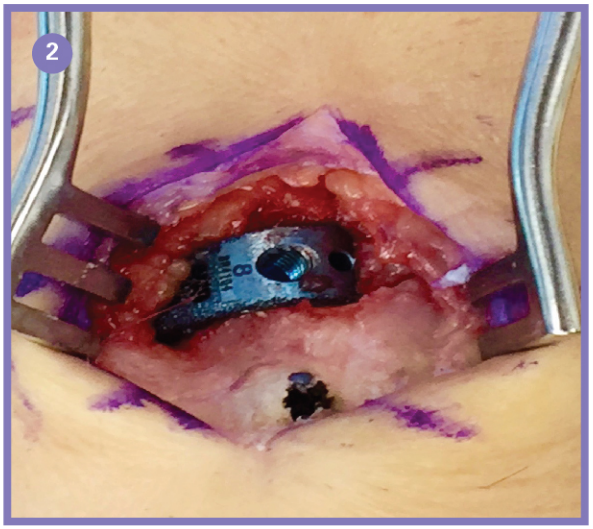

Figure 2:
Fully inserted TITAN 3-D™ Cotton Wedge demonstrating excellent anatomic contour and on-label countersunk single screw fixation.

PRESENTATION

36 y.o. female presents with medial and lateral hindfoot and ankle pain with a history of prior trauma to the ankle. One year prior to initial presentation, she sustained a bimalleolar ankle fracture which was treated with ORIF at an outside institution. She continued to have persistent pain and a second procedure for hardware removal was performed. At presentation, unfortunately, her pain continues and her previously asymptomatic flatfoot is increasingly deformed and painful. She is unable to perform activities of daily living and lacks both balance and proprioception to the distal extremity. Initial radiographic evaluation reveals nonunion of the fibula fracture with valgus deformity of the ankle and suspected persistent insufficiency to the deltoid ligament (Figure 3a, 3b). Surgical care is recommended for reconstruction of the unstable, non-united ankle and insufficient deltoid ligament.

Figure 3a - 3b: Lateral and AP weightbearing ankle radiographs at time of initial presentation.

INDEX SURGERY

Repair of the non-united fibula is treated with debridement of the nonunion and preservation of anatomic length and rotation. Calcaneal autograft is incorporated. Fixation is performed with the Gorilla® Ankle Fracture System, including ORIF of the syndesmosis. Subsequent to the lateral repair, a zero-stretch deltoid ligament reconstruction is executed.

Successful union of the fibula is achieved and the ankle mortise is neutralized (Figure 4a, 4b). Despite this, following completion of physical therapy, she is unable to return to pain-free activities of daily living and notes persistent pain at the posterior tibial tendon. MRI reveals posterior tibial tendinopathy secondary to her progressive flatfoot deformity. Periarticular flatfoot correction is recommended.

Figures 4a - 4b: Postoperative lateral and AP weightbearing radiographs following index surgery with repair of fibular nonunion.

SUBSEQUENT RECONSTRUCTION

Initial patient positioning is lateral, and a medial displacement calcaneal osteotomy is performed. Care is taken to medially translate and de-rotate the tuberosity out of the valgus deformity. Fixation is achieved with a single 7.0mm Monster® cannulated screw. Following this, the patient is rotated to the supine position without requirement for re-draping. A gastrocnemius recession is performed in standard fashion. Then, attention is directed to the medial hindfoot. A curvilinear incision exposes a hypertrophied posterior tibial tendon. The tendon is debrided and released from its primary insertion to the navicular. An FDL tendon transfer is then performed and fixated with an interference screw. The posterior tibial tendon is advanced accordingly based on the tension of the FDL transfer. Residual forefoot varus is noted, requiring Cotton osteotomy medial column realignment.

Figure 5: TITAN 3-D Cotton Wedge attached to Cotton Inserter, prepared for implantation.

Attention is directed to the dorsal aspect of the midfoot. The medial cuneiform is identified and a three-centimeter incision is made slightly medial to the EHL tendon. A sagittal saw is used to create a centrally located osteotomy of the medial cuneiform, taking care not to violate adjacent joints or breach the plantar medial cuneiform cortex. A pin distractor can be employed to open the osteotomy. The TITAN 3-D wedge trial sizers are utilized to determine desired alignment via fluoroscopic and clinical evaluation. The TITAN 3-D Cotton Wedge system includes size options in one millimeter increments from five to eight millimeters. The appropriate size is selected and the individually sterilized implant is passed to the sterile field and loaded onto the TITAN 3-D Cotton Inserter (Figure 5). The inserter aids in proper insertion alignment of the wedge, thus avoiding unintended frontal plane insertional malalignment or impingement onto the intermediate cuneiform. Fluoroscopic guidance is utilized to aid in wedge positioning. As desired position is achieved, the wedge is advanced into place with cautious mallet strikes (Figure 6). Now, the inserter is removed and the Precision Guide is attached to the inserted wedge. In a distal to proximal orientation, a guide wire is placed and position of screw fixation is verified with fluoroscopic imaging. The Precision Guide is removed. An appropriate length, fully-threaded positional cannulated screw (3.5 or 4.0 mm) is delivered to provide stable wedge fixation. As an alternative, dorsally based Gorilla® plates may be employed based on surgeon preference.

Figure 6: Partially inserted TITAN 3-D Cotton Osteotomy Wedge.

POSTOPERATIVE PROTOCOL:

A well-padded posterior splint is applied for one week. Subsequently, non-weightbearing cast immobilization is maintained until approximately six weeks post-surgery. Gradual return to weightbearing activities with boot immobilization is achieved initially, transitioning to an ankle brace and supportive shoe gear with the progression of protocol driven physical therapy.

At four-months status post periarticular flatfoot reconstruction with the TITAN 3-D™ Cotton Wedge, the patient has returned to meaningful full-weightbearing activities of daily living with improved balance and proprioception for the first time since her original trauma two years prior (Figure 7a, 7b, 7c, 7d).

Figures 7a - 7d:
AP ankle, AP foot, and lateral weightbearing radiographs four months following periarticular flatfoot reconstruction with TITAN 3-D™ Cotton Osteotomy Wedge.

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