

CASE STUDY

Rotational Osteotomy for Hallux Valgus Utilizing a Novel Technique with Plate and Guided Cross Screw



Surgeon Author: Joseph X. Kou, MD
Walnut Creek, CA

FEATURED PRODUCT: PROMO™ Triplanar Hallux Valgus Correction System

Introduction - Overview of Indication and Modalities of Treatment

Surgical management of hallux valgus can be difficult. There are various degrees of deformity, and multiple surgical procedures have been developed to manage these degrees of deformity. Most of these procedures only manage hallux valgus in a single, transverse plane. However, many times hallux valgus has a multiplanar component where there is a coronal plane rotational component as well as varus angulation of the 1st metatarsal. Paragon 28® has developed the PROMO™ system, which addresses a hallux valgus multiplane deformity through a single oblique osteotomy.

After correction is made, the metatarsal is fixated into place through the osteotomy with a Mini-Monster® interfragmentary screw and neutralized by a locking plate and screw construct. Specific PROMO™ plates that are sized and shaped around the oblique angle of the osteotomy are available within the system. In addition, PROMO™ includes a patent-pending PRECISION® guided system which enables the user to place a cross screw across the osteotomy while avoiding hardware collision with on-axis plate screws.

Presentation

Patient is a 57 y/o female with history of chronic bunion and hammertoe pain. The patient has experienced progressive pain over the medial eminence of her bunion as well as her hammertoe over many years. She has tried conservative management with accommodative and reasonable shoe wear, as well as padding and strapping of the toes. Despite this, she continues to have pain on a daily basis.

Examination

CLINICAL EXAM

On physical examination, the patient is noted to have a severe hallux valgus deformity as well as pronated hallux. Additionally, the patient has a hammertoe deformity of the 2nd toe. The patient is noted to have 2+ dorsalis pedis pulses and posterior tibial artery pulses, and her sensation is intact. The 1st tarso-metatarsal joint is noted to be stable when stressing the joint. There is tenderness over the medial eminence of the bunion.



PROMO™
PROXIMAL ROTATIONAL METatarsal OSTeotomy

Radiographic Imaging and Assessment

Standing AP and lateral radiographs of the foot were taken pre-operatively (**Figures 1 and 2**). No significant arthritic changes were noted at the 1st MTP joint. The hallux valgus angle was measured at 45°. There was no evidence of subluxation of the 1st tarso-metatarsal joint or plantar gapping.



Figure 1: Standing pre-operative lateral view



Figure 2: Standing pre-operative AP view

System Overview

The patent-pending PROMO System contains a series of custom guides (See **Figures 3a-3c**) and implants utilized in the measurement, construction and fixation of an oblique osteotomy on the proximal aspect of the first metatarsal. Once the osteotomy is created, the distal aspect of the metatarsal can be de-rotated. Due to the unique oblique nature of the osteotomy, simultaneous multi-plane correction can be achieved through this rotation (**Figure 3**).

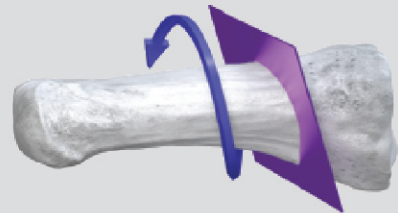


Figure 3: An oblique osteotomy allows for both frontal and transverse plane correction



Figure 3a: PROMO Alignment Guide

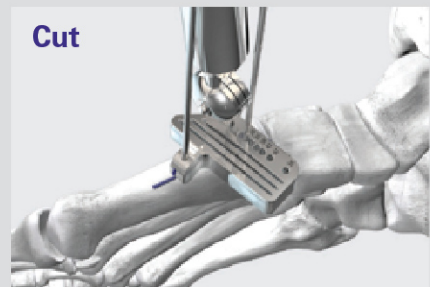


Figure 3b: PROMO Cut Guide



Figure 3c: PROMO Rotation Guide

Pre-operative Planning

In this particular case, the patient was measured to have an 18° IMA and grade 3 (30°-39°) rotational deformity (see **Figure 3** and **Table 1**). By referencing the PROMO table (see **Table 2**), these two variables correspond to a 42° osteotomy cut angle.

Surgical Technique

Before performing the osteotomy, a modified McBride bunionectomy is performed. A medial incision is first made at the 1st MTP joint where a capsulotomy is performed, followed by resection of the medial eminence. An incision is then made in the patient webspace and the fibular sesamoid is identified. The adductor hallucis and lateral capsule is sharply released from the fibular sesamoid to complete the lateral release. A PIP fusion of the 2nd toe is also performed to correct the hammertoe.

At this point the medial incision is extended proximally to expose the 1st metatarsal. A K-wire is placed midline, 1 cm distal to the 1st TMT joint, perpendicular to the 1st metatarsal shaft, and parallel to the weight-bearing surface. The cutting jig is placed into position and the osteotomy is performed according to the vertical inclination angle determined from the PROMO table. A K-wire is placed using the final guide in the system in order to de-rotate the osteotomized metatarsal until the correction is dialed in. The osteotomy is then stabilized with a reduction forcep and provisional k-wire fixation. Final fixation is achieved using an interfragmentary cannulated screw, followed by the Baby Gorilla PROMO plate.

A medial capsular imbrication and repair is then performed, followed by a layered closure. A compression dressing is applied as well as a simple post-op shoe.



Figure 3: Standing pre-operative AP view with measurement overlay

Rotation Range	0°	10° - 19°	20° - 29°	30° - 39°
Lateral Head Shape	Sharp	Irregular	Rounded	Circular
Lateral Condyle Visibility	Not Visible	Notable	Observable	Apparent
Lateral Articular Surface Continuity	None	Step-Off	Notched	Smooth
Image Examples (Right 1 st Metatarsal)				

Table 1: Frontal Plane Rotation using a standard AP radiograph.

		Rotation Angle (°)			Vertical Inclination Angle
		10-19	20-29	30-39	
IMA Angle (°)	8-10	38	28	23	
	11-12	47	33	28	
	13-14	55	38	33	
	15-17	55	42	38	
	18-20	55	47	42	

Table 2: PROMO Angle Values Table utilized to determine vertical inclination (osteotomy) angle.

Post-operative Protocol

The patient is brought back for follow-up 10-14 days post-operatively. The sutures are removed and the patient is transitioned into a low-tide cam walker brace. Partial heel-weight bearing is allowed in the brace until 6 weeks post-op. At that point, the patient is progressed to full weightbearing as tolerated and into supportive shoe wear as swelling allows.

Currently the patient is over a year out from surgery and is very satisfied with the results of the procedure. Radiographs from 6 months post-op demonstrated a fully healed osteotomy with maintained correction of the deformity. Note the sharp edge of the lateral aspect of the 1st metatarsal head in the post-op films compared to the rounded lateral edge in the pre-op films as well as full correction of the IMA and HVA.



Figure 4: Standing post-operative AP view with PROMO™ fixation.



Figure 5: Standing post-operative lateral view with PROMO™ fixation.

References

1. Yamaguchi S, Sasho T, Endo J, et al. Shape of the lateral edge of the first metatarsal head changes depending on the rotation and inclination of the first metatarsal: a study using digitally reconstructed radiographs. J Orthop Sci. 2015; 20(5): 868-874

For the contraindications, potential complications and adverse reactions, warnings and precautions associated with this device, please refer to the device-specific instructions for use at <http://www.paragon28.com/ifus>

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Paragon 28, Inc.
4B Inverness Ct. E., Suite 280
Englewood, CO 80112, U.S.A.
855.786.2828 | www.paragon28.com

Paragon 28 Medical Devices Trading Limited
43 Fitzwilliam Square West
Dublin 2, D02, K792, Ireland
+353 (0) 1541 4756

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