CHAPTER **8**

HIGH INTERMETATARSAL ANGLE HALLUX VALGUS DILEMMA: To Austin or Not To Austin… Rationale and Indications

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INTRODUCTION

The high intermetatarsal angle hallux abducto valgus deformity is a complex condition to surgically repair. Corrective procedure selection can be perplexing as there are several features of this deformity that require careful assessment. Precise assessment of this deformity is complicated by the fact that several clinical examination parameters remain undefined. Consequently, the competent selection of a definitive procedure(s) remains much more art than science. Despite these ambiguities, there are principles to guide appropriate procedure selection.

PROCEDURE SELECTION

There are two interconnected principles that simultaneously direct procedure selection for the high intermetatarsal angle (IMA) hallux abducto valgus (HAV) deformity. The dual principles are addressing the deforming etiology, and fitting the repair to the patient. The first principle of addressing the deforming etiology implies a clinical understanding of the deformity. Towards a competent clinical understanding is the consistent, reliable, and reproducible clinical evaluation. The etiology of HAV may be effectively evaluated by dividing the deformity into proximal and distal components. Proximal components include the presence or absence of a hypermobile first ray and the reducible or nonreducible intermetatarsal angle. The distal components include lateral adaptation of the articular cartilage and lateral soft tissue contracture. To effectively resolve the high IMA deformity and realign the first metatarsophalangeal joint (MTPJ), both proximal and distal components require treatment.

The second dual principle of fitting the repair to the patient directs the clinician to consider the impact of a selected procedure upon the patient. Multiple patient specific considerations must be clinically weighed when selecting a corrective procedure (e.g., the negative effects of prolonged immobility and the ability of the patient to comply with nonweightbearing). The ideal procedure for the high IMA HAV deformity achieves 2 goals: deformity correction and early weightbearing. Given specific clinical findings these goals can be attained through the long dorsal arm modified Austin bunionectomy procedure.

Table 1

MODIFIED AUSTIN VERSUS PROXIMAL CORRECTION OF THE HIGH IMA

Modified Austin	Proximal Correction
- Less shortening of first metatarsal	- More shortening of first metatarsal*
- Early weightbearing	- Late weightbearing
- Less postop immobilization	- Prolonged postop immobilization
- Reliable bone healing	- Less reliable bone healing
- PASA correction	- PASA correction is limited

*Oblique CBWO may be modified to maintain length by cutting the hinge and slide lengthening the distal fragment.

The long dorsal arm modified Austin bunionectomy is a versatile procedure. The modification referred to herein involves capital fragment lateral transposition and medial rotation to respectively repair proximal and distal etiologies of the high IMA hallux valgus deformity. Historically the Austin bunionectomy has been recommended for treatment of mild to moderate intermetatarsal angles of less than 18 degrees. These conventional indications may be expanded to include higher IMAs given certain clinical findings and utilizing specific techniques. It is the purpose of this paper to clarify the indicating findings for employing the modified Austin in the treatment of the severe hallux valgus deformity. Several advantages of utilizing the modified Austin for the high IMA HAV are listed in Table 1. This distal first metatarsal osteotomy reliably offers more rapid recovery with fewer complications.

PUSHING THE AUSTIN FOR HIGH IMA CORRECTION: INDICATING FINDINGS

All high IMA HAV deformities are not conducive to repair by the modified Austin. Proximal first metatarsal procedures are typically preferred in both hypermobile and pediatric forms of this deformity. For example, severe hallux valgus deformities in the presence of a hypermobile first ray and/or unstable medial column are best repaired by Lapidus arthrodesis. Likewise, severe pediatric hallux valgus deformities in the presence of open physeal plates are most appropriately treated through a proximal first metatarsal osteotomy.

For as clear as these indications appear, there is significant uncertainty, particularly with mixed clinical findings, in the judicious selection of a corrective proximal first metatarsal procedure. Further uncertainty exists regarding the use of distal osteotomy in repair of severe hallux valgus conditions. Predicting the suitability of a procedure for resolving the high IMA HAV deformity begins with delineation of indicating clinical findings.

In general, as will be discussed below, the modified Austin is best indicated in repair of the high IMA hallux valgus deformity when both the proximal first ray is deemed stable in the sagittal plane and the IMA is reducible in the transverse plane. The proximal first ray (PFR) described herein refers to both the first metatarsal-medial cuneiform (first MCJ) and naviculo-medial cuneiform joints (NMJ).

Sagittal plane stability of the PFR relates to the absence of hyper-mobility with range of motion. The PFR complex is evaluated with dorsal and plantar mobilization of the first metatarsal upon a manually stabilized midfoot. Hypermobility is present when the sagittal plane motion is deemed excessive.

Standard guidelines have not been established for the clinical evaluation of PFR sagittal stability. This lack of an accepted clinical test eliminates the possibility of defining normal and abnormal ranges of motion. Not surprisingly, the designation of PFR hypermobility remains clinically subjective.

Further controversy regarding PFR hypermobility exists regarding the articular source of the hyper-mobility. Namely does the instability stem from the first MCJ, the NMJ, or both? Given the ambiguity surrounding objective measurement, there is no substitute for extensive and perceptive clinical experience in evaluating proximal first ray sagittal plane range of motion.

Normal sagittal plane range of motion of the PFR designates stability at this level. This stability is the initial indicating clinical finding in deeming the modified Austin appropriate for treating severe hallux valgus deformities. A relative contraindication to distal osteotomy is the presence of PFR hypermobility. Biomechanically, the medial column overloading force (of PFR hypermobility) becomes distally directed during stance and creates medial splaying of the first metatarsal. Consequently, the distal first metatarsal osteotomy is not able to reliably correct either the high IMA or hallux abduction in the presence of hypermobility.

Consistent with this discussion of sagittal plane mobility is the clinical finding of distal first metatarsal elevation. Interestingly, both the hypermobile and stable PFR may exhibit first metatarsal elevatus. Clinical and radiographic elevatus can be observed by the visible presence of a dorsally prominent first metatarsal head, and by first

Figure 1A. In addition to hallux valgus deformity note the dorsally prominent first metatarsal heads in this subtle case.

Figure 1B. Overt first metatarsal dorsiflexion.

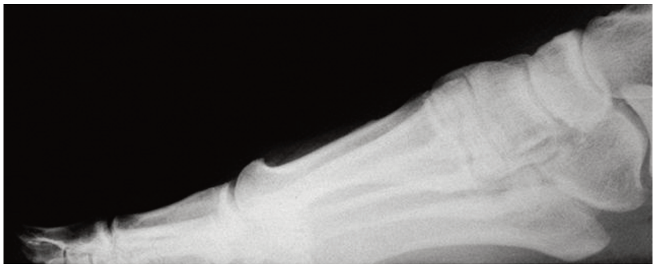

Figure 1C. Radiographic appearance of distal first metatarsal elevation. Note the first metatarsal dorsiflexion relative to the second metatarsal. Both the hypermobile and stable PFR may exhibit these clinical findings and are indicative of functional or structural hallux limitus. The symptoms of joint limitus may be generated by medial column overload necessitating treatment via orthotics postoperatively. Cheilectomy and other procedures may be indicated in addition to hallux valgus repair.

metatarsal dorsiflexion relative to the second metatarsal (Figure 1). These findings are indicative of a dorsiflexed first metatarsal and are clinically associated with functional and structural hallux limitus. The elevated first metatarsal is typically caused by medial column over-load of proximal biomechanical faults (e.g., ankle equinus, rearfoot valgus, talo-navicular subluxation, insufficiency of the peroneus longus, etc.). Hallux limitus symptoms associated with first metatarsal elevation may require treatment through ancillary procedures (e.g., cheilectomy), postoperative physical therapy, and orthotic management.

Transverse plane mobility of the first MCJ is similarly important to procedure selection for the high IMA hallux valgus deformity. In general the rigid high IMA necessitates proximal repair while the flexible IMA deformity is amenable to distal osteotomy. The reducible high IMA may be favorably repaired through modified Austin realignment of the proximal articular set angle (PASA). McGlamry demonstrated this method of reducing the IMA through the biomechanical effect of retrograde buckling following Reverdin osteotomy.

Transverse plane mobility is clinically evaluated both preoperatively and intraoperatively. Preoperative flexibility of the IMA may be demonstrated by manually reducing the intermetatarsal angle. More precise estimation of transverse plane reducibility may be radiographically observed on the AP view by taping the forefoot with the IMA in maximally reduced position. This is carried out while simultaneously adducting the hallux (Figure 2). A lack of preoperative reducibility does not mean that the IMA is not reducible. Complete appraisal is appreciated intraoperatively.

Intraoperative assessment is required to fully evaluate the transverse plane reducibility of the IMA. Reducibility is truly measured only after the lateral soft tissue release of the first MTPJ contracture is complete. Resolution of the hallux abduction contracture through soft tissue release liberates both the medially and proximally directed pressure of the

Figure 2A. Transverse plane reducibility of the IMA. The reducibility of the IMA is demonstrated here following manual reduction and taping of the forefoot. Note the change in first metatarsal length.

Figure 2B.

hallux upon the first metatarsal. This release resolves the lateral contracture and reduces the IMA in the flexible deformity. The reducible and semi-reducible IMA are amenable to repair by the modified Austin.

Correspondingly, the non-reducible high IMA deformity will remain uncorrected through distal first metatarsal osteotomy. The combined findings of PRF sagittal plane stability and transverse plane non-reducibility are indications for proximal first metatarsal osteotomy (e.g., closing base wedge osteotomy).

The finding of a non-reducible high IMA does not exclude repair by the modified Austin. Given the combined clinical findings of severe metatarsus adductus and significant increased PASA the modified Austin may be indicated in treating the non-reducible IMA. Typically, the presence of severe metatarsus adductus is associated with significantly increased PASA. In this setting PASA correction and first MTPJ realignment is buttressed proximally through IMA rigidity. Additionally, in severe metatarsus adductus foot types the proximity of the second metatarsal frequently limits the amount of intermetatarsal space available to resolve the true IMA. Considerable narrowing of the first interspace obviates the need for proximal correction. In this clinical situation the modified Austin achieves PASA correction through medial rotation of the articular cartilage and IMA reduction is addressed through lateral transposition. Favorable outcomes (i.e., parallel first and second toes and a congruous first MTPJ) can be achieved using this technique.

In the absence of overt metatarsus adductus, the severely elevated IMA is a relative contraindication for use of the distal first metatarsal osteotomy. Regardless of multiple favorable clinical findings the distal osteotomy is not effective in resolving the severely elevated IMA. In general, IMAs greater than 21 degrees cannot be reliably repaired through distal osteotomy.

Justifiably, osseous repair for the high IMA HAV deformity has been focused upon proximally based procedures. Despite powerful IMA correction, hallux abduction may persist due to the limitations of proximal procedures to repair the laterally deviated and re-contoured articular cartilage of a long-standing HAV deformity. This uncorrected distal etiology of hallux abduction requires an additional distal procedure to correct PASA, which results in additional shortening of the first metatarsal. Beneficially, the modified Austin can redirect PASA abnormalities through a single osteotomy.

Favorable high IMA HAV clinical findings for performing the modified Austin are listed in Table 2. The author's suggested algorithm for high IMA procedure selection is outlined in Figure 3. This algorithm is based on physical examination findings and does not address patient specific medical, psychological, and social considerations.

Patient specific factors direct the ultimate decision regarding procedure selection. These factors supersede physical examination findings. Preoperative benefit-outcome analysis for each patient is surveyed by the surgeon and final procedure selection is patient-centered. This patient-centered survey considers: the goals of the procedure, the patients' postoperative social support, the capability of the patient to remain nonweightbearing, the vascular and metabolic healing potential of the patient, the age and activity level of the patient, and the psychological/medical impact of prolonged inactivity.

Table 2

FAVORABLE CLINICAL FINDINGS FOR PERFORMING THE MODIFIED AUSTIN OSTEOTOMY IN THE PRESENCE OF A HIGH INTERMETATARSAL ANGLE HALLUX VALGUS DEFORMITY

- Increased lateral adaptation of first metatarsal articular cartilage (i.e., increased PASA)
- IMA reducibility
- Severe metatarsus adductus with significantly elevated PASA
- Long first metatarsal
- Wide metatarsal head
- Adult age

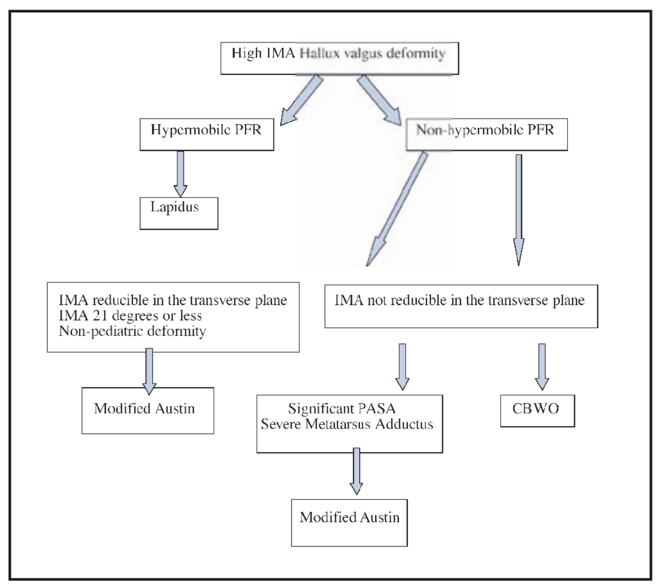

Figure 3. Procedure selection algorithm. This algorithm is based on physical examination findings and does not address patient specific medical, phychological, and social considerations.