CHAPTER **30**

UNRELIABILITY OF THE INTERMETATARSAL ANGLE IN CHOOSING A HALLUX VALGUS SURGICAL PROCEDURE

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DEFORMITY ASSESSMENT

Hallux valgus deformities are assessed by clinical and radiographic parameters that are used to formulate a surgical plan, and the choice of surgical procedures is made based on the synthesis of this combined data. Joint range of motion, rigidity, or flexibility of the metatarsophalangeal (MP) joint, and range of motion of the metatarsal-cuneiform joint are assessed manually prior to surgery. Radiographic findings that are assessed include the intermetatarsal angle, hallux abductus angle, sesamoid position, metatarsus adductus angle, presence or absence of arthritis in the MP joint and sesamoid apparatus, and sagging or subluxation of the metatarsal-cuneiform joint. There is general consensus that patients with high angular measurements require a more proximal procedure, either via osteotomy (shaft/base procedure) or arthrodesis (Lapidus procedure), and conversely, patients with low angular measurements are adequately corrected via distal osteotomy procedures (chevron, Austin, Mitchell, etc.).

MYTH OF THE HYPERMOBILE FIRST RAY

There is a popular opinion that patients with a hypermobile first ray (i.e., abundant sagittal range of motion) require proximal arthrodesis of the first ray (Lapidus procedure) to stabilize the medial column when addressing a hallux valgus in a patient with a high intermetatarsal angle. The assessment of a hypermobile first ray (i.e., hypermobile metatarsal-cuneiform joint) is largely subjective, difficult to measure and record, and assessor-dependent. Reports suggest that poor first ray function in hallux valgus deformities is largely a result of faulty muscle-tendon function around the MP joint, and that restoring the alignment of the joint will restore propulsive power to the medial column.

Contrary to the hypermobile first ray theory, this author questions the accuracy of this subjective assessment, and believes that normal sagittal plane metatarsal-cuneiform motion (Figure 1) has been misinterpreted as pathologic hypermobility that requires stabilization via Lapidus arthrodesis. If the weight-bearing radiographs do not demonstrate joint subluxation (i.e., medial subluxation of the first metatarsal on the medial cuneiform on the dorsal-plantar film, or dorsal subluxation of the first metatarsal on the medial cuneiform on the lateral film), then the clinical assessment of pathologic hypermobility should be questioned. An unstable first metatarsal-cuneiform joint in patients with a high intermetatarsal angle would be an appropriate indication for the Lapidus procedure (Figure 2). To the contrary, a rigid intermetatarsal angle is a better criterion that would warrant or require correction of the high intermetatarsal angle in a hallux valgus deformity via a base procedure such as osteotomy or Lapidus arthrodesis (i.e. impinging os intermetatarsum, bone block between base of first and second metatarsals (Figure 3). The author is of the opinion that sagittal plane flexibility of the first metatarsal-cuneiform joint equates to transverse plane flexibility, and that the ability to reduce the intermetatarsal angle in hallux valgus surgery is largely dependent on the ability to re-balance the soft tissue influences around the first MP joint, in addition to a modest change in the intermetatarsal angle through a distally-placed metatarsal osteotomy (Figure 4).

Figure 1. Normal sagittal dorsal and plantar excursion of the first metatarsal-cuneiform joint, which has been misinterpreted as hypermobility.

Figure 2. Medial subluxation and gross instability of the first metatarsal-cuneiform joint in a patient with a large intermetatarsal angle bunion deformity, which is an excellent indication for a Lapidus arthrodesis.

Figure 3. Impinging os intermetatarseum at the base of the first intermetatarsal space, and impinging prominent lateral base of the first metatarsal eroding into the second metatarsal base, both of which render the intermetatarsal angle inflexible, requiring a proximal surgical procedure.

Figure 4. Preoperative hallux valgus deformity demonstrating the medial-to-lateral flexibility and ability to shift the intermetatarsal angle, indicating a relatively flexible deformity that can be corrected with a combination of soft tissue rebalance and modest intermetatarsal angle correction via a distal metatarsal osteotomy.

Figure 5. Pre and post interspace release, demonstrating the degree to which the intermetatarsal angle is able to be reduced by soft tissue means alone.

INTRAOPERATIVE SEQUENTIAL REDUCTION

The ability to assess the rigidity or flexibility of a hallux valgus deformity is largely dependent on the intraoperative assessment following release of the lateral contracture around the metatarsophalangeal joint (Figure 5). This includes sequential release (and/or resection) of the adductor tendon, release of the fibular-sesamoid ligament, and release of the lateral head of the flexor hallucis brevis muscle/tendon or sesamoid-phalangeal ligament, the degree to which is dependent on ability to align the hallux parallel to the first metatarsal following each maneuver. After the hallux is aligned to the first metatarsal, one can determine how much reduction of the intermetatarsal angle is achieved. In a majority of hallux valgus deformities, a significant reduction in the intermetatarsal angle is achieved via soft tissue release of the lateral contracture, thereby reducing the effective intermetatarsal angle to a degree that it is able to be corrected by a distal osteotomy (Figure 6).

DISTAL METATARSAL OSTEOTOMY WITH SOFT TISSUE BALANCE

A distal metaphyseal osteotomy is often effective in correcting a hallux valgus in patients with a flexible intermetatarsal angle and reducible joint, in the absence of significant arthritis (Figures 7, 8). This is especially preferable to a base procedure (osteotomy or arthrodesis) in elderly or

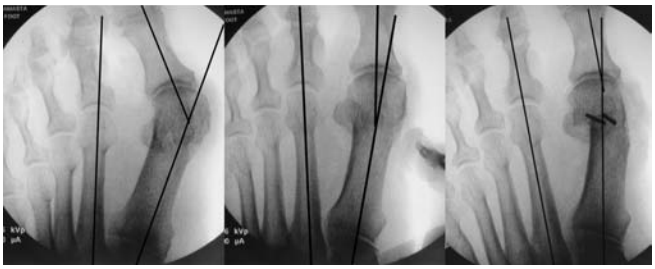

Figure 6. Intraoperative assessment of the intermetatarsal angle prior to surgery (19°), after the interspace release (10°), and following metatarsal osteotomy and medial capsulorrhaphy (10°). The hallux abductus angle reduces from 48° preopetative to 8° both following the lateral release and the osteotomy with capsulorrhaphy. The combined IM + HA angle change (combined bunion angle) decreased from 67° to 18° in this case.

Figure 7. Pre- and post- (1 year) correction of a hallux valgus deformity utilizing a distal osteotomy in combinationwith soft tissue re-balance around the joint. This patient's intermetatarsal angle reduced from 19° to 5° and the hallux abductus angle was reduced from 40° to 8°, or combined IM + HA angle change from 59° to 13°.

Figure 8. Pre- and postoperative (1 year) radiographs following revision surgery on a patient who had a recurrent bunion following a failed base osteotomy. This patient had a flexible intermetatarsal angle and did not have an adequate interspace release during the first surgery. This patient's intermetatarsal angle was reduced from 17° to 9°, and the hallux abductus angle was reduced from 32° to 11°, for a combined IM and HA angle change from 49° to 25°.

Figure 9. Pre- and postoperative (1 year) correction of failed prior bunionectomy with fusion of the first metatarsophalangeal joint, demonstrating change in intermetatarsal angle from 18° to 8°, and hallux abductus angle change from 39° to 11°, for a combined IM + HA angle change from 57° to 19°.

obese patients who cannot withstand the rigorous demands of being nonweight bearing, or for the patient who is at increased risk of a thromboembolic event due to being immobilized/casted following surgery. The healing of a distal metaphyseal osteotomy is more predictable and poses less risk than a proximal osteotomy or arthrodesis procedure, in the opinion of the author.

FIRST MP JOINT ARTHRODESIS

Arthrodesis of the first MP joint is an effective means of correcting a hallux valgus deformity, especially in patients who also have arthritis within the MP or metatarsal-sesamoid joint(s). It is also the author's preferred procedure for patients who have had multiple prior failed surgeries on the first ray, and whose tolerance for additional surgery that may not be definitive is waning. Significant correction of a severe hallux valgus is very effectively and definitively addressed via fusion of the joint (Figures 9, 10). In addition, this is a weight-bearing procedure and is of benefit in patients who are obese, osteoporotic, or for those patients where nonweight bearing is an unrealistic expectation.

SUMMARY

Hallux valgus correction combines reduction of the intermetatarsal and hallux abductus angles, and this is effectively achieved in a majority of patients through a distal osteotomy or arthrodesis procedure. Overuse of the Lapidus arthrodesis has been observed in recent years due to the myth of hypermobility of the first ray, whereby normal sagittal range of motion has been implicated as being

Figure 10. Pre- and postopetative correction of hallxu valgus/rigidus in a patient following fusion of the first metatarsophalangeal joint. The change in intermetatarsal angle was from 16° to 7°, and the hallux abductus angle change from 29° to 10°, for a combined IM + HA angle change from 45° to 17°.

pathologic, requiring a proximal approach to addressing a large bunion. It is the author's opinion that a majority of severe bunions can be addressed through a distal osteotomy, along with appropriate soft tissue rebalance around the first metatarsophalangeal joint. Taking advantage of abundant intermetatarsal flexibility will allow for use of a distal procedure, which allows the patient to be weight bearing, avoids the potential complications of cast immobilization, and reduces catastrophic events associated with failure of a proximal procedure.