

## STRUCTURAL (RIGID) HAV DEFORMITY RELATED TO OS INTERMETATARSIIUM

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Hallux abducto valgus is a complex deformity that can be caused by both biomechanical and structural abnormalities of the foot and first ray. In order to have long-term positive results, surgeons must consider both the structural and positional relationships of the first ray and how they relate to the patient's history and physical examination. Surgical correction of deformities of the great toe joint require a critical assessment of the various possible soft tissue and osseous abnormalities associated with hallux abducto valgus. This paper considers an anatomic variant (os intermetatarsium) and its effect on the first ray, and the surgical ramifications in the correction of hallux abducto valgus.

As in any condition, the initial evaluation of hallux abducto valgus begins with a good history and clinical evaluation. Evaluating the extent of the bunion requires astute observation of the degree of local deformity and how that relates to the range of motion, as well as the patient's general biomechanical examination. It is important to appreciate the flexibility or rigidity of the deformity. The success of the surgical repair requires addressing the under-

lying causes of the deformity via evaluation and eventual execution of the appropriate procedures necessary to achieve consistent repair of the deformity.

In order to formulate an appropriate surgical plan, the mobility of the first ray must be assessed. Flexibility of the first ray in the transverse plane is an important consideration. The degree of flexibility at the first metatarsophalangeal joint (MTPJ) is an important consideration in trying to differentiate the cause of a track-bound joint. Frequently, tight lateral joint structures lead to deformity rather than joint adaptation. The ability of a surgeon to correct hallux abducto valgus deformity in patients with large intermetatarsal angles is predicated upon the first ray being flexible. In a flexible deformity the correction depends upon the lateral release of the soft tissue tightness and the elimination of the dynamic forces of "retrograde buckling." Assessment of the flexibility of the ray is accomplished by applying medial to lateral compression to the first metatarsal head (Figure 1). A distal metaphyseal osteotomy will correct a higher intermetatarsal angle in a more flexible



Figure 1A. Loading of the foot accentuates the deformity.



Figure 1B. Proper technique of assessing the mobility of the first ray.



Figure 2A. Preoperative radiograph of a patient with a hallux abducto valgus deformity and a rigid first ray due to an os intermetatarsium.



Figure 2B. Postoperative appearance after a closing base wedge osteotomy.



Figure 3. Radiographic view of the os intermetatarsium and the resultant intermetatarsal splay at the metatarsal base.

deformity rather than in a more rigid one. A rigid first ray usually requires a more proximal procedure such as a base wedge osteotomy to provide adequate correction of the deformity. If a distal osteotomy is performed in a rigid (structural) deformity, it is more difficult to reduce the intermetatarsal splay significantly, even with a good soft tissue release. As a consequence, many times the medial metatarsal head may be over resected to reduce the remaining bunion. Radiographically, the postoperative appearance may then look like a "C-shaped" metatarsal.<sup>1</sup>

Preoperative radiographs are also an important component of the evaluation of the hallux abducto valgus deformity. Many measurements, positions, shapes and relationships have been described that aid in surgical planning that are beyond the scope of this paper. There are some radiographic findings that are consistently associated with a more rigid first ray, such as an enlarged articular facet between the metatarsal bases and the presence of a rudimentary os intermetatarsium<sup>2</sup> (Figure 2). These anatomic variants cause rigidity to the structural construct of the deformity. The os intermetatarsium causes a widening of the intermetatarsal base articulation, making closure of the intermetatarsal splay more difficult (Figure 3). These findings are an adjunct to the clinical and

surgical treatment plan. Collectively, the detailed examination will then allow the surgeon to formulate a treatment plan for the successful repair of the hallux abducto valgus.

Once the overall status of the foot is assessed, the normal progression of surgical intervention of hallux abducto valgus involves an anatomic approach to soft tissue (muscle/tendon) imbalance combined with metatarsal osteotomies depending on the degree of structural deformity. Many times in the moderate hallux abducto valgus deformity, an intraoperative decision must be made regarding which metatarsal osteotomy will be performed. This decision requires reassessment of the flexibility and/or rigidity of the first MTPJ and first ray, after anatomic dissection of the first MTPJ. The author illustrates that in cases where there is an os intermetatarsium, a closing base wedge osteotomy may be necessary due to the rigidity of the deformity (Figures 4, 5). The most dramatic presentation is a comparison between Figures 5 and 6. Figure 6 is the contralateral extremity of the patient shown

in Figure 5, however there is an absence of the os intermetatarsium. Otherwise it demonstrates similar angular relationships and deformity. However, it was treated with a lateral release and a distal metaphyseal osteotomy due to the deformity being more flexible.

In conclusion, a more proximal osteotomy is appropriate for correction of the hallux abducto valgus deformity in those patients with reduced mobility of the first ray and only moderate amounts of intermetatarsal splay, especially as seen in those patients with os intermetatarsium.

## REFERENCES

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2. Mothershed RA. Proximal procedures of the first ray: Osteotomies of the metatarsal base. In: Banks AS, Downey MS, Martin DE, Miller SJ, eds. *McGlamry's comprehensive textbook of foot and ankle surgery*, 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2001. p. 529-43.



Figure 4A. Preoperative radiograph of a patient with moderate hallux abducto valgus and an os intermetatarsium.



Figure 4B. A closing base wedge osteotomy was performed, satisfactorily reducing the intermetatarsal angle.



Figure 5A. Preoperative radiograph of a patient with moderate hallux abducto valgus and an os intermetatarsium.



Figure 5B. A closing base wedge osteotomy was performed, satisfactorily reducing the intermetatarsal angle.



Figure 6A. Preoperative radiograph of the contralateral extremity of the patient shown in Figure 5. Note the similar deformity, but the absence of an os intermetatarsium.



Figure 6B. A distal metaphyseal osteotomy and lateral release were performed, satisfactorily reducing the intermetatarsal angle.