

ADOLESCENT HALLUX VALGUS

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Adolescent hallux valgus differs greatly from adult hallux valgus. Therefore, it is important to look at this deformity with a very different conceptual framework from that which is usually applied to the adult patient. It is important to note the following:

1. Old ideas regarding adolescent hallux valgus are faulty.
2. The primary etiology of adolescent hallux valgus is adductus at the metatarsal cuneiform level.
3. The adductus foot type leads to high hallux adductus angle and a high proximal articular set angle (PASA).
4. The PASA is very difficult to measure preoperatively.
5. Correction of metatarsus primus varus and the proximal articular set angle are critical aspects for surgical repair in an adolescent patient.

Adolescent hallux valgus is very different from that in an adult patient. There is a very high failure rate in the literature when looking at specific types of procedures. The pathology is different in adults, and therefore distinct analysis and a change of conceptual framework is necessary. (Fig. 1) Many etiologies have been proposed for adolescent

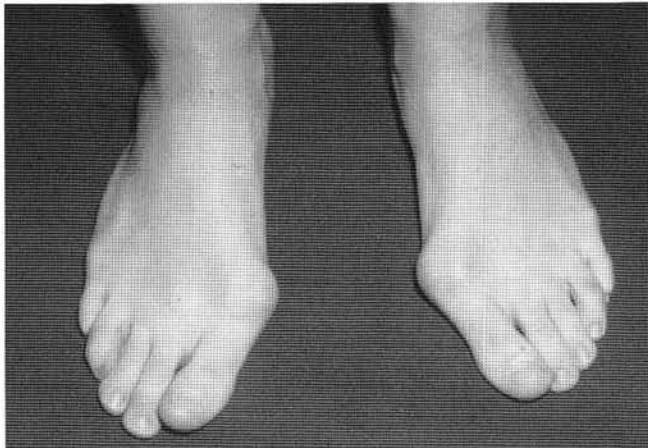


Figure 1A. Preoperative clinical view of a twelve-year-old girl with adolescent HAV. Note the adductus foot type.

hallux valgus, including genetics, equinus, flatfoot, and neuromuscular deformity. Most commonly, however, the real etiologies in the adolescent with severe hallux valgus are metatarsus primus varus and metatarsus adductus deformity.

An interesting study by LaReaux and Lee¹ identified that in adult patients there was a 13% incidence of metatarsus adductus in patients without bunions, and a 35% incidence of metatarsus adductus in adults with bunions. Pontious, Mahan, and Carter² identified a population of adolescent hallux valgus patients who had a 75% incidence of metatarsus adductus. Banks et al.³ also identified a population where 67% had metatarsus adductus in association with adolescent hallux valgus.

RADIOGRAPHIC ANGULAR RELATIONSHIPS

In order to understand the adolescent hallux valgus, it is important to recognize some key radiographic angular relationships. Metatarsus adductus leads to a high hallux abductus angle. This high hallux abductus leads to a high proximal articular set angle (PASA), presumably due to the effect of subluxation of the first metatarsal joint during the child's growth and development. It is also important to note that correction of metatarsus primus varus leads to a higher



Figure 1B. Bilateral AP radiographs showing sufficient metatarsus adductus to influence etiology and treatment of HAV.



Figure 2A Thirteen-year-old boy with closed epiphyses and adolescent HAV. AP radiograph shows metatarsus adductus, high metatarsus primus varus, increased IMA and increased PASA.

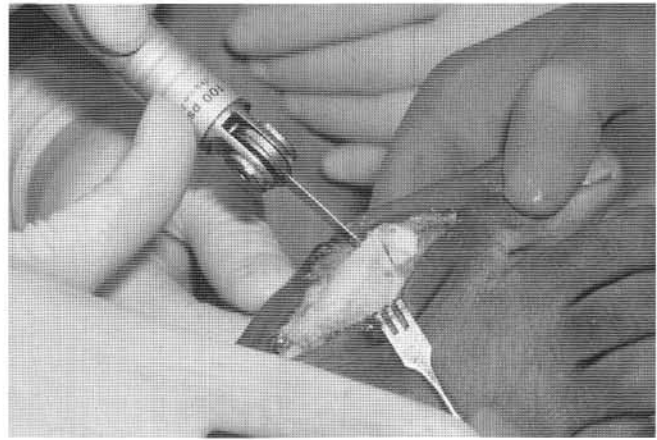


Figure 2B. Intraoperative photo during bone cuts for Reverdin osteotomy.



Figure 2C. Postoperative radiograph showing correction at the base and the head.



Figure 2D. Postoperative clinical photo. The right foot is 3 months postoperative.

tangential articular set angle, the relationship of the slope of the articular cartilage on the first metatarsal to the long axis of the second metatarsal. Therefore, after correction of metatarsus primus varus, it may be even more important to correct the PASA.(Fig. 2)

PASA IS DIFFICULT TO MEASURE PREOPERATIVELY

Unfortunately, the radiographic measurement of the proximal articular set angle is very difficult preoperatively. There is very poor reliability of the radiographic measurement of the proximal articular set angle with poor inter-rater reliability. One study demonstrated that the intra-operative measurement of PASA exceeded radiographic measurements by an average of 7 degrees. Fox and Firschein⁴ noted a wide range of practitioner variability in measurement of the PASA. Sullivan et al.⁵ identified excessive variability in measurement from one practitioner to another. Palladino and Towfigh⁶ noted only a 56% level of acceptance of reliability.

Therefore if this argument is followed logically, and the findings cited in the literature are accepted, the following can probably be agreed upon:⁷

1. PASA should be measured (or evaluated) intra-operatively to determine whether correction is necessary.
2. Metatarsus primus varus needs to be corrected proximally.
3. PASA often needs to be corrected in adolescent hallux valgus deformity.

The proximal correction in the metatarsus adductus patient consists of a base-wedge osteotomy to reduce the intermetatarsal angle. Bi-plane procedures have been described. These types of procedures may achieve partial correction of the IMA and partial correction of the PASA, but they are unlikely to get adequate correction for both in a severe deformity. Most commonly, a Reverdin or a Reverdin-Green procedure is used for PASA correction. Fixation can be achieved with cortical pins. In the author's experience, cortical pins provide stability and disappear without any inflammatory response from the bone. The sequence to these procedures can be debated. Most people would probably correct the PASA before doing the base correction. However the

author prefers to perform the base correction, and then analyze how much PASA correction is necessary before cutting the Reverdin osteotomy.

SUMMARY

The real deformity in adolescent hallux valgus is not the IMA, nor metatarsus adductus; it is metatarsus primus varus, the relationship of the long axis of the first metatarsal to the lesser tarsus. Correction of metatarsus primus varus with a closing base wedge osteotomy should be considered the gold standard. An opening base wedge osteotomy can be considered in short first metatarsals but these are not very common in this situation. A full metatarsus adductus repair with osteotomy of metatarsals 1 through 5 (Fig. 3), or 1 through 4 may occasionally be necessary in order to achieve adequate correction. A Fowler opening wedge cuneiform osteotomy can also be performed. This does provide some correction of the angle of the first metatarsal cuneiform articulation and also provides some stability to the first metatarsal cuneiform articulation.

Capital osteotomies such as the Austin by themselves do have an important role in adolescent hallux valgus. That role is restricted to those situations where there is a moderate intermetatarsal



Figure. 3. Metatarsus adductus 1 through 5 correction. Oblique radiograph showing screw placement.

angle, the foot is relatively rectus, and there is no high PASA. The intermetatarsal angle cannot be adequately corrected in the severe adductus foot by use of a capital osteotomy. Instead, the adductus foot requires proximal metatarsal correction. Metatarsus primus varus angle correction is extremely critical in adolescent hallux valgus. Correction of PASA is probably the most important key in prevention of recurrence. Capital osteotomies need to be reserved for moderate IMA.

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