JUVENILE AND ADOLESCENT HALLUX VALGUS

The development of a hallux valgus deformity in children and adolescents is actually an uncommon entity. Most of these occurrences can be treated nonoperatively. Surgery is often deferred until skeletal maturity because of historically high recurrence rates and inconsistent results.

An arbitrary division of hallux valgus occurring in childhood can be made by age at presentation. Patients are divided into juvenile and adolescent age groups. While most of the factors you see listed here do apply to one type of hallux valgus deformity more than the other, there is a good deal of overlap as well between the juvenile and adolescent groups. The juvenile hallux valgus deformity usually is present between the ages of six and ten years of age and is associated with metatarsus primus varus, as well as metatarsus adductus. Often the first MTP joint is congruous in a valgus position, and, therefore, has a lateral slope to the hallux MP joint or an increased DMAA. Hallux valgus interphalangeus is also quite common in these patients, and the first metatarsal cuneiform joint is often inclined medially. Accessory navicular and pes planus commonly occur in this clinical group. Also showing up in this age group are certain congenital and neuromuscular causes of hallux valgus, such as cerebral palsy or connective tissue disease such as Ehlers-Danlos syndrome.

Adolescent hallux valgus occurs between the ages of 10 and 18 years and usually presents with less deformity than one sees with the juvenile variety. There may be a much smaller medial eminence, and the patient usually will have a hypermobile first ray. The main problem with which these patients present to the orthopaedist is that of a wide forefoot that is not well accommodated in a fashionable shoe.

Juvenile and adolescent hallux valgus are very different from the adult hallux valgus deformity because the younger patient has open physes and growing feet. There is a certain amount of biologic plasticity, if you will, that can lead to a progressively worse deformity with the stresses incurred across the physis. The juvenile hallux valgus complex is associated with a very high recurrence rate when operated, and there is usually a great amount of parental and sometimes grandparental concern. Physical and psychological immaturity play a big role in managing the juvenile hallux valgus deformity. I think the slide on the right of a girl who presented with a tattoo on her speaks volumes for what the orthopaedist is dealing with here.

The juvenile hallux valgus deformity is almost never associated with degenerative joint disease, and bursal thickening is rare. There is usually much less pronation, and the sesamoids are not subluxed as severely as they are in the adult. The joint is congruent in at least 50 percent of the juvenile hallux valgus cases. A congruent joint is one that has a concentric reduction. An incongruent joint is one that is subluxed.

In 1995 Michael Coughlin presented and later published the results of his 11-year retrospective study of 60 feet operated for juvenile hallux valgus, paying particular attention to the distal metatarsal articular angle. He took a multi-procedural surgical approach, performing a Chevron or modified McBride bunionectomy for patients with mild deformities. A distal soft tissue
procedure with first metatarsal osteotomy was employed for correction of moderate and severe deformities with MTP subluxation. A double osteotomy or extraarticular correction was used in cases of moderate and severe deformities with an increased DMAA.

The distal metatarsal articular angle defines the relationship of the articular surface of the distal first metatarsal to the metatarsal's longitudinal axis. The DMAA in the slide on the right is represented by the angle Alpha. Alpha plus Beta equals 90 degrees.

These two slides provide excellent examples of, on the left, a congruent first metatarsophalangeal joint that is still in valgus, and, therefore, has an enlarged distal metatarsal articular angle. This is a case of juvenile adolescent hallux valgus. The slide on the right represents a case of acquired or adult hallux valgus in which the distal metatarsal articular angle is close to 0 degrees. The joint is incongruent and in severe valgus.

Piggott published an interesting study of hallux valgus appearing in adolescents and early adult life in 1960. He wrote that in the normal foot, the articular surfaces of the first metatarsophalangeal joint usually are not set strictly at right angles to the long axes of their supporting bone. On the right you see the longitudinal K-wire in line with the direction of the first metatarsal shaft. The articular surface at the distal end of the first metatarsal is oriented in significant valgus.

These slides show radiographic and intraoperative examples of a patient with a very large distal metatarsal articular angle. In Piggott's 1960 study, he found that in the adult or acquired cases of hallux valgus, more than 90 percent of his patients had an incongruent first MTP joint. Coughlin's 1995 study was significant in that in his patients with juvenile hallux valgus, almost 50 percent were congruent.

Coughlin concluded that the juvenile hallux valgus is a very different clinical entity than acquired hallux valgus. He also found that no one single operation works for every case that presents. The key to a successful surgical management of the patient with juvenile hallux valgus was a preoperative appreciation of the distal metatarsal articular angle, which he felt may be the defining characteristic of juvenile hallux valgus. Another way to think about this is to think of the juvenile onset hallux valgus as a completely different entity from the adult acquired hallux valgus deformity. As you increase the degree of hallux valgus with congruency maintained, you increase the distal metatarsal articular angle, and, therefore, have a congenitally more dysplastic foot.

Coughlin's study also helped to dispel some common myths about juvenile hallux valgus. He concluded that pes planus, the presence of open physes, and metatarsus adductus, as well as probably the presence of a long first metatarsal do not in and of themselves cause hallux valgus, nor do they preclude the successful surgical treatment of juvenile hallux valgus.

Careful assessment of the hallux valgus complex is in order. The two main indications for surgery are pain and/or progression of deformity. The surgeon must also address the skeletal and psychological maturity of the patient and address as well patient and family expectations. Many patients with deformity occurring in this age group can be quite unrealistic in their expected postoperative shoewear.
On exam one must check very closely for generalized ligamentous laxity, scoliosis, or pectus deformities. One must rule out neuromuscular disease such as cerebral palsy or connective tissue disease such as Ehlers-Danlos syndrome. The mobility of the first ray, as well as the orientation of the first metatarsal cuneiform joint must be addressed, and the patient should be checked for fixed pes planus and hindfoot valgus, which can occur in up to 41 percent of these patients. One would also want to look for heel cord contractures and an accessory navicular. These patients will have a high degree of tarsal coalition and metatarsus adductus. Callosities are evidence of transfer metatarsalgia.

Also in your exam try and locate the area where the patient hurts the worst, whether it is over the medial eminence itself, under the sesamoid, or deep within the hallux MTP joint. The grind test is a maneuver in which axial pressure is exerted across the joint, and the test is positive if it elicits pain. Usually this maneuver is more remarkable in the adult with osteoarthrosis. Make a careful assessment of the range of motion of the joint and find out if the valgus deformity of the great toe is passively correctable to a neutral hallux valgus angle. Make careful note of any pronation of the hallux.

There are many points to evaluate on the x-ray. The normal hallux valgus angle is well less than 15 degrees, and the first metatarsus adductus is usually less than 9 degrees. One series reported that 70 percent were less than 11 degrees. One should also check for hallux valgus interphalangeus and the degree of subluxation of the sesamoids.

Make sure you check the slope and distal metatarsal articular angle for the hallux metatarsophalangeal joint. Check whether this joint is congruent, deviated, or subluxed. A congruent joint is one that is concentrically reduced. The incongruent joint is subluxed. This is the case in close to 50 percent of those patients with adolescent hallux valgus.

Check the inclination of the first metatarsal cuneiform joint, because this is usually proportional to the degree of the first intermetatarsal angle. The horizontal first MC joint usually resists spreading and increases in the first intermetatarsal angle. The oblique first TMT, however, does correlate with an increased IM angle. A curved first MC joint is one that has more mobility, and, therefore, also is associated with a higher degree of intermetatarsal angle. The presence of an intermetatarsal facet should be noted because this will present a block to attempts at surgical reduction of the first intermetatarsal angle.

Be careful to check the length of the first metatarsal relative to the second, and look for cortical stress hypertrophy of the longer second metatarsal.

One should obviously note whether the physes are open and whether there is any degree of metatarsus adductus, as trying to change the first intermetatarsal angle in these cases may end up with a negative value if the adductus is severe. Check the size of the medial eminence and whether there have been any subchondral or sub bursal cysts that have formed.

Nonoperative treatment is indicated for the majority of juveniles and adolescents with hallux valgus. We would especially propose nonoperative treatment, perhaps in the form of a soft arch support and shoe wear modifications, for the patient with hyperelasticity and/or significant pes planus. The most successful results of nonoperative treatment for adolescent hallux valgus have been achieved with roomy footwear. It is impractical to think adolescents will wear shoes that
look like those pictured on the right, but fortunately, current fashion trends tend to favor girls wearing work boots, hiking boots and oxfords to school.

The adolescent with asymptomatic mild bunion deformity should be observed for progression. The patient with the moderately severe deformity should probably undergo conservative treatment until the surgeon is sure the patient is mature enough to cooperate.

Operative treatment for adolescent hallux valgus is individualized. Soft tissue repair alone is usually inadequate for obtaining a long-term satisfactory result. The successive operative management tends to parallel the degree of correction of the first intermetatarsal angle. The presence of an open first metatarsal physis does not necessarily correlate with recurrent hallux valgus if the procedure is done correctly. An open physis usually necessitates an osteotomy through the cuneiform. We know that the Akin procedure alone is inadequate, and the Keller procedure is contraindicated in this age group. We want to avoid malunion of the osteotomy, want to maintain mobility of the first toe joint, and we want to fix these osteotomies securely. The surgeon should avoid the temptation to do a very generous medial exostectomy.

The Chevron and Mitchell distal first metatarsal osteotomies are indicated for the patient who has a congruent or perhaps slightly incongruent first metatarsophalangeal joint. The hallux valgus angle should be less than 30 degrees and the first IM angle less than 15 and preferably closer to 12 degrees when applying these techniques. It helps if the hallux valgus is passively correctable on physical exam preoperatively. We don't want to do a Mitchell osteotomy in the patient with a short first metatarsal, and neither of these procedures will work well in the patient with generalized hypermobility.

This is an example of a young woman who had just reached skeletal maturity and had an adolescent hallux valgus deformity. Her preoperative first IM angle was 14 degrees and the hallux valgus angle 28 degrees. A distal Chevron osteotomy with varus impaction of the capital fragment was performed, providing an excellent correction of the first IM angle to 4 degrees and a neutral hallux valgus angle.

The distal soft tissue procedure, combined with proximal osteotomy, is your workhorse for the incongruent first MTP if you can avoid the proximal physis. This can be applied to the patient with essentially any hallux valgus angle or intermetatarsal angle, but does not work well in realigning the already congruous hallux MTP joint that has an increased DMAA.

This is a clinical example of a patient with moderately severe hallux valgus and a subluxed second hammer toe. Through the first wound the fibular sesamoid is freed up, the deep transverse intermetatarsal ligament divided, a lateral hallux MP capsulotomy performed, and the transverse and oblique heads of the adductor hallucis released. The medial wound is used for medial exostectomy and medial capsular plication. The proximal crescentic osteotomy is done through the third wound, and in this case, a fourth wound was used for the hammer toe repair.

This is a case of acquired hallux valgus with an incongruent first MTP joint that was successfully repaired with a distal soft tissue procedure (essentially a modified McBride bunionectomy) and proximal metatarsal osteotomy secured with a cancellous screw and bone grafting from the medial eminence.
This is an example of a case where the distal soft tissue procedure and proximal osteotomy were applied inappropriately. A careful check of the preoperative films here reveals a congruent valgus HMP joint with a DMAA of 25 degrees. The proximal osteotomy and the distal soft tissue realignment here actually overcorrected the joint and converted it from congruent to incongruent, stiff and potentially arthritic.

The operative indications for the opening wedge osteotomy, either at the base of the first metatarsal or in the first cuneiform, would include the patient with a short first metatarsal or a very significant intermetatarsal angle. The patient with an oblique first metatarsal cuneiform joint and the young patient with open physes are usually benefitted by this procedure. This is a patient who presented at 13 years of age in 1985 with hallux valgus and open physes. A distally based closing wedge osteotomy of the first metatarsal was coupled with a more proximal opening wedge osteotomy of the middle cuneiform.

Subsequent hardware removal was performed, and she presented with eight years of good follow-up and maintenance of her reduction and a congruent first MTP joint.

The Akin procedure is best employed as an adjunct to other procedures. One can perform a double osteotomy for the patient who presents with a congruent valgus first MTP joint with an increased DMAA. A metatarsal osteotomy is used to diminish the first intermetatarsal angle, and the Akin proximal phalangeal osteotomy then diminishes the valgus of the great toe. This procedure is best applied to the patient with a laterally sloped HMP or increased DMAA and a congruent joint. Intra-articular realignment would lead to pain and stiffness. An extra-articular repair is needed. The Akin procedure can also help the patient with an already short first metatarsal.

This is an example of a patient who presented with a very short first proximal phalanx and a deeply concave, congruent first MTP joint. The patient had an increased IM angle and also an increased distal metatarsal articular angle. The patient underwent a distal Chevron osteotomy of the first metatarsal and an Akin osteotomy of the proximal phalanx.

Postoperative care of the adolescent includes casting for compliance if necessary. The patient should be kept in a full-time toe spica wrap that the surgeon changes himself for the first six weeks and a night wrap or spacer for the second six weeks after surgery. You need to protect their weight bearing. Recurrence or persistence of hallux valgus in the adolescent patient is usually due to a failure of correction of the intermetatarsal angle or incompletely correcting the hallux valgus angle. This may also be caused by not appreciating the particular pathoanatomy of the first metatarsal cuneiform joint preoperatively. These are usually failures of preoperative assessment, either not appreciating the particular pathoanatomy or performing the wrong procedure on the wrong patient.

One must resist the temptation to perform that one procedure that the surgeon is most comfortable with on every patient he sees. There is a reason why there are more than 130 bunionectomy procedures in the orthopaedic and podiatric literature. Complications include recurrence or persistence of the hallux valgus and often lead to revision surgery.

Remember, that if the valgus joint is already congruent, then an intra-articular repair such as a Chevron or distal soft tissue procedure with proximal osteotomy may lead to an incongruous
joint, persistent or recurrent hallux valgus, and in these cases the surgeon must consider an extra-articular repair as the procedure of choice.

Remember our patient with the ill-advised distal soft tissue procedure and proximal osteotomy in light of an increased DMAA.

In summary, one must remember that kids are not just little adults. They are actually quite different in many ways. To get the best result, the surgeon must appreciate the particular pathoanatomy of the patient involved, and you must correct all elements of this deformity. Beware of the older patient or older adolescent who presents late with persistence of a congenital bunion deformity. Just because the patient presents as an adult does not mean that this is an adult or acquired hallux valgus deformity. The slide on the right represents a patient who had a horrendous deformity that had been there ever since she was young, but did not present for treatment until she was an adult. Again, there is no single procedure suited for all patients.

Treat these patients nonoperatively whenever possible and maintain soft tissue balance at the hallux MTP joint when you do operate them. Make sure you correct the first intermetatarsal angle and avoid an overzealous medial exostectomy. Cast the patient for compliance if necessary.