JUVENILE AND ADOLESCENT HALLUX VALGUS

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Introduction

The disorder of juvenile and adolescent hallux valgus presents considerations that are quite different from surgery for hallux valgus in an adult. These considerations include the presence of epiphyses, etiologies sufficiently powerful to cause deformity in a young individual, and the difficulty of deciding the timing of the surgery with respect to bone growth. The deformity differs from that of the adult by demonstrating less valgus rotation of the digit and an absence of chronic tissue reactions such as degenerative joint disease and bursal thickening.

The patient with juvenile hallux valgus usually presents for evaluation somewhere between the ages of 11 to 14. During this time period children become much more aware of their own bodies and how they are perceived by others. The desire to begin wearing stylish shoes also appears around this age and this may initiate symptoms in a previously asymptomatic patient. A parent who suffers from a bunion deformity may also bring in their similarly-afflicted child for evaluation around this age.

Incidence and Etiology

Some studies suggest that approximately 50% of adults with hallux valgus remember their deformity beginning during their teens or earlier (1). This would seem to indicate that many children in this age range already have at least an incipient hallux valgus. The patient with a full-blown deformity severe enough to be visually noticeable and/or symptomatic is more unusual. Whatever the incidence it is clear that females with hallux valgus after the age of 14 outnumber males by at least three or four to one (2). One study reports blacks outnumbering whites with hallux valgus by five to one (2).

For a child to develop a deformity that is usually only developed much later in life there must be unusually powerful forces at work. Some etiologies that have been suggested include heredity, metatarsus adductus, pes valgus deformity, equinus, and other forces causing a hyper-pronation syndrome (3, 4). The inheritance of hallux valgus is considered to be by means of an autosomal dominant pattern with incomplete penetrance. It may be that full penetrance results in a deformity that presents earlier in life and/or a more severe deformity. The concept that pes valgus deformity may result in a hallux valgus was best stated by Hohman who noted that "Hallux valgus is always combined with pes planus and pes planus is always the predisposing factor in hallux valgus" (5). Like all truisms, Hohman's is overstated but fairly well reflects clinical experience.

It is most likely that pes valgus deformity and other etiologies that cause excessive pronation initiate the development of hallux valgus by creating dynamic muscle imbalance. Metatarsus adductus is also frequently seen with juvenile hallux valgus and may initiate the development of hallux valgus both by compensatory pronation and structural metatarsus primus varus. Other possible etiologies include cerebral palsy and other neurologic disorders, rheumatoid arthritis, and trauma. A long first ray has also been implicated by many authors as a frequent cause of juvenile hallux valgus (1).

Non-operative Care

There are a limited number of non-operative treatments for juvenile hallux valgus. Splints, toe wedges, bunion shields, and wide shoes may reduce symptoms temporarily in mild to moderate cases. It is difficult to call this approach conservative because during the time that this limited therapy is being employed, progression of deformity with further joint accommodation and cartilage deformation may occur. Biomechanical control with orthoses may prove useful in certain situations where the following criteria apply:

1. the etiology of the deformity is biomechanical, and the foot is controllable with orthoses,
2. the bunion deformity is not significantly painful, and
3. the deformity itself is not severe (no overlapping second toe) and is still flexible.

More commonly, biomechanical control is used as a postoperative follow-up to control deforming forces and prevent recurrence.

Surgical Treatment: When to Operate

Although non-operative care of juvenile hallux valgus is not usually very promising, nonetheless the decision to operate must be made in accordance with accepted criteria. The goals of surgery are to relieve pain, restore joint function, prevent progression of deformity, and improve cosmetic appearance. Surgical indications can be broken down into three categories: pain, deformity, and cosmetic. The indication for surgery when there is pain and limitation of activity is relatively straightforward.

Progressive deformity is also an important indication for surgery. The presence and progression of deformity during a period of bone and soft tissue growth can result in severe joint and soft tissue adaptation. It is quite common to see a badly deviated joint with a high proximal articular set angle in a pediatric patient. The longer the deformity is present, the more difficult is the surgical correction. For this reason, preservation of joint function can best be accomplished when surgical intervention for severe deformity is not delayed.

Cosmetic indication is mentioned last among the indications because it is the least important. However, when there is a rather obvious bunion deformity present that is of significant concern to the patient, improvement of cosmetic appearance is a legitimate indication for surgery as long as the patient truly has an informed understanding of the potential risks and probable benefits of the surgery. In a static deformity without apparent joint dysfunction, the surgeon should first make an effort to discourage surgery for the sake of cosmetics alone. "First do no harm".

Whether or not to do surgery is an important decision but so is the decision as to the *timing* of any surgery. In particular, there are two schools of thought as to whether or not surgery should be contemplated prior to the completion of bone growth. Some authors advocate delaying any surgery until bone growth is completed so that no damage can occur to the epiphysis. So long as the deformity is static, delaying surgery might be prudent in the asymptomatic foot with hallux valgus. Unfortunately, this approach has been used too often as an inviolate rule. Too many of us have seen the severe deformities that can occur when deformity is allowed to progress while waiting for bone growth to be completed.

Simmonds and Menelaus noted that their best surgical results occurred with patients who were operated on before the foot was fully grown, usually in the age rage of 11-15 years (6). In a painful or progressive deformity or one that is moderate to severe, surgery should not be delayed for a prolonged period of time.

Surgical Approaches

There are somewhere between 150-200 surgical procedures that have been described for repair of hallux valgus deformity. Most of these have failed to stand the test of time. Current approaches can be broken down into base procedures, head osteotomies, soft tissue procedures, hallux osteotomies, and epiphysiodesis. These approaches have been described as being used alone or in combination with each other.

Base procedures include closing and opening wedge osteotomies, crescentic osteotomy, and Lapidus fusion. These procedures are useful because they attack the increased intermetatarsal angle more effectively than head procedures. This is particularly important in metatarsus adductus. The Lapidus fusion results in significant shortening of the ray and should only be used where there is instability of the first metatarsocuneiform joint and a relatively long first ray. The crescentic osteotomy provides correction in multiple planes but it is extremely difficult to achieve stability of this osteotomy. Opening wedge osteotomies increase the length of the ray and are useful when the first ray is short. However, as noted earlier, it is more common to have a long first metatarsal in juvenile hallux valgus.

The closing abductory wedge osteotomy is the most useful procedure to reduce the increased intermetatarsal angle. The technique can be performed as either a transverse or oblique osteotomy. In either technique the position of the first metatarsal base epiphysis must be noted and avoided. Because of the rapidity of bone healing in children, removable Kirschner wire (K-wire) fixation is more than adequate.

There are numerous head osteotomies that have been used in the correction of juvenile hallux valgus (7, 8). These include: Austin, Mitchell, Reverdin, Wilson, Roux, and Peabody. Ideally, the head osteotomy should be used to reduce the apparent intermetatarsal angle as well as any increased proximal articular set angle. The decision as to which procedure to perform is dependent upon several factors including the rigidity of the deformity, the displacement necessary for correction of the intermetatarsal angle, the adequacy of the bone stock, and the etiology of the deformity. The final decision on which osteotomy to perform should not be made until after inspection of the joint surface. A traditional Austin osteotomy will not be adequate to correct a deformity with a severe proximal articular set angle. Similarly, a Reverdin osteotomy may not achieve significant reduction of the intermetatarsal angle if flexibility of the ray is limited.

"Cheater" Akin procedures are detrimental in juvenile

hallux valgus surgery when they are used to substitute for adequate correction of the proximal articular set angle. When a toe is straightened on a joint that is still deviated, the joint will never function properly. Soft tissue release and muscle tendon balance must be performed in conjunction with any other procedures that are selected. It is uncommon for a McBride type bunion repair to be adequate as a solitary procedure in juvenile hallux abducto valgus. Sesamoidectomy should not be performed. Rather, soft tissue release and adductor tendon transfer should be utilized to restore function to the sesamoids.

Epiphysiodesis has recently come to the attention of podiatric surgeons because of an article by Fox and Smith in 1983 (9). The concept of controlling the final position of the first metatarsal by stopping the growth on one side of the epiphysis is fascinating and the reader is referred to the original article by Fox and Smith. However, it should be noted that their report is only preliminary since it discusses surgeries on only four patients (six feet). Another report by Ellis discusses surgeries on 20 feet but there was no followup longer than 14 months (10). Epiphysiodesis by bone graft is irreversible (unlike a custom staple technique) and predicting the exact amount of bone growth that any one child may have left is imprecise at best (11). The unpredictability of the procedure, combined with the irreversibility of the bone grafting technique should give the surgeon cause for thought prior to performing the procedure.

Ancillary Procedures

Removal or control of deforming forces must be considered an integral part of the repair of juvenile hallux abducto valgus. This means that it is not uncommon to perform pes valgus correction, metatarsus adductus repair, and/or heel cord lengthening in conjunction with the bunion repair. The decision as to whether or not to perform ancillary procedures should be based on the degree of control that can be achieved over the foot without such procedures. This decision is made more difficult by the fact that the area of secondary attention is often without symptoms. Nonetheless, forefoot adductus, pes valgus deformity, and gastrocnemius-soleus equinus must be carefully evaluated prior to surgery.

Failure

Failure in juvenile hallux abducto valgus surgery generally has to do with recurrence. Scranton and Zuckerman noted a failure rate of 35%, 56% in patients with flatfeet and 50% of those with a long first ray (12). Helal reported the following failure rates: 34% with the Peabody, 54% with the McBride, 43% with the modified McBride, and 40% with Joplin's procedure (13). Although these failure rates are clearly higher than those experienced by most well-trained foot surgeons, they point up the need for accurate procedural selection and control of deforming forces.

Summary

Juvenile hallux abducto valgus surgery can be most gratifying when it is performed for the proper indications. Procedure selection, timing, and control of deforming forces are the most important factors associated with a successful result (14, 15).

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