CHAPTER 3

THE COLLAPSING PES VALGO PLANUS FOOT

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It can be considered bold to designate anyone as the Father of any particular aspect of foot and ankle surgery. In the case of flatfoot surgery, I feel confident that there would be little disagreement with the statement that E. Dalton McGlamry, DPM is the father of modern collapsing pes valgo planus (CPVP) surgery. More important than his introduction and popularization of certain procedures has been his consistent underlying philosophy regarding the significance of the pathology. Much of the medical community has looked upon CPVP surgery as a cosmetic exercise, seeing little functional importance. Early on, Dr. McGlamry recognized the destructive effects of equinus and CPVP along with the dysfunctional pain they inflict upon patients.[1] Perhaps now, with the much greater awareness of tibialis posterior dysfunction (TPD) in the adult, we can see that CPVP is the precursor in a continuum of failure of the stabilizing mechanisms of the foot with eventual collapse.

PATHOLOGY

Equinus is a severely destructive force, either as a primary aspect of the deformity or as a secondary result of the CPVP. When the equinus is the primary deforming force, compensation will occur in distal joints such as the subtalar joint (STJ) and the midtarsal joints. How that compensation becomes expressed in a particular way is unclear. The hypothesis of planal dominance is helpful in explaining some forms of compensation.[2] This hypothesis is based on two premises: 1. The axis of motion of the STJ can vary widely, with extremes being a vertical, horizontal, or longitudinal axis. The average STJ axis of 42 degrees up from the transverse plane, 16 degrees medial from the longitudinal axis, may in fact exist. More common is a large amount of variation from the normal. 2. Compensation occurs in a plane perpendicular to the STJ axis. Thus a STJ with a vertical axis will compensate in the transverse plane.

There are difficulties with the planal dominance hypothesis. First, it is clear that the motion of the STJ is much more complex and dynamic than can be explained with planal dominance. Second, the axis of the STJ can only be inferred clinically and not measured. We infer the axis of motion based upon radiographic and clinical findings. Radiographically, some joint relationships are thought to be representative of certain axes. For example, a high cuboid abduction angle combined with reduced talo-navicular articulation are interpreted to be representative of transverse plane compensation from a vertical axis. Clinically, one can place the STJ through its range of motion and appreciate, in some patients, a tendency for motion to occur predominantly in one plane. Nonetheless, the planal dominance hypothesis is a useful way to initially look at feet with CPVP.

Regardless of where the pathology occurs, the primary element of the pathology is instability. The medial column is most often visible as the area of greatest instability. This is apparent in static stance as a lowered medial arch with heel valgus. In gait, the medial column is seen to be initially stable with collapse of the arch during midstance and heel-off. Within the medial column, the instability can occur at the talo-navicular joint, the navicular cuneiform joint, or the first metatarsocuneiform joint. In the severely collapsed foot (usually an adult), instability can also occur at the ankle level, with stretching and failure of the deltoid ligament. In the child, compensation seems to occur more often at the talo-navicular joint. Medial column instability was once thought to be the primary deformity, and consequently was the subject of numerous surgical approaches. These included soft tissue re-balancing procedures such as the Kidner or Young, and fusions such as the Hoke and the Miller. The Lowman procedure combined elements of both.[3]

Other approaches addressed the rearfoot either through the orientation of the calcaneus (Silver, Koutsogiannis) or by blocking of excess subtalar motion (Gleich). Although lateral opening wedge osteotomies seem logical for frontal plane dominant CPVP, they have diminished in popularity in recent years because of the greater

multi-planar changes effected by the Evans osteotomy. The subtalar blocking approach remains popular with the use of a variety of arthroeresis devices.

ETIOLOGY

Donald R. Green, DPM, San Diego, California, has written and lectured extensively on the biomechanics of CPVP. He describes the following as etiologies of CPVP:[3]

1. Forefoot varus
2. Flexible forefoot valgus
3. Equinus
4. Congenital talipes calcaneovalgus
5. Torsional abnormalities
6. Muscle imbalance
7. Ligamentous laxity
8. Neurotrophic feet
9. Any factor (such as obesity) that produces a medial shift in weight bearing

EVALUATION

Evaluation of the CPVP foot is complex. It is critical to identify the primary deforming force and the primary site of compensation. These components of evaluation include structural examination, muscle inventory, biomechanical evaluation, radiographic analysis, Hubscher maneuver, clinical gait analysis, and quantitative gait analysis.

Once the evaluation is complete, the physician can consider the benefits of surgical versus conservative care. Indications for surgical repair include pain unrelieved by conservative care, progression of the deformity, instability, and deformity. These indications are modified by the patient's age, weight, degree of pathology, functional demands, and response to conservative care.

PODIATRY INSTITUTE EVOLUTION

The Podiatry Institute approach has evolved considerably over the past 25 years. Initially, the Young suspension was used, based on outstanding results reported in the European literature. The response was good, particularly for creating some plantarflexion of the first ray, and stabilizing the navicular cuneiform joint. Advancement of tibialis posterior was then added to create some transverse plane stability. Later, additional tendon work was recommended, including flexor digitorum longus transfer and peroneus brevis to longus anastomosis. Tendo Achillis lengthening was added early on to reduce the deforming forces created by equinus. Later still, the Evans calcaneal osteotomy was added, after James V. Ganley DPM had introduced it to the profession.[4]

TREATMENT

The Evans calcaneal osteotomy is an impressive procedure that creates significant stability in the rearfoot and midfoot without arthrodesis. Originally described by Dillwyn Evans as a procedure for treatment of over-corrected clubfoot and rigid flatfoot, the procedure became useful as a treatment for CPVP.[5] The procedure involves an anterior calcaneal osteotomy with lengthening of the lateral column with a bone graft. This procedure has become the dominant flatfoot procedure among The Podiatry Institute faculty.

Some critical elements for success of the Evans calcaneal osteotomy include:

1. Oblique incision, with careful attention to avoid the sural and intermediate dorsal cutaneous nerves.
2. Reflection of the EDB muscle belly, being careful not to disturb ligamentous attachments at the dorsal calcaneal cuboid joint.
3. Through-and-through calcaneal osteotomy, about 1 cm proximal to the calcaneal cuboid joint. It should be angulated slightly distal as well.
4. Distraction of the osteotomy with a baby lamina spreader or with pins and distractor to facilitate insertion of a truncated wedge of allogeneic or autogenous iliac crest (tri-cortical bone). The graft is usually about 1 cm at its widest part and tapers to 7 mm medially. An additional piece of graft can be applied to fill the remainder of the defect, although it is not mandatory.
5. Fixation of the graft is left to the judgement of the surgeon.
6. Check the sagittal plane alignment, particularly laterally. Check the patient for equinus and correct as necessary.
7. Maintain the patient in a non-weight-bearing cast for 8 weeks and allow protected weight bearing after that point, if radiographs show good consolidation.

The sagittal plane correction in the lateral column occurs with plantarflexion of the cuboid on the calcaneus. The mechanism for this plantarflexion originates with the plantar calcaneal cuboid ligaments. As the lateral column is lengthened, the ligaments become stretched, and the cuboid and calcaneus are drawn toward each other, resulting in an increase in the calcaneal pitch. The procedure is effective in realigning the talo-navicular joint, and reducing the cuboid abduction angle.[6]

Can the Evans be performed as an isolated procedure? Yes, however, the author rarely performs it alone. Augmentation by medial column fusions and tendon balancing procedures will help reduce the forefoot varus and increase stability within the medial column. The author usually performs the medial column tendon suspension, consisting of the Young suspension of tibialis anterior through the navicular, advancement of tibialis posterior, and possibly tightening of the spring ligament. In sequence, the lateral osteotomy is performed first, and then the medial column is checked for position and stability with the lamina spreader holding the osteotomy open. The medial column is then opened if necessary, and the suspension performed. The procedure is easier to perform before the Evans bone graft has been inserted, which reduces mobility of the midfoot. Mosca[6] uses a medial cuneiform osteotomy to address medial column position and adductus of the forefoot (skewfoot).

SUMMARY

The CPVP foot is a surgical challenge. Recognition of the morbidity created by instability in the foot and ankle is increasing, but the general medical community is still generally unaware of the significance of CPVP. The Evans is a powerful and important procedure for stabilizing the foot. The medial column suspension improves both position and stability.

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