

Treating Pediatric Clubfoot and Pes Planus



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The word *orthopaedic* has two ancient Greek roots: “*orthos*” meaning straight or right, and “*paideia*” referring to the rearing of children. Thus, the original term pertained to the treatment of disorders of the bones and joints and the correction of skeletal abnormalities in children. It was probably believed, and

it is generally still the case, that the earlier a deformity is addressed, the better the chances for success.

Congenital Clubfoot

This is certainly true for talipes equinovarus (TEV), more universally known as clubfoot, one of the most common congenital birth defects of the foot. Although the incidence varies somewhat according to race, TEV occurs in about one out of every 1,000 births, with the occurrence in boys being twice that of girls. Clubfoot is seen unilaterally and bilaterally; bilateral presentations make up approximately half of the cases. The etiology of the disease is not clearly understood, and many believe the causes to be multi-factorial, including genetic considerations, the intra-uterine environment, and a variety of abnormalities related to the development and insertion of muscles, tendons, and ligaments. Regardless of the origin, it is important to identify congenital clubfoot as early as possible for two reasons: to begin immediate treatment to address and correct the deformity, and to rule out other, more serious diseases that may be masking as TEV, such as neuromuscular disorders, spinal tumors, or even trauma.

Conservative Clubfoot Treatment Options

A number of conservative treatment options are available to correct flexible clubfoot. Based on the severity and duration of the condition, a practitioner may employ one or several of the following treatments:

Serial Casting: This is the most traditional technique to treat clubfoot. The Ponseti method is considered a successful way to incrementally correct the deformity. Serial casting relies on the “stress relaxation” effect to stretch the contracted ligaments and tendons—much like a rubber band losing its tension when it is continuously overtaut.

During casting, the clubfoot should be manipulated from distal to proximal, beginning by first correcting the forefoot adduction and varus. The equinus component is addressed later, often surgically, and care must be taken that the castings do not create a “rocker bottom” foot. To avoid slippage and address any tibial torsion, casts typically run above the knee. Casts are changed frequently, often weekly, and may continue for several months. The amount of correction is increased gradually with the goal of creating a foot that is plantargrade, functional, and stable. Progress is monitored by x-ray.

Denis-Browne Bar: Once serial casting has achieved the correction, the correction can be maintained by using appropriate

The typical clubfoot is turned inward and down in a classic cavo-adducto-varus presentation. Radiographic analysis will confirm the diagnosis of TEV; one will often see a talar head that is deformed and irregular, a talo-calcaneal angle that is decreased, and a talo-first-metatarsal angle that is increased. In unilateral cases, the clubfoot side is often shorter, and there are deep-seated medial skin creases. If the foot is correctable, conservative measures should begin immediately—as early as neonatally—since the deformity is progressive. Left untreated, joint contractures and accommodations will develop into a rigid clubfoot. Patients with rigid clubfoot should be referred as surgical candidates.

Flexible Flatfoot

There does not seem to be a clear consensus as to the rate of moderate-to-severe pediatric pes planus, or flatfoot, in the general population. The literature indicates a very broad range (from 3–24 percent), with several studies settling between 15–20 percent. There does appear to be a link between obese children and flatfoot, a further indication that being overweight sets the stage for more health complications later in life. The normal infant foot will not have an arch and usually displays some heel valgus. A child’s arch develops over time and should become more apparent around the age of seven.

In addressing the disorder, it is important to determine if you are dealing with a flexible flatfoot. Rigid flatfoot, caused by tarsal coalitions, usually requires surgery and will not be helped by foot orthotics. Equinus deformity can also result in the presentation of a flatfoot and should be dealt with as the primary

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shoes and a splint such as the Denis-Browne Bar. The bar incorporates stiff leather straight-last or abducted-last shoes, which are set in an externally rotated position on the bar. The apparatus is worn for more than 20 hours a day, and extra padding or support may be added to the inside of the shoe.

Corrective Shoes and Orthotics: As the correction takes hold and the child begins to walk, he or she can wear firm orthopedic shoes that preserve the foot position. A variety of accommodations can be considered, including supportive shoes, modified lasts, and external sole modifications. Foot orthotics will also help support the realigned position. In addition, there may be a leg-length discrepancy that should be addressed with either an internal or external lift.

When using these conservative options to treat clubfoot, keep these two important ideas in mind:

1. The earlier a program begins, the less musculoskeletal rigidity has to be overcome.
2. To prevent a recurrence of symptoms, preventative follow-up measures are essential. The use of custom foot orthotics, corrective shoes, and other physical therapies—for as long as five years—are essential to maintaining the correction.

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cause before orthotic therapy begins. Finally, be aware that other motor-neuron disorders can cause flatfoot in a child and, if suspected, necessitate further investigation.

There has been an historical belief that early correction of children's flatfoot will result in the development of an arch. This has not been scientifically tested and proven but remains a prevalent idea with some merit and considerable anecdotal evidence. Originally, pediatric pes planus was addressed using traditional Shaffer plates (high medial flange) and Whitman plates (high medial flange and lateral "clip"). These were often made from stiff sole leather, but other versions were fabricated using steel, aluminum, or Rohadur. Being flexible and correctable, a child's foot could adapt to the rigidity and shape of these devices.

Currently, the most commonly prescribed children's foot orthotic is the UCBL. Named for the University of California at Berkley Laboratory, where it was first developed, the UCBL is a rigid thermoplastic foot orthotic with an extra-deep heel cup (30mm+/-) and high medial and lateral walls extending distally toward the metatarsal heads. The UCBL provides classic "arch support" as it cradles the medial column and also controls the entire rearfoot. Further correction can be achieved by adding either a medial Kirby-type heel skive to the cast or a medial extrinsic post to the shell. Extra stability in pediatric orthotics is provided by extending the heel-post trim line farther distally, and having a flatter and wider shell just behind the metatarsal



Gait plates with lateral extensions, to correct in-toe.

rigid flat plates inserted into the shoe to change the break point although they are now often incorporated into a regular foot orthotic. Gait plates to correct in-toe (and so induce out-toe) have a shell that ends just behind the first metatarsophalangeal joint (MPJ) on the medial side, and then extends distally past the fifth MPJ on the lateral side. This rigid lateral extension inhibits flexion of the lesser metatarsals and encourages external rotation. Gait plates work best in shoes that flex at the ball because rigid-soled shoes block their effectiveness. Gait plates to treat out-toe can also be prescribed with the extension reversed. However, many cases of pes plano valgus can be corrected using a UCBL with good medial support, which will address the compensatory pronation. **O&P EDGE**

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