Talipes equinovarus (Club foot)

What is talipes equinovarus?

Congenital **talipes equinovarus** is a congenital orthopaedic condition. It is characterised by a permanent alteration of the morphology of the foot and its relationship with the leg, so the foot cannot be placed flat on the ground when in the physiological standing position. The foot is excessively turned (equinovarus) with a high medial longitudinal arch (cavus).[1]

Talipes equinovarus present at birth may be either positional or congenital:

Positional talipes is a normal foot that has been held in a deformed position in the uterus. Postural talipes is correctable with gentle passive dorsiflexion of the foot. This positional variant occurs about five times more often than congenital talipes equinovarus.[2]

Congenital talipes is a fixed condition, which may be idiopathic or teratological:

- The idiopathic type is usually an isolated skeletal anomaly. It is usually bilateral, and has a higher response rate to conservative treatment and a tendency to recur.
- Causes of the non-idiopathic type include genetic syndromes, teratological anomalies, neurological disorders and myopathies. There may be diametrically opposite deformities in the feet (calcaneovalgus in one foot and equinovarus in the other), presence of other anomalies and poorer response to treatment.

The rest of this article is about congenital talipes equinovarus.

How common is talipes equinovarus? (Epidemiology)[3]

- The incidence is approximately 1 in 1,000 births.
- Around 50% of cases affect both feet.
- Talipes is almost twice as common in males as it is in females.
- Globally, 150,000-200,000 babies with talipes are born each year. Approximately 80% of these will be in low- and middle-income countries.[4]
- The birth prevalence of club foot varies between 0.51 and 2.03/1,000 live births in low-income and middle-income countries.[5]
- Most will not receive effective treatment and will grow up with severe disability.

What causes talipes equinovarus? (Aetiology)[6]

The consensus theory is thought to explain the occurrence of talipes. This incorporates neuromuscular and anatomical causes (muscle fibre abnormalities, titling and rotation of the talus, hypoplasia of the anterior tibial artery), polygenic multifactorial genetics and arrested fetal development (ie that the fetal foot is in equinovarus and it fails to correct at birth).

Associations

Oligohydramnios, uterine anomalies and multiple pregnancy may lead to positional talipes due to fetal restriction; however, they are not associated with an increased prevalence of congenital talipes.

In 20% of cases, talipes is associated with other genetic and congenital conditions. These include distal arthrogryposis, congenital myotonic dystrophy, myelomeningocele, amniotic band sequence, trisomy 18 and chromosome 22q11 deletion syndrome.[7]

Talipes equinovarus symptoms (presentation)

Although talipes is recognisable at birth, the severity of the deformity can vary from mild to an extremely rigid foot that is resistant to manipulation. [8]

- The hindfoot is in rigid equinovarus (foot is turned inwards and downwards) and the forefoot is adducted and supinated. The sole of the foot points medially.
- The heel is high, with the fibula prominent, and the calf muscle and foot are typically smaller than normal.
- In adulthood there may be residual adduction of the forefoot, shortening of the Achilles tendon and a small foot.

Investigations

Diagnosis is on the clinical appearance and assessment, although imaging is helpful in order to define severity and to monitor progress of treatment.

- X-rays - anteroposterior (AP) plus lateral standing or simulated standing.
- Ultrasound; talipes correction during serial manipulation can be monitored using ultrasound.

Associated diseases

Talipes may be associated with other congenital disorders: particular associations include spina bifida, cerebral palsy and arthrogryposis.

Maternal polyhydramnios and other conditions which restrict space in utero (such as uterine abnormalities and multiple pregnancy) have an association with positional talipes but not with congenital (fixed) talipes.

Classification [4] [9]

The Pirani scoring system is often used to provide a forecast about the likely treatment for an individual foot. Pirani scoring looks at six anatomical features of the deformity. Each component may score 0, 0.5 or 1:

- Hindfoot contracture score (HCFS):
    - Posterior crease.
    - Empty heel.
    - Rigid equinus.
- Midfoot contracture score (MFCS):
    - Medial crease.
    - Curvature of lateral border.
    - Position of head of talus.

A higher score on presentation may indicate that a higher number of casts will be required, although a low score does not exclude the possibility that a tenotomy may be required. Children with an initial high score are more likely than those with lower scores to experience relapse during the bracing phase.

Talipes equinovarus treatment and management[1] [10]

If diagnosed at or soon after birth, talipes can be successfully treated non-surgically, and this has become the gold standard. There are two methods:

Ponseti method[11] [12]

The Ponseti method has, over recent years, become the gold-standard treatment for talipes in most of the world. It is used in children up to 2 years of age.

The Ponseti method requires stretching. The foot is repositioned and a cast is applied. The foot is repositioned and re-cast weekly for several months. Towards the end of the process, Achilles tenotomy (under local anaesthetic) is usually performed to lengthen the tendon.

Maintenance involves routine stretching. The child wears special shoes or braces full-time for three months, then nightly for three years. Failure will occur if the brace is not worn. Typical cases require five casts over four weeks. Complex cases may require more.

Botulinum toxin is sometimes used as an alternative to tenotomy. It is injected into the calf muscle to weaken the Achilles tendon. This allows the foot to be turned into a normal position over a period of 4-6 weeks. Most talipes can be corrected with a single injection.

French functional method [13]

The French method, also known as the 'functional method', is easiest to do with young children. The child's foot is gradually stretched to achieve the right position, being held in place with tape after stretching. Specialised physiotherapists are needed. A 2016 review suggests that the French functional method is more successful than the Ponseti method. [14]

Surgery [15]

Surgery is not recommended as a primary treatment for talipes. It may need to be considered in walking children because of the greater stiffness of the foot, but is used mainly in cases of fixed deformity in which the lateral column of the foot is much longer than the medial as a consequence of an unbalanced growth.

Techniques include selective medial release and posteromedial release, with or without cuboid subtraction osteotomy. Tenotomy and tendon elongation and transfer and joint fusion are sometimes used; the choice of procedure and the optimal timing are controversial.

Prognosis [15]

Community perceptions about talipes affect treatment-seeking in many parts of the world. Misconceptions about the causes of talipes include lunar and solar eclipses, religious and magical explanations and the health status and behaviours of parents. People often do not seek treatment because they are unaware about its availability and do not realise that talipes is a correctable condition. [16]

Without treatment

A neglected or uncorrected deformity forces the child to start walking on the lateral aspect of the foot, which worsens the equinus and supination. The lateral column of the foot grows more than the medial column, and the foot becomes stiff.

Eventually the deformity is no longer reducible. As the child's weight goes through the side and top surfaces of the foot, a large bursa and callous form on the weight-bearing surface. A child with neglected talipes will have difficulty in wearing normal shoes and may experience lifelong pain and disability.

With conservative treatment [11] [14]

Conservative treatment using the Ponseti and French functional methods provides excellent results with an initial correction rate of over 90% in idiopathic talipes. Serial Ponseti casting in cases of late relapse has also demonstrated encouraging results. [17]

With surgical treatment

Surgery is now only generally considered for cases where the deformities are fixed, compensatory growth changes have occurred and the condition cannot be corrected by manipulation. This typically includes ambulant children, although a precise cut-off in terms of age and development has not been defined.

- Approaches include wedge excision of the calcaneo-cuboid bone, fusion of the midtarsal and subtalar joints, or calcaneal osteotomy and talectomy.
- A single episode of corrective surgery may not be sufficient. Further corrective surgery may be required later in childhood.
- Surgery may lead to functional, growth and aesthetic problems in the foot as the child grows. Complications of surgery include:
    - Incomplete corrections or overcorrection.
    - Skin problems and neurovascular injuries.
    - Loss of correction over time.
    - Residual deformity after skeletal maturity.
    - Stiffness and/or early degenerative changes involving the ankle, the subtalar and the midtarsal joints.

Historical background

Historical figures born with one or both feet in 'clubbed' condition include the Roman emperor Claudius and the Egyptian pharaoh Tutankhamun who had both talipes and a cleft palate. It is likely that he needed a cane to walk. More recently, sports people born with talipes include the football player Steven Gerrard and Olympic gold figure skater Kristi Yamaguchi.

Dr Mary Lowth is an author or the original author of this leaflet.

Further reading

- Club Foot and the Ponseti Method; Ponseti International
- Mustari MN, Faruk M, Bausat A, et al; Congenital talipes equinovarus: A literature review. Ann Med Surg (Lond). 2022 Aug 18;81:104394. doi: 10.1016/j.amsu.2022.104394. eCollection 2022 Sep.

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