**CLUB FOOT - CURRENT CONCEPTS**

Club foot is a common congenital anomaly in the lower limb. It is a challenging problem to manage.

Incidence - 1:1000 live births in caucasians

 3:1000 live births in polynesians

 Male : Female ratio 2:1

 50% is Bilateral

20% are associated with other congenital abnormalities

ETIOLOGY Unknown. Various theories have been proposed

1. Germ plasm defect
2. Retracting fibrosis
3. Neuromuscular
4. Genetic
5. Environmental

**Recent advances in etiology -** Several chromosomal deletion regions, including 2q31-33 are associated with talipes equinovarus and may harbor genes that contribute to the idiopathic talipes equinovarus phenotype

**Antenatal diagnosis** - Can be diagnosed antenatally using ultrasound. Positive predictive value of 83% with a false positive rate of 17%. False-positive rate was higher for unilateral (29%) than for bilateral clubfoot (7%). Scans at 20 to 24 weeks may be more reliable for the diagnosis than those taken earlier.

 Degree of deformity was difficult to assess before birth. At birth, 26% were found to require no treatment, while 61% needed surgery . This has iImportant implications for prenatal counseling

**AIM OF TREATMENT**

To achieve concentric reduction of the talocalcaneonavicular joint

To maintain reduction

To restore normal articular alignment of the tarsus and the ankle

To establish muscle balance between evertors and invertors, dorsiflexors and plantarflexors

To provide mobile foot with normal function and weight bearing

**TREAMENT METHODS**

**CONSERVATIVE**

 **KITE**

 **PONSETI**

 **BENSAHEL**

**SURGICAL**

 **‘one-size fits all’ Turco**

 **‘a la carte’ Bensahal**

Long term studies have shown that extensive surgery produces conspicuous anatomical changes, significant muscle weakness, and insufficient ankle range of motion . Functional results have been reported to be better if extensive surgery could be avoided. Reoperations required in more than half of the patients. Risk of serious complications which are sometimes more difficult to treat

Recently there has been a shift from surgical to conservative treatment. This was due to the work of Ignacio Ponseti, Professor of Orthopaedics , The University of Iowa . He stated that ‘our patients treated 25 to 42 years ago it was found that although the treated clubfeet were less supple than the normal foot, there were no significant difference in function or performance compared to a population of a similar age born with normal feet.’

Ponseti technique involves serial casting of the lower limb using a strictly defined technique. Once the foot is corrected, an abduction foot orthosis up to the age of four years. The tenotomy of the tendo Achillis at ‘hindfoot stall’. Transfer of the tibialis anterior tendon in recurrent deformity in children over two and a half years of age.

 **PATHOANATOMY** - The talus and calcaneus are in severe flexion. The calcaneus, navicular and the cuboid are adducted and inverted. The navicular tuberosity is close to the medial malleolus. The first metatarsal is in more flexion than the other metatarsals, thus causing the cavus. The clubfoot deformity mimics the normal extreme position of subtalar flexion, adduction, and inversion. The anterior end of the calcaneus is beneath the talar head, which results in an equinus and varus deformity of the heel.

Correction of clubfoot deformity can be accomplished by abducting the forefoot while simultaneously blocking the talus in the ankle joint. This motion brings the position of the foot from adduction, inversion, and flexion (supination) to abduction, eversion, and extension (pronation)

**PONSETI – steps**

The first metatarsal is in more flexion than the other metatarsals, thus causing the cavus*.* The cavus is corrected by extending the first metatarsal and supinating the forefoot. First metatarsal is extended and the forefoot is held in supination in proper alignment with the midfoot and the calcaneus. In this position the foot can be abducted under the talus. Counterpressure is applied on the lateral aspect of the head of the talus. The heel is not touched. The medial tarsal ligaments are stretched allowing the calcaneus to abduct with the foot and the anterior tuberosity of the calcaneus is disengaged from its position under the head of the talus. The lower part of the tibia is grasped by one hand with the index and middle fingers resting on the inner aspect of the tibia just above the medial malleolus. The thumb rests on the lateral aspect of the head of the talus. The other hand grasps the forefoot and midfoot in slight supination. Complete correction of the clubfoot requires severe abduction of the midfoot and forefoot to stretch the tight medial tarsal ligaments. Calcaneus is severely adducted, flexed and inverted under the talus. When the calcaneus abducts it simultaneously extends and everts to its normal and neutral position under the talus. The heel is in varus when the foot and calcaneus are adducted. The heel is the normal position when the adduction of the foot and of the calcaneus are corrected.

**The common errors in the treatment are**

1. Remove the plaster cast at home the day before the cast change.
2. Much correction is lost while the foot is out of the cast.
3. The cast should not be removed more than an hour before the new cast is applied.
4. Pronating the supinated forefoot is incorrect because it increases the cavus deformity and locks the midtarsal joint, which prevents correction of the heel varus and internal rotation deformity
5. Arching the foot as if to straighten a bent wire with pressure applied near the calcuneocuboid joint is a major error Medial pressure at the calcaneocuboid joint prevents the calcaneus from abducting since the calcaneus can evert only when it is abducted

**Kite’ error** - Kite wrongly believed that the heel varus would correct simply by everting the calcaneus. He did not realize that the calcaneus can evert only when it is abducted,.

**EQUINUS CORRECTION** - Correct the equinus deformity with serial casts in mild cases. Pressure should be applied on the midfoot rather than the forefoot to prevent rockerbottom deformity. In 90% of cases, it is necessary to perform an Achilles tenotomy to correct the residual equinus deformity. Tenotomy should be performed only after 70 degrees of foot abduction is achieved and the heel is palpated to be in a valgus position . An Achilles tenotomy is performed on infants as old as six months with local anesthesia in an office setting. For infants older than six months GA may be needed. After a percutaneous Achilles tenotomy is performed, the LLC is applied for 3 weeks to allow the severed Achilles tendon to heal. The cast is applied with the foot in 70 degrees of external rotation and maximum dorsiflexion (approximately 10 degrees to 20 degrees ).

**BRACING PHASE**

Foot abduction orthosis set at 45 degrees of external rotation for the normal foot and 70 degrees of external rotation for the clubfoot. For bilateral cases, both feet are set at 70 degrees of external rotation . Brace should be worn 23 hours per day for the first three months and then at night only for two to four years. Frequent follow-up visits during the bracing period are required to ensure compliance with the protocol. Compliance with the bracing protocol is the most challenging aspect of the Ponseti method is to maintain compliance with the bracing protocol.

**Relapse** is common in infants with rigid feet, especially those with short, fat feet. Early relapse is heralded by supination and varus deformities of the forefoot and heel. Treatment for relapse is repeat casting to regain correction and then continued bracing. Surgery is required in in less than 3% of cases

**Tibialis anterior tendon transfer -** Dynamic supination occurs secondary to weak peroneal tendons and strong the tibialis anterior muscle. Tibialis anterior tendon transfer to the lateral cuneiform might be necessary in children older than 24 months when the lateral cuneiform is ossified

Ponseti method has revolutionized the treatment of club foot**.** Can correct club foot in 90% of cases . Avoid extensive surgical procedures. Long term result of surgical treatment is disappointing. Ponseti method can be used in older children. It may be successful even in relapsed and neglected club foot

.