The Clubfoot and Metatarsus Adductus are common musculoskeletal disorders in newborn babies. The etiology is not well known but is considered a combination of genetic and environmental factors. The two disorders are slightly different from each other: Metatarsus Adductus is a milder condition and has higher chances of spontaneous resolution than the clubfoot. The common treatment options involve manipulation and casting. Surgery is reserved for severe and resistant cases.

Introduction

Clubfoot and Metatarsus Adductus are congenital anomalies in the pediatric population which become apparent at the time of birth. In both disorders the foot is inwardly turned and resembles the shape of the kidney. The tendons and ligaments are stiff, which results in restricted foot that cannot maintain the normal range of movements.
**Talipes equinovarus** can be of two forms

1. Congenital Talipes Equinovarus (CTEV) is a congenital disorder that causes one to walk on the ankle. It is the most common congenital foot disorder affecting 1.2 children per 1000 live births. Mostly bilateral.
2. Acquired Talipes Equinovarus (ATEV) results from diseases such as polio or cerebral palsy. It is usually unilateral.

Severe untreated TEV leads to the development of a foot with a club like appearance hence the name.

**Metatarsus adductus/ metatarsus varus** is a congenital deformity that results into inward turning of the forefoot. It affects 1 in 1000 live births being more common among first born children.

### Etiology of Clubfoot (Talipes Equinovarus) and Metatarsus Adductus

The exact etiology is still unknown. The largest number of cases is termed as **idiopathic**. Clubfoot and Metatarsus Adductus can be **isolated or associated with other congenital anomalies** like AMC, myelodysplasia, Spina bifida and other defects.

Disorders of the nervous system constitute the **second largest percentage of etiological factors** for clubfoot, including myelomeningocele and arthrogryposis. Interestingly, any part of the muscle, nerve, brain or spinal cord can be affected. There are many theories concerning the idiopathic causes of these conditions.

### Some common assumptions

- Genetic factors as almost 25 % of the total cases are familial.
- Environmental factors, which include various procedures, like early amniocentesis, or amniotic fluid problems such as oligohydramnios. Maternal factors, like cigarette smoking, and viral infections have also been studied.
- The positioning of the baby in utero; for instance, breech position.
- The abnormal insertions of muscles.

### Classification of Clubfoot (Talipes Equinovarus) and Metatarsus Adductus

Several theories have been put forward to try and explain the etiology of TEV. This has led to the classification of TEV into:

1. Osseous type.
2. Muscular type
3. Neuropathic type
4. Idiopathic variety.

Metatarsus adductus is classified into

1. Simple MTA
2. Complex MTA
4. Serpentine foot (complex skew foot)
Pathology and Features of Clubfoot (Talipes Equinovarus) and Metatarsus Adductus

The disease affects joints and bones of the foot leading to development of secondary soft tissue contractures. Similarly, the disease may affect the surrounding soft tissue to cause the development of secondary changes in bone.

The involved bone deformities include:
- Varus deformity.
- Equinovarus.
- Cavus.
- Valgus.
- Forefoot abduction.
- Internal tibial torsion.

The secondary soft tissue changes include:
- Reduced foot size.
- Tight skin over the dorsum of the foot.
- Calluses over the dorsum.
- Hypertrophy of the anterior tibial artery.
- Atrophy of the muscles and tendons of the posterior compartment of the leg.
- Concave medial boarder of the foot and a convex lateral boarder.

These deformities if uncorrected lead to anatomical abnormalities and stumbling gait among other problems and must therefore be corrected before they turn permanent.

Symptoms of Clubfoot (Talipes Equinovarus) and Metatarsus Adductus

It is a painless condition in itself unless some complications like a fracture or an inflammation occur on the affected side. The symptoms of both disorders include:

- In Clubfoot, the ankle is curved inwards and the foot is pointed downwards. The heel of the affected foot is smaller. The condition can be unilateral or bilateral.
- In Metatarsus Adductus, the front is bent towards the middle of the foot. It is often bilateral.
- The affected foot is shorter than the normal.
- The shoes do not seem to fit and the child cannot enjoy normal playing activities due to a narrow range of motion.

Diagnosis of Clubfoot (Talipes Equinovarus) and Metatarsus Adductus

Clubfoot and Metatarsus Adductus can easily be diagnosed by following the simple protocol.

- Ultrasound scanning in utero can detect the condition, but it is mostly diagnosed at birth.
- Physical examination: The doctor observes the foot and the movements that
can be made. A complete birth history and family history is also important as genetic factors play a major role in the causation.

- Diagnostic procedures like X-rays are done to view the structures in detail.

## Treatment of Clubfoot (Talipes Equinovarus) and Metatarsus Adductus

A treatment option is selected based upon certain factors:

1. Child’s age, other congenital anomalies and medical history.
2. Extent and severity of the condition.
3. Tolerance ability of the child for various procedures and medications.
4. The expected duration of a specific treatment option.
5. The preferred option by the parents or guardians.

### Metatarsus Adductus

Metatarsus adductus resolves spontaneously in 90% of the cases by 4 years of age with a further 5% resolving upon walking thus, the disease rarely needs aggressive management.

## Management of metatarsus adductus takes the following approach:

1. Observation: No treatment is needed for deformities that are actively corrected.
2. Serial stretching: It is needed for deformities that are only passively corrected.
3. Casting: It is recommended for rigid deformities with a goal of obtaining a straight lateral foot.
4. Surgery: If all the above have failed then operative management is the next resort with procedures such as:
   - Tarsometatarsal capsulotomies
   - Open metatarsal osteotomies
   - Opening wedge or closing wedge osteotomies for serpentine deformities.
   - Multiple metatarsal osteotomies with forefoot pinning and tarsometatarsal capsular release (Hamen procedure).

## Clubfoot (Talipes Equinovarus)

The management of TEV takes two forms i.e. conservative or surgical management.

### 1) Conservative:

a. The Kite and Lovell method.

It is the method of choice for children younger than 6 months and begins soon after birth. It involves weekly serial manipulation by the mother during diaper change for about 6 months and placement of above knee casts up to 6 weeks.

If correction is achieved during the first 6 months then, maintenance is done by use of Phelps’s brace during the day and Dennis brownie splint during the night for 6 to 18 months after which a below knee walking calipers is used till 4 years. Beyond this active intervention is replaced by serial check-ups for recurrence.

b. The Ponsetti method:
It has several advantages over other conservative methods

- Higher success rates of up to 98%.
- It can be used for older children up to 2 years.

It is also advantageous over surgical methods in that:

- It results into a more flexible foot thus more effective in later life.
- Less intensive.

It may be initiated as soon as possible with weekly stretching by a medical practitioner and long leg cast installation every 1-2 weeks.

Tenotomy for Achilles tendon release and lengthening are done before the last cast which is maintained for 3 weeks. The deformity should be reversed by six weeks.

The maintenance phase follows with corrective foot orthosis administered 23 hours a day for 3 months and later for night time use up to 4 years of age.

2) Surgery:

Soft tissue procedures:

These are done for recurrent cases before the age of 4 years. They include the TURCO’s procedure for correction of posterior foot abnormalities such as:

- Lengthening of the Achilles tendon.
- Capsulotomy for the ankle and subtalar joint.
- Release of the posterior talofibular and calcaneofibular joints.

Plantar procedure such as

- Release of the plantar fascia.
- Release of abductor hallucis and flexor digitorum brevis.

Medial procedure such as

- Lengthening of the tibialis posterior and flexor digitorum longus.
- Release of the talonavicular, superficial part of the deltoid ligament and spring ligament.

Bony procedures:

They are used for patients older than 4 years of age and include

- Dwyer’s lateral closed wedge osteotomies.
- Use of external fixators.

Prognosis of Clubfoot (Talipes Equinovarus) and Metatarsus Adductus

Both these conditions carry an excellent prognosis, provided that the treatment is started at the earliest possible time. The management should be started soon after birth, as the tissues are softer and the manipulation is much easier at that time.
References


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