

**Comparative Study of Management of**  
**CTEV by Turco's**  
**Procedure & Ponsetti's Technique.**

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## **ABSTRACT**

A prospective study was undertaken in the field of management of CTEV regarding the correction of deformity in BETHESHA ORTHOPEDIC AND JOINT REPLACEMENT CENTRE, HUBLI. During the period from August 2009 to July 2012 (i.e. three years) 33 were treated operatively and conservatively. Among them all patients are under our follow-up.

The study was conducted with dye emphasis for clinical observation and analysis of results after the surgical management of congenital talipes equino varus by Turco`s one stage posteromedial soft tissue release and its comparison with the result of conservative management by Ponseti method.

## INTRODUCTION

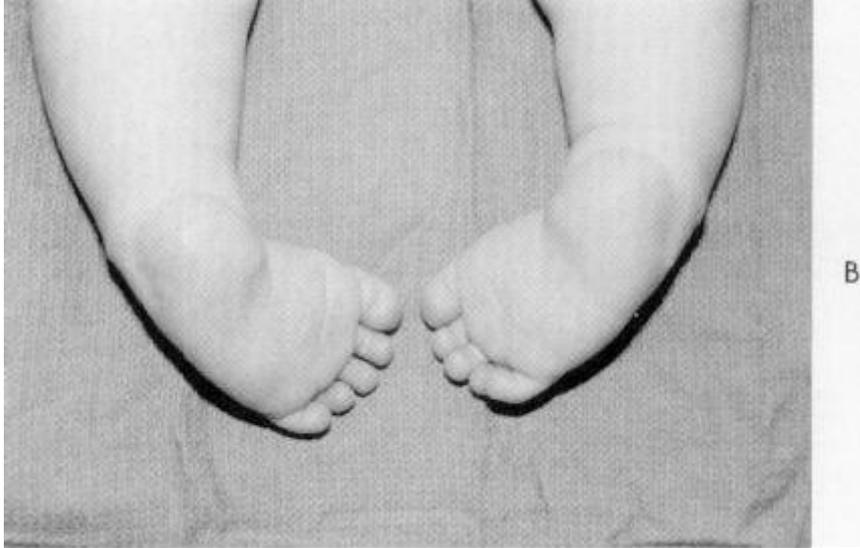
Congenital talipes equino varus (CTEV) is the medical term applied to the true clubfoot deformity in the newborn, club foot is the most common congenital foot defect affecting one to two per 1,000 population. Note that this condition is not painful. It is twice as common in males and can be unilateral or bilateral 50/50%.

Congenital" means before or at birth. Talipes, literally "ankle-foot", refers to the talus. Equinovarus refers to the position of the clubfoot, in equinus and varus or adductus.

The condition varies in severity from mild, which is correctable by the examiner, to severe, in which the deformity is rigid. Treatment will reflect this.



Anterior view: adduction and supination of forefoot and equinus of hindfoot



Posterior view: inversion, plantar flexion, and internal rotation of calcaneus, as well as cavus deformity with transverse plantar crease.

## **AIMS AND OBJECTIVES**

- 1] To assess the results of surgical correction of CTEV

by Turco`s one stage postero-medial soft tissue release.

- 2] To compare the result of our study with standard Turco`s series and Ponseti series.

## **MATERIALS AND METHODS**

## **CLINICAL FEATURES**

### **Description of the deformities:-**

The anatomical deformities in CTEV are many: equinus of the heel, varus and cavus of the midfoot, and adductus and supination of the forefoot. There are changes in bone, skin, tendons and ligaments. The bones actually become distorted due to contractures of the soft tissues.

The bones chiefly deformed are the talus, calcaneus, navicular and cuboid. The ankle joint is severely affected with significant malrotation.

Upon clinical examination, the "true clubfoot" (CTEV) appears to have the above-described malformations and is stiff. It will not correct upon manipulation manually because the fixed contractures cause gross stiffness.

It is evident that this anomaly is very complicated and a serious problem facing the orthopaedic surgeon!

### **Skin abnormalities:-**

The skin over the dorsolateral aspect of the foot usually stretched out, thin and atrophied, rarely there is

a mild abrasion in this area at birth.

Some feet have a deep cleft on the medial plantar surface. In older children there may be callosities on 5<sup>th</sup> metatarsal.

Knee and tibia usually not much discrepancy, as the child grows up wasting of the calf, hyperextension deformity of the knee and fixed equinus deformity as child attempts to place the deformed foot in plantigrade position.

The ankle normally there is slight lateral rotation of the ankle mortice, which is increased, in idiopathic club foot, The medial malleolus is usually is under developed and is slightly anterior to its normal position.

## Radiology

Kite was 1st to use radiographs to assess the correction deformity.



Normal foot AP view (20-40 degree)



Club foot

AP view



Normal foot LAT view



Club foot LAT

view.

### **Importance:**

Making diagnosis of Talonavicular subluxation before ossification.

It helps to determine which component of the anatomical deformity is most in for correction and equally important type of surgical intervention.

Radiography which enables the surgeon to determine the combination of deformities of equinus, hindfoot varus, Talocalcaneal subluxation, forefoot adduction that exist in particular foot.

Successive radiographs during treatment gives a exact evaluation of progress.

## **Management**

### **Aims of treatment:**

- 1] To correct the deformity, so that the child has a foot of normal shape and full mobility a plantigrade, pliable and cosmetically acceptable foot.
- 2] To restore muscle power and maintain correction.

The main thing that we do not want to do is damage the articular cartilage. In infants, this is the most delicate tissue. The ligaments are the strongest. Force may damage bones and cartilage and still not stretch the ligaments and tendons. Once damaged, stiffness occurs and the deformity will recur .

### **Correction of deformity:**

#### 1] Non operative

A] By manual correction.

B] Forceful manipulation with aid of orthopedic appliances.

#### 2] Operative treatment

- A] Soft tissue procedures
- B] Bone procedures.

### **Manipulation by Ponseti method:**

#### **Cavus correction:**

Supinating the forefoot to place it proper alignment with the hindfoot. The position is maintained by the above knee pop cast with knee in 90 degrees flexion.

#### **Varus, inversion and adduction correction:**

Must correct simultaneously the varus, inversion and adduction of hindfoot, because the tarsal joints are in strict mechanical interdependence and cannot be corrected sequentially.



### **Maintaining the correction:**

If serial casting successfully corrects the malformation, over a period of months, an orthotic will be prescribed and worn for many months afterwards to maintain the position. In young babies, a knee- ankle-foot orthotic (KAFO) is common. In older babies who will be learning to stand and walk an ankle- foot orthotic (AFO) is used. The surgeon will see the child in clinic on a regular basis to monitor the correction of the clubfoot.



### **Surgical treatment:**

The indications for surgical intervention in CTEV are the failure of reduction of the Talonavicular and calcaneocuboid joints by manipulation and casts. Persistent forceful manipulation and prolonged casting

can do more harm than good as explained earlier. Therefore, surgery is now a days actually considered to be conservative treatment.

The operation itself is the open reduction of the Talonavicular and calcaneocuboid joints by complete subtalar release and posteromedial release.

Requisites are: 1) age of the patient - 8 to 12 weeks minimum; 2) adequate size of foot - at least 10 cms; 3) experienced pediatric orthopedic surgeon.

**Following structures to be lengthened or sectioned:**

- a) Muscles and tendons - Achilles (Z plasty), posterior tibial, adductor hallucis, flexor digitorum brevis and flexor digitorum longus, flexor digitorum brevis and abductor digiti quinti and quadratus planti.
- b) Capsules and ligaments - Talonavicular, subtalar, calcaneocuboid joint, ankle capsule, contracted ligaments on posterolateral aspect of ankle and subtalar joint and interosseous Talocalcaneal ligament.

**The operation:**

For surgery, the patient is anesthetized, positioned prone, a tourniquet applied to the proximal limb, the limb is surgically scrubbed and draped.

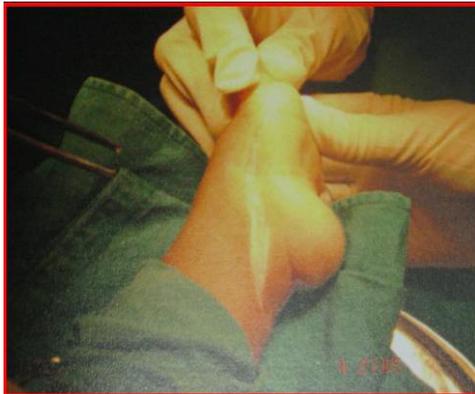
After the releases and reductions are completed, one or two K-wires are inserted to hold the reduced and corrected position. These fixate the talonavicular and calcaneocuboid joints. They are inserted by drill, then are shortened and bent externally. This makes for easy removal, and eliminates danger of migration.

Generally at four to six weeks post-op, the cast and surgical pins are removed. Again the foot is examined. Sometimes orthotic fitting is done at this time for a knee-ankle-foot orthotic (KAFO) or an ankle-foot orthotic (AFO). The limb is then recasted until the orthotic is ready, which is usually two weeks. Some surgeons prefer to skip the KAFO stage, but keep casts on the patient up to 10 weeks and then put the child directly into an AFO.

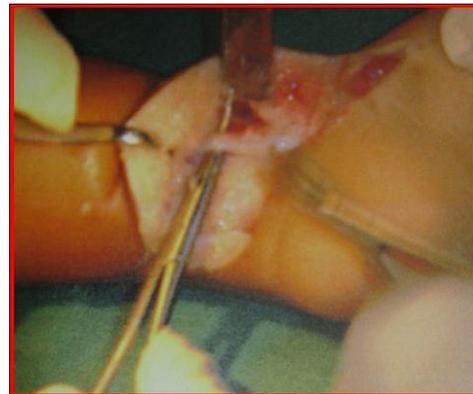
The orthotic device will be worn for many months. The parents may remove it from time to time for bathing and exercises and so on. The surgeon will see the patient in the clinic at regular intervals to monitor the

condition of the foot.

If a KAFO is used, it will eventually be replaced by an AFO to allow the baby to walk. These are worn inside shoes.



Skin incision



Tibialis Posterior



FDL



Posterior Capsulotomy  
capsulotomy



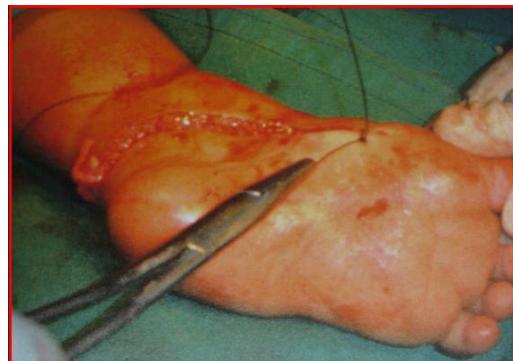
Talonavicular joint



Intra operative assessment



Intra operative assessment



Skin

closure

### **Resistant and recurrent clubfeet :**

Occasionally, the deformity recurs. This can be distressing for all concerned. There are a few different operations that can be performed to correct these resistant feet. The orthopaedic surgeon will choose the one that will work successfully for each particular patient, taking into consideration the age and condition of each patient. Examples of surgery are: again the posteromedial releases, osteotomies, tendon transfers or arthrodesis (fusion) of some of the bones.

### **Result:**

Total 22 cases are studied in our series with both conservative and surgical .In out of 22 patient there is only one patient found positive family history[4.5%] and no history of twins observed in our series, all patients were full term normal delivery with no birth complication and no other congenital deformity was detected in our series.

**SEX INCIDENCE :** In Turco's series, of 14 cases there were ten males (71.4%) and 4 females (28.6%) for the

sex ratio of 2.5 males to one female.

In Ponseti series, of 8 cases 5 were males (62.5%) and 3 females (37.5%) for the sex ratio of 1.7 males to 1 female.

### **LATERALTY:**

#### **Turco's series:**

Out of 14 cases 7 cases were bilateral and 7 cases unilateral (50%each). In unilateral cases out of 7, right foot was involved in 4 cases (57%)and left foot in 3 cases(43%).

#### **Ponseti series:**

Out of 8 cases 4 cases were bilateral and 4 cases unilateral (50%each).

In unilateral cases out of 4 cases, 2were right sided (50%) and 2 left sided(50%).

### **AGE AT SURGERY\ MANIPULATION:**

#### **TURCO'S SERIES:**

The youngest child was 6months old and oldest child was 3 years old. In bilateral cases both feet were operated at an interval of 7 to 10 days.

## **PONSETI SERIES:**

The youngest child was 1 month old and oldest child 9 months old .

### **Number of corrective casts applied:**

For 6 children: 5 casts

For 2 children: 6 casts

Average number of casts applied: 5.25

Tenotomy done for all 8 cases (100%)

## **FOLLOW UP:**

### **Turco's series:**

Duration of follow up ranges from 3 months to 2 1\2 years with an average period of 16 months.

### **Ponseti series:**

Duration of follow up : from 3 months to 16 months with an average period of 11 months .

## **FINAL OUTCOME:**

During the follow up period, each foot is evaluated cosmetically and functionally and rated accordingly.

GOOD : clinically well aligned foot.

No residual or very minimal adduction deformity

and

Ankle dorsiflexion was more than 10 (degrees) above the normal.

Ability to Evert the foot to neutral position

Fair : Correction acceptable in appearance.

Minimal residual deformity.

Ability to dorsiflex the ankle to neutral position.

Poor: Activity limited residual deformity such as hindfoot.

Adduction, heel varus, inability to dorsiflex and Evert the foot to neutral position etc...

In Turco's series results were:

Good: in 15 feet (71%)

Fair: in 04 feet(19%)

Poor: in 02 feet(10%)

In our study it was observed that the results in the early age group (6 & 9 months) are good when compared to the older age group. In early age group 13 feet were operated , 10 feet had good correction (77%). In older age group (above 9 months old), out of 8 feet 5 had good result (62.5%).

**In our Ponseti series:**

Out of 12 feet 11 feet had good correction (91.7%)

	Turco`s	Ponseti
Total	14	8
Male	10 (71.4%)	5 (62.5)
Female	4 (28.6)	3 (37.5)
Bilateral	7	4
Unilateral	7	4
Right foot	4	2
Left foot	3	2

Younger Child	6 months old	1 months old
Oldest Child	3 yrs	9 month
Follow up	16 months	11 months

**Final outcome :**

Result	Tumor's	Ponseti
Good	15[71%]	11[91.7%]
Fair	4[19%]	1[8.3%]
Poor	2[10%]	0[0%]

## **COMPLICATIONS**

**1) Skin necrosis:**

We had three feet with these complications, ended up with fair/poor results.

The reason in all 3 cases was poor post operative

care and infection.

**2) Plaster sores :**

We had 1 foot in Turco's series and one foot in Ponseti series, both healed.

**3) Residual deformities :**

There were 3 feet with residual fore foot adduction and one foot with residual varus deformity in our Turco's series.

**4) Over correction and Pes planes:**

No patient had this complication in our series

**5) Calcaneus deformity :**

We did not have this complication in our series.

## **DISCUSSION**

The postero medial soft tissue release as described by Turco's has gained worldwide popularity since its introduction in 1971. It had often failed to provide complete correction and in some feet it has produced our correction.

In our study of Turco's one stage postero medial soft tissue release we included grade second and third deformities. We selected those cases which failed in conservative treatment.

The results of our study where good in 71%, fair in 19% and poor in 10% . The results can be compared with the good results following radical soft tissue release by other authors (De Rosa 1986, McKay 1983, Simon 1985, Thomson 1982).

Turco's has results of excellent and good in 86%, fair in 9% and poor in 5%. In our Turco's series it is

revealed that results of surgery in early age group is better as it restores the normal alignment of the feet before the child start walking.

We have not used the radiographic evaluation for assessing the correction because there is wide range of variation within the limits of normal. Normal values vary depending on the child's age. Drawing lines through the middle of a small ossified mass is inaccurate, especially since the mass is not necessarily the centre of the bone. Furthermore, the position of the beam, the degree of dorsiflexion or plantar flexion and the adduction significantly affect measurements.

We had done a comparative study of Turco's series results with Ponseti series. In 1940 's Dr. Ignacio Ponseti and his team had done surgical correction on so many club feet and many of the patients returned with complications like residual deformities , stiffness of joints etc.. Later in 1950's Ponseti pioneered his own method of correction of CTEV.

### **Ponseti's method of serial manipulation and casting**

Ponseti casting technique involves weekly manipulation and casting as directed by knowledge of the precise patho-anatomy of clubfoot. In this method the first cast aims at correcting the cavus by supinating the first metatarsal bringing it in normal relation to the rest of the metatarsals and to bring the fore-part in alignment with the hind-part.

Further casts aim at correcting the inversion of the foot by rotating all of the foot distal to the talus while the talus is fixed in the ankle mortise. During this manipulation, a thumb is placed on the lateral aspect of the head of the talus using it as a fulcrum while outward pressure is exerted on the first metatarsal and first cuneiform. During this maneuver, an attempt is made to realign properly and simultaneously the calcaneocuboid, the talocalcaneonavicular and posterior talocalcaneal joints. This manipulation should be gentle and followed by the application of a well molded thinly padded light plaster cast. This correction may involve four to five plaster cast changes.

The equinus is corrected next by dorsiflexing the foot with the heel in a neutral or slight valgus position.

Two to three casts may be needed in the attempt to correct equinus. If at this stage at least 15° of passive dorsiflexion could not be achieved with the examiner applying a single finger pressure, a simple percutaneous tenotomy of the tendoachilles may be performed with the patient under local anaesthesia. A toe-to-groin cast with the foot in maximum dorsiflexion and the knee at 90° angle is then applied for 3 weeks. Ponseti found that 85 to 90 percent of clubfoot could be successfully corrected by this method Ponseti's method, in which the counter pressure applied over the talar head laterally as the foot, held in supination, is abducted as a unit, differs from the Kite's method in which the pressure is applied on the calcaneocuboid joint. Ponseti termed this maneuver by Kite as "Kite's error", as it prevents the movement of calcaneum out from under the talus.

Herzenberg et al evaluated Ponseti method of manipulation & casting in 27 patients of less than 3 months of age. They found that only 3% of this group required posteromedial release in the first year of life as compared to 94% of the control group where conventional casting method was used.

Colburn and Williams, in a prospective study of 57 clubfeet in children less than 3 months of age treated with Ponseti method, found that 54 of 57 clubfoot were successfully corrected without requiring posteromedial release. Only 3 feet required extensive surgical correction.

Ponseti reported that 89% of feet treated by this method had a good or excellent result at the time of thirty year follow up. In this series Achilles tenotomies were done in 70% of the patients.

Kite and Lovell reported that upto 90% feet could be corrected without any surgery. However the average duration of cast treatment was 22 months as compared two to four months in the Ponseti method.

Lehman et al in 2003 assessed the early results of Ponseti method of casting in 30 children (45 feet) with idiopathic clubfeet. The mean age of presentation for all patients was 10.8 weeks( range 0.5-40 weeks). 40 feet were corrected by mean 5.4 casts( range 4-9) and placed into abduction orthosis. 5 feet were not placed into foot abduction orthosis due to failure of castings. They found that these 5 feet had an age at presentation

of >7 months and had undergone larger no. of casts( mean 6.4; range 4-9). 25 feet in this study were subjected to percutaneous tendoachilles tenotomy.

Morcuende et al in a retrospective evaluation of the records of 157 children of up to 2 years of age (256 clubfeet) concluded that the Ponseti method is a safe and effective treatment for congenital idiopathic clubfoot and radically decreases the need for extensive corrective surgery even after previous unsuccessful non-surgical treatment. These children were treated by Ponseti's method of casting and a percutaneous tendoachilles tenotomy was done under local anaesthesia whenever equinus was not fully corrected with casts alone. Percutaneous tenotomy performed during the first few months of life has been shown by Cooper and Dietz to be a benign procedure with no long term effect on the muscle strength.

In our Ponseti series we treated 12 feet, out of which 11 feet had good correction (91.7%), which is comparable to the original series.

The advantages are more with this method. This is a conservative type of management. Hence the method

fails, either we can offer second series of manipulation or surgical correction .There is no risk of anesthesia , infection , wound dehiscence , skin necrosis etc... also this is cheaper when comparative surgical method of correction.

On the other hands this methods needs constant vigilance supervision, perseverance by treating doctor and more importantly willingness and co-operation from the parents.

## **CONCLUSION**

In our Turco's series 21 feet were taken up for surgery. 71% got good results 19% fair and 10% poor laterality was equal , males were affected more (71.4%) at the rate 2.5:1.

In early age group (<9months) the result was good in 77%, where as in old age groups (>9months ), 62.5% got good correction.

If the children with CTEV are treated early i.e. before he / she starts walking and bony changes appear, Turco's one stage postero medial soft tissue release with proper follow up and splinting gives a cosmetically normal looking and functionally acceptable pain free foot as seen in the study performed.

In our Ponseti series we treated 8 cases (12feet) by serial manipulation, POP casting followed by per cutaneous heel cord tenotomy. We had a good correction rate of 91.7%. So undoubtedly this method offers a better alternative to surgical techniques especially in younger age group patients.

The choice of treatment depends on various factors.

The treating doctor has to assess the deformities and to decide the treatment modality which is suited for that patient. More importantly the willingness and financial status of the parents must be considered. In Ponseti method the patient has to come for weekly manipulations at least 4 to 6 weeks.

Both in Turco's as well as Ponseti method the follow up period is equally important. The treating doctor is supposed to hand over the "battons of responsibility" to the parents, after the surgical / non surgical correction of deformity.

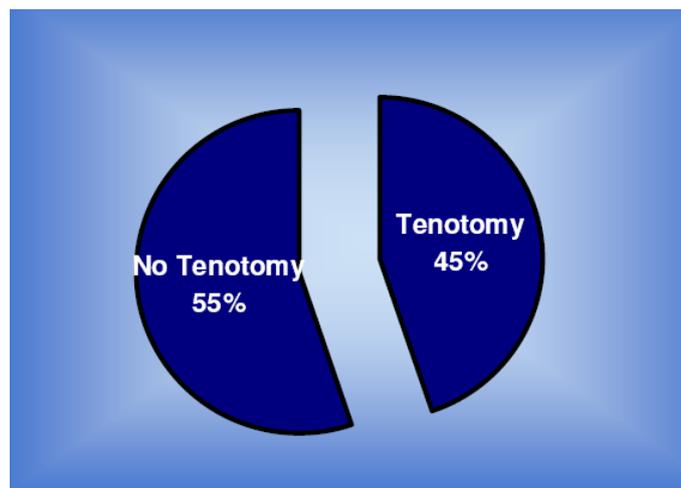
So, either Turco's or Ponseti method can be selected after careful assessment so that the child will get maximum benefit.

Mean initial Catterall-Pirani score was 3.39 ( Range 0.5 to 5.5). After a mean of 7..24 casts (range 1-12) Mean final Catterall- Pirani score was 0.14 (Range 0 to 0.5). Mean change in Catterall-Pirani score at the end of castings was 3.25 (Range 0.5 to 5.5).

At three, six and twelve month follow ups, the scores were 0.19, 0.603 and 1.12 respectively. These values , when compare to the initial CP scores by paired t test gave a p value of 0.000 which is significant.

Percutaneous tendoachilles tenotomy was done in 12 feet(44.8%) for correction of residual equines deformity. Tenotomy was safely performed in children of age 6.5 to 11 months (mean 8.2 months)

### Tenotomy



Percentage of cases in whom Achilles tenotomy was done

## TURCO METHOD

**CASE NO: 1**



**Pre-operative**



Post-operative (good correction)

### CASE-2



Pre-operative



3month follow up



6 month follow

up



2 ½ year follow-up(good correction)

### CASE-3 (8 months baby)



Pre-operative



3 months follow-up  
(good correction)



6 months follow-up  
(good correction)

### CASE-4 (3 yrs)



Pre-operative



1

year follow-up

(good correction)

## **PONSETI METHOD**

**CASE-5(4 months)**



Before manipulation  
manipulation



After 4th

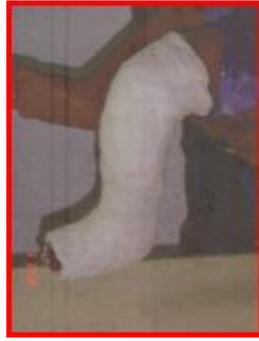


After bilateral tenotomy & casting, 3 months follow-up



6 months follow-up(good correction)

### CASE-6(8 months)



Before manipulation  
months follow-up

After tenotomy

6

**CASE-7(9 months)**



Before manipulation  
manipulation.

After

4th

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