

ORIGINAL RESEARCH

To study the percentage of cases requiring percutaneous tendo-achillestenotomy and predicting factors, in clubfoot management by Ponseti technique under 2 year age group

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ABSTRACT

Introduction: Tendo-achilliestenotomy is required as last step of ponseti method of treatment of Congenital TalipesEquinoVarus (CTEV). Not all cases require tenotomy. It is important to study the factors which predicts the need for tenotomy and to determine the outcome in cases who do not require tenotomy. **Purpose:** The purpose of this study 1) to determine percentage of cases requiring tenotomy, 2) to determine the factors which help in predicting the need for tenotomy, in the Ponseti method of treatment of idiopathic clubfoot under 2 year age group. **Methods:** This is a prospective study conducted at the Orthopaedic Surgery unit of IGGGH & PGI, Pondicherry with idiopathic club foot aged from 7days to 2 years between June 2014 to May 2016 (two years) and includes 30 childrens(40 clubfeet) having idiopathic Clubfoot, corrective cast application at weekly interval as per Ponseti protocol and were assessed with Pirani scoring system. **Results:** The deformity was classified, according to the Pirani scoring system into 3 groups. Majority of the patients (60%) were having pretreatment Pirani Score between 5-6. Overall mean Pirani Score for all patients was 4.9. Total of 38 (95%) of the forty clubfeet underwent a percutaneous Tendoachillestenotomy to correct a residual equinus deformity. Need for tenotomy was significantly increased in clubfeet which were more severe at presentation and more rigid. Hind foot contracture score was also related with increased need for tenotomy. **Conclusion:** Clubfoot can be successfully treated with Ponseti technique by serial casting. Tenotomy is not required in all cases. Severity of the deformity at presentation predict the need for tenotomy especially the hindfoot contracture score along with the rigidity of the clubfoot. Those cases requiring tenotomy and those not requiring, were well corrected at the end of casting. The outcome of both group was comparable. The need for tenotomy does not indicate poorer outcome.

Keywords: Congenital TalipesEquinoVarus, Clubfoot, Percutaneous Tenotomy, Tendoachillies

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INTRODUCTION

Congenital TalipesEquinoVarus (CTEV) is the commonest congenital musculoskeletal malformation (1).

Idiopathic congenital clubfoot consists of complex malalignment of the foot that involves soft and bony parts which is characterized by equinovarus hind foot, mid foot and fore foot cavus and adduction.(1-2)

Kite was the first to recommend gentle manipulation and cast immobilizationPonseti suggests two reasons for the poor results found with Kite's technique. First, the use of the calcaneocuboid joint as the fulcrum blocks the abduction of the calcaneus and thereby prevents eversion of the calcaneus. Second, pronation

of the forefoot to correct the cavus actually worsens the cavus.

Ponseti's technique has become the standard and most effective treatment modality for correction of CTEV in newborn. It consists of weekly stretching plaster casts followed by percutaneous tenotomy of tendoachilles. Achilles tenotomy is needed in 70-80% of cases after successful correction of forefoot adduction and heel varus [1-3].

Subsequently various methods of deformity evaluation and treatment monitoring were developed. Pirani scoring system is clinical based, easy to apply and is fairly reproducible with minor inter-observer variability.

MATERIALS AND METHODS

This is a prospective study conducted at the Orthopaedic Surgery units of IGGGH & PGI, Pondicherry with idiopathic club foot aged from 7days to 2 years between June 2014 to May 2016 (two years) and includes 30 childrens having idiopathic Clubfoot (40 club feet), corrective cast application at weekly interval as per Ponseti protocol and were assessed with Pirani scoring system.

INCLUSION CRITERIA

1. Newborn babies and children between 7 days to 2 year of age with idiopathic club foot.
2. Unilateral and bilateral cases.

EXCLUSION CRITERIA

1. Non-idiopathic clubfoot like neuropathic clubfoot, syndromic clubfoot, postural clubfoot, metatarsus adductus.
2. Age more than 2 years.
3. Patients that have undergone prior surgical intervention for clubfoot

Children were evaluated and graded for severity of clubfoot by Pirani severity scoring system.

The Pirani system registers the deformity of six different components of the clubfoot. These are divided into the

1)hindfoot components: Posterior crease, empty heel, rigid equinus, 2)midfoot components: Medial crease,curvature of the lateral border of the foot, and the position of head of the talus.

Each component is given a score of 0,0.5, or 1.0 and consequently, the scale is from 0 to 6 points, with 6 representing the most severe deformity.

The congenital clubfoot undergoing treatment was assessed at each visit and assigned.

- a. A Mid foot Score (MS) of up to 3 (0=normal, 3=severe deformity)
- b. A Hind foot Score (HS) of up to 3 (0=normal, 3=severe deformity)
- c. A Total Score (TS) of up to 6 (0=normal, 6=severe deformity)

USE OF PIRANI SCORE

Every clubfoot under Ponseti management was "Scored" at each week for HS, MS ad TS (Total Score).

The Scores were plotted on a graph to know how the foot was recovering on the roadmap of treatment.

Tenotomy was indicated when $HS > 1$, $MS < 1$ and the head of the talus was covered.

After calculating Pirani Severity Score at initial presentation and at weekly interval during follow up, it was noted in proforma specially made for it.

CATEGORIZATION OF FEET

The feet were classified into three categories with respect to the severity of the deformity on the basis of initial Pirani score.

Group-I: Pirani score of 1.5-2.5 points.

Group-II: Pirani score of 3-4.5 points.

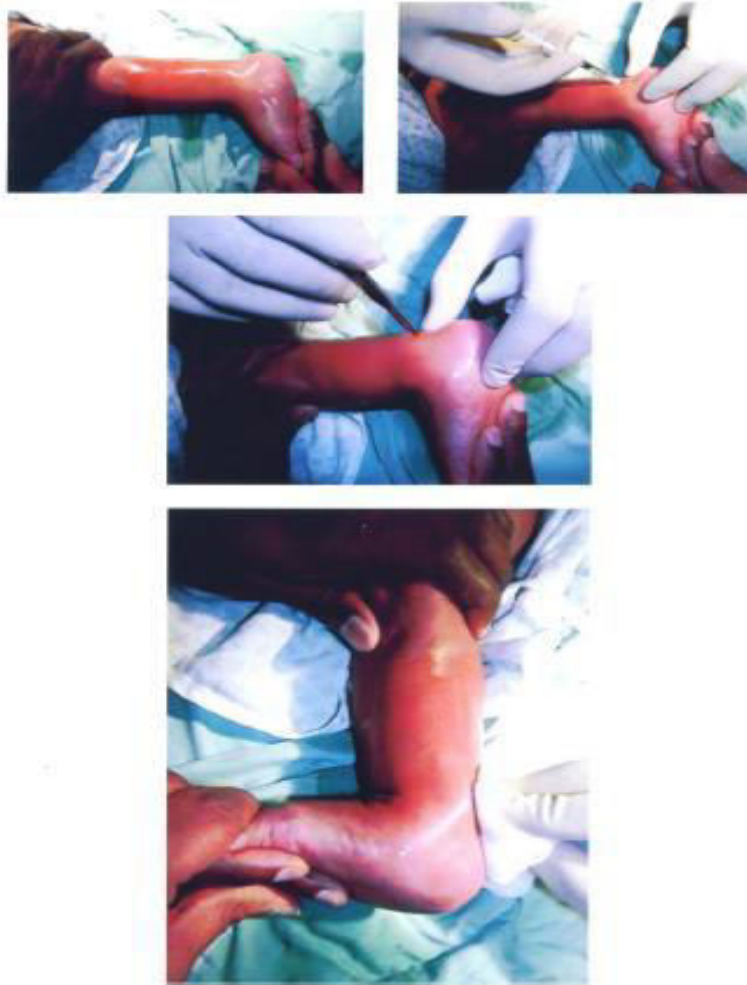
Group-III: Pirani score of > 5 points.

Foot was classified into supple type, if manual reduction was possible; and rigid type, where manual reduction was impossible

Parents were informed about the study and surgical technique used in this study. Only those who were ready, were included in the study after signing a written consent.

SURGICAL TECHNIQUE

The patient was placed in supine position. An assistant maintained the positioning of the limb with Knee is kept at 90° flexion and hip abducted to reach the posterior part of the foot. The equinus deformity at the ankle is assessed. All aseptic precautions are taken. Antisepsis was performed with a solution of povidine iodine. Local anesthesia was used with a solution of 1% lidocaine (~0.2mL) injected in the subcutaneous tissue, at the region of the entrance for performance of the tenotomy. The tendo-achillis is palpated as a tense cord when the foot is dorsiflexed. surgical knife with blade 11 no. Was used. dorsiflexion force is continuously applied to the foot and as the tenotomy is completed a snap was perceived with a click and sudden visible increased correction of dorsiflexion. The completion of tenotomy was marked by a snap and visible correction of equinus allowing atleast 10 degrees of dorsiflexion. Thompson's test was performed in every case to further confirm the completion of section. A complete tenotomy gives a negative Thompson's test due to absence of transmission of movements from calf to heel. The circulatory conditions of the toes was observed by seeing nail blanching. Afterwards, corrective cast is then applied for 3 weeks. The patient observed for circulatory conditions of the ankles, to general state, and signs of bleeding for thirty minutes



RESULTS

Treatment was begun at less than six months of age in 23 cases (77%). In rest of the cases, treatment was initiated at more than 6 months of age.

In 30 cases, twenty (66%) had unilateral and ten (34%) had bilateral involvement. Right side was found to be more commonly involved (43%) in unilateral cases when compared to left (23%).

Foot was classified into supple type, if manual reduction was possible; and rigid type, where manual reduction was impossible. By this method, 87% feet were rated as supple and 13% as rigid, at time of initial presentation.

When mobility of clubfoot was compared with age at presentation, it was found that in majority of patient presenting at early age foot was supple. While in those presenting late, rigid variety of foot was more common.

The deformity was classified, according to the Pirani scoring system into 3 groups. Group-I with a Score of 1.5 to 2.5 points ABSENT, Group-II with a Score of 3 to 4.5 points was seen in sixteen feet (40%) and group-III the most common category with a Score between 5-6 points was seen in 24 feet (60%).

In present study, majority of the feet (60%) were having pre-treatment Pirani Score between 5-6.

The mean number of casts that were applied to obtain correction was. 6.8 (range- 4 to 14 casts). The more severe the initial deformity (Higher Pirani Score), the more casts were required to obtain correction

In group-II with Score of 3 to 4.5 points, 10 feet (62.5%) underwent percutaneous tenotomy, while in group-III with Score of 5 to 6 points; all feet (100%) required the tenotomy. Among all 85 % underwent percutaneous tenotomy.

Need for tenotomy among different groups at initial evaluation

Pirani score (groups)	Require tenotomy (%)	No tenotomy (%)
1-2.5 (group1)	0	0
3-4.5 (group2)	10 (62.5)	6 (37.5)
5-6 (group 3)	24 (100)	0
Total (40 club feet)	34 (85)	6 (15)

In the Pirani scoring system, the relation between hindfoot score and the need for tenotomy was separately correlated.

Among the 24 clubfeet with a hindfoot score of more than 2, 24 clubfeet (100%) required tenotomy. Ten clubfeet out of 16 with a hindfoot score of 1.5 or less (62.5%) required tenotomy

At the end of casting correction achieved was similar in both requiring and not requiring tenotomy. Mean post treatment Pirani score during final follow up was 0.25 (0 to 2).

DISCUSSION

A clinical study on one of the most common congenital deformity of foot i.e. congenital talipes equinovarus was carried out in Department of Orthopaedics, IGGGH & PGI, Pondicherry, to study the percentage of cases requiring percutaneous tendoachillestenotomy and predicting factors in clubfoot management by Ponseti technique under 2 year age group.

In total, there were thirty childrens (forty feet) treated by Ponseti technique.

A large proportion of patients were seen very early in life. The youngest patient who was included in this study was 8 days old and eldest was 1 year 10 months. 25 patients (33 feet) were below 1 year age group and there mean age at presentation was 10.9 weeks excluding last 5 cases whose age were 1 year or more.

Dobbs et al. who reported clubfeet in 51 patients observed mean age of 12 weeks, at initial presentation (4).

As regard laterality, 10 of our cases were bilateral (33%) and 20 were unilateral (67%) (13 right and 7 left sided) which is in concordance with other series presented by, **Wyne Davis** (44% bilateral and 56% unilateral) (5).

In my study, I used Pirani scoring system which is in accordance with **Lehamn et al.** series, which shows Pirani scoring is easy to use and simple and fairly reproducible (6). Overall mean Pirani Score of 4.9 was recorded for all feet. Similarly mean Pirani Score of 4.6 was noted by **Lehman et al.** (6).

In my study, number of casts required for full correction ranged from 4 to 14 and patients requiring mean number of 6.8 casts. **Noam Bor et al.** in their series had mean total Pirani score 4.7 (2 to 6) and mean number of cast required was 6 similar to our study (7).

The rigidity of the clubfeet was reflected in the number of casts required to correct the deformity. Those cases where more than 7 casts were required showed significantly greater need for tenotomy. We observed that chubby feet tend to be more rigid, requiring more number of casts and tenotomy.

In the present study the mean number of casts that were applied to obtain correction in group I, II and III were 0, 6 and 7.4 respectively. The more severe the initial deformity, the more casts were required to obtain correction. However overall mean number of

cast for all groups was 6.8 (range, 4-14 casts), which is quite similar to **Laaveg and Ponseti and Herzenberg et al.** who reported mean number of cast as 7 (8) (9).

In our study 34(85%) feet out of 40 required percutaneous tenotomy of Tendoachilles.

In this study those who having pirani score between 5-6 (group 3), all need tenotomy. This shows initial severity score was associated with the need to perform tenotomy.

Similar finding mentioned by **Morcuende et al.** study (n=256) tendoachillestenotomy was done in 86% of the cases (10).

In **M Changulani et al.** study, 85% (n100) patients required percutaneous tenotomy of tendoachilles (11).

We found that a significant percentage of cases with severely deformed feet required tenotomy. Clubfeet, which scored 5.0 or more in the Pirani scoring system, had a significantly increased need for tenotomy than lesser scores. In this system, the hindfoot score component, specifically, showed correlation with the need for tenotomy, where clubfeet with a score of 2-3 required tenotomy in a significantly greater percentage. This is probably because of the severity of the equinus being included in the hindfoot score. The components of the hindfoot score reflect the severity of hindfoot contracture.

Colburn et al. and Scher et al. requiring percutaneous tenotomy in 67% and 72% feet respectively (12) (3). On the other hand Lehman et al. required as low as 25(55%) tenotomies in 45 clubfeet in 30 patients (6).

Most important observation noted from this study is the recognition that feet requiring tenotomies were equally well corrected clinically at the end of casting as those that did not require tenotomies. This conclusion reinforces the notion that even severe idiopathic clubfeet can be successfully treated using proper application of the Ponseti technique and the need for a tenotomy does not suggest a poorer result.

Mean post tenotomy pirani score during final follow up was 0.25.

This value was compared with initial Pirani score using "paired t test", which showed P value less than 0.0001. By conventional criteria, this difference is considered to be extremely statistically significant.

In **MdSaifUllah et al.** series mean post-treatment Pirani score of the study group was: 0.36 ± 0.43 similar to our study (13).

In this study, we found that there was no difference in the outcome in cases where tenotomy was done and where tenotomy was not.

CONCLUSION

Ponseti Method is an excellent conservative method for treatment of Congenital Talipes Equino Varus (CTEV) deformity. The patients who have lower Pirani score at initial visit (i.e., less severe deformity) respond better and faster to the treatment as compared to those who have higher Pirani score at initial visit (i.e. more severe deformity). Tenotomy is not required

in all cases. Severity of the deformity at presentation predict the need for tenotomy especially the hindfoot contracture score along with the rigidity of the clubfoot. Those cases requiring tenotomy and those not requiring, were well corrected at the end of casting. The outcome of both group was comparable. Our results are from a small patient population with a short follow up period. We recommend further studies in larger population with a longer follow up

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