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# Ponseti method for treatment of idiopathic congenital talipes equinovarus at tertiary care center in India

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## ABSTRACT

**Background:** Different treatment methods were tried with variable success rates but Ponseti method of serial casting and manipulation stood apart due to better understanding of foot biomechanics and became accepted choice of treatment worldwide.
**Methods:** 50 patients were enrolled in the study out of which 40 were available for final follow-up. We studied 40 cases during October 2018 to December 2020 at Government Medical College, Aurangabad. Out of 40 cases 31 were male and 9 were female. 25 were unilateral and 15 were bilateral. All cases were idiopathic. 4 inches Plaster of Paris (POP) bandages were cut into half and such 2 inches POP bandages were used for casting. Tenotomies were performed under controlled environment of Operation Theater with general anaesthesia. Number 12 surgical blade was used. Dennis-Browne splint was used for maintenance of correction.
**Results:** Out of total 55 feet studied, 10 feet (18.18%) required tendo Achilles tenotomy and 45 feet (81.82%) were treated with casting alone. There were 8 cases of relapses (20%). All relapsed cases were treated with repeat casting as per Ponseti protocol and none of them required repeat tenotomy. Complications related to plaster were minimal and there were no incidence of rocker bottom deformity.
**Conclusions:** We conclude that in a low income developing country like India where case load is very high; Ponseti method is effective, inexpensive form of treatment with minimal complications. Need for extensive soft tissue procedures vastly reduced with this method.

**Keywords:** CTEV, Clubfoot, Ponseti method, Percutaneous tendochilles tenotomy

## INTRODUCTION

Global prevalence of clubfoot is about 1 in 100 live births.[1] Various forms of treatment are tried but none found to be 100% curable due to poor understanding of pathoanatomy of foot in earlier times. Still each case poses a challenge to an orthopedic surgeon.

However in India, condition is more serious due to lack of availability of trained orthopaedic surgeons in peripheral rural parts of the country. Child being born with deformity, if not corrected, becomes socially ostracized in adult life. Mental trauma which comes with it becomes grave in adult life.

Classical dictum of aggressive surgical correction of these deformities has now shifted towards more conservative methods due to poor functional outcomes of these surgical procedures.

Kite initially advocated conservative treatment for idiopathic clubfoot.[2] But he was correcting only one deformity at a time instead of simultaneously correcting all. Though he was able to correct most of the deformities,

persistence of heel varus was a major problem due to calcaneaopedal block.

Ponseti, University of Iowa, published his first article on clubfoot in 1963 where he corrected all the deformities at once in contrast to Kite.[3] Initially Ponseti's work was neglected but in 1995 he published another article with 35 years of follow up, where he showed excellent results in most of the cases by use of his method.

In low income countries like India, many children with such deformities do not get timely treatment due to which they land up having more severe deformities in adult life. Objective of our study was to determine whether the amount of extensive corrective surgeries is reduced or not with the use of Ponseti method. Percutaneous tendo-achelles tenotomy was a part of treatment by Ponseti method.

## METHODS

All the patients included in our study were treated at tertiary care center i.e. Government Medical College, Aurangabad, Maharashtra, India during October 2018 to December 2020. Out of total 50 patients who were less than 2 years of age at the time of presentation, 40 were available for final follow-up.

### *Inclusion criteria*

The study included clinically diagnosed idiopathic congenital talipes equinovarus (CTEV) with age <2 years.

### *Exclusion criteria*

The study excluded patients with syndromic CTEV, age >2 years, and recurrent CTEV.

A written informed consent was taken from the parents of all the children included in the study. Simple random sampling was used. Patients visiting outpatient department (OPD) were randomly selected. Sample size was calculated using standard formula i.e. $4pq/ l^2$ where, "p" was prevalence and "l" is error which is taken as 5%. This comes around 16. Therefore, our sample size of 40 was higher than what was minimally required to carry out study.

Out of 40 patients, 31 were male and 9 were female. 25 were unilateral and 15 were bilateral. 7 patients gave history of at least one affected relative. Total involved feet were 55.

4 inches wide POP bandage, which is cut into half and cotton roll was used for casting. Tendo-achilles tenotomy was done in controlled environment of Operation Theater which is in contrast to what was advocated by Ponseti who used to do it under local anaesthesia. Dennis Browne foot abduction brace was used for maintenance of correction.

**Figure 1: Child with clubfoot.**

**Figure 2: POP cast application.**

All the children were thoroughly examined to rule out any neuromuscular abnormality, birth defects like spina bifida or skeletal defects. All the parents were inquired about history of consanguineous marriages, oligohydromnios/polyhydromnios, history of drug intake during pregnancy and positive family history if any.

Parents didn't bear any treatment cost and they were extensively counselled about nature of deformity, treatment plan, importance of follow up and compliance of the brace.

Pirani scoring was used for assessment. Ponseti regime used at our institution is as follows.[4]

Skin of the child was thoroughly examined at the time of presentation. We waited for at least two weeks from birth to allow the skin to mature whenever possible. Weekly serial casting was done after manipulations. Initially Below knee casts were applied which were converted to above knee immediately with knee in 90° flexion. We asked the parents to come for next follow up after soaking the casts in warm water which allowed us to remove the casts easily. We never allowed to remove the casts at home. Percutaneous tendo-achelles tenotomy was performed under general anaesthesia if required. Above knee casts for 3 weeks were given after tenotomy.

**Figure 3: Tenotomy.**

Dennis Browne foot abduction brace was given to all the patients after achieving adequate abduction and no equinus.[5] Bracing was done 23 hours a day for initial 3 months after correction. Night time and nap time bracing was advised to all the patients after 3 months and to continue the same till the age of 5 years. All the braces were manufactured by the same manufacturer. Braces were changed periodically as children grown in size.

**Figure 4: Child on DB brace.**

**Figure 5: Corrected deformity.**

The statistical analysis was performed using the paired "t" test where the means of initial Pirani and the final Pirani scores were compared and the difference was checked for significance.

## RESULTS

The study was carried out in 40 patients who were less than 2 years of age attending the outpatient department of orthopaedics in Government Medical College, Aurangabad during October 2018 to December 2020.

### *Age*

The mean age of presentation of all the patients were 5.26 months (160 days), with range of 0.03-24 months (1–720 days). Most frequent age of presentation was 3 months.

**Table 1: Correlation between age of presentation and sex.**

| Range (month) | 0-6 | 6-12 | 12-24 | Total |
|---|---|---|---|---|
| **Male** | 22 | 5 | 4 | 31 |
| **Percentage** | 55 | 12.5 | 10 | 77.5 |
| **Female** | 6 | 1 | 2 | 9 |
| **Percentage** | 15 | 2.5 | 5 | 22.5 |

### *Sex ratio*

Out of total 40 patients 31 were male and 9 were female. In this study male to female ratio was 3.4: 1.

**Table 2: Distribution of sex of patient.**

| Sex | Number | Percentage |
|---|---|---|
| **Male** | 31 | 77.5 |
| **Female** | 9 | 22.5 |
| **Total** | 40 | 100 |

### *Laterality*

Out of 40 patients 15(37.5%) were having bilateral deformity and remaining 25 (62.5%) were having unilateral deformity. Those patients who were having unilateral deformity, 13 (32.5%) were right sided and 12 (30%) were left sided.

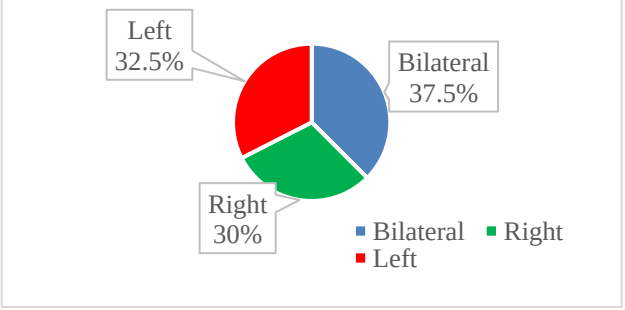


**Figure 6: Side of involvement.**

***Evaluation of results***

In our study average no of casts required per patient was 6. Ten patients required tenotomy. Percentage of tenotomy was 18.18%.

**Table 3: Average initial Pirani score.**

| Age | Average score |
|---|---|
| **0-6 months** | 5.02 |
| **6 months–1 year** | 5.36 |
| **1-2 years** | 5.75 |

**Table 4: Average final Pirani score.**

| Age | Average score |
|---|---|
| **0-6 months** | 0.0135 |
| **6 months–1 year** | 0 |
| **1-2 years** | 0.2222 |

Bracing was done in all patients in which adequate abduction and equinus correction has been achieved. Good bracing compliance was seen in 32 patients while poor compliance was seen in 8 patients. None of the patients required posteromedial soft tissue release surgery.

**Table 5: Statistics.**

| Pirani scoring | n | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| **Initial Pirani scoring** | 55 | 5.37 | 0.7 | 3.5 | 6 |
| **Final Pirani scoring** | 55 | 0.0785 | 0.1450 | 0 | 0.5 |

The "t" value is 53.62494. The "p" value is <0.00001. The result is significant at p<0.5

**Table 6: Average number of casts.**

| Age | No. of cast |
|---|---|
| **0-6 months** | 5.21 |
| **6 months–1 year** | 5.5 |
| **1-2 years** | 7.4 |

## DISCUSSION

Clubfoot is an oldest known deformity to mankind. It is found even in Egyptian mummies. Hippocrates in 400 BC described this deformity and attempted to tackle the problem with gentle manipulations.[6]

Nicholas Andry in his book Orthopedia described a deformity of the foot resembling the foot of a horse, which he called pedes equinal.[7]

Ponseti method is becoming accepted method to treat idiopathic clubfoot all over the world as several studies shown promising results and excellent functional outcomes.

We evaluated following variables. Age of the patient at presentation to our institution, sex incidence, laterality, number of casts, need for percutaneous tendoachilles tenotomy and need for extensive soft tissue release procedure.

Kite in his series of 1509 cases has reported 70% males and 30% females.[8] In Turco's series of 468 patients there were 334 (71.36%) males and 134 (28.63%) females; male: female ratio was 2.5:1.[9]

The average number of casts in our study was 6. None of the patients in our study required extensive soft tissue release procedure.

Chand and Mehtani et al evaluated 115 idiopathic clubfeet in 79 children presenting with relapse following treatment by the Ponseti method.[10] They concluded that surgical intervention should be reserved for residual deformity only after a fair trial of Ponseti cast treatment. Regular follow-up and strict adherence to brace protocol may reduce future relapse rates. Our patients who were treated by Ponseti method had much better ankle range of motion both in dorsiflexion and plantarflexion.

***Complications***

We came across certain complications due to application of casts such as pressure sore, edema and blanching of toes due to tight casts, cast slippage, bruise over thigh.

**Figure 7: Complications.**

Tight casts are immediately split and reapplied. Pressure sores and thigh bruises were treated by dressings and prophylactic oral antibiotics.

## CONCLUSION

Incidence in males is thrice as compared to males. Bilateral affection is most common. 3.5-4.5 was most common

Pirani severity scoring at the time of presentation. Our study has reaffirmed the effectiveness and usefulness of Ponseti technique as it produced excellent results with minimum surgical intervention.

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## REFERENCES

1. Ansar A, Rahman AE, Romero L, Haider MR, Rahman MM, et al. Systematic review and meta-analysis of global birth prevalence of clubfoot: a study protocol. BMJ Open. 2018;8(3):e019246.
2. Rijal R, Shrestha BP, Singh GK, Singh M, Nepal P, Khanal GP, Rai P. Comparison of Ponseti and Kite's method of treatment for idiopathic clubfoot. Indian J Orthop. 2010;44(2):202-7.
3. Ponseti I, Staheli LT. Clubfoot: Ponseti management. Seattle, Wash.: Global-HELP. 2005.
4. Lampasi M, Abati CN, Stilli S, Trisolino G. Use of the Pirani score in monitoring progression of correction and in guiding indications for tenotomy in the Ponseti method: Are we coming to the same decisions? J Orthop Surg (Hong Kong). 2017;25(2):2309499017713916.
5. Hattori T, Ono Y, Kitakoji T, Iwata H. Effect of the Denis Browne splint in conservative treatment of congenital club foot. J Pediatr Orthop B. 2003;12(1):59-62.
6. Dobbs MB, Morcuende JA, Gurnett CA, Ponseti IV. Treatment of idiopathic clubfoot: an historical review. Iowa Orthop J. 2000;20:59-64.
7. Burrows HJ. Orthopaedia. Med Hist. 1962;6(2):196.
8. Kite JH Principles in the treatment of congenital clubfoot. J Bone Joint Surg. 1939;21:595-606.
9. Turco VJ. Resistant congenital clubfoot American Academy of Orthopedic Surgeons Instructional Course Lectures, St Louis the CV Mosby Co. 1975;24.
10. Chand S, Mehtani A, Sud A, Prakash J, Sinha A, Agnihotri A. Relapse following use of Ponseti method in idiopathic clubfoot. J Child Orthop. 2018;12(6):566-74.

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