

ORIGINAL PAPER

# Treatment of Clubfoot by Ponseti Method: Our Experience

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## ABSTRACT

*Historically clubfoot was recognized and documented since the time of ancient Egyptians. Hippocrates introduced Talipesquinovarus into medical literature in 400 B.C. Although different treatment methods have been described with varying degrees of success, Ponseti method in clubfoot correction with its well-documented long-term success rate, is becoming an accepted treatment method all over the world.*

*The objective of this study was to prospectively evaluate the short-term results of using the Ponseti technique for treatment of 418 children with clubfoot deformity, and to determine if the number of extensive corrective surgeries can be reduced in these children.*

*Consecutive cases were studied between July 1st - 2012 to July 31 - 2014 at Gauhati Medical College and Hospital, Guwahati. A total of 418 cases were studied. These included 277 male and 141 females, 227 bilateral, 191 unilateral (Right=119, Left=72) cases. Idiopathic clubfoot constituted 399 cases while 19 cases were syndromic. For casting, plaster of Paris (POP), bandage and cotton roll was used; for Tenotomy local anesthesia and 15 number surgical blades, and for maintenance of correction Steenbeek foot abduction brace was used for this procedure.*

*The Ponseti method is a safe and effective treatment for congenital Talipesquinovarus, and radically decreases the need for extensive corrective surgical procedures. With its low rate of complication, high effectiveness, low*

*cost and need for minor surgery like a percutaneous Tenotomy of Achillestendon, Ponseti method has unmatched potential in developing countries like India.*

**Keywords:** *Clubfoot, Ponseti method, serial manipulations and casting, percutaneous Tenotomy of the Achilles tendon*

## INTRODUCTION

Clubfoot or more correctly CTEV<sup>1</sup> is one of the commonest congenital abnormalities found in children all over the world with an incidence of about 5-6/1000 live births.<sup>2</sup> No two clubfeet are the same; the statement highlights the challenge that the deformity presents. At the same time, the importance of accurate and complete treatment of the clubfoot cannot be over emphasized especially in a country like India, where any deformity becomes a cause of social ostracism. Misconceptions regarding etiology, pathology and efficacy of the treatment have been largely perpetuated in the expansive literature. The disappointing long term results of treatment through complex surgical procedures has inspired some to seek out less invasive, more conservative methods typified by Ponseti method.

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Dr. I.V. Ponseti, Prof. Emeritus<sup>3,4</sup>, University of Iowa has been the pioneer of manipulation and casting for the management of this problem. He first published his article in 1963,<sup>5</sup> but his efforts were neglected initially till 1995 when he published his results with 35 years of follow up. Since then this technique is gaining momentum all over the world because of its advantages of low cost, minimum surgery and good results if properly done. Although Kite<sup>6,7</sup> was the leading advocate of conservative treatment of clubfoot for many years his treatment was lengthy and short of satisfaction. Kite corrected each component of the deformity separately instead of simultaneously, and although he managed to correct foot cavus, and pronation and its harmful consequences, the correction of heel varus took him inordinate amount of time.

Many children in low-income countries (about 80% occurring in the developing world)<sup>8</sup> end up in neglected or untreated CTEV because of lack of treatment facility. The objective of this study was to prospectively evaluate the short-term results of using the Ponseti technique for treatment of 418 children with clubfoot deformity, and to determine if extensive corrective surgery was necessary in these children. Percutaneous Tenotomy of tendo Achilles was included in the Ponseti method of treatment.

## PATIENT AND METHODS

All the patients in the present study were treated at Gauhati Medical College and Hospital, Guwahati, Assam, India. During July 1st, 2012 – July 31, 2014, 418 patients all below the age of 10 years were treated by Ponseti method.<sup>9, 10</sup> Correction and part of maintenance through follow up was continued till the end of bracing. Informed consent was taken from the parents of all the children included in the study.

The study included both idiopathic and syndromic clubfoot. Out of 418 patients, 399 were idiopathic and 19 were syndromic. Neglected clubfoot was also included in the study. Total number of male patients were 277, and 141 were females. 191 cases were unilateral. 15 patients gave a history of having at least one affected relative. 213 patients presented in the age group of 0-3 months while 52 cases were neglected clubfoot.

For casting, POP bandage and cotton roll was used. For Tenotomy, local anesthesia, sterile syringe and needles

and 15 number surgical blades were used. For maintenance of correction, Steenbeek foot abduction splints were used. All parents of the children were questioned, and children were examined regarding presence of birth defects, neuromuscular or skeletal defects. Maternal history of the pregnancy like oligo or polyhydramnios, any radiological exposure during pregnancy, history of drug intake, maternal illness, consanguineous marriage, and any positive family history were taken. The parents were extensively counselled as regards the nature of deformity, treatment plan, the goal of achieving a cosmetically acceptable and plantigrade foot and importance of follow up. The treatment was free, and a counsellor was also available.

The severity of the deformity was assessed using the modified Pirani scoring.<sup>11,12</sup> The Ponseti method was used in our institution according to the following regime. Correction of the deformity by weekly serial casting, maintenance of correction by Steenbeek foot abduction brace<sup>13</sup>, and percutaneous Tenotomy of the Achilles tendon if required. Treatment was started as soon as possible after referral, preferably shortly after birth as and when the skin permitted, and consisted of gentle manipulation and serial application of long leg plaster casts without the use of anesthesia as described by Dr. Ponseti. After achieving adequate abduction and no equinus deformity, the baby is put on splint 23 hours a day for the first 3 months, and then 14 hours a day for 3 years.

Decision to perform a tendo Achilles tenotomy<sup>14</sup> under local anesthesia would be taken depending on the Pirani score vis a vis HS\* $>$ 1, MS\* $<$ 1 with the head of the talus well reduced. After achieving satisfactory correction cast is applied for 3 weeks and then the Steenbeek splint is applied 23 hrs a day for the first 3 months, and then 14 hours a day for 3 years.

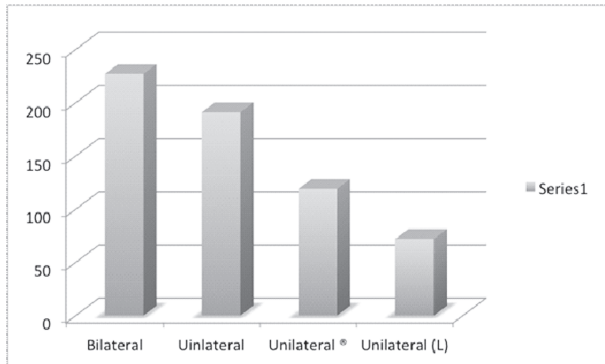
\*HS: hind foot score, MS: mid foot score

## RESULTS

The study was carried out in 418 patients who were less than 10 years of age attending the outpatient department of orthopedics in Gauhati Medical College Hospital from July 1st, 2012 – July 31st, 2014.

**Sex Ratio:** Out of total 418 cases 277 were male and 141 cases were female. In this study, male and female ratio was 1.96:1 which correlates well with Turco series.

**Laterality:** The laterality is shown in **Figure 1**. The distribution were as follows: bilateral – 227, unilateral – 191, unilateral (right) – 119 and unilateral (left) – 72.



**Figure 1** Laterality of cases

In our series the prevalence of bilaterality corresponds to 54.3 % bilateral, 28.4 % right sided, 17.2 % left sided.

**Evaluation of Results:** In our study, the average number of casts required per patient was 5.16. Fifty-three (12.6 %) patients required more than 8 casts. There were 22 patients in the casting treatment stage, and 100 casting dropouts. Tenotomy was performed in 58 patients, and not performed in 418 patients. The percentage of tenotomies performed was 13.87 %. There was no Tenotomy dropouts, or any patient in Tenotomy treatment stage.

Bracing was done for all patients upto the age of 4 years. There were 158 patients in bracing treatment stage and 84 bracing dropouts. Good brace compliance was seen in 118 patients while poor compliance was seen in only 1 patient. 15 had moderate brace compliance. None of the patients required postero-medial soft tissue release surgery (PMSTR).

## RELAPSE

Total number of relapse patients were 24. Re-casting, bracing with or without Tenotomy was the treatment for all relapsed patients. None of the relapsed patients underwent PMSTR or other extensive corrective surgeries.

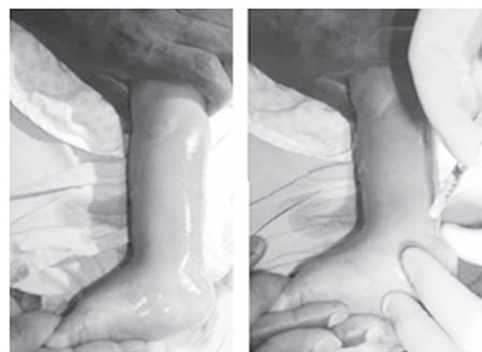
## CLINICAL PHOTOGRAPHS



**Figure 2** Clubfoot



**Figure 3** POP cast application



**Figure 4** Tenotomy procedures



**Figure 5** Corrected deformities



**Figure 6** Steenbeck foot abduction brace



**Figure7** Complication of Application



**Figure 8** Clubfoot babies in different stages of treatment

**DISCUSSION**

He identified congenital Talipes equinovarus was known to medical world since the time of Hippocrates; manipulation and holding the foot in corrected position

as early as 400 B.C. Several indigenous casting methods have evolved in the past based on pure logic to undo the deformity by producing the force in the opposite direction. J.H.Kites was the most precise in describing his technique and reported a success of 90%. However when used by other surgeons this method had a low correction and high relapse rate.

Several studies have surfaced demonstrating the successful use of Ponseti method in clubfoot correction, so much so that the method is becoming an accepted method of clubfoot treatment all over the world. Some of these patients who were followed up for 30 years showed no deterioration of function or appearance of the feet. In our study the average number of casts required was 5.16, which is much less than any traditional method. The average number of days of treatment was also less. The less number of tenotomies in our study in comparison to other series is due to dropouts in the pre tenotomy stage, and also due to unwillingness of the parents for any surgical interventions. This also explains more number of castings in few patients than what is proposed by Ponseti. The number of patients requiring surgical correction by extensive soft tissue release procedures like PMSTR was much reduced by Ponseti method.

**Table 1** Types of surgical methods

| Different research works | Ponseti method | Traditional method |
|--------------------------|----------------|--------------------|
| Sudhir Kapur et al       | 8.3 %          | 32.3 %             |
| A.V. Sanghvi             | 1 %            | 6 %                |
| John E. Herzenberg       | 3 %            | 91 %               |
| Present study            | None           | -                  |

The major concern in the operative treatment of congenital clubfoot is functional outcome. Numerous reports shows good results for the first 10 years of life. However as the child with clubfoot becomes an adult, the functional results often deteriorate. Open surgical release often leads to scarring and stiffness of the ankle with resulting limitation of movement and strength.<sup>15, 16, 17, 18, 19</sup> Aronson and Puskarich<sup>20</sup> studied the disability associated with various clubfoot treatment options. Patients who had undergone PMSTR had reduced ankle plantar flexion motion and diminished push off strength. Our patients who were treated with Ponseti method had much better ankle range of motion, both in dorsiflexion and plantar flexion. The patients were also saved from the complications of general anesthesia and all the complications of a major surgical

procedure as percutaneous Tenotomy; a minor procedure was performed under local anesthesia.

## COMPLICATIONS

We came across a few minor complications like plaster ulceration in the thigh, angioedema of the feet in a minority of patients. These were treated by dressing and foot elevation and loose cast application.

## CONCLUSION

Ponseti method is a safe, effective, economical and reliable method of treatment for both idiopathic and syndromic clubfoot. The method requires a simple procedure of Tenotomy, which can be done under local anesthesia on OPD basis. The needs for extensive soft tissue procedures, and the side effects associated with these, are substantially reduced if the method is done correctly in experienced hands. This will reduce the cost, hospital stay, and economic burden in a country like India. Our study has also reaffirmed the effectiveness and usefulness of Ponseti technique in clubfoot correction.

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**Contribution of authors:** We declare that the authors named in the article did all the work and all liabilities pertaining to claims relating to the article will be borne by the authors.

**Ethical clearance:** Ethical clearance for the study was taken from ethical committee.

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