

# Short Term Results of Ponseti Technique in the Management of Idiopathic Clubfoot

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## ABSTRACT

**Background:** The prevalence of clubfoot ranges from 0.6-1.5 per 1,000 live births. Ponseti method's excellent long term results in comparison studies and the discouraging long term results of surgically corrected foot has led to the renewal of interest in the former. The current study was taken up to evaluate the short-term results of Ponseti method in the treatment of idiopathic clubfoot. **Methods:** A prospective study was conducted in the Department of Orthopedics, JNIMS, Imphal during the period of March 2016 to September 2018. All children with clubfoot of consenting parents treated in the CTEV clinic by Ponseti technique were included as the study-subjects. Syndromic clubfoot and children with clubfoot initially treated elsewhere were excluded. The study-subjects were followed up-to a minimum period of one year. The Pirani scoring system was used to score each foot at the outset of treatment. The Laaveg and Ponseti functional scoring system was used to assess the final outcome. A Goniometer was used to measure the passive Restriction of Movement (ROM) relevant in the scoring system. The final outcomes were graded as Excellent (90-100), Good (80-89), Fair (70 to 79) and Poor (<70 points). **Results:** 32 Idiopathic clubfeet in 20 patients were studied. The mean Pirani score prior to treatment and after treatment (at final follow-up) were found to be 4.9 and 0.4 respectively. A total of 25 tendoachilles tenotomy were performed giving a tenotomy rate of 75%. The maximum number of tenotomy was performed in the group with the highest Pirani score at initial evaluation. No procedural complications were seen. 24 feet had “Excellent” score (75%). There were three feet each in the category of “Good” and “Fair” scores. There was a poor outcome in a resistant case with “Poor” score in both feet, functionally and subjectively. **Conclusion:** The Ponseti method is a safe, effective and reliable technique in the treatment of Idiopathic clubfoot with successful results even in the hands of orthopedists who do not have any prior widespread experience. Extensive surgeries that result in functionally inferior feet may be prevented with timely institution of treatment by the Ponseti method..

**Keywords:** Ideopathic clubfoot, Ponseti method, Short-term result, Tenotomy.

## INTRODUCTION

According to 2014 estimate by Global clubfoot Initiative, the prevalence of Clubfoot varies from 0.6 to 1.5 per 1,000 live births; the lowest being in Asians (0.6) and highest among Pacific Islanders. It is reported that 80% of all clubfoot cases are being born in lower middle income countries (LMICs).

Literature reports a major shift in the treatment of Clubfoot from operative to less invasive methods since late 1990s leading up to this decade.<sup>[1]</sup> Ponseti method's excellent long term results in comparison studies and the discouraging long term results of

surgically corrected foot has led to the renewal of interest in the former.<sup>[1-6]</sup> The Ponseti technique is described as one that is simple, yet effective in tackling this common congenital musculoskeletal disorder. It is a specific technique of gently manipulating and stretching the feet to correct it, followed by a “toe to high groin cast” to hold the stretch at weekly intervals correcting the foot gradually hence. The treatment phase usually ends with a 3 week-long cast after a percutaneous TendoAchilles tenotomy to correct ankle equinus, the last component in the order of correction. This is followed by a maintenance phase during which the child is made to wear a Foot Abduction Brace (FAB) that ensures abduction and dorsiflexion, to prevent recurrence of the deformity in the corrected foot.

As Ponseti method is associated with some varying opinion among researchers in the treatment of

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clubfoot, we felt the importance of evaluating its result.

**Aim:**

The current study was done to evaluate the short-term results of Ponseti method in the treatment of idiopathic clubfoot.

**MATERIALS AND METHODS**

A prospective study was conducted in the Department of Orthopedics, JNIMS, Imphal during the period of March 2016 to September 2018. All children with clubfoot of consenting parents treated in the CTEV clinic by Ponseti technique were included as the study-subjects. Two cases of

syndromic clubfoot encountered during the study were excluded, even though the same treatment was applied. Children with clubfoot initially treated elsewhere were also excluded. The study-subjects were followed up-to a minimum period of one year, that is, up-to September 2019.

The Pirani scoring system was used to score each foot at the outset of treatment. Foot scoring was done at each visit to assess the progress, resistance, recurrence and to decide the timing of tenotomy. Gender, bilaterality of foot involvement, age of the child at first cast, the number of casts required before tenotomy, skin and cast complications, tenotomy details and Foot abduction Brace compliance.

**Table 1: Laaveg & Ponseti Functional Scoring System**

Category	Points
Satisfaction (20 points) I am ...	
1. Very satisfied with end results	20
2. Satisfied with end results	16
3. Neither satisfied nor unsatisfied with end results	12
4. Unsatisfied with end results	08
5. Very unsatisfied with end results	04
Function (20 points) In my daily living my club foot ...	
1. Does not limit my activities	20
2. Occasionally limit my strenuous activities	16
3. Usually limits me in strenuous activities	12
4. Limits me occasionally in routing activities	08
5. Limits me in walking	04
Pain (30 points) My club foot ...	
1. Is never painful	30
2. Occasionally causes pain during strenuous activities only	24
3. Usually is painful after strenuous activities only	18
4. Is occasionally painful during routine activities	12
5. Is painful during walking	06
Position of heel when standing (10 points)	
1. Heel varus 0 degree or some heel valgus	10
2. Heel varus 1-5 degree	5
3. Heel varus 6-10 degree	3
4. Heel varus >10 degree	0
Passive motion (10 points)	
1. Dorsiflexion	1 point per 50 (up-to 5 points)
2. Total varus-valgus motion of heel	1 point per 100 (up-to 3 points)
3. Total inversion-eversion of foot	1 point er 500 (up-to 2 points)
Gait (10 points)	
1. Normal	6
2. Can toe-walk	2
3. Can heel-walk	2
4. Limp	2
5. No heel strike	2

We employed the Laaveg and Ponseti functional scoring system to assess the final outcome [Table 1]. A Goniometer was used to measure the passive Restriction of Movement (ROM) relevant in the scoring system. The final outcomes were graded as Excellent (90-100), Good (80-89), Fair (70 to 79) and Poor (<70 points).

We encountered difficulty in scoring the subjective assessment of satisfaction as most patients in the study population are below verbal response age, and parents were involved in scoring.

Treatment was instituted as early as possible in all cases, but infants presenting within few days of birth were counseled for the following week to suit the clinic timings on Friday. The authors are also of the opinion that the results are not appreciably altered by a delay of days or a week before starting treatment. Lewis E Zionts et al found no significant influence of the age at the start of treatment on the number of casts, duration of cast phase, need for heel cord tenotomy, skin problems attributable to brace, or early relapse.<sup>[1,2]</sup>

The feet were manipulated and cast applied using rapidur plaster of paris and softroll for a moulded well-fitting cast; a toe to high groin cast with knees in 90 degrees of flexion. The first cast in each case was aimed at cavus correction by lifting the first metatarsal head, bringing the forefoot in alignment with the hind foot. In the subsequent weekly visits, manipulation was done by abducting the forefoot with talar head as the fulcrum of rotation to correct the adduction; while simultaneous and spontaneous heel varus correction occurs without directly manipulating the calcaneum. 4 to 7 casts were required to achieve abduction of 70 degrees and heel going into valgus correction, at which time a percutaneous tenotomy was performed under local anaesthesia to correct the residual equinus. A post-tenotomy cast was applied for 3 weeks allowing the tendon to heal. The feet were reassessed after three weeks and a foot abduction brace (FAB) worn with the affected foot in 70 degrees of abduction and 15 degrees of dorsiflexion, worn for 23 hours a day for three months followed by night time use till the age of 3 to 4 years. Patients were followed up monthly at the start of orthosis use and then once every 3 months till final follow-up.

## RESULTS

32 Idiopathic clubfeet in 20 patients were studied prospectively of which 13 were males. The mean duration of the study-subjects was 27 months. 12 children had bilateral affection. 50% were firstborn, followed by 2nd order (6 cases) with equal incidence of 2 each in 3rd and 4th birth orders; the oldest child treated was 1 year 10 months and the youngest 3 were a week old. Male:female ratio in our study is 1.86. The mean Pirani score prior to treatment and after treatment (at final follow-up) were found to be 4.9 and 0.4 respectively. A total of 25 tendoachilles tenotomy were performed giving a tenotomy rate of 75%. No procedural complications were seen. [Table 2].

**Table 1: Requirement of tenotomy based on Pirani Score at initial evaluation**

Pirani score	Tenotomy	No tenotomy
0 to 2.5	-	2(100)
3 to 4.5	7(87.5%)	1(11.1%)
5 to 6	18(81.8%)	4(18.2%)

**Table 3: Requirement of tenotomy based on number of casts required before tenotomy**

No. of casts	Tenotomy	No tenotomy
Up-to 5 casts	16 (69.6%)	7 (30.4%)
6 and more	9 (100%)	-

In the study, none of the patients with Pirani score < 3 required tenotomy. Of the 25 children that underwent tenotomy; seven patients (87.5%) required tenotomy in 3 to 4.5 score group and 18 (81.8%) required tenotomy in the group with Pirani

score more than 5. The maximum number of tenotomy was performed in the group with the highest Pirani score at initial evaluation [Table 3]. The average number of casts required to achieve correction was 5.6. All (100%) patients who required six or more casts underwent tenotomy. Tenotomy rate was comparatively lower (69%) in patients who required 5 or less casts for correction. 24 feet had "Excellent" score (75%). There were three feet each in the category of "Good" and "Fair" scores. There was a poor outcome in a resistant case with Poor score in both feet, functionally and subjectively.

A single case of relapse occurred in a child presenting at one and half years of age. Superficial pressure sores from plaster developed in three patients; two over the talar head and one patient over the proximal thigh area which resolved spontaneously in well-molded casts.

There were six cases of Residual Grade 1 Forefoot Adductus (0.5 CLB score) with minimal functional impairment.

There were four patients with Rigidity Equinus score of 0.5 at final assessment, plantigrade neutral ankle on walking. Each of these patients underwent tenotomy in the treatment phase. The authors are of the opinion that the feet will gradually improve with progressive weight bearing.

Three heels were found to be moderately empty with empty heel score of 0.5 each. There was no significant gait disability or significant functional limitation.

There was a single case of relapse in a child whose age at the start of treatment was one and half years. The cause of relapse was attributable to deviation from bracing protocol and could be partly due to relatively higher age at presentation for treatment and was managed by additional four casts, which led to uneventful outcome with excellent score at final follow-up. Parents disclosed a deviation from bracing protocol. On enquiry, the parents gave a history of fever and some unrelated ailment for which the child got treated.

## DISCUSSION

Male: Female ratio in our study was 1.86 which was found to be slightly lower to 2.1 in a 400 case study by Angela Evans et al in 'The Bangladesh Clubfoot Project Audit and 2.2 (119:54) in a 173 case study in Zimbabwe by Tracey Smythe et al.<sup>[7,8]</sup> The mean Pirani score prior to treatment and after treatment (at final follow-up) were 4.9 and 0.4 respectively.

The tenotomy rate in the current study was found to be 73.5%. This finding is comparable to earlier study findings done in India and abroad.<sup>[9-13]</sup>

In the study, none of the patients with Pirani score less than 3 required tenotomy. Of the 25 that underwent tenotomy; seven (87.5%) required

tenotomy in 3-4.5 score group and 18 (81.8%) required tenotomy in the group with Pirani score > 5. The maximum number of tenotomy was performed in the group with the highest Pirani score at initial evaluation. Similar results are observed in other studies which show that initial evaluation of high Pirani scores being a predictor of higher Tenotomy rate; with some studies quoting Pirani score of 4.75 as a cut-off point for predicting the need for tenotomy.<sup>[14-15]</sup>

A higher tenotomy tendency with higher initial Pirani scores in the present study indicates that patients with higher Pirani scores at the initial evaluation will predictably require a tenotomy in the course of treatment. All patients who required six or more casts for correction underwent tenotomy showing that cast number also has a positive co-relation with tenotomy rate; the more the casts required in treatment, the higher the chance of requiring a tenotomy.

Successful treatment result of “Good” to “Excellent” was achieved in 27 feet (84.4%). The Ponseti method has a success rate of 92 to 100% worldwide, with surgical rates decreasing by 7% per year after peaking in 2000-2001.<sup>[16]</sup> The modest results we obtained in the study could be attributed to the initial learning curve of the orthopedists involved in the study.

## CONCLUSION

The Ponseti method is a safe, effective and reliable technique in the treatment of Idiopathic clubfoot with successful results even in the hands of orthopedists who do not have any prior widespread experience. Extensive surgeries that result in functionally inferior feet may be prevented with timely institution of treatment by the Ponseti method.

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