

ORIGINAL RESEARCH

Functional outcome of management of congenital idiopathic clubfoot by ponseti method in children under two years of age

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ABSTRACT

Introduction: Clubfoot occurs in approximately 1 in 1000 live births and is one of the most common congenital birth defects. There have been many reports of successful treatment of Congenital idiopathic clubfoot with the Ponseti method in the western world; similar studies in developing countries like India are few.

Objective:

- To study functional outcome of management of Congenital Idiopathic Clubfoot by Ponseti method in children upto 2 years of age.
- To continually educate about clubfoot and encourage the parents at initiation and during the course of treatment.

Materials and Methods: The study was conducted at Government medical college (GMCH), Chandigarh. The source of data is all confirmed cases of clubfoot diagnosed at GMCH, Chandigarh. The study was done from November 2021 to November 2022, and cases were selected on OPD basis. The cases were confirmed to be Congenital idiopathic clubfoot, by ruling out any other congenital anomalies and other non-idiopathic causes. Serial manipulation and casting were done using the Ponseti method of Clubfoot correction. Pirani scoring was used to assess both the severity at presentation and functional outcome at the end of treatment. Analysis of results was done using relevant statistical methods.

Results: In our series, we have treated 50 babies with Congenital Idiopathic Clubfoot by Ponseti method by serial casting. Out of 50 patients 36(72%) were Males and 14(28%) were females. Out of 50 cases 28(56%) were unilateral while 22(44%) were bilateral cases. Among the unilateral cases Right side was more often affected. 19 cases were right sided while 9 cases had left side affection. We used the Pirani severity score at the end of final cast as a functional tool for the assessment of the functional outcome. The results were graded as excellent, good and poor. Excellent is when Pirani score after last cast is 0 to 0.5, Good is when Pirani Score is 0.5 to 1 and Poor if Pirani score is 1 or more. Out of the 50 patients treated, 72 feet underwent treatment in which excellent results were achieved in 37 cases (51.38%) while good results in 34 patients (47.22%) and poor results in 1 case (1.38%).

Conclusion: We conclude that the Ponseti method is a very safe, effective and economical treatment for the correction of club foot that radically decreases the need for extensive corrective surgeries especially in developing countries.

Key words: Clubfoot, Ponseti, CTEV, Pirani score

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INTRODUCTION

Since many years, evolutionary biologists have admired the exquisite design of the human foot and how its features make it possible for us to effortlessly walk upright. Human feet are a marvel of engineering that, as a pair, contain more than 50 bones—about one quarter of all the bones in your entire body. Working

together with those bones are 60 joints and more than 200 muscles, tendons and ligaments that allow your feet to move. Walking on two legs was one of the keys to humans' development from ancient ape-like ancestors.

Foot is the foundation of our body. The importance of foot cannot be described enough and even a small deformity of foot makes locomotion inefficient and

damageto it can cause serious harm to our body and how we complete our daily tasks.

Of many deformities of foot, Congenital Talipes Equino Varus commonly known as clubfoot is a very common condition which we encounter during our practice. The incidence of congenital clubfoot is approximately one in every 1000 live births¹. Clubfoot can occur in either one or both feet-bilateral cases of clubfoot account for around 50% of cases. It is almost twice as common in males as in females. Although most cases are sporadic, familial occurrences have been reported.

Many theories have been proposed, but still the underlying cause of clubfoot is still mostly unknown. Clubfoot was first described in ancient Egyptian tomb paintings, and treatment was described in India as early as 1000 B.C. The first written description of clubfoot was given to us by Hippocrates (circa 400 B.C.), who believed the causative factor to be mechanical pressure. Arcaeus, in 1658 had written a chapter on the treatment of clubfoot which describes his stretching technique as well as two mechanical devices for maintenance of the correction. In 1803, Scarpa² published his historical "Memoir on Congenital Club-foot of Children". In 1806, Timothy Sheldrake³ published an essay entitled "Distortions of the Legs and Feet of Children". He believed that the disability was due to the ligaments and the muscles.

Ponseti⁴ carefully studied the pathophysiology of clubfoot and learnt from the mistakes of his predecessors and developed his current method of correction of clubfoot. The Ponseti technique was developed in the 1960s by Dr. Ignacio Ponseti at the University of Iowa in the USA. It wasn't until the 1990s after Dr. Ponseti came out of retirement that his method really began to take hold. He published his book, entitled, "Congenital Clubfoot: Fundamentals of Treatment"⁴ in 1996. His book was one of many

factors during this time period that led to a renewed interest about his technique for treating clubfoot.

MATERIALS AND METHODS

METHODOLOGY

SOURCE OF DATA

The study was conducted at Government medical college, Chandigarh. The source of data is all confirmed cases of Clubfoot diagnosed at GMCH, Chandigarh. The study was done from November 2021 to November 2022, and cases were selected on OPD basis. The cases were confirmed to be congenital idiopathic clubfoot, by ruling out any other congenital anomalies and other non-idiopathic causes.

INCLUSION CRITERIA

The cases selected fulfilled following criteria:

1. Confirmed cases of idiopathic clubfoot from newborn babies upto children of two years.
2. Unilateral and Bilateral cases.
3. Consent to participate in the study.

EXCLUSION CRITERIA

1. Non-Idiopathic Clubfoot like Neuropathic, Postural, Syndromic, Metatarsus Adductus, neglected clubfoot, Relapsed club foot.
2. Patients above the age of 2 years.
3. Patients who are unfit and noncompliant to the described technique.
4. Patients with abnormalities of hip or spine.

RESULTS

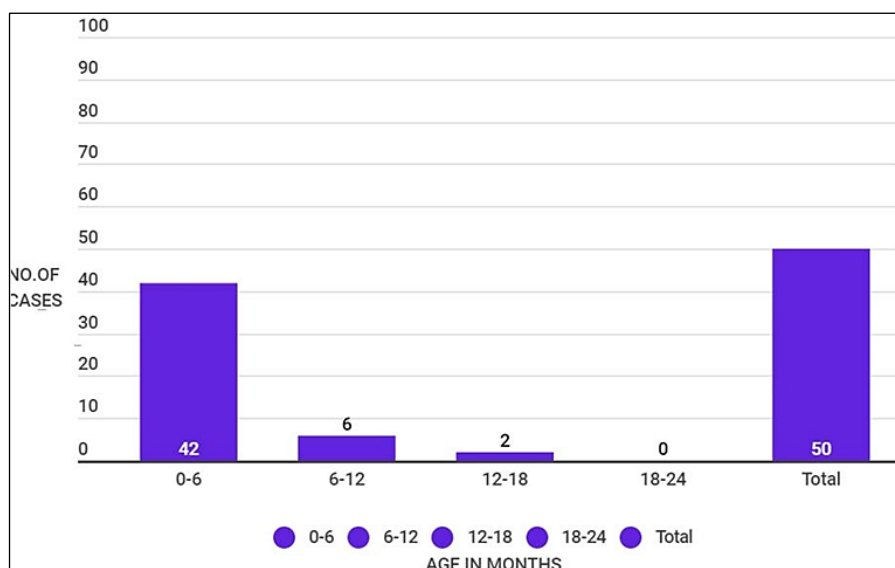
50 patients were included in our study. 1 patient underwent Posteromedial Soft tissue release and was considered as a failure. A total of 72 feet were treated with Ponseti technique.

Table 1: Frequency distribution of age of patients at presentation

Range (month)	Frequency	Percent
0-6	42	84.00%
6-12	6	12.00%
12-18	2	04.00%
18-24	0	00.00%
Total	50	100.00%

42 patients were below age of 6 months which came upto 84% while the number of patients between 6

months and 1 year were 6(12%). 2(4%) patients were between age of 12 and 18 months (Table-1).

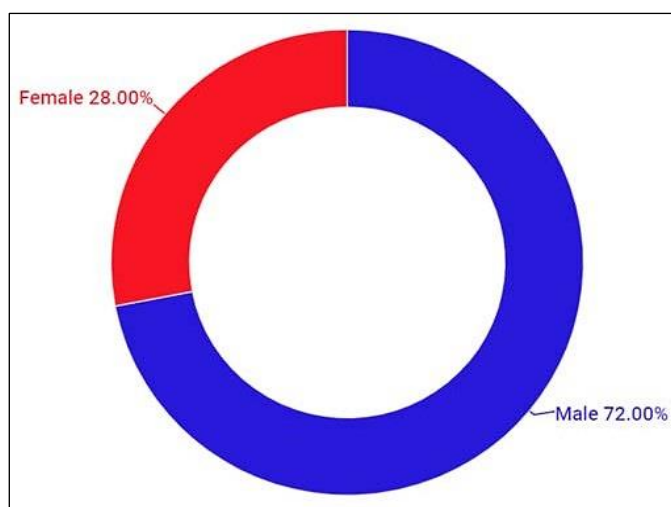


Graph1: Frequency Distribution of Age of Patients at Distribution

Table 2: Distribution of sex of patients

	Number	Percentage
Male	36	72.00%
Female	14	28.00%
Total	50	100%

Out of 50 patients 36(72%) were Males and 14(28%) were females (Table 2). Male female ratio was 2.57:1.



Graph2: Sex Distribution of Patients

DISCUSSION

Clubfoot is a very common condition that presents to an Orthopaedician and many ways of treatment are being tried by different practitioners across the world. There was a growing argument between surgical and conservative method of management of Clubfoot deformity, but nowadays a shift towards conservative treatment with casting is being preferred worldwide. Controversies do exist because of the lack of a standard scale to evaluate the functional outcome of treatment and the lack of long term follow up studies.

Lloyd-Roberts⁷³ wrote “Clubfoot will doubtless continue to challenge the skill and ingenuity of Orthopaedic surgeons”, Prof. Ignacio Ponseti devised his method of conservative treatment of congenital talipes equino varus which starts from day one of age and is based on the fundamentals of kinematics and pathoanatomy of the deformity. This method successfully realigns clubfoot in infants without extensive and major surgeries.

Of the children who presented to us, 84% (42 out of 50 babies) were below 6 months of age. 16% of children who presented were 6 months of age or

above suggesting a probably deficient referral system in our area and ignorance on the part of the parents. Out of 50 cases 28 were unilateral (56%) while 22 were bilateral cases. About 44% cases were bilateral. Among the unilateral cases Right side was

more often affected. 19 cases were right sided while 9 cases had left side affection. It accords with other studies done by Ponseti *et al.*, Changulani *et al.*,⁷⁴, Lehman *et al.*,⁷⁵, Christian *et al.*,⁷⁶ and Pavone *et al.*,⁷⁷

Table 13: Comparison of laterality with other studies

	Unilateral	Bilateral
Ponseti <i>et al.</i> , ¹⁷	40 (60%)	27 (40%)
Lehman <i>et al.</i> , ⁷⁵	15 (50%)	15 (50%)
Changulani <i>et al.</i> , ⁷⁴	32 (48%)	34 (52%)
Christian <i>et al.</i> , ⁷⁶	70 (60%)	46 (40%)
Pavone <i>et al.</i> , ⁷⁷	50 (61%)	32 (39%)
Our Study	28 (56%)	22 (44%)

In study by Ponseti *et al.* 60% were unilateral. Lehman *et al.*, Changulani *et al.*, Christian *et al.* and Pavone *et al.* found unilateral cases to be 50%, 48%, 60% and 61% respectively. This is in concordance with our results of 56% unilateral cases (Table 13).

According to our study the incidence of clubfoot is more in males compared with females. The male to female sex ratio in our study is 2.57:1. Our study had 72% (36) males compared to 28% females. Morcuende⁷⁸ *et al.* reported a male female ratio of 2.13: 1. Yamamoto⁷⁹ (male:female, 3:1), Chesney D *et al.*,⁸⁰ (2:1). Also reported similar results. The male preponderance found in this study is in agreement with other studies. A study by M. Changulani⁷⁴ *et al.*, who found that out of 66 patients treated, 50 patients (75.75%) were males and 16 patients (24.24%) were females.

The average number of casts applied was 7.74. In a series by Ponseti *et al.*,¹⁷ the number of cast per feet was five to ten (average 7.6). In another study by Laaveget *et al.*, the mean number of casts during their treatment was seven. Morcuende⁷² reported that 90.0% of the patients required five or fewer casts. Over a period of time, with more experience, people have started changing plaster casts at shorter intervals. The mean duration from first cast to tenotomy was calculated to be 47.18 days in our study. We had performed weekly casting as it is difficult for the parents to travel long distances and bring babies for casting more than once in a week. This was comparable to study by Solanki *et al.*,⁸¹ who compared Ponseti with accelerated Ponseti method in which he compared group of patients who underwent casting once a week with three castings per week. Group of patients who underwent once weekly casting had mean duration from first cast to tenotomy of 47.25 days which is comparable to our study.

The average number of cast application needed for correction increases as the Pirani severity score of foot increases. The average number of casts in our study in group of patients with PSS <2 was 5 while in group with PSS 2-4 was 7.69, group with PSS 4- 6 was 8.523 and patients with PSS of 6 was 10.

The average number of cast application needed for correction also increases with age of presentation.

In age group <6 months average number of casts needed was 7.59 while in age group 6-12 months it was 9.16, in age group 12-18 months it was 10.5.

CONCLUSION

The Ponseti technique for correction of CTEV is an excellent, safe and effective method according to results obtained by us

In a developing country like India, Ponseti method is very safe, economical and easy method.

The earlier the child presents to the doctor the quicker will be the correction and better will be the results.

The less severe types with low Pirani scores show better results and a quicker correction with less number of casts.

Correction by Ponseti technique initiated at an earlier age and adhered to regular weekly casting protocol tends to give better functional and cosmetic results.

Even relapses can be managed with further castings alone.

“Thus we conclude that the Ponseti method is a very safe, efficient and economical treatment for the correction of club foot that radically decreases the need for extensive corrective surgeries. The Ponseti method of cast correction is important especially in developing countries as it is effective and inexpensive. The results are excellent when treatment is begun early”.

SUMMARY

Our study was conducted as a prospective time bound study from November 2021 to November 2022 at Government medical college, Chandigarh.

The study included 50 patients both unilateral and bilateral cases. In total 72 feet which treatment in the form of casting.

42 patients were below age of 6 months which came upto 84% while the number of patients between 6 months and 1 year were 6 (12%). 2 (4%) patients were between age of 12 and 18 months.

Male female ratio was 2.57:1. Out of 50 patients 36 (72%) were Males and 14 (28%) were females.

Out of 50 cases 28 (56%) were unilateral while 22 were bilateral cases. Right side was more often

affected than left side. 19 cases were right sided while 9 cases had left side affection.

The most common Pirani score at presentation was in the range 3-4. Out of 72 feet 31 feet had Pirani scoring between 3 and 4 at presentation.

Average number of total casts needed were analysed among different age groups. Progressive increase in the average number of casts were seen to be increased as age advances. In the age group less than 6 months the number of casts required were 7.59; while in age group 6-12 months it was 9.16 and in age group 18-24 months it increased to 10.5.

The number of casts needed were analysed according to PSS at presentation. The average number of casts needed for correction increased progressively as the Pirani Severity Score at initial evaluation increased. The average number of casts increased from 5 in patients with PSS < 2 to 10 in group with PSS 6. The average number of casts in group with PSS 2 to 4 was 7.69 and PSS 4 to 6 was 8.52 respectively.

Out of 72 foets treated 39(54.42%) had to undergo tendoachilles tenotomy for equinus correction while 33(45.58%) were treated with cast.

It was observed that as age of presentation increases the number of total casts required for correction also increased. Similarly a linear relationship was seen between Pirani severity Score at presentation and total number of casts required for completion of treatment. On comparing the method of equinus correction, it was noted that, correction by cast application for equinus correction was more common when age at presentation and Pirani scoring is less. Patients with higher age and Pirani score required tendoachilles tenotomy more often for correction of equinus.

In patients with PSS < 2 all 4(100%) patients were treated with casts for equinus correction. Among the group of patients with PSS from 2-4, 23 patients(56%) were treated with tenotomy while 18 (44%) were treated with cast.

We used the Pirani severity score as a functional tool for the assessment of the functional outcome. The results were graded as excellent, good and poor. Excellent is when Pirani score after last cast is 0 to 0.5, Good is when Pirani Score is 0.5 to 1 and Poor if 1 or more. Out of the 50 patients treated, 72 foets underwent treatment in which excellent results were achieved in 37 cases (51.38%) while good results in 34 patients (47.22%) and poor results in 1 case (1.38%).

Only 1 case underwent Posteromedial soft tissue release. This case was considered as failure as no improvement in PSS was observed after application of 8 casts.

On analysing all the results of the study we can conclude that Ponseti method of Clubfoot correction is an excellent and effective technique in children under two years of age to obtain a painless, plantigrade, mobile, cosmetically acceptable foot.

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