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Original research article

FUNCTIONAL OUTCOME OF MANAGEMENT OF CONGENITAL IDIOPATHIC CLUBFOOT BY PONSETI METHOD IN CHILDREN UP TO 2 YEARS OF AGE

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Abstract

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.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 was done using the Ponseti method of Clubfoot correction. Pirani scoring was used to asses both the severity at presentation and functional outcome at the end of treatment.Analysis of results were done using relevant statistical methods. 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 1and Poor if Pirani score is 1 or more. Out of the 50 patients treated, 72 foots 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%). 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.

Keywords: Clubfoot, Ponseti, CTEV, pirani score

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

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ancient ape-like ancestors [1].

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 damage to it can cause serious harm to our body and how we complete our daily tasks [2].

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 births. 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 [3].

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, Scarpa published his historical "Memoir on Congenital Club-foot of Children". In 1806, Timothy Sheldrake 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. Ponseti 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" 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 [4].

Methodology

Source of data

The source of data was all confirmed cases of Clubfoot diagnosed 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 up to 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.

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4. Patients with abnormalities of hip or spine.

The cases were included from Orthopaedic OPDs, references from Paediatric wards, Paediatric surgery wards and Obstetrics wards. All the patients were treated on an outpatient basis. An informed consent was taken from the parents regarding management, complications and compliance. Older patients or those having non-idiopathic deformities were excluded from the study.
Every clubfoot under Ponseti management was scored each week for HS (hindfoot score), MS (midfoot score), and TS (total score) using Pirani Severity Scoring. Manipulation and casting were carried out without any anaesthesia or sedation.

Method of correction
The general principles of the Ponseti method for manipulative correction were followed:
Correcting all the components simultaneously, starting from cavus and leaving equinus for the last. Weekly manipulation and below-knee casts were applied and extended to above-knee casts with knee in 90 degrees of flexion. These were applied for four to six weeks and further, as per correction achieved.

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 foots 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 2: Relation between PSS at presentation and average number of total casts

PSS	Average no. of total casts
<2	5
2.0-4.0	7.69
4.0-6.0	8.52
6	10

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The number of casts needed were analyzed 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.

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. The average number of casts applied was 7.74.A total of 558 casts were applied for 72 feet.

Table 3: Method of equinus correction in foot

	Frequency	Percent
Tenotomy	39	54.42%
Cast	33	45.58%
Total foot	72	100%

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

Table 4: Pirani severity score distribution

PSS(At Presentation)	No. of foot
<2	4
2-3	11
3- 4	31
4-5	12
5- 6	11
6	3

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.

Table 5: Relation between Pirani severity score at Presentation and method of equinus correction

PSS		Eq. Correction method	
		Tenotomy	Cast
<2	Frequency	0	4
	Percent	0%	100%
2-4	Frequency	23	18
	Percent	56%	44%
4-6	Frequency	15	9
	Percent	62%	38%
6	Frequency	3	0
	Percent	100%	0
Total		41	31

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 01, 2022

The PSS at presentation and method of correction of equinus was analysed. 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.
In group with PSS 4-6, 15(62%) patients underwent tenotomy while 9(38%) patients were managed with casts. In patients with PSS 6 all 3(100%) patients were managed with percutaneous tendoachilles tenotomy.

Table 6: Frequency and Percentage of Posteromedial soft tissue release

PMR	Frequency	Percent
Not done	49	98%
Done	1	2%

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.

Table 7: Distribution of Functional outcome of foots treated with Ponseti technique

Age(months)	Excellent (Final PSS <0.5)	Good (Final PSS-0.5 to1)	Poor (Final PSS ≥1)
0-6	32(53.33%)	28(46.66)	0
6-12	5(55.55%)	3(30%)	1(11.11%)
12-18	0	3(100%)	0
Total	37(51.38%)	34(47.22%)	1(1.38%)

We used the Pirani severity score after 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 severity score after last cast is 0 to 0.5, Good is when Pirani Score is 0.5 to1 and Poor if Pirani Score is 1 or more. Out of the 50 patients treated, 72 foots 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%) (Table-12).
Excellent and good results were considered successful outcomes while Poor results were considered to be failure.

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-Roberts5 wrote “Clubfoot will doubtless continue to challenge the skill and

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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*. [6], Lehman *et al*. [7], Christian *et al*. [8], and Pavone *et al*. [9]

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.

We used the Pirani 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 1and Poor if 1 or more. Out of the 50 patients treated, 72 foots 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 patient [10].

We encountered 4 types of complications among all the castings performed, which included the following: 5 cases (10%) had complications out of which 1 case had skin abrasions, 1 case had a cast breakage, and 3 cases had cast loosening and slippage.

In our study only 1 case of relapse was seen. Relapse presented as forefoot adduction. The cause of relapse is attributed to non-compliance of brace. Strict instructions for the brace application, motivation, peer comparison and more frequent follow-up have led to increased compliance of the brace for these patients and early detection of any relapse. Morcuende *et al*. reported a 6% relapse rate in compliant patients and 80% in noncompliant patients. The underlying cause for the relapse in the compliant group was underlying muscle imbalance of the foot and ligament stiffness.

A single case had to undergo Postero Medial Soft tissue Release surgery and was considered a failure. The reason for failure was that PSS was 5 at presentation and age

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of presentation was 10 months of age. It was also attributed to non-compliance in follow up visits for casting.

Conclusion

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".

References

1. Azar F, Beaty J, Canale S, Campbell W. Campbell's operative orthopaedics.
2. 13th ed. Philadelphia: Elsevier; 2017;1031-1053.
3. Scarpa A. A memoir on the congenital club feet of children, and of the mode of correcting that deformity. 1818. Clin Orthop Relat Res. 1994;(308):4-7.
4. Sheldrake T. A practical essay on distortion of the legs and feet of children, &c. London: Printed for the author, and sold at his House; 1806.
5. Ponseti IV. Congenital clubfoot. Fundamentals of treatment.Oxford University Press. 1996:37-48.
6. Swann M., Lloyd – Roberts G.C., Catterall A. The anatomy of uncorrected club feet. A study of rotation deformity. J Bone J Surg. 1969; 51-B: 263-9.
7. Changulani, M.; Garg, N.K.; Rajagopal, T.S.; Bass, A.; Nayagam, S.N.; Sampath, J.; Bruce, C.E. Treatment of idiopathic club foot using the Ponseti method. Initial experience. J. Bone Joint Surg. Br. 2006, 88, 1385–1387.
8. Lehman, W.; Mohaideen, A.; Madan, S.; Scher, D.; Van Bosse, H.; Iannacone, M.; Bazzi, J.S.; Feldman, D.S. A method for the early evaluation of the Ponseti (Iowa) technique for the treatment of idiopathic clubfoot. J. Pediatr. Orthop. B 2003, 12, 133–140.
9. Sætersdal, C.; Fevang, J.; Fosse, L.; Engesæter, L. Good results with the Ponseti method: A multicenter study of 162 clubfeet followed for 2–5 years. Acta Orthop. 2012, 83, 288–293.
10. Pavone, V.; Testa, G.; Costarella, L.; Pavone, P.; Sessa, G. Congenital idiopathic talipes equinovarus: An evaluation in infants treated by the Ponseti method. Eur. Rev. Med. Pharmacol. Sci. 2013, 17, 2675–2679.
11. Morcuende J, Dolan L, Dietz F, Ponseti I. Radical Reduction in the Rate of Extensive Corrective Surgery for Clubfoot Using the Ponseti Method. PEDIATRICS. 2004;113(2):376-380.

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