

Original Research Article

A study on management of congenital clubfoot by Ponsetti technique in a rural medical college in India

Wazir Fahad Jan¹, Alamgir Jahan^{2*}, Mohd Yahya Dar¹, Firdous Ahmad Bangroo¹

Department of Orthopaedics, ¹SHKM GMC, Nalhar, NUH, Haryana; ²GMC Haldwani, Uttarakhand, India

Received: 24 October 2018

Revised: 06 December 2018

Accepted: 08 December 2018

*Correspondence:

Dr. Alamgir Jahan,

E-mail: fahadwzr94@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Congenital clubfoot also known as CTEV (congenital talipes equinovarus) is a common and debilitating congenital musculoskeletal anomaly affecting the children across the world with a slight preponderance in third world countries. The Ponsetti technique of casting has now become the mainstay of treatment of this condition. This method is especially effective in rural and underdeveloped areas with limited health care facilities. The purpose of this study was to evaluate the effectiveness of the Ponsetti technique in the correction of this deformity, through the assessment of modified Pirani score.

Methods: This was a prospective observational study conducted on 75 patients of either sex with 100 feet, with an average age of 3.6 months presenting to the Orthopaedic OPD of SHKM Government Medical College Hospital, Nalhar, Nuh, Haryana between September 2015 and September 2017, with a diagnosis of congenital clubfoot. All the patients were treated with Ponsetti technique and the results were analysed through the assessment of modified Pirani score. The patients were followed up for a period of 1 year after attainment of correction.

Results: Majority of the patients obtained full correction with this method. The mean value of the modified Pirani score improved from the pre-treatment value of 5.30 to 0.36 at the final follow up. The average number of casts required for full correction was 7.32.

Conclusions: Thus results of our study demonstrate that the Ponsetti method is a safe and effective method of treatment for congenital clubfoot, especially in rural and underdeveloped regions.

Keywords: Congenital clubfoot, CTEV, Ponsetti technique, Percutaneous tendoachilles tenotomy, Posteromedial soft tissue release

INTRODUCTION

Congenital clubfoot also known as CTEV (congenital talipes equinovarus) is a common and debilitating congenital musculoskeletal anomaly. The incidence of congenital clubfoot is approximately one in every 1000 live births.¹ Although most cases are sporadic occurrences, families have been reported with clubfoot as an autosomal dominant trait with incomplete penetrance.² Bilateral deformities occur in 50% of patients. The three basic components of clubfoot are equinus, varus, and

adduction deformities. Clubfoot is accompanied by internal tibial torsion. The ankle, midtarsal, and subtalar joints all are involved in the pathological process.^{3,4} The pathological changes caused by congenital clubfoot must be understood if the anomaly is to be treated effectively. According to Turco,⁵⁻⁷ the talus is forced into equinus by the underlying calcaneus and navicular, whereas the head and neck of the talus are deviated medially. The calcaneus is inverted under the talus, with the posterior end displaced upward and laterally, and the anterior end displaced downward and medially. McKay

added an awareness of the three-dimensional aspect of bony deformity of the subtalar complex in clubfoot.⁸ According to his description, the relationship of the calcaneus to the talus is characterized by abnormal rotation in the sagittal, coronal, and horizontal planes. These bony changes are followed by changes in the soft tissues. Contractures or anomalies of the soft tissues exert further deforming forces and resist correction of bony deformity and realignment of the joints. If the clubfoot is allowed to remain deformed, many other late adaptive changes occur in the bones. These changes depend on the severity of the soft-tissue contractures and the effects of walking. In untreated adults, some joints may spontaneously fuse, or they may develop degenerative changes secondary to the contractures, leaving them to face a life of disability.

A vast majority of children with congenital clubfoot are found in the developing countries like India, especially in the rural and underdeveloped regions. These patients don't have access to proper healthcare facilities, leading to improper treatment which culminates in a neglected clubfoot, which ultimately requires surgical procedures for correction and results are not that satisfactory. Also socioeconomic and financial constraints may prevent these children from getting the proper surgical treatment leading to physical as well as psychological disability to the patient. Thus it is of utmost importance, that congenital clubfoot should be treated as early as possible with a simple conservative method of treatment which is simple, effective and economically feasible for the patient. The Ponseti casting technique, devised by Dr. Ignacio Ponseti is now considered the conservative treatment of choice for congenital clubfoot, with a success rate of 92 to 98 percent.⁹⁻¹³ Several scoring systems have been devised for the assessment of the severity of congenital clubfoot viz Ponseti-Laaveg classification, the Dimeglio classification which have proved to be quite cumbersome to use.¹⁴ Modified Pirani score devised by Shafiq Pirani has now become the popular scoring system for clubfoot due to its convenience and the ability to assess the severity of each component of the deformity.¹⁵

In the present study, we evaluated the effectiveness of the Ponseti technique as a method of treatment in the correction of congenital clubfoot, thorough the assessment of modified Pirani score, in a rural medical college in India.

METHODS

After approval by the institutional ethics committee and informed written consent, the study was started. This was a prospective observational study conducted on 75 patients with 100 feet of either sex with an average age of 3.6 months, presenting to the Orthopaedic OPD of SHKM Government Medical College Hospital, Nalhar, Nuh, Haryana between September 2015 and September 2017, with a diagnosis of congenital clubfoot. The sex

distribution was 45 males and 30 females.

Inclusion criteria

Children with a diagnosis of congenital clubfoot and age less than 12 months patients with normal hip, spine and pelvis and no previous treatment received.

Exclusion criteria

Age greater than 12 months, patients associated neurological disorders and abnormalities of spine, hip and pelvis and previously treated patients.

At presentation all the patients were thoroughly examined and proper history was taken. Modified Pirani score was measured. The treatment was explained in detail to the parents. In the newborn patients the treatment was started 2 weeks after birth, while in rest of the patients it was started as early as possible.

Table 1: Modified Pirani score.

Parameters	Mild	Moderate	Severe
Midfoot			
Curved lateral border	0	0.5	1
Medial foot crease	0	0.5	1
Talar head coverage	0	0.5	1
Hindfoot			
Posterior crease	0	0.5	1
Rigid equinus	0	0.5	1
Empty heel	0	0.5	1

Maximum score is 6; Minimum score is 0. Higher the score, the more severe the deformity.



Figure 1: Clinical picture of a patient with bilateral clubfoot at presentation.

Treatment technique

The treatment was done in 2 stages, corrective casting and maintenance. Casting was done once a week till correction was achieved. In the first cast (Figure 2a) the cavus deformity was corrected by aligning the forefoot with the hindfoot, supinating the forefoot to bring it in line with the heel, and elevating the first metatarsal. Manipulation was done for around 1 minute. First the below knee cast was applied and then the above knee cast was applied with a slight external rotation force. After 1 week the cast was removed and now the adduction deformity was corrected by abducting the foot around the head of the talus, serial casts were applied over the next few weeks till the abduction deformity was corrected (Figure 2b), demonstrated by the neutral position of the forefoot in relation to the longitudinal axis of the foot. The final cast (Figure 2c) was applied with the foot in the maximally abducted position of 70 degrees and dorsiflexed 15 degrees for correction of equinus deformity. In the patients in whom the desired amount of dorsiflexion was not attained, a percutaneous tendoachilles tenotomy was done at the time of the application of the final cast. The final cast was removed after 3 weeks and the foot was placed in a maintenance brace.



Figure 2: a) Cast applied for correction of cavus deformity, b) Casts applied for correction of adduction deformity, c) Final cast applied in maximal dorsiflexion and abduction, d) A patient at follow up with brace in situ.

The brace (Figure 2d) was applied in such a way to maintain the foot in the corrected position of abduction of 70 degrees and dorsiflexion of 15 degrees. The parents were advised to apply the brace on the child for 23 hours each day for the first 3 months after casting and then while sleeping for 2 to 3 years. The patients were

subsequently followed up monthly for a period of 1 year and were advised to follow up regularly till the child reaches adolescence. At the end of 1 year, modified Pirani score was again measured and the data collected was subjected to analysis.

Statistical analysis

The data was analysed with SPSS version 17.0 software. The demographic variables were assessed by number and percentage. Simple arithmetic mean was used for the description of the values of modified Pirani score by comparison of the mean values of the score from pretreatment with that of the follow up, with a decrease in the score indicating correction of the deformity.

RESULTS

This was a prospective observational study. Most of the patients in our study attained full correction with Ponsetti method. The mean value of the modified Pirani score improved from the pre-treatment value of 5.30 to 0.36 at the final follow up. The average number of casts required for full correction was 7.32. Percutaneous tendoachilles tenotomy was required in 67 of the 100 feet. Two feet failed to achieve correction and required surgical procedure in the form of posteromedial soft tissue release, while three feet had relapse after initial correction and required recasting and percutaneous tendoachilles tenotomy for correction. Three feet developed skin abrasions after casting, they were managed by avoiding casting for one week and local antibiotic ointments. All these abrasions healed properly and the patients achieved full correction on subsequent casting.

Table 2: Age distribution.

Age in months	No. of patients	Percentage (%)
0-3	48	64
3-6	13	17.33
6-9	8	10.67
9-12	6	8
Total	75	100

Table 3: Sex distribution.

Gender	No. of patients	Percentage (%)
Male	45	60
Female	30	40
Total	75	100

Table 4: Feet requiring percutaneous tendoachilles tenotomy.

Tenotomy done	No. of feet	Percentage (%)
Yes	67	67
No	33	33
Total	100	100

Table 5: Table depicting the results of the study.

Parameter	Age of the patients at presentation in months	Modified Pirani score before treatment	Modified Pirani score at follow up of 1 year	Number of casts applied for achievement of correction
Mean value of the parameter	3.6	5.30	0.36	7.32

DISCUSSION

Congenital clubfoot also known as CTEV is a common and complex congenital deformity encountered in orthopaedic practice. The components of this deformity include cavus, adduction, varus and equinus. Early diagnosis and treatment are essential for a good functional outcome in this deformity. If left untreated, severe soft tissue contractures and bony deformities develop in the foot, culminating in disastrous functional and cosmetic outcomes. The treatment of the congenital clubfoot has evolved over the years, with the consensus being that the conservative treatment in the form of corrective casting, the initial choice of treatment. The casting program initially outlined by Kite and modified by Lovell and Hancock was moderately successful with the success rate, ranging from 15% to 80%.^{16,17} This method had a drawback as they considered that only forefoot is in adduction and lateral deviation of the forefoot with pressure on calcaneocuboid joint laterally holding the heel will correct adduction deformity, thus preventing the abduction of calcaneum and hence the correction of adduction deformity of hindfoot. This error was rectified by Dr. Ignacio Ponseti who proposed correction of adduction by simultaneous abduction at Lisfranc, calcaneonavicular, Chopart line and subtalar joints by putting pressure at talar head, without touching the heel.⁹⁻¹¹ Ponseti method has now become the cornerstone in the early management of clubfoot across the globe. This method is especially important in the rural and underdeveloped regions, due to poor socioeconomic conditions and lack of advanced medical facilities. This method of treatment is cheap, cost effective and compliant for the parents of these children. The effectiveness of Ponseti method in the correction of clubfoot has been demonstrated by several studies over the years.^{12,13,18}

In the present study, we evaluated the effectiveness of the Ponseti technique as a method of treatment in the correction of congenital clubfoot thorough the assessment of modified Pirani score, with a decrease in score indicative of correction of the deformity. This was a prospective observational study conducted on 75 patients with 100 feet of either sex (Table 3.) with an average age of 3.6 months (Tables 2 and 5.). All the patients were treated with Ponsetti method of casting and were followed up for a period of 1 year after completion of the treatment. The Modified Pirani score was measured at presentation and at follow up. Most of the patients in our

study attained full correction with Ponsetti method. The mean value of the modified Pirani score improved from the pre-treatment value of 5.30 to 0.36 (Table 5) at the final follow up. The average number of casts required for full correction was 7.32 (Table 5). Percutaneous tendoachilles tenotomy was required in 67 of the 100 feet (Table 4). There were no major complications in our study, two patients failed to achieve correction and required surgical correction, while three patients had relapse and improved on recasting. Three patients developed skin abrasions which resolved with local antibiotics.

The results of our study are quite comparable to other studies done about this technique.¹⁹⁻²¹ In the study by Rohit et al, the mean value of the modified Pirani score improved from 5.19 to 0.33, although the sample size of this study was larger with 356 feet but the results compare favourably to our study.¹⁹ The average number of casts applied in the various studies were as, 6.9 in Rohit et al, 6 in Changulani et al, and 7.2 in Christian et al, which are quite comparable to our study.¹⁹⁻²¹

CONCLUSION

From the above analysis, we can infer that the Ponsetti technique is a simple and highly effective modality of treatment for correction of congenital clubfoot, especially in rural and underdeveloped regions.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Staheli L. Clubfoot: Ponseti Management. Seattle, WA, USA: Global HELP Publications; 2003: 4–5.
2. Victoria-Diaz A, Victoria-Diaz J. Pathogenesis of idiopathic clubfoot. Clin Orthop Relat Res. 1984;185:14.
3. Irani RN, Sherman MS. The pathological anatomy of club foot. J Bone Joint Surg 1963;45:45.
4. Howard CB, Benson MK. Clubfoot: its pathological anatomy. J Pediatr Orthop. 1993;13:654.
5. Turco VJ. Surgical correction of the resistant club foot: one-stage posteromedial release with internal fixation: a preliminary report. J Bone Joint Surg. 1971;53:477.

6. Turco VJ. Resistant congenital clubfoot. *Instr Course Lect.* 1975; 24:104.
7. Turco VJ. Resistant congenital clubfoot: one-stage posteromedial release with internal fixation. *J Bone Joint Surg.* 1979; 61:805.
8. McKay DW. New concept of and approach to clubfoot treatment, I: principles and morbid anatomy. *J Pediatr Orthop.* 1982;2:347.
9. Ponseti IV, Smoley E.N. Congenital clubfoot: The results of treatment. *J Bone Joint Surg.* 1963;45:261–344.
10. Ponseti IV. Treatment of congenital clubfoot. *J Bone Joint Surg.* 1992;74:448.
11. Ponseti IV. Common errors in the treatment of congenital clubfoot. *Int Orthop.* 1997;21:137.
12. Bor N, Herzenberg JE, Frick SL. Ponseti management of clubfoot in older infants. *Clin Orthop Relat Res.* 2006;44:224.
13. Goksan SB, Bursali A, Bilgili F, Sivacioğlu S, Ayanoğlu S. Ponseti technique for the correction of idiopathic clubfeet presenting up to 1 year of age. A preliminary study in children with untreated or complex deformities. *Arch Orthop Trauma Surg.* 2006;126:15.
14. Dimeglio A, Bensahel H, Souschet P, Mazeau P, Bonnet F. Classification of clubfoot. *J Pediatr Orthop.* 1995;4:129.
15. Pirani S, Outerbridge H, Moran M, Sawatsky BJ. A method of evaluating the virgin clubfoot with substantial interobserver reliability. Presented at the annual meeting of the Pediatric Orthopaedic Society of North America, Miami, Fla, 1995.
16. Kite JH. Principles involved in treatment of clubfoot. *J Bone Joint Surg.* 1939;21:595.
17. Lovell WW, Hancock CI. Treatment of congenital talipes equinovarus. *Clin Orthop Relat Res.* 1970;70:79.
18. Morcuende JA, Dolan LA, Dietz FR, Ponseti IV. Radical reduction in the rate of extensive corrective surgery for clubfoot using the Ponseti method. *Pediatrics.* 2004;113:376.
19. Malhotra R, Mohapatra A, Arora G, Choudary P, Joshi H, Patel P. Ponseti Technique for the Management of Congenital Talipes Equinovarus in a Rural Set-Up in India: Experience of 356 Patients. *Children (Basel).* 2018;5(4):49.
20. Changulani M, Garg NK, Rajagopal TS, Bass A, Nayagam SN, Sampath J, Bruce CE. Treatment of idiopathic club foot using the Ponseti method. Initial experience. *J Bone Joint Surg Br.* 2006;88:1385–7.
21. 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;83:288–93.

Cite this article as: Jan WF, Jahan A, Dar MY, Bangroo FA. A study on management of congenital clubfoot by Ponsetti technique in a rural medical college in India. *Int J Res Orthop* 2019;5:172-6.