

An Outcome Evaluation of Management of Club Foot: A Hospital Based Study

Binay Kumar¹, Anshu Anand², Ajoy Kumar Manav³

¹Senior Resident, Department of Orthopaedics, Patna Medical College and Hospital, Patna, Bihar, India

²Senior Resident, Department of Orthopaedics, Patna Medical College and Hospital, Patna, Bihar, India

³Associate Professor and Unit Head, Department of Orthopaedics, Patna Medical College and Hospital, Patna, Bihar, India

Received: 12-11-2023 / Revised: 17-12-2023 / Accepted: 26-01-2024

Corresponding Author: Dr. Anshu Anand

Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to assess the orthopaedic management of club foot at tertiary health care centre.

Methods: This was cross-sectional study carried out in the Department of Orthopaedic at PMCH, Patna with idiopathic club foot less than one year age presented to the Orthopaedic Department during the two-year were included into the study. In the three-year period there were 50 patients after written explained consent were enrolled to study. All necessary details of the patients were noted like age, sex, pre interventions modified Pirani score noted.

Results: The majority of the patients were in the age group of 0-3 (months) were 40%, followed by 3-6 were 32%, 6-9 were 18%, 9-12 were 10%. The majority of the patients were Female i.e. 64% and Male were 36%. In all the age groups the Post treatment Pirani score significantly differed as compared to pre-treatment score i.e. 0-3 were 5.32 ± 2.18 and 1.55 ± 1.035 ($t=8.82, df=72, p<0.01$); 3-6 were 5.48 ± 0.82 and 1.58 ± 1.32 ($t=12.58, df=56, p<0.001$); 6-9 were 5.75 ± 2.15 and 2.18 ± 0.96 ($t=9.91, df=26, p<0.05$); 9-12 were 5.36 ± 1.24 and 1.86 ± 1.34 ($t=10.20, df=24, p<0.001$) were statistically significant.

Conclusion: According to the results of our investigation, the ponsetti approach was very efficient in the management of idiopathic club foot, as measured by the Pirani score for club foot assessment almost all the patients were doing well with this treatment.

Keywords: Club Foot, Modified Pirani Score, Ponsetti technique, Outcome of Club foot

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Idiopathic congenital talipes equinovarus (CTEV) is a relatively common complex three-dimensional deformity of the foot affecting approximately 1–2/1,000 newborns. The long-term aims of treatment are a pain-free, flexible, functional foot, with good mobility and tolerating normal footwear. Treatment remains controversial as initial correction can be achieved by surgical or non-surgical means or a combination of both. The traditional treatment for clubfoot may involve a combination of initial casting, extensive posterior medial soft tissue releases and bony procedures, followed by further casting. [1] This treatment is associated with significant risks, complications, and a potential for poorer prognosis with patients developing weak, stiff and scarred feet. [2,3]

Follow-up studies have also shown that these feet have a higher incidence of pain and their gait is affected. [2-4] A more conservative technique

pioneered by Ignacio Ponseti at the University of Iowa involves serial corrective manipulation and casting to reduce the deformity, with subsequent splinting in a foot abduction splint. [5]

Idiopathic congenital talipes equinovarus (CTEV) is a relatively common complex three-dimensional deformity of the foot affecting approximately 1–2/1,000 newborns. It is a common and challenging musculoskeletal deformity. [6] It represents a congenital dysplasia of musculoskeletal tissues distal to the knee. [7] All the medial soft tissues distal to the knee are contracted. This deformity has intraosseous and interosseous components resulting from abnormal bony relationship. It mainly affects the relationship of the talus with the tarsal bones so that, these bones assume extreme position of flexion, adduction and inversion at birth. [8] This results in hind foot equinus, hind foot varus and fore foot varus. [9] In cases of severe club foot deformity gait

is grossly affected and neglected patient walks on their ankles. [9] The worldwide prevalence is 0.6 to 1.5 per 1000 births, in India the prevalence is 1.19 per 1000 birth. [10,11]

The mechanism by which club foot develops is unknown but mechanical, neurological, muscular, bony, connective tissue and vascular mechanisms all have been proposed. [12] The etiology of club foot is not well elucidated while both genetic and environmental factors are frequently implicated and a little is known about environment risk factors. [13] It is a fact that even today club foot is still a challenge for paediatric orthopaedic surgeons. [14]

The aim of the present study was to assess the orthopaedic management of club foot at tertiary health care centre.

Materials and Methods

This was cross-sectional study carried out in the Department of Orthopaedics at PMCH, Patna with idiopathic club foot less than one year age presented to the Orthopaedic Department during the two-year were included into the study. In the three-year period

there were 50 patients after written explained consent were enrolled to study. All necessary details of the patients were noted like age, sex, pre interventions modified Pirani score noted.

All necessary details of the patients were noted like age, sex, pre interventions modified Pirani score noted. All of the patients underwent ponsetti technique for the management of idiopathic club foot. The Ponseti method consists of 2 equally important phases: the corrective phase and the maintenance [15] phase and consist of serial manipulation, casting and tenotomy of the Achilles Tendon. [16] This is followed by the use of foot abduction brace to prevent the occurrence of relapse. All these procedures are divided into two phases; 8 Casting Phase which consist of Manipulation, Casting and Tenotomy 15 Maintenance Phase which is the use of Foot Abduction Brace to prevent relapse or recurrence. [16,17] All such procedures were carried out in our institute At the end all of them evaluated by Pirani score. The statistical analysis was done by paired t-test and calculated by SPSS 19 version software.

Results

Table 1: Age and gender distribution

Age groups	N	%
0-3	20	40
3-6	16	32
6-9	9	18
9-12	5	10
Total	50	100
Gender		
Female	32	64
Male	18	36

The majority of the patients were in the age group of 0-3 (months) were 40%, followed by 3-6 were 32%, 6-9 were 18%, 9-12 were 10%. The majority of the patients were Female i.e. 64% and Male were 36%.

Table 2: Distribution of the patients as per the Pirani score

Age group	Pre-treatment score	Post treatment score	p-value (paired t-test)
0-3	5.32 ± 2.18	1.55 ± 1.035	t=8.82,df=72,p<0.01
3-6	5.48 ± 0.82	1.58 ± 1.32	t=12.48,df=56,p<0.001
6-9	5.75 ± 2.15	2.18 ± 0.96	t=9.91,df=26,p<0.05
9-12	5.36 ± 1.24	1.86 ± 1.34	t=10.20,df=24,p<0.001

In all the age groups the Post treatment Pirani score significantly differed as compared to pre-treatment score i.e. 0-3 were 5.32 ± 2.18 and 1.55 ± 1.035 (t=8.82,df=72,p<0.01); 3-6 were 5.48 ± 0.82 and 1.58 ± 1.32 (t=12.58,df=56,p<0.001); 6-9 were 5.75 ± 2.15 and 2.18 ± 0.96 (t=9.91,df=26,p<0.05); 9-12 were 5.36 ± 1.24 and 1.86 ± 1.34 (t=10.20,df=24,p<0.001) were statistically significant.

Discussion

Congenital talipes equinovarus (CTEV) is one of humanity's oldest and most frequent congenital

malformations, affecting one to two out of every thousand live births. [18] The four essential elements of the Ankle equinus, heel varus, forefoot adduction, and cavus are all deformities. [19,20] The non-operative therapy of clubfoot is widely considered as the first line of defence and should begin as soon as feasible after birth. Clubfoot is one of the most common deformity of the lower extremity encountered in paediatric orthopaedic practice. The worldwide prevalence is 0.6 to 1.5 per 1000 births, in India the prevalence is 1.19 per 1000 birth. [21-23] Clubfoot may occur in isolation or be associated with other syndromes, neurological

conditions and congenital malformations. Clubfoot is a burden to the child and can diminish the quality of life. [24,25]

The majority of the patients were in the age group of 0-3 (months) were 40%, followed by 3-6 were 32%, 6-9 were 18%, 9-12 were 10%. The majority of the patients were Female i.e. 64% and Male were 36%. Similarly Gupta A et al and Pulak S et al had a higher number of occurrences of clubfoot in males with 81% and 80% respectively. [26,27] There is a higher incidence of clubfoot in male children compared to females. According to Lochmiller C et al 25% of all isolated cases had a positive family history and Engell V et al has stated that heritability of isolated clubfoot was 30%. [28,29]

In all the age groups the Post treatment Pirani score significantly differed as compared to pre-treatment score i.e. 0-3 were 5.32 ± 2.18 and 1.55 ± 1.035 ($t=8.82, df=72, p<0.01$); 3-6 were 5.48 ± 0.82 and 1.58 ± 1.32 ($t=12.58, df=56, p<0.001$); 6-9 were 5.75 ± 2.15 and 2.18 ± 0.96 ($t=9.91, df=26, p<0.05$); 9-12 were 5.36 ± 1.24 and 1.86 ± 1.34 ($t=10.20, df=24, p<0.001$) were statistically significant. According to recent studies, illiteracy and poverty are two factors that cause some affected children to be neglected, making it more difficult to correct the deformity. [30] Oligohydramnios, family history, male baby, first baby, and twin pregnancy are all risk factors. Because clubfoot is a visible deformity, there is no need for a particular inquiry or screening programme to discover it, albeit it can be detected prenatally using high-resolution ultrasound during the second trimester. [31]

Considering etiological theories of connective tissue hypothesis the primary abnormality of connective tissues is responsible for club foot deformity which is supported by the association of club foot with different anomalies. [32] Wazir Fahad Jan also found that Majority of the patients obtained full correction with this method. [33]

Conclusion

According to the results of our investigation, the ponsetti approach was very efficient in the management of idiopathic club foot, as measured by the Pirani score for club foot assessment almost all the patients were doing well with this treatment.

References

1. Cummings RJ, Lovell WW. Operative treatment of congenital idiopathic club foot. JBJS. 1988 Aug 1;70(7):1108-12.
2. Dobbs MB, Nunley R, Schoenecker PL. Long-term follow-up of patients with clubfeet treated

- with extensive soft-tissue release. JBJS. 2006 May 1;88(5):986-96.
3. Ippolito E, Farsetti P, Caterini R, Tudisco C. Long-term comparative results in patients with congenital clubfoot treated with two different protocols. JBJS. 2003 Jul 1;85(7):1286-94.
4. Karol LA, O'Brien SE, Wilson H, Johnston CE, Richards BS. Gait analysis in children with severe clubfeet: early results of physiotherapy versus surgical release. Journal of Pediatric Orthopaedics. 2005 Mar 1;25(2): 236-40.
5. Ponseti IV. Treatment of congenital club foot. JBJS. 1992 Mar 1;74(3):448-54.
6. Macnicol MF. The management of club foot. JBJS 2003; 85-B (2): 167-70.
7. Herring JA. Tachdjian Paediatrics: Vol 3. In W.B Saunder Company 2002: 922-50.
8. Herzonburg JE, Carroll NC, Christofersen MR, et al. Club Foot analysis with the three dimensional computer modeling. JPO, 1999: 8-257.
9. Manaster BJ. Congenital foot anomalies. In hand book of skeletal radiology 1996: 338-49
10. Dobbs MB, Gurnett CA. Genetics of clubfoot. Journal of paediatric orthopedics. Part B. 2012; 21(1):7-9. Doi:10.1097/BPB.0b013e328349927c
11. Ansar A, Rahman AE, Romero L et al. Systematic review and meta-analysis of global birth prevalence of clubfoot: a study protocol. BMJ Open. 2018; 8(3):e019-- 246. Published 2018 Mar 6. Doi:10.1136/bmjopen-2017-019246
12. Miedzybrodzka Z. Congenital Talipes equinovarus (club foot) a disorder of the foot but not the hand. J Anat 2003; 202 (1): 37-42.
13. Chesney D, Barker S, Miedzybrodzka Z, et al. Epidemiology and genetic theories. Bull hosp Joint Dis. 1999; 58 (1): 59-64.
14. Anand A and Sala DA. Club foot Etiology and Treatment. Review article. Indian Journal of Orthopaedics 2008; 42 (1): 22-8.
15. Parsa A, Moghadam MH, Jamshidi MHT. Relapsing and residual clubfoot deformities after the application of the ponseti method: a contemporary review. Archives of bone and joint surgery. 2014; 2(1):7.
16. Africa Clubfoot Training Project. Chapter 5 Africa Clubfoot Training Basic and Advanced Clubfoot Treatment Provider Courses - Participant Manual. University of Oxford: Africa Clubfoot Training Project, 2017.
17. Gopakumar, T. and Rahul, M., 2014. Ponseti technique in the management of Idiopathic club foot. Kerala Journal of Orthopaedics, 27 (1), pp.15-17.
18. Taneja DK. Soujourn with club foot—35 years experience. Ind J Orthop. 2002;36(2):2.

19. Irani RN, Sherman MS. The pathological anatomy of idiopathic clubfoot. *Clin Orthop Related Res.* 1972;84:14–20.
20. McKay DW. New concept of and approach to clubfoot treatment: section I-principles and morbid anatomy. *J Pediatric Orthop.* 1982;2(4):347–56.
21. Kruse LM, Buchan JG, Gurnett CA, Dobbs MB. Polygenic threshold model with sex dimorphism in adolescent idiopathic scoliosis: the Carter effect. *JBJS.* 2012 Aug 15;94(16):1485-91.
22. Dobbs MB, Gurnett CA. Genetics of clubfoot. *Journal of paediatric orthopedics. Part B.* 2012; 21(1):7-9.
23. Ansar A, Rahman AE, Romero L et al. Systematic review and meta-analysis of global birth prevalence of clubfoot: a study protocol. *BMJ Open.* 2018; 8(3):e019-246.
24. Faldini C, Prosperi L, Traina F, Nanni M, Tesfaghiorghi S, Tsegay S, Yosief M, Pungetti C, Sanzarello I. Surgical treatment of neglected congenital idiopathic talipes equinovarus after walking age in Eritrea: an Italo-Eritrean cooperation. *Musculoskeletal surgery.* 2016 Aug;100:133-7.
25. Owen RM, Kembhavi G. A critical review of interventions for clubfoot in low and middle-income countries: effectiveness and contextual influences. *Journal of Pediatric Orthopaedics B.* 2012; 21(1):59-67.
26. Gupta A, Singh S, Patel P, Patel J, Varshney MK. Evaluation of the utility of the Ponseti method of correction of clubfoot deformity in a developing nation. *International orthopaedics.* 2008; 32(1):75-79.
27. Pulak S, Swamy MKS. Treatment of idiopathic clubfoot by ponseti technique of manipulation and serial plaster casting and its critical evaluation. *Ethiopian journal of health sciences,* 22(2), 2012.
28. Engell V, Nielsen J, Damborg F, Kyvik KO, Thomsen K, Pedersen NW, Overgaard S. Heritability of clubfoot: a twin study. *Journal of children's orthopaedics.* 2014; 8(1):37-41.
29. Lochmiller C, Johnston D, Scott A, Risan M, Hecht JT. Genetic epidemiology study of idiopathic talipes equinovarus. *American journal of medical genetics.* 1998; 79(2):90-96.
30. Evans AM, Chowdhury MM, Kabir MH, Rahman MF. Walk for life-the National Clubfoot Project of Bangladesh: the four-year outcomes of 150 congenital clubfoot cases following Ponseti method. *Journal of Foot and Ankle Research.* 2016 Dec;9:1-0.
31. Staheli L. Clubfoot: ponseti management. *Global HELP Organization;* 2009.
32. Wynne-Davis R. Family studies and the cause of club foot. *JBJS* 1964; 46-B (3); 445-63.
33. Jan WF et al. *Int J Res Orthop.* 2019 Jan;5(1):172-176.