

Original Research Article

Correction of idiopathic congenital talipes equinus varus by Ponseti technique in newborn

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ABSTRACT

Background: Clubfoot is one of the commonest congenital anomaly. Though various modalities of treatment are available for this common disorder ranging from surgical release, distraction by external fixator to conservative methods none has proved to be standard for treatment.

Methods: A study of 40 cases (62 feet) of clubfoot treatment was done at Post Graduate Institute of Swasthiyog Prathishthan, Miraj by Ponseti technique. Cavus was corrected in first manipulation by first metatarsal lift (supination) followed by forefoot adduction and heel varus in subsequent manipulation until abduction of 60-70 degree is achieved.

Results: Post treatment evaluation of results was done. 75% feet had very good results, 20% had good results and 5% had poor results, 11% had relapse of deformity ranging from mild to severe. Two feet required retenotomy before casting, only one foot required RPMR.

Conclusions: The Ponseti method of correction of clubfoot is a safe and effective treatment and radically decreases the need for extensive corrective surgeries and achieves functional pain free normal looking plantigrade feet with mobility and required no modified shoes.

Keywords: Congenital talipes equinovarus, Ponseti method, Newborn, Correction

INTRODUCTION

The congenital talipes equinovarus (CTEV) or clubfoot is one of the most common and complex congenital deformities. The incidence of idiopathic clubfoot is estimated to be 1 to 2 per 1,000 live births.¹ The deformity has four components: ankle equinus, hindfoot varus, forefoot adductus, and midfoot cavus.² The goal of the treatment is to correct all the components of clubfoot to obtain painless, plantigrade, pliable and cosmetically and functionally acceptable foot within the minimum time duration with least interruption of the socioeconomical life of the parent and child.^{2,3}

Clubfoot is one of the most common congenital orthopedic anomalies and was described by Hippocrates in the year 400 BC.⁴ However, it still continues to challenge the skills of the pediatric orthopedic surgeon as it has a notorious tendency to relapse, irrespective of whether the foot is treated by conservative or operative means. Part of the reason that the foot relapses is the surgeon's failure to recognize the underlying pathoanatomy. Clubfoot is often automatically assumed to be an equinovarus deformity, however, other permutations and combinations, such as calcaneovalgus, equinovalgus and calcaneovarus, are possible. Out of these four combinations, calcaneovalgus occurs most

frequently, followed by equinovarus deformity. In more than 99% of the cases, calcaneovalgus responds to conservative treatment, which involves passive manipulation by the mother and usually does not require casting or operative intervention.⁵

The equinovarus deformity is classified into congenital and acquired. The congenital is further classified into idiopathic and non-idiopathic types. The idiopathic type is typically an isolated skeletal anomaly, usually bilateral, has a higher response rate to conservative treatment and a tendency towards a late recurrence. The causes of the non-idiopathic type include deformity occurring in genetic syndromes, teratologic anomalies, neurological disorders of known (e.g., spina bifida) and unknown etiology and myopathies. The non-idiopathic type is characterized by diametrically opposite deformities in the feet (calcaneovalgus in one foot and equinovarus in the other), presence of other anomalies and a poor response to conservative or operative treatment. Acquired equinovarus has neurogenic causes (e.g., poliomyelitis, meningitis, sciatic nerve damage) and vascular causes (Volkman ischemic paralysis).^{6,7}

The Ponseti casting technique of club foot management has been shown to be effective, producing better results and fewer complications than traditional surgical methods.⁸ In recent years, interest has been renewed in the Ponseti casting technique, and many centers now believe that most clubfeet can be treated by Ponseti casting technique rather than surgery.^{9,10} Ponseti casting technique is especially important in developing countries, where operative facilities are not available in the remote areas. The physicians and personnel trained in this technique can manage the cases effectively with the cast treatment only.¹¹⁻¹³

Here we present a prospective study of correction of idiopathic CTEV by Ponseti technique in new born.

METHODS

The present study was a cross sectional observational study, conducted among 40 infants presented with CTEV in CTEV clinic at P.G.I. of Swasthiyog Prathishthan, Miraj, Maharashtra during study duration of May 2004 to May 2006. All patients were of less than two months of age with virgin feet.

Inclusions criteria

Infants presenting with CTEV were included in the present study.

Exclusion criteria

Neonates with clubfeet associated with meningocele, meningomyelocele, arthrogryposis multiplex congenita and other neuromuscular causes were excluded.

- For casting, Plaster of Paris bandage and cotton roll.
- For TA tenotomy: lignocaine 2%, sterile syringe and needle, 11 no surgical blade.
- For maintenance of correction: Steenbeeks abduction brace.

Ethical approval

The present study was conducted after the due approval of the institutional ethical committee.

In the present study, detailed clinical history, clinical examination findings of the study subjects were noted with the help of standard, semi-structured, pre-validated case record proforma. Manipulation and serial casting of the cases was done, findings were recorded subsequently. Ponseti method was used: Serial manipulation and weekly casting for four to five casts followed by percutaneous TA tenotomy.

Follow up

Post bracing f/u was done at monthly interval for three months, three monthly for one year and six monthly thereafter.

Pirani's scoring system

Need: The deformities occurred in CTEV need to be quantified, in order to decide further modality of management. Pirani's scoring system is widely used scoring system. The components are mentioned below in Table 1.

- Total score (TS) up to six: (0=normal, 6=severe deformity).
- Mid foot contracture score (MFCS) up to three: (0=normal, 3=severe deformity).
- Hind foot contracture score (HFCS) up to three: (0=normal, 3=severe deformity).

Table 1: Scoring systems used in the study.

Parameters		Score
Components of MFCS		
Curved lateral border (CLB)	Normal	0
	Mildly curved	0.5
	Pronounced curvature	1

Continued.

Parameters		Score
Medial crease (MC)	Multiple fine creases	0
	1-2 deep creases which don't change contour of arch	0.5
	Deep creases which change contour of the arch	1
Lateral part of head of talus (LHT)	Inability to palpate talar head	0
	Talar head palpable with difficulty	0.5
	Talar head easily palpable	1
Components of HFCS		
Posterior crease (PC)	Multiple fine creases which don't change contour of heel	0
	1-2 deep creases which don't change contour of heel	0.5
	3-5 deep creases which change contour of heel	1
Empty heel (EH)	Tuberosity of calcaneum immediately palpable	0
	Tuberosity of calcaneus palpable deep in heel	0.5
	No bony prominence appreciated	1
Rigidity of equinus (RE)	Ankle dorsiflexes fully	0
	Ankle dorsiflexes upto neutral	0.5
	Ankle dorsiflexes less than neutral	1

Statistical analysis

The data was collected using Microsoft Excel software 2016. The data was analysed using IBM SPSS software version 22. The data was presented in the form of tables and graphs for frequency analysis.

RESULTS

The present study was conducted among 40 infants (62 feet) presented with clubfoot. In this study the mean follow up period was 18 months, lowest being six months and highest 25 months results have been categorized into three groups on the basis of three parameters.

Table 2: Mean follow up period in the study subjects.

Follow up period	
Mean	18 months
Maximum	25 months
Mininum	6 months

Table 3: Management in study subjects.

Management and relapse	Number of clubfeet	Percentage (%)
Percutaneous tenotomy	52	83.87
Plaster cast	10	16.12
Relapse	15	24.19
Recasting	12	19.35

Among 40 infants, 18 (45%) were male infants while 22 (55%) were female infants. The male:female ratio was 1:1.22 (Figure 1).

Out of the 62 clubfeet, 42 (67.74%) were rigid and 20 (32.25%) were of non-rigid variety (Figures 2, 3A). In this study, total of 52 (83.87%) feet (38 rigid and 14 non-rigid) required percutaneous tenotomy. Only 10 (16.12%)

feet (4 rigid and 6 non-rigid) were improved by plaster cast alone (Figure 3B and C). Out of 62 feet 58 (93.54%) were managed successfully (Figure 3D).

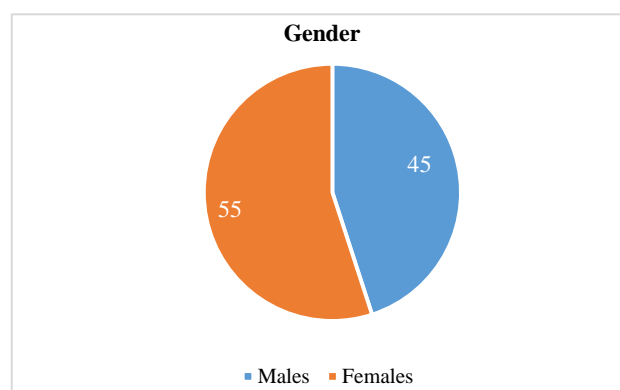


Figure 1: Distribution of study subjects according to their gender.

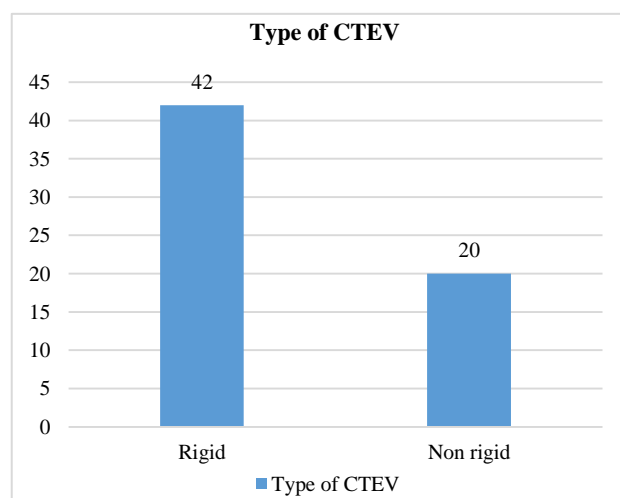


Figure 2: Distribution of study subjects according to type of CTEV.

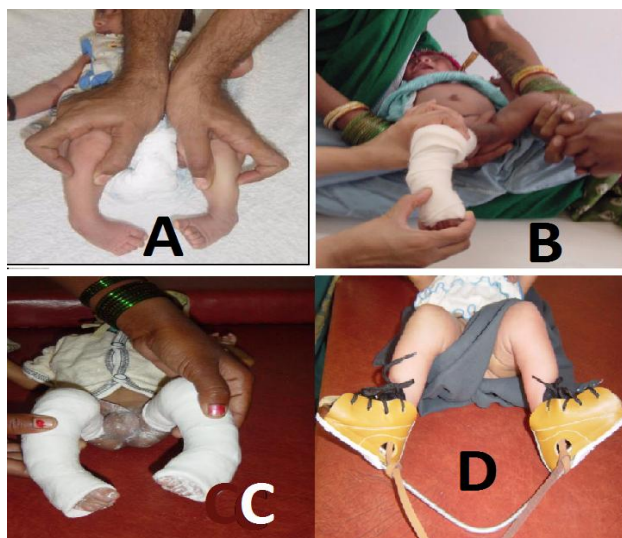


Figure 3 (A-D): Images of few cases in the present study.

We observed that 15 feet had relapse, 12 treated by recasting and completely corrected. One feet required RPMR. No major complications occurred in our series. Minor complications like excoriation of skin are seen in five patients treated by local skin care and extra padding for cast. Excessive crying was complained by parents in one case cast was removed by parents at home.

DISCUSSION

Clubfoot has been recognized for complexity and resistance to treatment since the time of Hippocrates. The number of operations for clubfoot is many but the results are not encouraging and more complications are encountered after operative treatment, moreover there are no long term studies supporting surgical treatment. Most surgeons believe manipulation to be easy however they rarely complete the treatment and abandon it and go on to surgery.

In the confusing scenario Ponseti technique has evolved and proved across the world to be one of the most promising way to correct club foot with low cost, minimum surgery and good result in short period of time. Fibroelastic properties of connective tissues and ligaments so this method does not aim at radiological correction and can be evaluated on the basis of clinical correlation.^{14,15}

In our study, the male:female ratio was 1:1.22. Ullah et al, in their study observed that M:F ratio was 1:2. Both studies shows more number of female subjects presenting with clubfoot deformity.¹⁶

Solanki et al, in their study, enrolled total 31 children (40 feet) with idiopathic clubfoot were included in the study, nine of whom were bilateral. Of these 31 patients, 19 were male and (57.69%) and 12 female (42.30%). The

mean age of the children was 2.7 months in accelerated group and 4.71 months in standard group.¹⁷

Out of the 62 clubfeet, 42 (67.74%) were rigid and 20 (32.25%) were of non-rigid variety. Ullah et al, in their study observed that Of the 58 clubfeet, 37 were rigid and 21 of non-rigid variety.¹⁶

In this study, total of 52 (83.87%) feet (38 rigid and 14 non-rigid) required percutaneous tenotomy. Only 10 (16.12%) feet (4 rigid and 6 non-rigid) were improved by plaster cast alone. Out of 62 feet 58 (93.54%) were managed successfully. Ullah et al, in their study observed that out of total 50 (86.2%) feet (35 rigid and 15 non-rigid) required percutaneous tenotomy. Only 8 (13.79%) feet (2 rigid and 6 non-rigid) were improved by plaster cast alone. Out of 58 feet 56 (96.55%) were managed successfully by them.¹⁶

We observed that 15 feet had relapse, 12 treated by recasting and completely corrected. One feet required RPMR.

Morcuende et al presented one of the earliest reviews on accelerated Ponseti. They retrospectively reviewed 230 patients (319 clubfeet) retrospectively. They compared 5 days casting with 7 days casting and concluded that both groups had comparable outcomes.¹⁸

Sharma et al also did a similar study comparing biweekly and weekly plaster change in 40 cases (53 feet). Average duration of treatment in accelerated group was 15 days and standard group was 35 days. They concluded both protocols to be equally effective.¹⁹

No major complications occurred in our series. Minor complications like excoriation of skin are seen in five patients treated by local skin care and extra padding for cast. Excessive crying was complained by parents in one case cast was removed by parents at home.

Ullah et al, in their study observed that, 3 (5.17%) patients developed complication. One (1.71%) developed skin excoriation and other 2 (3.4%) developed blister formation.¹⁶

Hence the advantages of Ponseti method as observed by the current study were, it is an OPD treatment, 78% good to excellent results with 35 yrs of follow up can be ensured, efficient complete correction in this method has correct biomechanical basis for realigning deformed ankle and foot joints and corrects deformity due to favorable approx. two months, economical, no major surgery is required and can be used in children upto age of one year, even after previous unsuccessful non-surgical treatment.

The only disadvantage is strict patient compliance and regular follow up upto full correction is required. Patient

compliance can be increased by inclusion of community health workers and pretreatment counselling of parents.

CONCLUSION

It can be concluded that CTEV deformity can be effectively treated by Ponseti casting technique with excellent results and without significant morbidity. This method is simple, effective, minimally invasive, and inexpensive and ideally can be performed at outpatient department without general anaesthesia, even in neonatal period.

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Conflict of interest: None declared

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

REFERENCES

1. Arif M, Inam M, Sattar A, Shabir M. Usefulness of Ponseti technique in management of congenital talipes equino-varus. J Pak Orthop Assoc. 2011;23:62-4.
2. Ponseti IV. Clubfoot management. J Pediatr Orthop. 2000;20:699-700.
3. Kite JH. The clubfoot. New York: Grune and Stratton; 1964.
4. Turco VJ. Clubfoot. New York: Churchill Livingstone; 1981.
5. Colburn M, Williams M. Evaluation of the treatment of idiopathic clubfoot by using the Ponseti method. J Foot Ankle Surg. 2003;42:259-67.
6. Adegbehingbe OO, Oginni LM, Ogundele OJ, Ariyibi AL, Abiola PO, Ojo OD. Ponseti clubfoot management: changing surgical trends in Nigeria. Iowa Orthop J. 2010;30:7-14.
7. Ippolito E, Farsetti P, Caterini R, Tudisco C. Long-term comparative results in patients with congenital clubfoot treated with two different protocols. J Bone Joint Surg Am. 2003;85:1286-94.
8. Göksan SB. Treatment of congenital clubfoot with the Ponseti method. Acta Orthop Traumatol Turc. 2002;36:281-7.
9. Bor N, Coplan JA, Herzenberg JE. Ponseti treatment for idiopathic clubfoot: minimum 5-year follow up. Clin Orthop Relat Res. 2009;467:1263-70.
10. Cooper DM, Dietz FR. Treatment of idiopathic clubfoot. A thirty-year follow-up note. J Bone Joint Surg Am. 1995;77:1477-89.
11. Agarwal RA, Suresh MS, Agarwal R. Treatment of congenital clubfoot with Ponseti method. Indian J Orthop. 2005;39:244-7.
12. Dyer P J, Davis N. The role of the Pirani scoring system in the management of club foot by the Ponseti method. J Bone Joint Surg Br. 2006;88:1082-4.
13. Beaty JH. Congenital anomalies of the lower extremity. In: Canale T. and Beaty JH. editors. Campbells operative Orthopaedics 11th ed. Philadelphia, Pennsylvania: Mosby Elsevier; 2007: 1079-1100.
14. 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. Int Orthop. 2008;32:75-9.
15. Kadhum M, Lee MH, Czernuszka J, Lavy C. An Analysis of the Mechanical Properties of the Ponseti Method in Clubfoot Treatment. Applied Bionics Biomechanics. 2019:4308462:11.
16. Ullah SM, Ferdous KMNU, Shahjahan M, Sayed SA. Management of Congenital Talipes Equino Varus (CTEV) by Ponseti Casting Technique in Neonates: Our Experience. J Neonatal Surg. 2013;2(2):17.
17. Solanki M, Ajmera A, Rawat S. Comparative study of accelerated ponseti method versus standard ponseti method for the treatment of idiopathic clubfoot. J Orthop Traumatol Rehabil. 2018;10:116-9.
18. Morcuende JA, Abbasi D, Dolan LA, Ponseti IV. Results of an accelerated Ponseti protocol for clubfoot. J Pediatr Orthop. 2005;25:623-6.
19. Sharma P, Yadav V, Verma R, Gohiya A, Gaur S. Comparative analysis of results between conventional and accelerated Ponseti technique for idiopathic congenital clubfoot. Orthop J MP. 2016;22:3-7.

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