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Congenital Talipes Equino Varus in Infants: Management By Ponseti Method and Outcome

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Abstract: ***Objective:*** ***CTEV in infants is a commonest Orthopedic problems for which there are many methods to treat. Our study is a descriptive analysis of Ponseti method and management of CTEV and its outcome.*** ***Setting :*** ***Orthopedic ward of tertiary care teaching hospital in South India.*** ***Design:*** ***A 2 year prospective longitudinal hospital based observational study and its outcome.*** ***Participants :*** ***30 infants with 43 idiopathic clubfoot from 1st week of life to 1 year after birth excluding those infants with associated congenital malformations.*** ***Results :*** ***Out of 30(21 males & 9 females) infants, 17 had unilateral clubfoot & 13 had bilateral clubfoot (total 43 club foot). The mean age of the presentation to treatment was 3 weeks. Depending upon the response to Ponseti method of management, the number of castings required prior to tenotomy varied with each patient (7 castings in 7 patients, 8 castings in 18 & 9 in 5 infants). Out of 43 clubfoot, 41(95.35%) had achieved normal corrections, 2(4.65%) required post operative soft tissue release, 38(88.37%) had undergone percutaneous tenotomy & 3(6.97%) got corrected without tenotomy. All the feet were applied with Dennis Brown splint and after 2 year period of follow up, out of 43 clubfoot, 6(13.95%) relapses occurred ; 4(9.30%) were equinus, 2(4.65%) were equino-cavo-varus and subsequently the relapses were corrected surgically.*** ***Conclusions :*** ***Ponseti method is a safe, effective technique to treat CTEV which radically reduced the need for extensive surgery. This method enables us to correct most idiopathic clubfoot with gentle manipulation, casting and percutaneous tenotomy. Bracing is the key to long term success of the Ponseti method and also to prevent relapses requiring major surgical interventions.***

Keywords: congenital talipes equino varus, clubfoot, Ponseti method, Infant, Outcome

1. Introduction

Congenital talipes equino varus (CTEV) or Clubfoot is one of the commonest orthopedic problems seen in infants. CTEV is the term used to describe as a deformity involving in utero malalignment of the calcaneo-talar-navicular complex of the foot [1]. The incidence is 1 in 1000 live births with male to female ratio is 3:1, and is bilateral in 50% of the infants [2,3].

The etiology of clubfoot is classified into 2 categories : idiopathic clubfoot, where there is only foot deformity & the rest of the musculoskeletal system is normal and non idiopathic clubfoot where the foot deformity is a local manifestation of associated systemic skeletal deformities [4,5].

The clinical features of CTEV are characteristic. The foot points plantar with small heel drawn up. There is a forefoot cavus, adducts & hindfoot varus, equinus [CAVE]. The skin creases are deeply furrowed on the concave medial & plantar aspect and the skin on lateral dorsum of the foot is thinned, stretched & its creases disappear. The degree of flexibility varies and patients exhibit calf atrophy. If CTEV remains neglected, the deformity progressively increase, ambulation will be difficulty & there is limb length discrepancy leading to gait abnormality in a subset of untreated cases [1,2].

Radiological assessment of CTEV before and after correction is more reliable than clinical evaluation alone and also for future comparison. Anteroposterior & lateral radiographs are recommended with the foot held in maximally corrected position. A common radiographic finding is “parallelism” between lines drawn through the axis of talus & calcaneus on the lateral radiograph, indicating hindfoot varus. Clinicians believe that radiographs are not required in evaluation & treatment of CTEV in infants & reserved for older children with persistent or recurrent deformities [1,6,7,8].

The treatment of clubfoot should be started immediately following birth so that the child achieves mobile foot with normal function. There are basically 2 methods of management: conservative management & surgical correction [1,2,9].

The first visit of infant or neglected child should be treated by conservative management. Techniques included are taping, strapping, manipulation & serial casting [1,10,11,12,13,14]. Ponseti , who was a professor of orthopedics at university of Lowa, USA had developed a special technique of manipulation & serial casting of correction following the pneumonic CAVE [cavus, adductus, varus, equinus], had been supported by many studies which showed >95% good result, better than any method leading to decreased need for extensive surgery [15,16,17,18].

Surgical realignment has a definitive role in the management of CTEV in minority of clubfoot that have failed with conservative management. The specific surgical procedure is tailored to the unique characteristics of each deformity. In older children with residual deformities, bony procedures may be required in addition to soft tissue surgery [19,20].

We report our experience of 30 infants with 43 clubfoot managed successfully using Ponseti method.

2. Methods

This is a prospective, longitudinal hospital based observational study which included 30 infants with 43 idiopathic clubfoot, aged from 1st week to 1st year after birth who attended Government General Hospital, Guntur, South India from September 2012 to September 2014, over a period of 2 years. The study was approved by institutional ethical committee and the informed consent was taken from the parents.

All the infants data was recorded in a predesigned proforma containing name, age, sex, parent details, address, family history, pregnancy & delivery details of mother, any prior treatment taken for clubfoot and examination details of spine, hips, upper & lower limbs with both feet and also other systems for associated clinical problems. Infants with other congenital malformations were excluded from the study. All infants were managed with Ponseti method after counseling parents about this method for long term management.

The steps of Ponseti method of management are (see also the table below) :

- A specific method of manipulation
- A specific method of castings
- A percutaneous method of tenotomy
- A specific method of bracing with Denis Brown splint for 2-3 year period
- Follow-up for recurrence
- A specific method of treating recurrence

Clinical Feature	*Pathology*	*Corrective Manipulation*	*Cast Number*
Cavus	Plantar flexed 1st metatarsal	Dorsi flex 1st metatarsal	1
Adductus	Medial subluxation of talo-navicular joint	Abduct foot	2, 3, 4
Varus	Calcaneal inversion	Adduct calcaneus	2, 3, 4
Equinus	Calcaneal flexion	Abduct calcaneus	2, 3, 4
	Tibio-talar flexion	Percutaneous tenotomy & cast in maximal abduction & 10 -20 degree extension	5

Table showing the steps involved in Ponseti method of manipulative correction of clubfoot

Photograph showing steps involved in Ponseti method of management of clubfoot

All 30 infants treated with Ponseti method were followed over a 2 year period & assessed for any deformities which were subsequently managed surgically. All the data was documented, statistically analyzed using suitable statistical methods.

3. Results

Out of 30 infants, 21 were male & 9 were female. Out of 30 infants, 17 had one clubfoot & 13 had bilateral clubfoot (total 43 clubfoot in 30 infants). The mean age of initial presentation to treatment was 3 weeks, 6 out of 30 infants came on 1st wk of life.
Depending upon the response to Ponseti method of management, the number of castings required prior to tenotomy varied with each patient. Out of 30 infants, 7 castings were required in 7 infants, 8 castings in 18 infants & up to 9 castings in 5 infants.

All cases were followed and the average duration of follow-up was 12.5 months. Out of 30 infants, 4 infants were followed up to 6 mo period; 13 infants up to 7-12 mo period; 8 infants up to 13-18 mo; the remaining 5 infants were followed up to a period of 19-24 months.

Duration of months of follow up	No. of infants
0-6 months	4
7-12 months	13
13-18 months	8
19-24 months	5

Out of 43 clubfoot; 41(95.35%) had achieved near normal correction, 2 clubfoot(4.65%) required posteromedial soft tissue release, 38 foot(88.37%) had undergone percuteneous tenotomy & 3 foot(6.99%) got corrected without tenotomy.

All the foot were applied with Denis Brown splint for 2 years & followed-up for 2 year period for any relapses. Out of 43 clubfoot, 6(13.95%) had relapses; 4(9.30%) relapses of equinus & 2(4.65%) relapses of equino-cavo-varus was observed and were corrected with repeat tenotomy & serial POP castings.

4. Discussion

In our study, we performed the Ponseti method on 43 idiopathic clubfoot in 30 infants; 21 male & 9 female. There were 17 unilateral & 13 bilateral clubfoot. Out 43 clubfoot at the end of treatment, 41(95.35%) had achieved maximum correction & only 2(4.65%) clubfoot required major surgical procedures. This study demonstrated that the use of Ponseti method of managing idiopathic clubfoot was the most successful when started early which had reduced the need for further extensive corrective surgery. So, the results of our study are comparable with many studies using Ponseti method (see the table)

S. No	*Name of the Author*	*Year of Study*	*Success Rate (%),*
1	Jowett CR, Morcuende, Ramchandran[21]	2011	90
2	Eberhardt, Peterlein, Fernandez, Wirth T[22]	2013	89
3	Bor, Coplan, Herzenderg[23]	2009	89
4	Colburn M, Williams et al[10]	2003	95
5	Morcunde JA, Dolan LA, Ponseti IV[18]	2004	98

6	Seger E, Keret D et al[24]	2005	94
7	Goksen SD, Bursali A et al	2006	97
8	Radker C, Sudeet et al	2006	93
9	Mathew D, Dobbs MD, JR Rubbie	2004	100
10	Laaveg SJ, Ponseti et al	1980	90

Compared to some of the above studies, success rate in our study is better as we started treating early after birth (6 out of 30 infants on 1st week of life to treatment) and the treatment is free as our hospital is run by the government and also effective counseling regarding the long term management. But few other studies showed >95% success rate is due to better compliance compared to our study which is due to non-compliance with the abduction brace by the care takers at home in spite of counseling during each visit to the hospital.

The relapses in our study could be due to poor socio-economic status, illiteracy, rural back ground of the parents. In our study we had 6(13.95%) relapses out 43 clubfoot; 4(9.30%) equinus relapse & 2(4.65%) equino-cavo-varus relapse for which appropriate surgical correction was done which is comparable with other studies as given below.

S No	Name of the Authors	*Year of Study*	*Relapse Rate(%)*
1	Morcuende JA ,Dolan LA, Ponseti IV et al[18]	2004	11
2	Milind M, Deepak S, Hirlal R Chavda	2011	28
3	Mathew B, Dobbs ,JR Rubbie et al	2004	18
4	Goksen SB, Bursali A et al	2006	31

Although this meticulous method of serial manipulation & cast applications as outlined by Ponseti method is essential to obtain initial correction of idiopathic clubfoot deformity, our data demonstrated that non-compliance with the use of bracing is the primary risk factor for the recurrence of deformity. Early identification & intervention of the relapse decreases the need for major soft tissue surgery. Relapses following Ponseti method are subtle and foot stays supple due to minimum surgical intervention [25,26,27].

5. Conclusions

Ponseti method is a very safe, effective treatment for the correction of clubfoot, drastically decreasing the need for extensive surgery and this should encourage the national efforts to make this method as the gold standard treatment of congenital clubfoot. The physician & surgeon who adopt this method feels rewarded by the satisfaction of successfully correcting what traditionally had been a very frustrating deformity to treat.

The Ponseti method enables us to correct most clubfoot with gentle manipulation, casting & percutaneous tenotomy. Bracing is the key to long term success of Ponseti method. Ponseti method is the most successful treatment technique for idiopathic congenital clubfoot till date.

ONE OF THE CASE STUDIES WITH PONSETI METHOD OF MANAGEMENT AND OUTCOME

BEFORE CORRECTION CASTING | WITH POP | WITH DB SPLINT F/UP | AFTER 4 MO

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