

Research Article

Ponseti Method of Correction of Congenital Talipes Equinovarus Deformity Under Two Year of Age Using Dimeglio Scoring System

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Abstract

Background: Congenital talipes equinovarus (CTEV) is the most common disorder of foot. Conservative treatment is the first line management for CTEV. Our objective was to determine the frequency of successful outcome of non-surgical correction of CTEV deformity between 6month to 2year age using Dimeglio scoring system.

Method: This multicenter descriptive case series was done using non-probability consecutive sampling technique. Total 62 cases, having age of 06 months to 02-year, of both genders, with failed conservative treatment of clubfoot diagnosed on history and clinical examination were enrolled. They were treated with six ponseti cast at one-week interval. Cast was removed in out patient department and after manipulation new cast was applied. The last cast was applied for two weeks. Patients were followed up at two weeks, one month, three months and after six months. We record findings at six months only.

Results: There were 43 males (69.4%) and 19 females (30.6%). Mean age was 11.16±5.52 months. Frequency of outcome results was excellent in 30 patients (48.4%), good in 20 patients (32.3%), fair in 08 patients (12.9%) and poor in 04 (6.5%). Frequency of successful surgical correction of CTEV with posteromedial soft tissue release is 50 (80.6%). Statistically significant difference was found between age of children hindfoot varus ($p<0.05$) and between age of children and ankle dorsiflection ($p<0.05$).

Conclusion: There were more male population than female in our study. The radiological outcome was excellent to good in majority of the patients treated with ponseti cast with minimum failed treatment.

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Introduction

Clubfoot, or talipes equinovarus, is a congenital deformity consisting of forefoot adduction, midfoot cavus, hindfoot varus and ankle equinus. The deformity was explained for the first time in the era of

Hippocrates. The term talips is derived from Latin words foot, pes, talus and ankle. Patients walking on their ankles were referred by this term.^{1,2} Its overall incidence is 1 to 2 in 1000 live births.³ The male to female ratio is 2:1.⁴

The foot is inclined inwards, axially rotated outwards and pointing downwards. In relation with talus, medial rotation of navicular, calcaneus and cuboid bone is made, and they are held in inversion and adduction by tendons and ligaments. Despite of the supination of foot, front of foot is pronated in comparison with the back of foot that causes cavus. Congenital talipes equinovarus be taken as 'syndromic' when it occurs in association with other features as part of a genetic syndrome.⁵ For usual environmental factors, sensitivity is poligenically inherited. Clubfeet are mostly idiopathic and can be linked with quite number of syndromes i.e. arthrogryposis, Larsons and Downs Syndrome. There must be exclusion of underlying neurological sources peculiar in stiff bilateral clubfeet.⁶

Diagnosis of CTEV, is both by clinical and roentgenographic examination. Clinically, the hind foot is in equinovarus and forefoot in adductin and midfoot in cavus. Based on acuteness of deformity, medical creases and deep posterior can be observed. At the time of birth, in ipsilateral side, calf atrophy can be observed by internally rotating and shortening of tibia. However, its appearance becomes visible with growing age. Full neurological and spine assessment should be included for examination, while other joints should be observed for deformity and stiffness. From antero-posterior view roentgenographically, in the normal foot, the measurement of talocalcaneal angle is usually 25 degrees to 50 degrees from lateral view, however in club foot it is < 25 degrees i.e. the calcaneus and talus prove high parallelism in the club foot.⁶

Treatment of the idiopathic clubfoot is controversial.⁷ Surgical treatment has complications included infection, neurovascular damage, persistent and recurrent deformity. In the conservative treatment, all the patients are treated by serial manipulations and castings.⁸ Operative treatment includes extensive posterior, medial and lateral releases. The releases are best done at a young age but can be done satisfactorily in children until 5 years of age.⁹ Ilizarov method is an effective solution for resistant clubfoot.¹⁰

Conservative treatment is the mainstay of the treatment in child upto six months of age with CTEV. Failure of the conservative treatment may require surgical correction which is associated with compli-

cations including neurovascular injury, infection, under or over correction and long duration of follow up. Conservative method has advantage over surgical correction as it is safe, non-invasive, low cost, without complications, easily acceptable to the parents and can yield equal result in older child. With this we studied the frequency of successful outcome of non-surgical correction of CTEV deformity of children between 6month to 2year age in terms of radiographic angle correction.

Methods

This multicenter descriptive case series was done using non-probability consecutive sampling technique at Department of Orthopaedic Surgery Allied and District Head-quarter (DHQ) Hospital Faisalabad and Orthopedic Unit-II, King Edward Medical University / Mayo Hospital, Lahore, from February 2012 to January 2013. Total 62 cases, having age of 06 months to 02-year, of both genders, with failed conservative treatment of clubfoot diagnosed on history and clinical examination were enrolled. Our exclusion criteria were previously operated cases of club foot, children with clubfoot secondary to poliomyelitis, and diagnosed on history and clinical examination.

After obtaining ethical permission from the hospital / university board, informed written consent was obtained from the mother of the child. We collected data on a pre-designed questionnaire. All child with club foot was classified using Dimeglio¹¹ scoring system. It has four parameters of equinus in sagittal plan, varus deviation in frontal plan, forefoot adduction, and rotation around the talus in calcaneoforefoot block. This scale also includes medial crease, posterior crease, cavus and weak calf musculature. It has 20 scores. They were graded as benign (<5score), moderate (<5 to <10), severe (10 to <15) and very severe (15 to <20scores) with >90% soft-soft, resolving, >50% soft-stiff, reducible, partially resistant, <50% soft-stiff, reducible, partially resistant, and <10% stiff-stiff resistant respectively. Six CTEV cast was applied with one-week interval in the out-patient department and last cast was applied for two weeks. They were monitored for the sign of ischemia clinically. All patients were discharged one hour after the cast after assuring the absence of ischemia signs. In pre-walking patients, foot abduction orthosis (Denis

Brown Shoe) with splint was used and in walking patients, walking shoes were used. Patients were worn shoes 24 hours a day except bathing. Patient was followed up at two weeks, one month, three months and after six months. Any complication was noted and dealt in these visits. Findings were recorded only at six months. On follow up the outcome was assessed clinically from poor to the excellent. By excellent we mean that complete correction of the deformity, by good we mean failure of correction of one deformity, fair we mean presence of more than two deformity and poor means no correction of the deformity.

Data was entered and later analyzed using SPSS version 20.0. Quantitative variables were calculated as mean \pm SD. Qualitative variables were calculated as frequencies and percentages. Chi square test was used for qualitative variables and pvalue <0.05 was taken significant.

Results

Out of the total 62 patients, the youngest patient was six months of age and the oldest of 02 years of age. Mean age was 11.16 \pm 5.52. There were 43 boys (69.4%) and 19 girls (30.6%). This shows that CTEV is more common in male population. Majority 26 (41.9%) child has severe deformity, 18 (29.03%) moderate, 10 (16.1%) had severe foot deformity and 07 (11.29%) had very severe deformity of club foot according to Demiglio scoring system. Forefoot adduction was corrected in 49 feet (79%) and was noted in 13 feet (21%). Hindfoot varus was corrected in 58 feet (93.5%) and was not corrected in 4(6.5%) feet. Ankle dorsiflexion was more than 90 degrees in relation to tibia in 58 patients (93.5%) and was less than 90 degrees in 04 patients (6.5%). Equinus was corrected in 58 (93.5) feet and frequency of non-correction was 04 (6.5%) feet. Pain at ankle was present in 39 (62.9%) and was absent in 23 (37.1%). Metatarsus adductus was present in 04 feet (6.5%) while it was absent in 58 feet (93.5). Frequency of outcome results was excellent in 30 patients (48.4%), good in 20 patients (32%), fair in 08 patients (12.9%) and poor in 04 patients (6.5%) (Figure 01). Frequency of successful surgical correction was 50 (80.6%) (Table 01). Chi-square test was applied to determine the statistically significant difference amongst age of the child in months and correction of forefoot adduction, hindfoot varus, equinus and ankle dorsiflexion deformities. It was found

Table 1: Demographic Detail of Age, Gender, Forefoot Adduction, Hindfoot Varus, Equinus, Pain Ankle, Dimeglio Score and Successful Outcome

Variable	Frequency (N=62)	Percentage (%)
Gender of the patient		
• Male	43	69.4
• Female	19	30.6
Age in months (Mean \pm SD)	11.16 \pm 5.52	
Forefoot adduction		
• Absent	49	79
• Present	13	21
Hindfoot varus		
• Absent	58	93.5
• Present	04	6.5
Ankle dorsiflexion		
• >90 degree	58	93.5
• <90 degree	04	6.5
Equinus		
• Present	58	93.5
• absent	04	6.5
Pain ankle		
• Present	39	62.9
• Absent	23	37.1
Metatarsus Adductus		
• Present	58	93.5
• Absent	04	6.5
Outcome of the Treatment		
• Excellent	30	48.4
• Good	20	32.3
• Fair	08	12.9
• Poor	04	6.5
Successful outcome		
• Yes	50	86.6
• No	12	19.4

Table 2: Chi-Square Test of Age of the Child and Correction of Forefoot Adduction, Hindfoot Vvarus, Equinus and Ankle Dorsiflection Deformities

	Age of the Child in Months						p-value
	6-10	11-14	15-18	19-22	22-23	Total N=62	
Correction of forefoot adduction							0.93
• Yes	13	13	08	09	06	49	
• No	01	01	02	04	05	13	
Correction of hindfoot varus							0.01
• Yes	14	14	10	11	09	58	
• No	00	00	00	02	02	04	
Correction of Equinus							0.14
• Yes	13	13	10	13	09	58	
• No	01	01	00	00	02	04	
Correction of ankle dorsiflection							0.03
• Yes	14	14	08	12	09	58	
• no	00	00	02	00	02	04	

significant difference between age of the child and hindfoot varus (p-value 0.01) and ankle dorsiflexion (p-value 0.03). It was not significant for correction of forefoot adduction (p-value =0.93) and hindfoot varus (p-value=0.14) table 02.



Figure 01. *A Child with Bilateral Club Foot before Casting and Correction of the Deformity after Casting.*

Discussion

There are three well known facts concerning the natural history of clubfoot. The lesions are complex and age rapidly. The problem of clubfoot starts before birth and continues its evolution thereafter. The initial malposition is quickly replaced during growth by deformities and retractions which become fixed. The desired results can be achieved by reversing the deformities. Ponseti method is typically implemented in first week of life but it can be applied in walking age of the child. Some author reported the use of this method at the age of nine years.¹² After correction of the deformity (90-100o), the maintenance phase is started.^{13,14}

Conservative treatment is done in early presenting cases. Treatment insufficiency may result in child with stiff club foot. Manipulations, strappings and

plaster of paris casts whenever done correctly results in a spectacular improvement in external improvement. One needs to consider clubfoot to be three dimensional problem in which persistence of one deformity is always the starting point for an unsuccessful result and a relapse. There needs to avoid the aggressive treatment that produces stiffness and over correction.

Salemani et al¹⁵ conducted a study on correction of club foot by two casting methods. He reported success rate of 96% with ponseti casting method (follow up time of 36.2 months). In our study the success rate 86.6%. Kumar et al.¹⁶ had 83% success rate with ponseti casting. The reason of lower outcome in our study could be due to the difference in age group. Garacia et al¹⁷ used 5 to 7 ponseti cast for correction of idiopathic club foot. In our study we used six casts for correction of the club foot in majority of the patients. The successful outcomes are similar with other study.¹⁶

Pavone, Testa et al.¹⁸ reported the number of cast correlation with the age of the patient. He found negative correlation between age of presentation and final outcome of foot range of motion with additional casting of 5 to 10 in their study. This study confirms our findings of treating club foot with ponseti casting method between the age of 6months to 2year. The successful outcome in our study are high and favour the use of ponseti casting in older children. We used the foot abduction orthosis in all cases to prevent the relapse. Our findings are supported by other studies.¹⁹⁻²¹ We used splint in child with walking age child. In walking age the splints are required to prevent the relapse.^{17,22} The proportion of males to females in this study was 2.2 to 1, however, in the study conducted by Ponseti IV, this ratio was 2 to 1. In patients of this study, bilaterality was observed to be 30 and about 50% as per study.²³

In our study all patients with failed conservative treatment of clubfoot were included. Measurement of result was made. In our study 48.4% were excellent results, 32.3% good results, 12.9% fair and 6.5% were poor results. Thus 80.6% excellent to good results were observed (Figure 01). The forefoot adduction was corrected in 79%, Equinus in 93.5%, Heel varus in 93.5%.

Our study has limitation of small sample size, with short follow up. There needs the randomization of the population for better outcome in older child. The result of the study favour the treatment method of ponseti casting in older child. Surgery is invasive, and it can be used to avoid the complication of the surgery in child.

Conclusion

Older child with club foot treated with ponseti casting has good to excellent functional outcome with correction of foot deformities. Older child can be treated with ponseti casting having mild to severe deformities.

Ethical Approval: Given

Conflict of Interest: None

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