

Original Research Article

Assessment of Ponseti technique of manipulation and serial casting in idiopathic clubfoot

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ABSTRACT

Background: Congenital talipes equinovarus is one of the commonest congenital foot deformities. Ponseti technique of treatment of clubfoot has gained popularity in the last few decades. Feet treated by Ponseti technique are supple, flexible and pain free. We have treated congenital idiopathic clubfoot with Ponseti technique at our institute and present our results.

Methods: Forty eight feet in thirty children with clubfoot were treated by Ponseti technique in our institute. The study was conducted from December 2013 to December 2015. Parents were counselled regarding treatment protocol and maintenance with bracing was closely monitored. Each child was followed up for a minimum of six months. Pirani score was used to objectively document progress of treatment.

Results: The average number of casts required for complete correction was 6.6. 38% feet required tendoachilles tenotomy. Higher the initial Pirani score, more number of casts were required to achieve full correction. Number of casts needed for complete correction did not correlate to time of presentation.

Conclusions: Ponseti method is very effective in correcting congenital idiopathic clubfoot deformity. It's easy to learn, is inexpensive and can completely correct the deformity. In developing nations, well trained Orthopaedic surgeons can treat these children effectively and decrease disabled population.

Keywords: Clubfoot, Ponseti, Pirani score

INTRODUCTION

Congenital clubfoot also known as congenital talipes equinovarus, is a congenital deformity involving one foot or both. The four basic components of clubfoot are ankle equinus, hindfoot varus, forefoot adductus, and midfoot cavus.¹ It is a relatively common birth defect occurring in about 1 in every 1000 live births and approximately half of them have bilateral clubfoot.²⁻⁴

Congenital clubfoot is considered to be idiopathic when it occurs in isolation while non-idiopathic clubfoot occurs as a part of other congenital anomalies like

myelodysplasia, arthrogyrosis, or multiple congenital abnormalities.⁵

The goal of treatment of clubfoot is to achieve a supple, pain free, functional plantigrade foot.¹ Treatment of congenital clubfoot has evolved over the years. Forced manipulation was done in 19th century.⁵ In 1930s, Kite used to gently manipulate foot and apply casts for correction.⁶ But, his techniques involved correction of each component separately instead of simultaneous correction of all deformities.⁷ Many authors did not manage to reproduce good results published by kite and feet that remained uncorrected or relapsed after

conservative treatment underwent surgery.^{8,9} During second half of the 20th century, posteromedial soft tissue release described by Turco became popular.^{10,11} Modifications of the technique and their results were published subsequently.¹²⁻¹⁵ However, long term follow up studies reported unsatisfactory results with skin necrosis, infection, pain, joint stiffness, ankylosis, residual deformity and late onset arthritis being common complications.¹⁶⁻¹⁸ The current primary indications of surgery are resistant, relapsed clubfoot and the procedure should be customized to the patient and not an extensive release.^{19,20}

Dr. Ignacio Ponseti after extensive anatomical studies and clinical evaluation advocated a technique of club foot correction which results in strong, flexible and pain free feet.¹ The technique involves manipulation and serial casting, tendoachilles tenotomy and bracing later on to maintain correction.²¹⁻²⁵ Various authors worldwide have practiced ponseti technique and have reported excellent results.²⁶⁻³⁰ Also, Ponseti technique is easy to learn and is inexpensive. There is a need for similar study in Indian set up where large proportions of club foot babies remain untreated or poorly treated because of blind beliefs, superstitions, poverty and ignorance leaving them to face a life of disability.

METHODS

This is a prospective study done from December 2013 to December 2015 in the Department of Orthopaedics, Nizam's Institute of Medical Sciences, Punjagutta, Hyderabad. 30 children with congenital idiopathic clubfoot under one year of age were included in the study. 18 children had bilateral involvement and hence number of feet treated was 48. Non idiopathic clubfoot and previously treated cases elsewhere were excluded from the study.

All parents were explained in detail about the treatment protocol, bracing protocol and importance of regular follow-up. A complete and detailed history was taken in every case. Each case was subjected to thorough general physical, systemic and local examination (spine, hip and extremities) in a quiet and relaxed atmosphere and on the mother's lap. The children were assessed for the severity of the deformity by Pirani scoring system and the initial Pirani score was recorded.

The Ponseti technique of serial corrective casting was followed. The foot was manipulated for a minute before each cast. First the cast was applied below the knee and then was extended to the upper thigh. The cavus was corrected first by supinating the forefoot to correct the relative pronation of the first metatarsal and to bring the first metatarsal in line with the other metatarsals. After the correction of cavus, the subsequent casts aimed at correcting adduction and varus by abducting the supinated foot with counter pressure on the head of the

talus on the lateral side. The heel was not touched to allow the calcaneus to abduct with the foot.

The children were called at a regular interval of 7-10 days for further manipulation and change of cast. At each visit, the amount of correction was assessed by Pirani score. The cast was removed at each visit by soaking in water and unwrapping the plaster of paris just before the new cast was applied. Casts were applied till an abduction of 60° to 70° was achieved. After achieving complete abduction (60°-70°) and correction of heel varus, residual equinus was observed. If ankle dorsiflexion of >10° was possible, final cast was applied with foot in complete abduction and fully dorsiflexed position for a duration of three weeks. After achieving complete abduction if ankle dorsiflexion remained <10°, a percutaneous tenotomy of the Achilles tendon was performed. Percutaneous Achilles tendon tenotomy was done under local anesthesia using 0.5cc of 2% lignocaine in minor operation theatre. Cast was applied right after the tenotomy with the foot in 60° to 70° abduction and 15° of dorsiflexion for duration of 3 weeks. The children were given oral antibiotics and analgesics for duration of five days.

After achieving complete correction, a custom made brace with open-toe high top shoes attached to ends of a bar was given. The brace was set at 70° of external rotation on the affected side and 40° degrees of external rotation on the normal side. The bar was bent 10° with the convexity away from the child, to hold the feet in dorsiflexion. The size of the splint was taken prior to tenotomy so that brace could be applied immediately after cast removal.

The brace was advised to be worn full time for the first three months and then for 12 hours at night and 2 to 4 hours in the day for a total of 14 to 16 hours during 24-hour period until the child is 3 to 4 years of age. CTEV shoes were given to facilitate walking during daytime. The parents were instructed to perform exercises on the foot at home. After the brace application the patient was followed up every month for the first three months and every two months for the next six months. During each follow-up the corrected foot was examined in detail, checked for any recurrence and exercises and bracing protocol were emphasized. Follow-up of minimum 6 months is available for all cases. Statistical analysis was done using SPSS windows software.

RESULTS

Half of the children (50%) in the study were less than 1 month of age at the time of initial presentation. The youngest child was of 10 days of age and the oldest child was of 9 months of age at the time of initial consultation. Majority of children (83.33%) were males. 18 cases (60%) had bilateral clubfoot. Among unilateral (12 children) cases, right side (10 cases) was more commonly involved. History of consanguineous marriage was

present in 36.67% cases. 6 cases (20%) had family history of similar foot deformity. First born children (53.5%) were more common than other birth order children. 63.33% of children were cesarean births and most of them had history of oligohydramnios.

Table 1: Demographic data.

	Number of children	Percentage (%)
Age at presentation (in months)		
< 1	15	50
1-6	12	40
6-12	3	10
Sex		
Males	25	83.33
Female	5	16.67
Side		
Right	10	33.33
Left	2	6.67
Bilateral	18	60
Birth order		
1 st	16	53.33
2 nd	7	23.33
3 rd	5	16.67
4 th	2	6.67
Consanguinity		
Yes	11	36.67
No	19	63.33
Cesarean section delivery		
Yes	11	36.67
No	19	63.33
Family history		
Yes	6	20
No	24	80

The mean initial Pirani score was 4.4 for 48 feet, with minimum score of 2.0 and maximum score of 6.0. Three children, all with bilateral clubfoot showed no correction even after 8 casts and required posteromedial soft tissue release. The mean number of casts required for remaining 42 feet was 6.6. Tendoachilles tenotomy was needed in 16 feet (38%). There was no correlation between age of presentation and number of casts applied. The number of casts required to achieve complete correction increased with increase in the initial Pirani score. During the follow-up period none of the 27 cases presented with

recurrence. All children showed good compliance with the treatment.

Table 2: Treatment results.

	No. of children	Percentage (%)
Complete correction with ponseti		
Yes	27	90
No, needed PMSTR	3	10
Initial Pirani score		
Minimum	2	
Maximum	6	
Mean	4.4	
Number of casts		
Minimum	2	
Maximum	12	
Mean	6.6	
Tenotomy		
	No. of feet	
Yes	16	38
No	26	62



Figure 1: (A) 4 month old male child with bilateral congenital clubfoot with initial Pirani score of 4; (B) after 4th cast; (C) maintenance with brace.

Table 3: Number of casts required for complete correction based on initial Pirani score.

Initial Pirani score	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	Total
2-3	1	3	1	0	0	0	0	0	0	0	5
3.5-4	0	0	6	0	0	0	0	0	0	0	6
4.5-5	0	0	0	4	1	4	0	0	0	0	9
5.5-6	0	0	0	0	0	3	0	1	1	2	7
Total	1	3	7	4	1	7	0	1	1	2	27

There were two complications. One case had plaster sore which was superficial and was treated with regular dressings and healed within a week. Another child was brought to emergency department 6 hours post cast application with complaints of excessive crying, swelling of toes. Cast was removed and blebs were found over leg. A diagnosis of impending compartment syndrome was made and was treated with blebs rupture, regular dressings, limb elevation. The child improved with conservative treatment.

DISCUSSION

In 1990s, Dr. Ignacio Ponseti published long term results of his technique with excellent results.²²⁻²⁵ Numerous authors have concurred with his outcomes and now worldwide Ponseti technique is the treatment of choice for congenital clubfoot if the child presents within one year of birth.²⁶⁻³⁰

Our institute, being a tertiary hospital receives clubfoot children referred from other hospitals. Hence, many children were referred to us early. Though, age did not influence results, it is recommended to start treatment as early as possible.

There was male preponderance and more than half of the children had bilateral clubfoot. Congenital clubfoot was more common in first born children and many were caesarean born. These results are similar to other studies.²⁶⁻³⁰

We report 90% success rate (27 out of 30 children) with Ponseti technique. This may be attributed to good technique as we have been using Ponseti technique for the past 10 years and also good compliance from children's parents who were counselled well and were involved in every stage of treatment.

The more severe the deformity i.e. higher the initial Pirani score, more number of casts were required for achieving full correction. In bilateral cases, the initial Pirani scores were same in both feet. Also, deformity was found to be severe in bilateral cases and both feet required the same number of casts for the correction of the deformity.

Ponseti technique gives satisfactory results and is inexpensive. In developing countries, where disease burden is huge, Ponseti technique can cure many clubfoot children and prevent a life of disability. Pirani scoring system which is an integral part of the Ponseti method is easy to use and helpful in the management. Parents should be made integral part of the treatment protocol and well informed, cooperative parents are key to success.

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