Outcome of Ponseti method of manipulation and casting for idiopathic clubfoot at Nishtar Medical University Hospital Multan.

Tariq Mahmood[1], Muhammad Badar ud Din Zafir[2], Muhammad Khalid Chishti[3], Muhammad Shafee Khalid[4], Azmat Rasool[5], Muhammad Furqan Ahmad[6]

[1,2]Associate Professor Orthopaedics Nishtar Medical University Multan
[3]Assistant Professor Orthopaedics Nishtar Medical University Multan
[4]Assistant Professor Orthopaedics Nishtar Medical University Multan
[5]Assistant Professor Orthopaedics Nishtar Medical University Multan
[6]Post Graduate Trainee Orthopaedics Nishtar Hospital Multan

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Corresponding author:
Muhammad Badar ud Din Zafir
E-mail: drzafir77@yahoo.com

ABSTRACT

Objective: To determine the outcome of Ponseti technique of manipulation and serial casting for idiopathic clubfoot in terms of correction achieved as per improvement in Pirani scoring.

Methods: This descriptive study was conducted in Orthopaedic department Nishtar Medical University Hospital Multan from 25th January 2019 to 25th January 2021. All children of below one year age with idiopathic clubfoot fulfilling the inclusion criteria were treated with Ponseti method of manipulation and serial casting on weekly basis. Pirani score was used to assess foot deformity before and after casting and interpreted as excellent outcome(0 and 1 score),good outcome(1.5 and 2.5 score) and poor outcome(≥3 score).The pre and post casting Pirani score was compared and *P* value was calculated with paired t-test. *P* value< 0.05 was considered significant.

Results: In this study 100 children with idiopathic club feet were enrolled but 90 children completed the study. Bilateral club feet was present in 45(50%) children and unilateral in 45(50%) children. The total feet treated were 135. The mean age was 45.31±61.87 days. Male children were 53 (58.9%) and female 37 (41.1%). The average number of casts were 5.37±1.80. Tendo Achilles tenotomy was carried out in 73 (81.1%) children. The mean pre casting Pirani score of the right foot was 4.88±1 and post casting 0.13±0.44($p < 0.05$) The mean pre casting Pirani score of the left foot was 5.02±1.19 and improvement was noticed with post casting Pirani score of 0.8±0.20($p<0.05$).Overall excellent outcome was documented in 110(81.48%) feet and good outcome in 25(18.51%) feet.

Conclusion: The Ponseti technique of manipulation and casting was very effective in correcting the club foot deformity as indicated by significant improvement in Pirani scoring and excellent outcome in majority of our patients.

Keywords: Club foot, Congenital Talipes Equinovarus, Pirani score, Ponesti.

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INTRODUCTION

Idiopathic club foot or Congenital Talipes Equinovarus (CTEV) is a common birth defect that occurs in 1 to 2 per 1000 live births globally.[1-3] In Pakistan club foot deformity has been reported in approximately 1.4 to 1.5 / 1000 live births.[4,5] In 30% to 50% cases usually both feet are involved.[1,2] The etiopathogenesis of CTEV has been linked to several genetic and environmental factors and some are associated with arthrogryposis, myelomeningocele and amniotic bands but in 80% of cases the etiology is unknown and are termed as idiopathic clubfoot.[1,2] Familial inheritance however, has been reported in 11% of CTEV cases.[6,7] Presence of clubfoot deformity has a negative psychological impact on the parents

therefore it is important that the family receive emotional support besides treatment of the pathology.[8] Untreated club feet can result in deform foot bones and degeneration of adjacent joints.[1,2] Due to the potential devastating complications of surgery in idiopathic CTEV, treatment preferences have changed primarily to non-operative approaches like splinting, taping and casting and Ponseti method of serial casting has become the standard of care.[1] The Ponseti treatment of clubfoot deformity was first introduced by Dr. Ignacio Ponseti in North America and it include an initial phase of manipulations, serial castings with or without percutaneous Achilles tenotomy followed by maintenance phase of foot bracing.[1,9] The Ponseti method is simple, easy to learn and economically feasible with excellent results reported in many studies.[10,11]

To objective of our study was to determine the outcome of Ponseti technique of manipulation and serial casting for idiopathic clubfoot in terms of correction achieved as per improvement in Pirani scoring.

METHODS

We conducted this descriptive study in Orthopaedic department Nishtar Medical University Hospital Multan from 25th January 2019 to 25th January 2021.Children of both gender and age less than one year with idiopathic club foot and normal hip and spine presenting to our out patient department were enrolled in this study. Children with neurologic, neuromuscular, syndromic clubfoot and previously treated clubfoot in other centers were excluded from our study. After enrolment complete history and physical examination of all children were carried out. Informed written consent was taken from parents or guardians of the children. The pre casting Pirani score was calculated by examining the presence or absence of posterior foot crease, heel empty or not, equinus rigid or not, medial crease present or absent, degree of lateral boarder curvature, and talus head covered or not.[12,13] The minimum total Pirani score was 0 while maximum total Pirani score was 6. Weekly manipulation and Ponseti serial casting was carried out in all children as per standard protocol.[14-16] Percutaneous Achilles tenotomy under local anaesthesia was done in only eligible children(< 15 degree dorsiflexion and <70 degrees abduction).[17] Post treatment Pirani score was calculated after achieving full correction and Dennis-Brown foot bract was applied for maintenance phase. Post casting Pirani score was interpreted as excellent outcome(0 and 1 score),good outcome(1.5 and 2.5 score) and poor outcome(≥3 score).[18]

Data was stored and analyzed using SPSS version 27. Mean and standard deviation for numerical variables like age was calculated. Frequencies and percentages for qualitative variables like gender and side was calculated. Effect modifiers like gender, age, side, duration and family history was controlled by stratification. Post stratification independent sample t test and one way Anova test was applied to see their effect on outcome. Paired sample t test was applied to calculate the statistical difference between the pre and post treatment Pirani score. *P* value < 0.05 was considered significant. Data was presented in table where necessary.

RESULTS

We enrolled 100 children with idiopathic clubfoot in our study but 90 children were able to complete this study as 6(6%) children died of other diseases while 4(4%) children were lost to follow up after initial casting and were excluded from final analysis. Male children were 53 (58.9%) and female 37 (41.1%). Bilateral club feet was present in 45(50%) children and unilateral in 45(50%) children. The total feet treated were 135.Majority(53.33%,n=72) of feet were right while left foot was involved in 63(46.66%).The mean age of our children with clubfoot was 45.31±61.87 days(range 1 day to 270 days). The average number of casts were 5.37±1.80(range 2 to 11). The mean Pirani score of right foot before casting was 4.88±1.11(range 2.5 to 6) while after casting it was 0.13±0.44(range 0 to 2.5).The improvement was statistically significant($p < 0.001$).The mean Pirani score of left foot before casting was 5.02±1.19(range 1 to 6) while after casting it was improved to 0.8±0.20 (0 to 1.0).This difference was statistically significant($p < 0.001$). Overall excellent outcome was documented in 110(81.48%) feet and good outcome in 25(18.51%) feet. Post stratification of data analysis and comparison revealed no statistically significance in Pirani score terms of gender, age, residential address, family history and tenotomy.(table I) Children born in hospital had statistically improved Pirani score of left foot than right foot($p<0.00$). Children born with normal vaginal delivery had improved Pirani score of right foot than left($p<0.001$).Children with 1 to 6 castings had better Pirani score of left foot than right foot(p=0.010).No complication related to casting or tenotomy was documented in our series.

Table I: Post stratification data analysis and comparison.

Parameter		Total Feet n=135	Right foot post treatment Pirani score			*P* value	Left foot post treatment Pirani score			*P* value
Total patients, n=90			n=	Mean	SD		n=	Mean	SD	
Gender	Male, n=53	77	45	0.18	0.54	0.261	32	0.63	0.17	0.511
	Female, n=37	58	27	0.06	0.16		31	0.10	0.24	
Age	< 3 weeks	68	33	0.76	0.22	0.523	35	0.86	0.19	0.232
	3 weeks to 3 months	44	26	0.15	0.50		18	0.83	0.26	
	3 months to 6 months	17	10	0.30	0.79		7	0.12	0.30	
	6 months to 1 year	5	3	0.10	0.12		2	0.15	0.21	
Residential address	Urban	83	46	0.19	0.54	0.106	37	0.68	0.17	0.590
	Rural	52	26	0.02	0.09		26	0.10	0.24	
Place of birth	Hospital	103	56	0.14	0.48	0.699	47	0.02	0.10	<0.001
	Home	32	16	0.09	0.27		16	0.25	0.32	
Mode of delivery	Normal vaginal	67	34	0.09	0.23	<0.001	33	0.14	0.26	0.066
	Episiotomy	6	4	1.25	1.44		2	0.09	0.10	
	C- section	62	34	0.04	0.14		28	0.18	0.94	
Family history	Positive	11	7	0.07	0.19	0.707	4	0.02	0.12	0.428
	Negative	124	65	0.14	0.46		59	0.85	0.21	
Number of casts	1 to 6 casts	101	54	0.56	0.19	0.010	47	0.07	0.21	0.748
	7 to 11 casts	34	18	0.36	0.80		16	0.09	0.20	
Tendoachilles tenotomy	Yes	113	62	0.13	0.46	0.891	51	0.09	0.22	0.483
	No	22	10	0.15	0.34		12	0.04	0.14	

DISCUSSION

In our study 90 children(135 feet) with mean age 45.31±61.87 days were treated with Ponseti method of manipulation and serial casting. We documented pre casting and post casting Pirani score of 4.88±1 and 0.13±0.44($p < 0.05$) respectively for the right foot while mean pre casting Pirani score of the left foot was 5.02±1.19 and improved to 0.8±0.20($p < 0.05$) post casting. Overall excellent outcome was documented in 110(81.48%) feet and good outcome in 25(18.51%) feet in our series. Kumar[19] treated 90 feet with Ponseti method and noted that the mean pre casting Pirani score of 4.6 was improved to 0.55 after the casting. Excellent and good outcome was noted in 78.18%. Malhorta[20] treated 356 children of clubfoot with Ponsti technique. The mean age was 4.03 months. He documented excellent outcome in 275(77.2%0,good in 41(11.2%) and poor in 40(11.1%) cases. Sakale[21] noted excellent outcome in 92% cases of club foot treated with Ponseti. Faldini[18] noted excellent outcome in 9 (75%)children and good in 3(25%) children in his series of 12 children treated with Ponseti technique.

Ahmad and Mehmood[22] treated 88 clubfeet with Ponesti serial casting and noted that Pirani scored had improved from 5.51±0.62 to <0.5. Saetersdal[23] treated 162 clubfeet and documented Pirani score of 0.5 in 77% cases at 4 years follow up. Smythe[24] treated 337 feet with Ponsti technique and observed that the mean Pirani score at presentation was 3.80±1.15 and improved to 0.80±0.56 at the end of casting. Jaqueto and colleague[25] treated 51 clubfoot with Ponsti technique and noted the improvement in Pirani score from pretreatment of 5.5 to 3.6 post treatment. These authors observed a significant improvement in deformity in 46(90.2%) feet.

In our study the average number of serial casts were 5.37 which is comparable to other studies(Table II) Achilles tenotomy was performed in 81.1%(n=73) feet in our study. Variable frequency of Achilles tenotomy can be seen in literature(Table III).

The limitations of our study were small sample size and short duration of follow up. Further studies are therefore needed to confirm our results.

Table II: Literature review of average number of serial casts used in Ponseti method for correction idiopathic congenital clubfoot.

S. No	Author Name	Year of Publication	Average number of casts
1	Malhorta R20	2018	6.9
2	Smythe T24	2016	7.27
3	Jaqueto PA25	2016	5.8
4	Saetersdal C23	2012	7.2
5	Changulani M et al 26	2006	6
6	Lehman W et al 27	2003	5.4
7	Our Study	2022	5.37

Table III: Frequency of Achilles tenotomy in idiopathic clubfeet in other studies.

S. No	Author Name	Year of Publication	Frequency of Achilles tenotomy
1	Ahmad I [22]	2020	77.2%
2	Malhorta R[20]	2018	77%
3	Smythe T[24]	2016	78.9%
4	Jaqueto PA[25]	2016	83.8%
4	Pavone V[28]	2013	72%
5	Saetersdal C[23]	2012	79%
6	Changulani M *et al* [26]	2006	79%
7	Lehman W *et al* [27]	2003	75%
8	**Our Study**	**2022**	**81.1%**

CONCLUSION

The Ponseti technique of manipulation and casting was very effective in correcting the club foot deformity as indicated by significant improvement in Pirani scoring and excellent outcome in majority of our patients. Cosmetically acceptable and plantigrade foot can be achieved with Ponseti technique. We therefore recommend this technique as treatment of first choice to treat infants with idiopathic club foot.

Conflict of Interest: None

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