

Comparison of Results of Standard Versus Accelerated Ponseti Method for Congenital Club Foot Deformity

KAMRAN ASGHAR¹, MUHAMMAD MOBUSHIR², HAMZA FAREED³, KASHIF ABBAS⁴, MUHAMMAD NASIR NAWAZ⁵, MUHAMMAD SALIM⁶, NOUMAN MAQBOOL⁷

¹Assistant Professor Orthopaedics, Foundation University Medical College, Islamabad

^{2,3}Assistant Professor Orthopaedic Surgery, Foundation University Medical College, Islamabad

⁴Registrar Orthopaedic department, Fauji Foundation Hospital, Rawalpindi

⁵Consultant Orthopaedic Surgeon, Tehsil Headquarters Hospital, Taxila Rawalpindi

⁶Professor and Head of Orthopaedics Department, Foundation University Medical College, Islamabad

⁷Professor and Head of Unit Orthopaedics, Fauji Foundation Hospital, Rawalpindi

Corresponding author: Kamran Asghar, Email: thekmcite@hotmail.com, Cell: 03139642114

ABSTRACT

Objective: To compare the outcome of standard versus accelerated Ponseti method for congenital club foot deformity.

Study Design: Randomized Controlled Trial

Place and Duration: Department of Orthopedics Surgery, Fouji foundation hospital, Rawalpindi, duration was six months from February 2021 to July 2021.

Methodology: Total 80 patients of either gender presented with congenital club foot deformity were enrolled. Patients' ages were ranging between 1-6 months. Patients will be randomly divided into two groups by using lottery method. Group-A (n=40) patients were received accelerated Ponseti techniques and Group-B (n=40) patients had received standard Ponseti techniques. The cast were changed twice weekly in the accelerated group and once weekly in the standard group. Patients will be followed-up in OPD after 1, 4, 8 and 12 weeks. After 12 weeks, patients will be evaluated for Pirani and Dimeglio scores by using modified functional rating system score.

Results: There were 25 (62.5%) male and 15 (37.5%) patients were females in Group A with mean age 2.36 ± 1.48 months. In Group B, 23 (57.5%) patients were males while 17 (42.5%) were females with mean age 2.48 ± 1.74 months. In group A, mean Pirani score at presentation was 6.48 ± 2.76 and in group B it was 6.58 ± 2.66 . Mean number of cast required in group A was 6.68 ± 1.74 and in group B it was 6.14 ± 1.56 . At end of treatment mean Pirani score in group A and B was 0.48 ± 0.36 and 0.54 ± 0.32 , no significant difference was found between both groups with p-value > 0.05 . At presentation, mean Dimeglio score in group A and B was 11.04 ± 2.48 and 11.56 ± 2.74 , at follow-up it reduces to 0.86 ± 0.48 and 0.88 ± 10.56 . At final follow-up, 22 (55%) patients had excellent and 18 (45%) had good functional outcomes in group A and in group B 20 (50%) had excellent, 18 (45%) had good and 2 (5%) had fair functional outcomes.

Conclusion: It is concluded that both accelerated and standard techniques had comparable efficacy and safety for club foot deformity.

Keywords: Club Foot Deformity, Standard Ponseti, Accelerated Ponseti Method, Pirani Score

INTRODUCTION

Congenital talipes equinovarus (clubfoot) is one of the most common congenital malformations; it affects 1–3 in 1000 live births and occurs twice as often in male fetuses [1]. It can be unilateral (30–40%) or bilateral (60–70%) and can be either an isolated malformation (50–70%) or complex and associated with other structural or genetic anomalies (30–50%) [2-3].

Ponseti technique has been accepted as the standard method of treatment for clubfoot [4]. The Ponseti method lends itself well to developing a nation-wide program for clubfoot treatment in countries with limited resources [5]. Accelerated Ponseti method of twice weekly casting has similar results as Standard Ponseti method with the advantage of earlier correction of the deformity and better parents compliance [6].

Accelerated Ponseti method with casts being done twice weekly, is being utilized recently to reduce the duration of plaster treatment [4]. It has been reported in previous studies that accelerated Ponseti method can help to achieve the early healing and early removal of cast [7-8]. It has been reported that correction of all deformities was

achieved in 95% cases with accelerated method and 90% cases with standard method [8].

One trial found that mean duration of cast was 58.2 ± 8.3 days in the standard group and 39.5 ± 5.2 days in the accelerated group ($P < 0.05$), but the difference in achieving the Pirani and Dimeglio score was insignificant i.e. Initial mean Pirani score was 4.67 ± 0.73 in the standard group and 4.35 ± 0.76 in the accelerated group, and the score decreased to 0.34 ± 0.38 and 0.35 ± 0.31 , respectively ($p > 0.05$). Initial mean Dimeglio score was 11.75 ± 2.75 in the standard group and 10.51 ± 2.57 in the accelerated group, and the score decreased to 0.79 ± 0.77 and 0.79 ± 0.71 , respectively, immediately after casting ($p > 0.05$) [9].

Another trial found that the mean difference in the pirani score was 0.65 ± 0.17 and that in the dimeglio score was 1.11 ± 0.43 [10].

The rationale of this study is to compare the outcome of standard versus accelerated Ponseti method for congenital club foot deformity. Though literature, it has been observed that accelerated Ponseti method is more beneficial in terms of reduced duration of casting in infants with clubfoot deformity as compared to standard method, however the efficacy is equal (Pirani score). But in routine,

standard method (one weekly) is done in many clinical set-ups due to its ease, and less number of visits per week. But this may increase the duration of treatment. Although much data has been present in literature showing more efficacy of accelerated Ponseti method for clubfoot deformity. So this study is planned to obtain the local data that can be implemented in local setting in future with more appropriate method for management of clubfoot deformity in future and improve the patient's outcome.

MATERIALS AND METHODS

This randomized controlled trial was conducted at the Department of Orthopedics Surgery, Fouji Foundation Hospital, Rawalpindi, duration was six months from February 2021 to July 2021. Total 80 patients (100 feet) of either gender presented with congenital club foot deformity were enrolled. Patients ages were ranging between 1-6 months. Infants with neurogenic or syndromic club foot deformity (on clinical examination), and previously operated or relapsed club foot deformity (on medical record) were excluded.

Informed consent will be taken before randomization. Demographic information like name, age, gender, lateral side, weight of infant will be noted. Patients will be randomly divided into two groups by using lottery method. Group-A (n=40) patients were received accelerated Ponseti techniques and Group-B (n=40) patients had received standard Ponseti techniques. The cast will be changed twice weekly in the accelerated group and once weekly in the standard group. All procedures will be done by researcher with assistance of the staff nurse. Patients will be followed-up in OPD after 1, 4, 8 and 12 weeks. After 12 weeks, patients will be evaluated for Pirani and Dimeglio scores by using modified functional rating system score (as per operational definition). Total days required for casting will be noted (as per operational definition). All the information will be calculated by researcher himself through a Proforma (attached).

Data will be entered and analyzed using SPSS 22. Quantitative data like age, weight of infant, total cast duration and Pirani and Dimeglio scores will be presented by mean±SD. Qualitative data like gender and lateral side will be presented by frequency and percentages. Both groups will be compared for mean Pirani and Dimeglio scores and cast duration by using independent samples t-test. P-value ≤ 0.05 will be considered as significant.

RESULTS

There were 25 (62.5%) male and 15 (37.5%) patients were females in Group A with mean age 2.36±1.48 months. In Group B, 23 (57.5%) patients were males while 17 (42.5%) were females with mean age 2.48±1.74 months. In group A, 18 (45%) patients had right foot, 16 (40%) had left and 6 (15%) had both. In group B 20 (50%) had right, 17 (42.5%) had left and 3 (7.5%) had both. (Table 1)

In group A, mean Pirani score at presentation was 6.48±2.76 and in group B it was 6.58±2.66. At end of treatment mean Pirani score in group A and B was 0.48±0.36 and 0.54±0.32, no significant difference was found between both groups with p-value >0.05. However, a significant reduction was observed from presentation to end of treatment (p-value <0.05). (table 2)

Table 1: Baseline details of all the included patients

Variables	Group A (Accelerated)	Group B (Standard)
Mean Age (months)	2.36±1.48	2.48±1.74
Gender		
Male	25 (62.5%)	23 (57.5%)
Female	15 (37.5%)	17 (42.5%)
Site		
Left	16 (40%)	17 (42.5%)
Right	18 (45%)	20 (50%)
Both	6 (15%)	3 (7.5%)

Table 2: Pirani Score at presentation and at end of Treatment

Variables	Group A (Accelerated)	Group B (Standard)	P-value
Mean Pirani Score			
At Presentation	6.48±2.76	6.58±2.66	>0.05
At End of Treatment	0.48±0.36	0.54±0.32	>0.05
P-Value	0.0001	0.0001	

At presentation, mean Dimeglio score in group A and B was 11.04±2.48 and 11.56±2.74, at follow-up it reduces to 0.86±0.48 and 0.88±10.56. No significant difference was found between both groups with p-value >0.05. However, a significant reduction was observed from presentation to end of treatment (p-value <0.05). (Table 3)

Table 3: Dimeglio Score at presentation and at end of Treatment

Variables	Group A (Accelerated)	Group B (Standard)	P-value
Mean Dimeglio Score			
At Presentation	11.04±2.48	11.56±2.74	>0.05
At End of Treatment	0.86±0.48	0.88±10.56	>0.05
P-Value	0.0001	0.0001	

At final follow-up, 22 (55%) patients had excellent and 18 (45%) had good functional outcomes in group A and in group B 20 (50%) had excellent, 18 (45%) had good and 2 (5%) had fair functional outcomes. No significant difference was observed between both groups with p-value <0.05. (Figure 1)

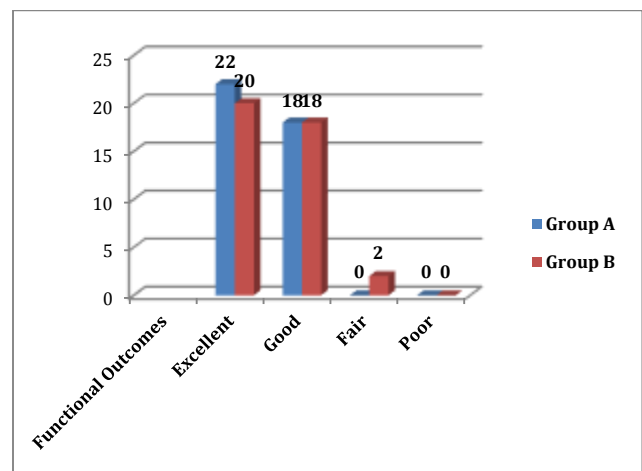


Figure 1: Functional outcomes between both groups P-value >0.05

DISCUSSION

Serial Ponseti casting, developed by Dr. Ignacio Ponseti in the 1940s, has become generally accepted around the world as a non-operative technique to the treatment of clubfoot since its introduction in that decade. The weekly frequency of manipulation and cast application enables for the gradual correction of joint surfaces as well as collagen relaxation and atraumatic remodelling of joint surfaces to take place, while lowering the danger of fibrosis that can occur after surgical release of the joint capsule. As Ponseti has showed, if this corrective procedure is implemented within the first month of birth, the necessity for posterior medial and lateral release can be avoided in up to 95% of instances. Some reports claim that the success rate is lower in older infants (7 to 10 months old) than in younger infants; however, Alves et al. (2009) reported contradictory evidence, stating that the relapse rate and other outcomes were similar regardless of the age of the patients at the time of initial treatment [11-12].

We conducted present study to compare the outcomes of standard ponseti technique versus accelerated ponseti technique in infants with club foot deformity. In this regard 80 patients were randomly divided into two equal groups, each group contains 40 patients. Group A received accelerated method and group B received standard ponseti method. Majority 60% patients were males while 40% were females. Mean age of patients in our study was 2.48 ± 2.86 years. These results were comparable to many of previous studies in which males were predominance with average age of 40 days [13-14].

In present study we found that in group A, mean Pirani score at presentation was 6.48 ± 2.76 and in group B it was 6.58 ± 2.66 . At end of treatment men Pirani score in group A and B was 0.48 ± 0.36 and 0.54 ± 0.32 , no significant difference was found between both groups with p-value > 0.05 . However, a significant reduction was observed from presentation to end of treatment (p-value < 0.05). A study conducted by Kumar R et al [15] reported that mean Pirani score at presentation was 4.91 and at follow-up mean Pirani score was 0.081. No significant difference was found between accelerated and standard Ponseti technique regarding Pirani score with p-value > 0.05 .

Another study by Gillani SF et al [16] demonstrated that 95% in accelerated group and 90% in standard group had Pirani score < 1 . No significant difference was observed regarding efficacy between both groups (p= > 0.05).

In our study we found that at presentation, mean Dimeglio score in group A and B was 11.04 ± 2.48 and 11.56 ± 2.74 , at follow-up it reduces to 0.86 ± 0.48 and 0.88 ± 10.56 . No significant difference was found between both groups with p-value > 0.05 . However, a significant reduction was observed from presentation to end of treatment (p-value < 0.05). Many of previous studies showed similarity to our findings in which Dimeglio score was significantly reduces from presentation to end of treatment. However no significant difference was observed between accelerated method and standard technique regarding Dimeglio score with p-value > 0.05 [17-18].

Our study found that the twice weekly accelerated protocol required fewer cast changes to achieve correction than the standard protocol; however, when comparing the accelerated protocol to the standard protocol, the number

of cast changes required to achieve correction was higher with the accelerated protocol. Morcuende and colleagues [19] reported that they conducted percutaneous tendo Achilles tenotomy on 83 percent of their patients (85 percent of the five-day group and 81 percent of the seven-day group).

In present study at final follow-up, 22 (55%) patients had excellent and 18 (45%) had good functional outcomes in group A and in group B 20 (50%) had excellent, 18 (45%) had good and 2 (5%) had fair functional outcomes. No significant difference was observed between both groups with p-value < 0.05 . Islam MS et al [20] reported in their study that 55.55% clubfeet had excellent results and 44.45% had good results in the standard group, whereas 66.23% clubfeet had excellent results and 33.77% had good results in the accelerated group. None amongst the two groups had fair or poor results.

Another study conducted by Solanki M et al [21] reported that 80% and 75% patients had excellent, 20% and 25% had good functional outcomes in accelerated and standard technique.

CONCLUSION

We came to the conclusion that both expedited and standard procedures were equally effective and safe in the treatment of club foot deformity. The use of accelerated ponseti casting has significantly shortened the overall length of time required for Ponseti casting treatment without causing any complications. It has lessened the overall economic burden placed on the poor patient by minimising the number of days of work missed as well as the total amount spent on travel expenses and accommodations.

REFERENCES

1. Sharon-Weiner M, Sukenik-Halevy R, Tepper R, Fishman A, Biron-Shental T, Markovitch O. Diagnostic accuracy, work-up, and outcomes of pregnancies with clubfoot detected by prenatal sonography. *Prenat Diag* 2017;37(8):754-63.
2. Viaris de le Segno B, Gruchy N, Bronfen C, Dolley P, Leporrier N, Creveuil C, et al. Prenatal diagnosis of clubfoot: chromosomal abnormalities associated with fetal defects and outcome in a tertiary center. *J Clin Ultrasound* 2016;44(2):100-5.
3. McKinney J, Rac MWF, Gandhi M. Congenital talipes equinovarus (clubfoot). *Am J Obstet Gynecol* 2019;221(6):B10-B2.
4. Sahu B, Rajavelu R, Tudu B. Management of idiopathic congenital talipes equinovarus by standard versus accelerated Ponseti plaster technique: A prospective study. *J Orthop Traumatol Rehab* 2015;8(1):30.
5. Shah A, Mehta R, Aroojis A. The Ponseti method of clubfoot treatment in walking age children: is it effective? A study of 56 children from 1 to 10 years of age. *Journal of pediatric orthopedics Part B* 2019;28(2):159-66.
6. Dutta A, Sipani AK, Kumar P. A comparative study between standard and accelerated ponseti method in management of idiopathic congenital talipes equinovarus. *Int J Orthop* 2019;5(2):359-63.
7. Ullah S, Inam M, Arif M. Club foot management by accelerated Ponseti technique. *Rawal Med J* 2014;39(4):418-20.
8. Salman Ahmed O-U-RMABSG. Comparison of Accelerated VS Standard Ponseti Method in Management of Idiopathic Clubfoot. *J Pak Orthop Assoc* 2014;26(1):4.

9. Islam MS, Masood QM, Bashir A, Shah FY, Halwai MA. Results of a Standard versus an Accelerated Ponseti Protocol for Clubfoot: A Prospective Randomized Study. *Clinics in orthopedic surgery* 2020;12(1):100-6.
10. Cosma D, Vasilescu D E. A clinical evaluation of the Pirani and Dimeglio idiopathic clubfoot classifications. *J Foot Ankle Surg* 2015; 54 (4): 582-5.
11. Herring JA. *Tachdjian's pediatric orthopaedics : From the Texas Scottish Rite Hospital for Children*. Saunders; 2013. 1696 p.
12. Alves C, Escalda C, Fernandes P, et al. Ponseti method: Does age at the beginning of treatment make a difference? *Clin Orthop Relat Res*. 2009;467(5):1271-1277.
13. Radler C, Mindler GT, Riedl K, Lipkowski C, Kranzl A (2013) Midterm results of the Ponseti method in the treatment of congenital clubfoot. *Int Orthop* 37:1827–1831
14. Porecha MM, Parmar DS, Chavda HR (2011) Mid-term results of Ponseti method for the treatment of congenital idiopathic club- foot—(a study of 67 clubfeet with mean five year follow-up). *J OrthopSurg Res* 6:3.
15. Rakesh Kumar, Sushil Kumar Singh. Conventional Ponseti vs. Accelerated Ponseti in the management of cases of idiopathic Clubfoot. *EJMCM* (2020). Volume 07, Issue 11, 2020.
16. Syed Furqan Gilani, Salman Ahmed, Obaid-Ur-Rehman, Muhammad Ali Bashir. Comparison of Accelerated VS Standard Ponseti Method in Management of Idiopathic Clubfoot. *JPOA VOL.26 (1) MARCH 2014*.
17. Cosma DI, Vasilescu DE (2014) Ponseti treatment for clubfoot in Romania: a 9-year single-centre experience. *J Pediatr Orthop B* 23(6):512–516.
18. Abbas M, Qureshi OA, Jeelani LZ, et al. Management of congenital talipesquinovarus by Ponseti method: a clinical study. *J Foot Ankle Surg*2008; 47:541- 5.
19. Morcuende J, Abbasi D, Dolan L. Results of an accelerated Ponseti protocol for clubfoot. *J Pediatr*2005 25: 623-625.
20. Islam MS, Masood QM, Bashir A, Shah FY, Halwai MA. Results of a Standard versus an Accelerated Ponseti Protocol for Clubfoot: A Prospective Randomized Study. *Clin Orthop Surg*. 2020;12(1):100-106. doi:10.4055/cios.2020.12.1.100.
21. Solanki, Mahendra & Ajmera, Anand & Rawat, Sanjay. (2018). Comparative study of accelerated ponseti method versus standard ponseti method for the treatment of idiopathic clubfoot. *Journal of Orthopedics, Traumatology and Rehabilitation*. 10. 116. 10.4103/jotr.jotr_11_18.