

Management of Spina Bifida Related Non Idiopathic Club-Foot with Ponseti's Method

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ABSTRACT

Objective: To determine the outcome of Ponseti's method among children with spina bifida related non-idiopathic clubfoot at a leading pediatric tertiary care children hospital of South Punjab, Pakistan.

Study Design: A retrospective cohort.

Place and Duration of the Study: Department of Pediatric Orthopedic Surgery, The Children's Hospital and Institute of Child Health, Multan Pakistan from 1st January 2016 to 31st March 2022.

Material and Methods: A total of 24 children (41 feet) of both genders aged up to 3 months presenting with non-idiopathic clubfoot related to spina bifida who underwent Ponseti's method for treatment of clubfoot, with a minimum post-treatment follow up of 3 years were included. Demographic data, severity of clubfoot disease along outcomes in terms of successful correction, unsuccessful correction, relapse were noted during the study period.

Results: In a total of 24 children, 15 (62.5%) were boys. Overall, mean age was calculated to be 2.6±2.2 weeks while 14 (58.3%) children were aged between 0-2 weeks. Bilateral feet were involved in 17 (70.8%) children while unilateral feet involvement was noted in 7 (29.2%) cases so total number of feet were 41. Out of these 41 feet, 38 (92.7%) had severity of clubfoot as per Pirani Score as 6. Number of casts performed were 8 or below in 39 (95.1%). Mean duration of follow up was 3.8±0.6 years. Correction of clubfoot was achieved in 36/41 (87.8%) feet. During the follow-ups, recurrence occurred in 11 (26.8%) feet.

Conclusion: Initial clubfeet correction in the spina bifida cases achieved good correction rates. Rate of recurrence was considerably high with a minimum follow up period of 3 years among spina bifida associated clubfeet.

Keywords: Achilles tendon, clubfoot, Ponseti's method, spina bifida.

INTRODUCTION

The worldwide incidence of clubfoot is estimated to be around 1.2/1000 live-births.^{1,2} It is estimated that around 90% of clubfoot cases are from developing countries.³ Clubfoot is considered to be the most common musculoskeletal abnormality among newborn and is the 7th most frequent congenital birth defect.⁷ Around 7500 children with clubfoot are born annually in Pakistan.³ Isolated clubfoot deformity in an otherwise normal and healthy child is termed as idiopathic clubfoot. Non-idiopathic clubfoot comprises of clubfoot associated with neuromuscular conditions mainly spina bifida, various syndromes and chromosomal abnormalities. Various components of foot with this deformity are described as equinus, adductus and cavus.⁵

Treatment of idiopathic clubfoot adopting "Ponseti's Method" is taken as "Gold Standard" all over the globe.⁶⁻⁹ Dr. Ignacio Ponseti was an orthopedic surgeon who initially employed this non-surgical approach.⁹ Ponseti's method for the correction of clubfoot is easy to perform, cost-effective and can be performed in an outpatient setting. Researchers have shown that Ponseti's method for the correction of clubfoot has gained increasing popularity in the recent decades and when used judiciously, it yields very good results while surgical approach is seldom required.^{10,11} Although, most prominent orthopedic societies around the world endorse Ponseti's method for the treatment of clubfoot but a global perspective study about the treatment of clubfoot revealed that only about 15% cases of clubfoot were treated with Ponseti's method.³

Despite the popularity of Ponseti's method, clubfoot patients associated with spina bifida or myelomeningocele, until recently were largely treated by extensive soft tissue release surgery of the affected foot as these were thought to be resistant to non-operative methods of manipulation and castings. Most of untreated or neglected cases of clubfoot end up acquiring life-long disabilities that may add financial issues on to individuals and societies especially in a resource constrained country like Pakistan.

The present study was aimed to describe our experience and outcome of Ponseti's method among children with spina bifida related non-idiopathic clubfoot at a leading pediatric tertiary

childcare hospital of South Punjab. The findings of this study were thought to help local orthopedic surgeons assessing the value of Ponseti's method among children with clubfoot.

METHODOLOGY

This retrospective cohort study was conducted at the department of pediatric orthopedics, The Children's Hospital and Institute of Child Health, Multan Pakistan from 1st January 2016 to 31st March 2022. Approval from "Institution's Ethics Committee" was sought. Verbal and written consents were sought from parents/caregivers.

Record of clubfoot patients related to myelomeningocele treated by Ponseti's method at department of Paediatric Orthopaedics from 01-01-2016 to 31-12-2018 was collected from Departmental Patient Database. Patients presenting up to three months of age at the start of treatment were included while those presenting at an age higher than three months were not included. All non-idiopathic clubfoot patients with associated medical conditions or syndromes other than spina bifida were excluded. Patients who had been partially treated for foot deformity elsewhere before visiting our department were also excluded from the study.

A minimum of three year follow up record of all the patients included in the study was obtained and examined.

Our clubfoot treatment team comprised of a consultant paediatric orthopedic surgeon with medical officers and technicians working under his supervision. A qualified and trained physiotherapist had been part of the team and actively involved in physiotherapy of the feet of the patients during casting phase as well as in the follow up period.

In the initial treatment phase, gentle manipulations of the foot was done before first cast and at every subsequent visits to stretch the soft tissue, ligaments and tendons of the foot. Plaster cast was applied in the newly stretched position after every 7 days. Severity of the clubfoot deformity was recorded at first presentation and then at each visit. Initial treatment phase consisted of 6-8 weeks. All parents/caregivers were asked to remove the plaster of paris cast 2-hours prior to follow up visit.

Foot was considered corrected when a minimum of 70 degree of abduction and 10 degree of dorsiflexion was achieved and there was no residual varus at hindfoot. Percutaneous tenotomy of the "Achilles tendon" was performed when 10 degree of dorsiflexion could not be achieved by casting alone. It was done at outpatient setting using local anesthetic. Following tenotomy, the affected foot was placed in the final cast for a duration of 3-weeks in the fully corrected position prior to initiate bracing. In the "maintenance phase", cases were given straight last shoes with Denis-Browne bar braces that were worn for a period of 23 hours per day for a duration of 2-3 months while afterwards, bracing at night time and 4 hours during nap time at day was advised up until 5 years of age minimum. Parents/caregivers were demonstrated daily exercises and physiotherapy to prevent recurrence and assist reduction in foot rigidity.

Relapse was labeled as appearance of cavus, adductus, varus or equinus as demonstrated by worsening of "Pirani Score". Manipulation as well as casting were re-performed among cases with relapse that were followed by tenotomy if required. Decision about soft tissue release surgery was made by the consultant orthopaedic surgeon if conservative measures failed to correct the relapse. Children unable to complete 3 year minimum duration of follow up were not included in the final analysis. Outcomes in terms of corrections (achieved/not achieved) or relapse were retrieved from the hospital record. A special proforma was made to record all study data. For data analysis, SPSS version 26.0 was employed. Numeric variables were shown as mean and standard deviation (SD). Categorical data was represented as frequencies/percentages.

RESULTS

During the study period, a total of 24 children fulfilled the inclusion/exclusion criteria so they were included in the final analysis. In these 24 children, 15 (62.5%) were boys. Overall, mean age was calculated to be 2.6±2.2 weeks while 14 (58.3%) children were aged between 0-2 weeks. Bilateral feet were involved in 17 (70.8%) children while unilateral feet involvement was noted in 7 (29.2%) cases so total number of feet were 41. Table-1 is showing baseline characteristics of children included in this study.

Table-1: Characteristics of Children (n=24)

Characteristics	Number (%)	
Gender	Boys	15 (62.5%)
	Girls	9 (37.5%)
Age at Presentation (weeks)	0-2	14 (58.3%)
	3-4	7 (29.2%)
	5-8	2 (8.3%)
	9-12	1 (4.2%)
Residential Area	Rural	14 (58.3%)
	Urban	10 (41.7%)
Affected Feet	Unilateral	7 (29.2%)
	Bilateral	17 (70.8%)

Table-2: Severity of Clubfoot and Number of Casts Performed in all feet (n=41)

Parameters	Number (%)	
Severity of Clubfoot as per Pirani Score	6	38 (92.7%)
	5	2 (4.9%)
	4	1 (2.4%)
Number of Casts	5	2 (4.9%)
	6	18 (43.9%)
	7	4 (9.8%)
	8	15 (36.6%)
	9	0
	10	2 (4.9%)
Tendo-Achilles Tenotomy	Performed	38 (92.7%)
	Not Required	3 (7.3%)

In a total of 41 feet, 38 (92.7%) had severity of clubfoot as per Ponseti's Score as 6. Number of casts performed were 8 or

below in 39 (95.1%) children while number of casts performed ranged between 5-10 as shown in table-2.

Mean duration of follow up was 3.8±0.6 years. Correction of clubfoot was achieved in 36/41 (87.8%) feet while remaining 5 (12.2%) feet could not achieve correction by Ponseti's method. During the follow-ups, recurrence occurred in 11 (26.8%) feet and in these cases, casting was performed again in 9 cases while soft tissue release surgery was conducted in 2 cases.

DISCUSSION

Adoption of Ponseti's method for efficient short-term as well as long-term outcomes among non-idiopathic foot deformities have been widely adopted approach by researchers around the world. Not much work is seen exploring outcomes of Ponseti's method among children with clubfoot deformities so present study was one of the very few researchers conducted in Pakistan.

We noted that 62.5% children with non-idiopathic clubfoot were male. Global data has shown that there is a male predominance in clubfoot cases.¹² A local large 8-year review of clubfoot correction adopting Ponseti's method analyzing 988 children revealed that 76.9% cases were male which is aligned with our findings.¹³

Age at the time of initiating casting is considered to be an important factor contributing to the successful outcomes among children undergoing correction of clubfoot adopting Ponseti's method. In this study, mean age at the time of enrollment was 2.4±2.2 weeks while 58.3% children were aged between 0-2 weeks. Experts have stated that casting should be started with in 1st week of age.^{14,15} Age group of children in the present study showed consistencies with what has been advocated in the past as the ideal age for initiating Ponseti's method.^{16,17}

In this study, tendo Achilles tenotomy was performed in 92.7% clubfeet desiring correction of residual equinus deformity. A study done by Gerlach DJ et al adopting Ponseti's method for treating clubfoot related with myelomeningocele revealed that 86% clubfeet needed percutaneous Achilles tendon tenotomy.¹⁸

In the presents study, successful outcomes in terms of initial correction of clubfoot was achieved in 87.8% feet with a minimum follow up period of 3 years. Studies have shown successful outcomes with Ponseti's method to be between 90-95% in both short-term as well as long-term accounts.^{19,20} Morcuende JA et al revealed 98% success rates aiming correction of clubfoot correction while local data has depicted 100% initial corrections among patients with clubfoot deformities adopting Ponseti's technique.²¹ Relapse was reported in 26.8% clubfeet in this study. Gerlach DJ et al in myelomeningocele associated clubfeet found higher relapse rates (68%) while relapse rate was only 26% in idiopathic clubfeet deformity cases.¹⁸

All our patients had independent regular follow up visits at physiotherapy department after complete correction of clubfoot. Regular follow up visits, adherence to foot brace wearing protocol, parents counseling and coaching about post correction physiotherapy plays an important role in prevention of recurrence and its early detection if it occurs.²²

Being a single center study with a relatively small size are some of the limitations of this study. Retrospective design of the study also accompanies some limitations as we were unable to actively coordinate with the study cases. We could not record data regarding impact of Ponseti's method on quality of life of the clubfeet cases.

CONCLUSION

Initial clubfeet correction in the spina bifida cases achieved good correction rates. Rate of recurrence was considerable up until a minimum follow up period of 3 years among spina bifida associated clubfeet. More studies with prospective design employing long term follow up periods are necessary to further establish the outcomes related to Ponseti's method aiming correction of non-idiopathic clubfoot.

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