

# EFFICACY OF PONSETI METHOD IN MANAGEMENT OF CLUBFOOT

Riaz Hussain<sup>1</sup>, Musarrat Hussain<sup>2</sup>, Muhammad Uzair<sup>3</sup>, Munir Ahmad<sup>4</sup>

## ABSTRACT

**Objective:** To determine the efficacy of Ponseti technique in term of Pirani's severity scoring in children with club foot.

**Materials and Methods:** This descriptive case series study was conducted in Orthopedics "B" Unit, Lady Reading Hospital Peshawar, from March 2013 to September 2013. Sample size was determined from WHO software for sample size. After approval from hospital ethical committee, patients were selected from OPD with diagnosis of congenital clubfoot with age less than 9 months, using well defined criteria. Disease, management procedure, efficacy, possible complications, period of treatment and follow up explained to the parents. Consent was taken and Ponseti method was used in all patients. Patients were followed and outcome was assessed and analyzed.

**Results:** A total of 96 patients were study during this study period. Age ranged from 1<sup>st</sup> day of life to 9 months with mean age was  $4 \pm 2.31$  months. Male 38(40%) to female 58(60%) ratio was 2:3. Bilateral clubfoot deformity was present in 60% while 40% were with unilateral deformity. Efficacy was assessed with Pirani severity score, among these Pirani severity score was effective in 82(85%) patients while Pirani severity score was not effective in 14(15%) patients.

**Conclusion:** Ponseti method is a safe and cost effective, satisfactory treatment for congenital idiopathic clubfoot with mid- term effectiveness.

**Key Words:** ponseti technique, pironi's severity, Club foot

## INTRODUCTION

Clubfoot is one of the most common congenital deformities, affecting about 1 infant in every 1,000 births<sup>1</sup>. Worldwide, approximately 100,000 new cases of clubfoot occur each year.<sup>1,2</sup> It may be unilateral or bilateral. It is often associated with other hereditary condition, such as myelodysplasias, arthrogryposis multiplex congenita and congenital dislocation of hip.<sup>1,3</sup> Untreated patients not only develop progressive increase in deformity associated with late adaptive changes but also have poor function even after surgical correction<sup>3</sup>.

Ponseti method is the gold standard method for treating clubfoot when started soon after birth ie within first 10 days of life.<sup>4</sup> The Ponseti method consists of a series of weekly manipulations and cast changes and, in most patients, a percutaneous Achilles tenotomy before application of the last 3-week cast<sup>5</sup>. After the casting period, the child wears a foot abduction brace till the age of four to maintain the correction and prevent relapse<sup>6</sup>.

<sup>1</sup> Orthopedic Department, Lady Reading Hospital, Peshawar

<sup>2,3</sup> Medical Officer, Lady Reading Hospital, Peshawar

<sup>4</sup> Department of Surgery, Khyber Teaching Hospital, Peshawar.

### Address for corresponding

**Dr. Riaz Hussain**

Orthopedic Department, Lady Reading Hospital, Peshawar

Cell: 0334-9011074

Email: khanriaz82@yahoo.com

Ponseti method provides a pain-free, flexible, functional foot, with good mobility and tolerating normal footwear<sup>7</sup>. The operative treatment is associated with significant risks, complications, and a potential for poorer prognosis with patients developing weak, stiff and scarred feet. Follow-up studies have also shown, higher incidence of pain and their gait is affected<sup>7</sup>.

Outcome treated by Ponseti method of clubfoot at 1 to 9 months of age is 72%. One other study estimated 98% efficacy which were treated with Ponseti method<sup>9</sup>. In respect of presence of this deformity in our population and use of Ponseti method for its treatment, this study was designed to know the efficacy of Ponseti method in clubfoot management in our institution.

## MATERIALS AND METHODS

This study was conducted in Orthopedic B Unit Lady Reading Hospital Peshawar from March 2013 to September 2013. It was a descriptive case series study. Sample size was 96, calculated using WHO software for sample size determination, using 72% efficacy of ponseti technique<sup>8</sup>, 95% confidence level and 9% margin of error. Patients with congenital talipes equinovarus deformity from either gender of age less than 9 months with unilateral or bilateral deformity were included. While paralytic clubfoot, those associated with other congenital malformation, age more than 9 months, previously treated in other center and those who lost follow were excluded.

After approval of the hospital ethical committee, study was started. Patients were selected through OPD

by clinical examination and radiological investigation with strict application of inclusion and exclusion criteria. The parents were told about the benefits of technique i.e. effective, with less complication, and are less cost effective than other techniques, duration of serial casting and manipulation i.e. 6 to 8 weekly casts. Informed written consent was taken from parents of all cases.

Photographs and radiographs of the affected limbs was taken prior to start manipulation and casts as standardized by Ponseti. Manipulation of the affected foot for one minute followed by casting from toes to groin. The cast was changed on weekly basis and a total of 6 casts was applied. After the last cast foot was assessed clinically, radio logically and a photograph of the effected foot was taken.

Decision of Achilles tendon tenotomy was made twelve weeks after start of the treatment on the basis of Pirani severity scoring i.e. tenotomy was made if HS>1 (hind-foot severity score) and MS<1 (mid foot severity score). All the information was entered in a Performa defined for this purpose. The patients were followed till the decision of tenotomy.

The data was analyzed using SPSS 10.0. Mean  $\pm$  standard deviation was calculated for quantitative variables like age. Frequency and percentages was calculated for qualitative variables like gender, side of deformity and efficacy of the technique.

## RESULTS

A total of 96 patients were studied to determine the efficacy of Ponseti technique in term of Pirani's severity scoring in children with club foot. Patients were stratified into four age groups. Mean age was  $4 \pm 2.31$  months (Table no.1). Male 38(40%) to female 58(60%) ratio was 2:3. Among these 58(60%) had Bilateral deformity while 38(40%) were with unilateral side of deformity, in which 20 patients had left foot deformity and 18 patients had right foot deformity.

Baseline Pirani severity score was analyzed as shown in Table no 2. After 4<sup>th</sup> week of treatment Pirani severity score was analyzed and is shown in Table no 3.

Efficacy of Pirani severity score among 96 patients was analyzed as Pirani severity score was effective in 82(85%) patients while Pirani severity score was not effective in 14(15%) patients. (Table no 4)

Stratification of efficacy of Pirani severity score with age distribution was analyzed as in 82 effective cases of pirani severity score. (Table no 5)

## DISCUSSION

The major concern with the operative treatment of congenital clubfoot is functional outcome. Extensive open surgery like postero-medial release is commonly associated with long-term stiffness and weakness which

is avoided by the Ponseti technique.<sup>10,11</sup> Aronson and Puskarich studied the disability associated with various clubfoot treatment options. Their results showed that patients who underwent casting only and patients who had additional percutaneus heel cord lengthening had the least deformity and disability.<sup>12</sup>

The Ponseti treatment of clubfoot has three phases: the corrective phase involves application of casts, the maintenance phase where splint fitting is emphasized and the transition phase where the splints are discontinued and regular foot wear allowed. Problems can occur in any phase due to many causes: incorrect casting technique, improper tenotomy, under-correct-

**Table no 1. Age Distribution (n=96)**

Age	Frequency	Percentage
1-2 months	38	40%
3-4 months	24	25%
5-6 months	19	20%
7-9 months	15	15%
Total	96	100%

Mean age was: 4 months

Standard deviation:  $\pm 2.31$

**Table no 2. Baseline Pirani Severity Score (n=96)**

Baseline Pirani Se- verity Score		Frequency	Percentage
0-3	Mild	19	20%
4-7	Moderate	48	50%
8-10	Severe	29	30%
Total		96	100%

**Table No 3. Pirani Severity Score After 4th Week  
(n=96)**

PIRANI SEVERITY SCORE AFTER 4th WEEK		FREQUENCY	PERCENT- AGE
0-3	Mild	82	85%
4-7	Moderate	10	10%
8-10	Severe	4	5%
Total		96	100%

**Table No 4. Efficacy Of Pirani Severity Score (n=96)**

EFFICACY PI- RANI SEVERITY SCORE	FREQUENCY	PERCENTAGE
Effective	82	85%
Not effective	14	15%
Total	96	100%

**Table No 5. Stratification of Efficacy Pirani Severity Score with age Distribution (n=96)**

<b>Age »»» Efficacy VV</b>	<b>1-2 month</b>	<b>3-4 month</b>	<b>5-6 month</b>	<b>7-9 month</b>	<b>Total</b>
Effective	33	21	17	11	82
Not effective	5	3	2	4	14
Total	38	24	19	15	96

ed deformity, ill-fitting splints, lack of understanding and poor compliance of patients' parents due to poor socio-economy can all affect a successful outcome.

Our study shows that among 96 patients treated with ponseti method, pirani severity score was effective in 82(85%) patients while pirani severity score was not effective in 14(15%) patients. Similar results were found in his study by Puskarich et al<sup>12</sup>. Comparable results were also noted in other studies performed by Herzenberg JE et al and Dyer PJ et al.<sup>11,13</sup>

The non-effective Ponseti in fourteen cases in our study shows the initial learning curve with this technique. There were more failure on the left side and this may reflect right hand dominance of the treating surgeon. Thus, a more abduction force may be required to correct the left foot when the left hand is the abduction side.

Poor splint compliance is a major issue especially in children coming from low socio-economic strata and where the parents education level is poor. In most of relapses, Denis-Browne splint is used infrequently and it is never used in some patients. We feel that although the foot morphology improves with rigid adherence to the casting technique it is the post-correction phase which needs careful attention and close follow up to ensure a successful outcome. Although 92-98% successful short-term results has been reported for the treatment of idiopathic clubfoot<sup>11,14,15</sup> with Ponseti method, documentation of the long term results of the technique when it has been used by other orthopedists are fewer.<sup>16,17</sup>

We tried to evaluate mid-term results for congenital idiopathic clubfoot treated by Ponseti method and are satisfactory with the outcome quantified by Pirani severity score. So we conclude that Ponseti method is a safe and cheap treatment for congenital idiopathic clubfoot with mid- term effectiveness.

## REFERENCES

1. Barker SL, Macnicol, Seasonal distribution of idiopathic congenital talipes equinovarus in Scotland. *J Pediatr Orthop B*, 2002;11(2):129-33.
2. Krosgaard MR. Increasing incidence of club foot with higher population density: incidence and geographical variation in Denmark over a 16-year period--an epidemiological study of 936,525 births. *Acta Orthop*, 2006;77(6):839-46.
3. Severin E. The frequency of congenital hip dislocation and congenital equinovarus in Sweden. *Nord Med*, 2005;55(7): 221-3.
4. Feldbrin Z. Muscle imbalance in the aetiology of idiopathic club foot. An electromyographic study. *J Bone Joint Surg Br*, 2005; 77(4):596-601.
5. Ippolito E. Update on pathologic anatomy of clubfoot. *J Pediatr Orthop B*, 2003;4(1):17-24.
6. Hootnick DR. Confirmation of arterial deficiencies in a limb with necrosis following clubfoot surgery. *J Pediatr Orthop*, 2000;8(3):187-93.
7. Kawashima T, Uhthoff KH, Development of the foot in prenatal life in relation to idiopathic club foot. *J Pediatr Orthop*, 2000;10(2): 232-7.
8. Handelsman JE, Badalamente MA, Neuromuscular studies in clubfoot. *J Pediatr Orthop*, 2003;11(1):23-32.
9. Dietz FR, Ponseti IV, Buckwalter JA. Morphometric study of clubfoot tendon sheaths. *J Pediatr Orthop*, 2003;3(3): 311-8.
10. Hutchins PM, Foster BK, Paterson DC, Cole EA. Long term results of early surgical release in club feet. *J Bone Joint Surgery Br* 2004; 67:791-9.
11. Herzenberg JE, Radler C, Bor N. Ponseti versus traditional methods of casting for idiopathic clubfoot. *J Pediatr Orthop* 2002;22:517-21.
12. Aronson J, Puskarich CL: Deformity and disability from treated clubfoot. *J Pediatr Orthop* 2000;10:109-19.
13. Dyer PJ, Davis N. The role of the Pirani scoring system in the management of club foot by the Ponseti method. *J Bone Joint Surg Br* 2006;88-B:1082-4.
14. Lehman WB, Mohaideen A, Madan S. A method for the early evaluation of the Ponseti (Iowa) technique for the treatment of idiopathic clubfoot. *J Pediatr Orthop* 2003;12(2):133-40.
15. Goksan SB. Treatment of congenital clubfoot with the Ponseti Method. *Acta Orthop traumtol Turc* 2002;36(4):281-7.
16. Laaveg SJ, Ponseti IV. Long-term results of treatment of congenital club foot. *J Bone Joint Surgery*, Am 2004;62:23-31.
17. Cooper DM, Dietz FR. Treatment of idiopathic clubfoot. A thirty year follow-up note. *J Bone Joint Surg* 2005; 77A:1477-89.