

Management of Congenital Idiopathic Club Foot with Ponseti Technique at GMMC Sukkur

ZULFIQAR A. SOOMRO¹, ZAMIR A. SOOMRO², SAEED A. SAMO³

ABSTRACT

Objective: To assess the outcome of the management of congenital idiopathic club foot with Ponseti technique by using the Pirani scoring system.

Patients and methods: This prospective study was conducted at department of Orthopaedic Ghulam Muhammad Mahar Medical College (GMMC) Sukkur from April 2011 to March 2012. A total number of 50 cases with 79 feet of congenital idiopathic clubfoot up to the age of one year of either sex were included in this study.

Results: The correction was obtained in 47 (94%) cases but three infants required PMR. Average number of casts applied was 5.7 (range: 4-8), average time for full correction was 10 weeks (range: 4-12 weeks), percutaneous Achilles tenotomy was required in 84% of cases. Mean comparison of Pirani score was significantly decreased at final stage.

Conclusion: The Ponseti method is a safe and effective treatment for the management of congenital idiopathic club foot, that PMR surgery is no longer necessary for the majority of congenital idiopathic clubfeet.

Keywords: Idiopathic, Clubfoot, Ponseti

INTRODUCTION

Congenital idiopathic clubfoot is a complex deformity occurring in an otherwise normal child since birth¹. Exact cause is unknown, however various theories include genetic disorder, intrauterine malposition, and primary germ plasm defect have been suggested. Incidence is one per 1000 livebirths², boys are affected twice than girls, >50% of cases are bilateral while right sided preponderance in unilateral cases³. Deformity consists of 4 components: hindfoot equinus, hindfoot varus, forefoot adduction, and cavus.

The goal of treatment is to correct all components of deformity with a pain free, plantigrade foot with good mobility, therefore most orthopaedicians have agreed that the initial treatment should be non-surgical, most of them involving manipulation and casting for many months which often resulted in partial correction⁴. The partially corrected feet were then treated by posteromedial release operations. The long term results have been disappointing include wound infection, wound dehiscence, overcorrection, heel valgus, undercorrection, heel varus, persistent equinus, metatarsus adductus, stiffness, and weakness leading to premature arthritis⁵.

Because of these complications a renewed interest in conservative treatment in the form of

Ponseti has occurred⁶. Since the late 1940s, Ignacio V. Ponseti, at university of Iowa, developed a method of clubfoot correction which is easy to learn and has been recommended for use in developing world with a high success rate of 83-98%⁷⁻⁹. With increased understanding of the biology of the deformity and of the functional anatomy of the clubfoot, the Ponseti technique has developed to give, in most cases, a result superior to that achieved by surgery¹⁰. Also he described that there is no single axis of motion exists on which to rotate the tarsus. The tarsal joints are functionally interdependent. The movement of each tarsal bone involves simultaneous shifts in the adjacent bones¹¹.

This method involves weekly stretching of the deformity followed by application of a long leg cast. All components of deformity usually correct within 5 to 6 weeks, with the exception of the equinus. A simple percutaneous Achilles tenotomy is often necessary to complete the correction. After correction a foot-abduction brace is used to maintain the correction¹². This technique results in strong, flexible and plantigrade feet with maintenance of function without pain has been demonstrated in a 35-years follow-up study¹³. The purpose of this study to assess the outcome of the management of congenital idiopathic club feet with Ponseti technique by using the Pirani severity scoring system.

Department of Orthopaedics, ¹GMMC Sukkur, ²CMC Larkana, ³PMC, Nawabshah

Correspondence to Dr. Zulfiqar A. Soomro, e-mail: zulifqar@hotmail.com

MATERIALS AND METHODS

The study has been conducted from April 2011 to March 2012 at Department of Orthopaedic, GMMC Sukkur. Fifty cases with 79 feet of either sex up to the age of one year were included in the study. Clubfoot deformity secondary to Polio, Cerebral Palsy, Arthrogryposis multiplex congenital (AMC Syndrome) and neuropathic (Spinabifida) were excluded from the study.⁸ Infants were evaluated and graded for severity by using the Pirani scoring system, which is based on physical examination and require no radiographic measurements or other special studies¹³. It comprises six clinical signs of contracture, each is scored according to the following principle: 0=no abnormality; 0.5=moderate abnormality; 1=severe abnormality. The six signs are separated into three related to the hindfoot (severity of posterior crease, emptiness of the heel, and rigidity of the equinus), and three related to the midfoot (severity of medial crease, curvature of lateral border of foot, and position of lateral part of the head of the talus). Thus, each foot can receive a hindfoot score between 0 & 3, a midfoot score between 0 & 3, and a total score between 0 & 6.^{9,14,15}

Treatment Protocol (Fig. 1)

The course of treatment followed the principles of manipulation and casting described by Ponseti as follows:

1. All components of the deformity are corrected simultaneously, not in sequence, except for the equinus, which should be corrected last.
2. The cavus, which results from pronation of the forefoot in relation to the hindfoot, is corrected together with the adduction by supinating and abducting the forefoot in proper alignment with the hindfoot.
3. With the longitudinal arch of the foot well molded and the forefoot in some supination, the entire foot can be gently and gradually abducted under the talus, which is secured against rotation in the ankle mortise by applying counter pressure with the thumb against the lateral part of the head of the talus.
4. Heel varus will correct when the entire foot is fully abducted under the talus. The heel is never touched.
5. Finally, the equinus is corrected by dorsiflexing the foot. This is generally facilitated by a simple percutaneous Achilles tenotomy under local anaesthesia.

To maintain the correction obtained by gentle manipulation, a plaster cast is applied in two sections. The first section extends from the toes to just below the knee and the second covers the knee and thigh. The knee is immobilized at a right angle.

The plaster cast is molded to fit the anatomy precisely. Abduction of the foot is progressively increased with each manipulation and plaster cast application until hypercorrection to about 70 degrees of foot abduction is obtained^{7,11,12,16,17}.

A foot-abduction brace is used to maintain the correction. This brace consists of a bar with shoes attached at the ends at 70 degrees of outward rotation on the affected side and 40 degrees on the normal side. The length of the bar should be equal to the width of the child's shoulders. The brace is used on a full-time basis for 2 to 3 months, and at night and during naptime for 3 to 4 years^{11,18}.



Fig 1: Summary of Ponseti method from serial casting, P/C tenotomy to DB shoes (Denis Brown Shoes)

RESULTS

Total number of 50 cases of either sex with idiopathic congenital clubfoot deformity up to the age of one year was included in this study. Out of 50 infants, 34 (68%) were males and 16(32%) were females with male to female ratio of 2.1:1 (Table 1). Age range was 0.5-12 months, with maximum number of infants 33(66%) were lying between 2 weeks to 4 months. The earliest cast applied was at an age of 5 days,

and the maximum age at which a cast applied was at 11 months. Out of 50 cases, 29 (58%) of clubfeet were bilateral; while 13 (26 %) cases were right sided and 8 (16%) of clubfeet were left sided (Table 2).

Distribution of Pirani's initial severity scores of right foot, score range was 3.5-6 and maximum number of patients had score 5 while mean \pm SD score was 4.9 \pm 0.6 and left foot, score range was 3.5-5.5 and maximum number of patients had score 5 and 5.5 while mean \pm SD score was 4.8 \pm 0.65. Percutaneous Achilles tenotomy was done in 42 (84%) cases. The number of casts range was 4-8 and mean \pm SD number of casts was 5.74 \pm 1.12. Full correction occurred in 4-12 weeks, in 26 (52 %) cases correction was achieved in 10 weeks; mean \pm SD was 8.5 \pm 2.0 weeks. Distribution of Pirani's final severity score of right foot, score range was 0-3 and maximum number of patients had score 1 while mean \pm SD score was 0.833 \pm 0.928. Distribution of Pirani's final severity score of left foot, score range was 0-2.5, and maximum number of patients had scored 0.5 while mean \pm SD score was 0.581 \pm 0.692. Mean comparison of Pirani's score at initial and final stages is presented in (Table 3). Mean scores of both right and left foot was significantly decrease at final stage as compared with initial Pirani's score is significant ($p<0.0001$).

Table 1: Genders (n = 50)

Gender	No.	%
Male	34	68.0
Female	16	32.0

Table 2: side of clubfeet (n = 50)

Side of clubfeet	No.	%
Bilateral	29	58.0
Unilateral (Right side = 13 26%, Left side = 8 (16%)	21	42.0

Table 3: Mean comparison of Pirani's score at initial and final stages (n = 50)

Sides	Pirani's severity score		P value
	Initial	Final	
Right	4.95 \pm 0.62	0.833 \pm 0.92	<0.0001
Left	4.79 \pm 0.65	0.58 \pm 0.69	<0.0001

P<0.0001 (Significant)

DISCUSSION

In published series success is defined as treatment that avoids a surgical soft tissues release operation and thus in this study the success rate is 94% (47 cases), a figure that compares with other series i.e. 83-98%. The results obtained in this study are comparable to those mentioned in the international literature.^{6-9,12,16,19}. In this study, the Pirani's initial severity score was 3.5-6 and maximum number of

patients had score 5, this is comparable with the study of Changulani et al⁹ revealed that most of the patients presented had severe deformity. The number of casts per feet in this study was 4-8 (average: 5.7). In a series by Ponseti et al¹³ it was 5-10 (average: 7.6), by Laaveg et al²⁰ it was 7, by Mourcuende et al²¹ the number was 5. Clubfeet presenting with a Pirani score of > 5 require more cast changes^{15,21,22}. In this study, the time for full correction of deformity required 4-12 weeks (average: 8.5 weeks). Ponseti et al⁹ required 5-12 weeks, Laaveg et al²⁰ required 8.6 weeks and Mourcuende et al²¹ reported 7 weeks.

In this study, percutaneous Achilles tenotomy was needed in 84% of cases. In a series by Pirani et al¹³ did tenotomy in 90%, Dobbs et al⁵ 91%, Laaveg et al²⁰ 78%, and Changulani et al⁹ experienced tenotomy in 85% of cases. I agreed with the findings of Scher et al²³; that clubfeet with Pirani score of >5 are highly likely to need an Achilles tenotomy. These final results showed the mean scores of clubfeet were significantly decreased at final stage as compared with the initial Pirani's score (p-values <0.0001).

On the contrary to other published studies, that the deformity can be corrected up to the age of 2 years.²⁴ In this study we found difficulty in correcting the deformity in children older than 9 months. Three of our patients treated with Ponseti method required PMR operation, and this was attributed to the late presentation of infants with severe Pirani score of 6. We observed that these older patients were difficult to hold in proper position and also difficult to do tenotomy under local anaesthesia. Therefore we experienced that these infants should undergo general anaesthesia for proper manipulation, tenotomy and casting.

Recent publications have stressed the importance of compliance with bracing program. Since most of the patients in the current study are from the lower class, educational level is low and thus they fail to understand the importance of bracing to maintain the correction. Strict instruction for the brace application, motivation by dedicated personnel, peer comparison and more frequent follow-up have lead to increased compliance. Mourcuende et al²¹ described a relapse rate of >80% in non-compliant cases. This is in contrast to a relapse rate of only 6% in compliant families^{13,25}.

In this series, the initial experience with the use of Ponseti method at GMMC Sukkur is as good as those from other published series. This study needs a future follow-up of these infants up to the age of skeletal maturity to observe the long-term effects of early response with Ponseti method. Lastly, the Ponseti method has been recommended for use in

the developing world due to its simplicity, high success rate, and low demands on health resources²⁶.

CONCLUSION

The Ponseti technique is a safe and effective treatment for management of congenital idiopathic club feet, this technique is also easy, result-oriented and economical, that posteromedial release operation is no longer necessary for the majority of congenital idiopathic club feet.

REFERENCES

1. Ponseti IV, Zhivkov M, Davis N, Sinclair M, Dobbs MB, Mourcuende JA. Treatment of the complex idiopathic clubfoot: Clin Orthop Relat Res 2006; 451: 171-6.
2. Skinner HB, Rab GT. Congenital clubfoot. In: Current diagnosis and treatment in orthopaedics. 4th ed. Newyork. Chicago. London. Sydney. Toronto: McGraw-Hill Co; 2006. 613-5.
3. Shah RA. Clubfoot in children surgical/ operative treatment. Ann Abbasi Shaheed Hosp Karachi KMDC Coll 2004; 9 (2): 605-7.
4. Sud A, Tiwari A, Sharma D, Kapoor S. Ponseti's vs Kite's method in the treatment of clubfoot- a prospective randomized study. Int Orthop 2007; 24: 11-5.
5. Dobbs M, Nunly R, Schoenecker PL. Long-term follow-up of patients with clubfeet treated with extensive soft tissues release. J Bone Joint Surg 2006; 88: 986-96.
6. Halanski MA, Davison JE, Huang JC, Walker CG, Walsh SG, Crawford HA. Ponseti method compared with surgical treatment of clubfoot: a prospective comparison. J Bone Joint Surg 2010; 92 (2): 270-8.
7. Zwick EB, Kraus T, Maizen C, Steinwender G, Linhart WE. Comparison of Ponseti versus surgical treatment for idiopathic clubfoot: a short-term preliminary report. Clin Orthop Relat Res 2009; 467 (10): 2668-76.
8. Din SU, Shah SA, Hayat S. Conservative treatment of congenital talipes equinovarus. J Postgrad Inst 2004; 18(3): 368-72.
9. Changulani M, Grag NK, Rajagopal TS, Bass A, Nayagam SN, Sampath J, et al. Treatment of idiopathic clubfoot using the Ponseti method. Initial experience. J Bone Joint Surg 2006; 88-B: 1385-7.
10. Goksan SB, Bursali A, Bilgili F, Sivacioglu S, Ayanoglu S. Ponseti technique for the correction of idiopathic clubfeet presenting upto 1 year of age: a preliminary study in children with untreated or complex deformities. Arch Orthop Trauma Surg 2006; 126: 15-21.
11. Scher DM. The Ponseti method for clubfoot correction. Oper Tech Orthop 2005; 15: 345-9.
12. Bor N, Coplan JA, Herzenberg JE. Ponseti treatment for idiopathic clubfoot: minimum 5 year followup. Clin Orthop Relat Res 2009; 467 (57): 1263-70.
13. Staheli L. Clubfoot: Ponseti management. 3rd ed. Global-HELP; 2009.
14. Hussain FN. The role of the Pirani scoring system in the management of clubfoot by the Ponseti method. J Bone Joint Surg 2007; 89 (4): 561-2.
15. Dyer PJ, Davis N. The role of the Pirani scoring system in the management of clubfoot by the Ponseti method. J Bone Joint Surg 2006; 88 (8): 1082-4.
16. Porcha MM, Parmar DS, Chavda HR. Mid-term results of Ponseti method for the treatment of congenital idiopathic clubfoot: a study of 67 clubfeet with mean 5 year followup. J Orthop Surg Res 2011; 6: 3-13.
17. Maranho DA, Noqeira MH, Simao MN, Volpon JB. Ultrasonographic evaluation of Achilles tendon repair after percutaneous sectioning for the correction of congenital clubfoot residual equinus. J Pediatr Orthop 2009; 29(7): 804-10.
18. Zions LE, Dietz FR. Bracing following correction of idiopathic clubfoot using the Ponseti method. J Am Acad Orthop Surg 2010; 18(8): 486-93.
19. Zontz LE, Zhao G, Hitchcock K, Maewal J, Ebramzadeh E. Has the rate of extensive surgery to treat idiopathic clubfoot declined in the united states? J Bone Joint Surg 2010; 92 (4): 882-9.
20. Laaveg SJ, Ponseti IV. Long-term results of treatment of congenital clubfoot. J Bone Joint Surg Am 1980; 62(1): 23-31.
21. Mourcuende JA, Terrazas G. Effect of cast removal timing in the correction of idiopathic clubfoot by the Ponseti method. Iowa Orthop J 2007; 27: 24-7.
22. Bor N, Katz Y, Vofsi O, Herzenberg JE, Zuckerberg AL. Sedation protocols for Ponseti clubfoot Achilles tenotomy. J Child Orthop 2007; 1(6): 333-5.
23. Scher DM, Feldman DS, Bosse HJP, Sala DA, Lehman WB. Predicting the need for tenotomy in the Ponseti method for correction of clubfoot. J Pediatr Orthop 2004; 24(4): 349-52.
24. Haqazy M, Nasef NM, Abdel-Ghani H. Results of treatment of idiopathic clubfoot in older infants using the Ponseti method: a preliminary report. J Pediatr Orthop 2009; 18(2): 76-8.
25. Haft GF, Walker CG, Crawford HA. Early clubfoot recurrence after use of the Ponseti method in a New Zealand population. J Bone Joint Surg 2007; 89(3): 487-93.
26. Gupta A, Singh S, Patel P, Patel J, Varshney MK. Evaluation of the utility of the Ponseti method of correction of clubfoot deformity in a developing nation. Int Orthop 2008; 32(1): 75-9.