

Original Research Article

Evaluation of Ponseti method in correction of congenital talipes equinovarus

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ABSTRACT

Background: Congenital idiopathic clubfoot is a complex foot deformity often requires many months of treatment and frequently resulted in incomplete or defective correction by older methods. Deformity can be corrected with serial manipulation and casting with minimal or no surgery as reported by Ponseti. This study is an attempt to evaluate the effectiveness of Ponseti technique in treatment of idiopathic congenital talipes equino varus.

Methods: 30 patients between age group of 01 to 24 weeks with 48 feet having congenital idiopathic clubfoot were treated using Ponseti technique. The guidelines for treatment were followed as per the Ponseti method of serial manipulation and casting at weekly intervals.

Results: 43 (89.58%) cases were treated successfully by using Ponseti technique without need of extensive surgery. 42 feet required tenotomy. 38 (79.16%) feet had an excellent outcome, 5 (10.42%) feet had a fair outcome and 05 feet (10.42%) had poor outcome as measured by the Pirani scoring system. 7 (14.58%) patients had cast related complications.

Conclusions: The Ponseti method is a safe, effective and reproducible method for correction of idiopathic congenital talipes equinovarus which significantly reduces the rate of extensive corrective surgeries for correction of clubfoot.

Keywords: Congenital idiopathic clubfoot, Ponseti technique, Pirani scoring system

INTRODUCTION

Congenital idiopathic clubfoot is a complex foot deformity that occurs mostly in an otherwise normal child. It is estimated that more than 1, 00,000 babies are born worldwide each year with congenital clubfoot. Eighty percent of the cases occur in developing countries. Most are untreated or poorly treated. Neglected clubfoot causes physical, social, psychological and financial burden on the patients, their families and society as a whole. Older methods of manipulations and serial casting usually required many months of treatment and frequently resulted in incomplete or defective correction.¹

As a result, extensive corrective surgery was indicated in 50% to 90% of the cases. Corrective surgeries are often associated with disturbing failures and complications. In addition, depending on the technique followed and the residual deformity, up to 47% of the clubfeet undergo one or more revision surgeries.^{2,3} This has led to development of renewed interest in non-operative management of congenital talipes equino varus. Clubfoot in an otherwise normal child can be corrected with serial manipulation and casting with minimal or no surgery as reported by Ponseti. This study is an attempt to evaluate the effectiveness of Ponseti technique in treatment of idiopathic congenital talipes equino varus.

METHODS

Between March 2014 to August 2016, 30 patients with 48 feet with congenital idiopathic clubfoot were treated at Ramkrishna Medical Research Centre's Jai Hospital private Limited, Nashik using Ponseti technique. There were 21 boys and 9 girls in the age group of 1 week to 24 weeks. Patients with congenital idiopathic clubfoot less than 01 year of age without any other neurological or syndromic involvement were enrolled in the study (Figure 1). Patients with previous history of treatment, relapse and recurrence were excluded from the study. The treatment was started as soon as possible after birth. All feet were assessed before treatment by using Pirani's scoring system. The Pirani scoring system is reliable, quick, and easy to use, and provides a good forecast about the likely treatment for an individual foot. The guidelines for treatment followed the Ponseti method of serial manipulation and casting at weekly intervals.⁴ Following a 2 to 3 minute gentle manipulation, Plaster of Paris cast was applied. In all cases plaster cast was applied above the knee. The parents were informed to check circulation and instructed to remove the plaster cast in case of any doubt. Plaster casts were replaced after seven days, immediately after removal of the previous cast in the clinic. Serial manipulation and casting was continued till 70 degrees of abduction was achieved. After correction of the forefoot adduction and alignment of forefoot to hind foot, the dorsiflexion was assessed. Equinus was judged by the limitation of ankle motion and by the Pirani score. Finally the residual equinus was corrected by percutaneous tenotomy of the tendo-achilles, when the midfoot score was <1 and hindfoot equinus persisted (Figure 2). This tenotomy was done on OPD basis under local anaesthesia using 1% lidocaine. No sedation was used during the procedure. Post operatively an above knee cast was given for 3 weeks. After the last cast was removed, correction was maintained by using Denis Browne splint (Figure 3). The orthosis was fitted

on the same day as high-top, straight-last shoes fitted to a Denis Browne bar of length equal to the distance between the child's shoulders. To prevent relapse of the deformity, the shoes used were well-fitted, open-toed, maintained in 70 degrees of external rotation and 10 degrees of dorsiflexion. The normal foot in a unilateral deformity was placed in 40 degrees of external rotation. This splint was worn for 23 hours a day for the first 3 months, then only during night time for 3 years. Once the child reached the walking age CTEV shoes were used during day in combination to night splinting. The mean duration of follow up was 18 months (15-21 months). Following complete correction of deformity, patients were assessed at one month intervals. At each visit the foot was assessed for any loss of correction, i.e., limitation of ankle motion, empty heel sign and, curving of lateral border of foot. Results were graded as excellent, if the Pirani score at final follow up remained zero; fair, if the total score was one (Hind foot score and mid foot score) or less and poor if the total score exceeded one. We used this simple assessment for grading the outcome as the follow-up period was short and as also this would help us to detect the early relapses.

Statistical analysis

Data analysis was conducted on an intention to treat basis. Statistical analysis was done using SPSS windows software. Distributions of the gender, age, side of foot were assessed using SPSS windows software.

RESULTS

In the present series, there were 21 males and 9 females making a ratio M:F =2.33:1. 18 (60%) cases were bilateral, while 12(40%) were unilateral. In our study clubfoot was commoner on the right side. RT:LT foot ratio being 1.4:1 (Table 1).

Table 1: Demographic profile of the patients.

Sex	Unilateral	Bilateral	Total Patients	Total feet	Right foot	Left foot	Total
Male	8	13	21	34	3	5	8
Female	4	5	9	14	2	2	4
Total	12	18	30	48	5	7	12

Table 2: Age profile of patients at the time of presentation.

Age in weeks	0-4	4-8	8-12	12-16	16-20	20-24
No of patients	18	06	04	01	0	01

The mean age at presentation in the present study was 5.33 weeks and It is evident that most (63%) of the patients were first born (Table 2).

While following the Ponseti method, out of 48 feet, 42 feet required tenotomy and in only 06 (12.5%) feet tenotomy was not performed. 10 (20.83%) feet had a

relapse of their deformity after initial successful treatment. The splint compliance was compromised in relapsed cases. In 5 cases of relapse, the Denis Browne splint was not used strictly according to the protocol while in 2 cases the shoes were poorly fitting. Out of the 10 cases of relapse, 3 were successfully treated by manipulation and recasting, 2 feet required a second

tenotomy of the tendo Achilles. 3 (6.25%) feet underwent a posterior release while 2 (4.16%) feet required a complete posteromedial soft tissue release (PMR) (Table 3).

Table 3: Profile of patients requiring tenotomy and other corrective procedures for relapse.

Procedures	No. of cases
Serial casting with P.C tenotomy of T.A	42
Serial casting without tenotomy	06
Recasting	03
Repeat tenotomy	02
Posterior release	03
PMR	02

Table 5: Complications of the procedure.

Complications	Redness of skin due to pressure	Slight swelling of toes	Erythema	Cast slippage
Number of feet	3	1	2	1



Figure 1: Bilateral club feet before correction.



Figure 2 (A and B): Correction of equines deformity after percutaneous tenotomy.

Table 4: Clinical results based on Pirani score.

Clinical result	Excellent	Fair	Poor
Number of feet	38	5	5

Results were graded for all feet. 38 (79.16%) feet had an excellent outcome, 5 (10.42%) feet had a fair outcome and 05 feet (10.42%) had poor outcome as measured by the Pirani scoring system. All patients with such extensive surgeries were graded as having poor outcome – 5 (10.41%) (Table 4).

7 (14.58%) patients had cast related complications including redness due to pressure, slight swelling of toes, downward slippage of cast and erythema. All these complications were attributed to a deficient casting technique. No infection, neurovascular compromise or profuse bleeding post tenotomy was observed (Table 5).

Thus, 43 (89.58%) cases were treated successfully by using Ponseti technique without need of extensive surgery.



Figure 3 (A and B): After full correction by Ponseti method and application of Dennis Brawn orthosis.

DISCUSSION

Correction of the clubfoot by non-operative means entails a thorough understanding of the pathoanatomy of this complex deformity.⁵ The indications, pitfalls and results of the Ponseti technique have been well described and several studies have attested to its efficacy.

In the present series, 30 clubfoot patients were studied, 21 males (70%) and 9 females (30%) with M: F ratio 2.33:1. Turco et al in his series of 468 patients found 334 (71.36%) males and 134 (28.63%) females having ratio of 2.5 males to 1 female.⁶ Max Bohm et al gave the ratio

4:1.⁷ Ponseti found 6 males to 1 female. Kite in a series of 1509 patients found 70.58% males and 29.42% females.⁸ Thus the literature varies for the male to female ratio. The finding in the present series coincides with those of Turco and Kite series.

In the present series, 18 (60%) patients had bilateral affection and 12 (40%) had unilateral affection. Turco et al⁶ in his series found 56.76% bilateral cases. Kite found 49.37 bilateral cases in his series.⁸ Ponseti et al found 40% bilateral cases.⁹ Preponderance of bilateral cases in our study coincides with other series in the literature. In unilateral cases more involvement was on the right side with 58.33% case. Turco et al in his series reported 104 right sided and 102 left sided cases.⁶ Chung, Kite and Palmer also found a slight preponderance of the right side.¹⁰ In Kite series he found 419 (54.8%) right and 345 (45.2%) left sided involvement.⁸

Majority of the cases in our study were of first birth order 63.33%. Morcuende et al noted that in his series that 60% cases were of first birth order.¹¹ One assumption in the mechanical theory is that, the foot is held in equinovarus

position by rigid uterine wall, as the tone in the primigravida uterus is high.

In the present study about 90% of the cases of idiopathic congenital clubfoot were treated successfully using the Ponseti method without the need for extensive corrective surgery. Morcuende et al reported 97.5% success, while Herzenberg et al gave 95% results with this technique and Goksan et al reported 95% success rate.¹¹⁻¹³ Among Indian studies Bhaskar and Rasal reported 80% while Agarwal, Suresh and Agarwal reported 96.7% excellent results.^{14,15} The rate of extensive surgeries like PMR was reduced to only 10.42% after Ponseti technique in our study. Morcuende et al and Herzenberg et al observed a similar fall in the rate of such surgeries for treatment of congenital clubfoot.^{11,12}

In our study tenotomy of the tendo Achilles was required in 87.5% of the cases. Changulani et al required tenotomy in 89.5% of cases while Laaveg and Ponseti reported tenotomy in 87.5%.^{16,17} Colburn and Williams also required tenotomy in 87.5% of cases.¹⁸ Following studies reported low tenotomy rates: Docker et al – 69%, Dyer and Davis – 60%, Shack and Eastwood– 62.5%.¹⁹⁻²¹

Table 6: Comparison of current study with other studies

Study	No. of babies	No. of feet	Mean initial age (weeks)	Mean weeks to tenotomy	Mean total weeks in cast	Patients without tenotomy (%)	Relapses (%)
Current study	30	48	5.33	8.64	10.85	12.5	20.8
Changulani et al ¹⁶	66	100	12	-	-	11	31
Laaveg and Ponseti ¹⁷	70	104	6.9	-	8.6	12.5	23
Colburn and Williams ¹⁸	14	24	1.3	-	7.8	12.5	17
Docker et al ¹⁹	-	62	-	-	-	31	25
Dyer and Davis ²⁰	47	70	-	5.3	-	40	-
Shack and Eastwood ²¹	24	40	4.3	5	8	37.5	7.5
Brewster et al ²⁴	51	80	4.5	8.5	10	25	6.25
Bor et al ²⁵	23	36	<8	6	9	0	14
Radler et al ²⁶	37	59	<3	-	11.4	0	2
Segev et al ²⁷	32	48	1.3	10	13	2	6
Abdelgawad et al ²⁸	89	137	6.6	5.5	-	23.6	13

We required a mean of 8.64 cast to reach the stage of tenotomy. This number is greater as compared to other studies. We attribute this increase to our inexperience in the casting and manipulation technique. Poor splinting was a major issue especially in children coming from low socio-economic strata and where the parent education level was poor. We used a number 15 surgical blade for tenotomy. Some authors like Minkowitz et al advocated use of large gauge hypodermic needle.²² Dobbs et al reported bleeding complications following percutaneous tenotomy due to injury to the peroneal vessels and small saphenous vein.²³ We did not come across any such complication. Table 6 shows the comparison of our study results with various other published studies.^{16-21,24-28}

Our series has a short follow up period. Laaveg and Ponseti discovered that the majority of relapses occur 3 years after the completion of the treatment.¹⁷ We agree a longer follow up is required in our study.

CONCLUSION

The Ponseti method is a safe, effective and reproducible method for correction of idiopathic congenital talipes equinovarus which significantly reduces the rate of extensive corrective surgeries for correction of clubfoot. For successful outcome and to prevent relapse, this technique must be applied strictly according to the protocol and parents must be taught the importance of full compliance with bracing. Our series has a short

follow up. Only a longer follow up will decide whether we can continue to match Ponseti's results.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee of Ramakrishna Medical Research Centre's Jai Hospital Pvt Ltd, Nashik, Maharashtra, India

REFERENCES

1. Dimeglio A, Bonnet F, Mazeau PH, De Rosa V. Orthopaedic treatment and passive motion machine: consequences for the surgical treatment of clubfoot. *J Pediatr Orthop B*. 1996;5:173-80.
2. Bradish CF, Noor S. The Ilizarov method in the management of relapsed club feet. *J Bone Joint Surg Br*. 2000;82:387-91.
3. Krauspe R, Vispo Seara JL, Lohr JF. Long-term results after surgery for congenital clubfoot. *Foot Ankle Surg*. 1996;2:77-82.
4. Ponseti IV. *Congenital clubfoot, Fundamentals of treatment*, Oxford University Press, London, 1996.
5. Ponseti IV, Campos J. Observations on the pathogenesis and treatment of congenital clubfoot. *Clin Orthop*. 1972;84:50-60.
6. Turco VJ. *Clubfoot*, 1st edition, Churchill-Livingstone, New York, 1981.
7. Bohm M. The embryologic origin of clubfoot. *J Bone Joint Surg*. 1929;11:229-59.
8. Kite JH. *The clubfoot*, Grune and Stratton: New York; 1964.
9. Ponseti IV, Smoley EN. Congenital clubfoot- the results of treatment. *J Bone Joint Surg*. 1963;45:261-75.
10. Palmer RM. The genetics of TEV. *J Bone Joint Surg*. 1964;46:542.
11. Morcuende JA, Dolan LA, Frederick R, Dietz and Ponseti IV. Radical Reduction in the Rate of Extensive Corrective Surgery for Clubfoot Using the Ponseti Method. *Paediatrics*. 2004;113(2):376-80.
12. Herzenberg JE, Radler C, Bor N. Ponseti versus traditional methods of casting for idiopathic clubfoot. *J Pediatr Orthop*. 2002;22:517-21.
13. Goksan SB. Treatment of congenital clubfoot with Ponseti method. *Acta orthop Traumatol Turc*. 2002;36(4):281-7.
14. Bhaskar A, Rasal S. Results of treatment of clubfoot by Ponseti's technique in 40 cases: Pitfalls and problems in Indian scenario. *Indian J Orthop*. 2006;40:196-9.
15. Agarwal RA, Suresh MS, Agarwal R. Treatment of congenital clubfoot with Ponseti method. *Indian J Orthop*. 2005;39:244-7.
16. Changulani M, Garg NK, Rakagopal TS. treatment of idiopathic clubfoot using Ponseti method: initial experience. *J Bone Joint Surg*. 2006;88:1385-7.
17. Sterling Laaveg, Ponseti IV. Long term results of treatment of congenital clubfoot. *Journal of Bone and Joint Surgery*. 1980;62:23-31.
18. Colburn M, Williams M. Evaluation of the treatment of idiopathic clubfoot by using the Ponseti method. *Journal of foot and ankle surgery*. 2003;42:259-67.
19. Docker CE, Lewthwaite S, Kiely NT. Ponseti treatment in the management of clubfoot: a continuing role of paediatric orthopaedic services in secondary care centres. *Ann R Coll Surg Engl*. 2007;89:510-2.
20. Dyer PJ, Davis N. The role of Pirani scoring system in the management of clubfoot by Ponseti method. *Journal of Bone and Joint Surgery*. 2006;88:1082-4.
21. Shack N, Eastwood DM. Early results of physiotherapist delivered Ponseti service for the management of idiopathic congenital talipes equinovarus foot deformity. *J Bone Joint Surg*. 2006;88:1085-9.
22. Minkowitz B, Finkelstein BI, Bleicher M. Percutaneous tendo Achilles lengthening with a large gauge needle: a modification of the Ponseti technique for the correction of Idiopathic clubfoot. *J Foot Ankle Surg*. 2004;24(4):263-5.
23. Dobbs MB, Gordon JW, Walton T, Schoenecker PL. Bleeding complications regarding percutaneous tenotomy of tendo Achilles in the treatment of clubfoot deformity. *J Paediatric Orthop*. 2004;24(4):353-7.
24. Brewster MBS, Gupta M., Pattison GTR, Dunn-van der, Ploeg I.D. Ponseti casting – a new soft option. *J Bone Joint Surg*. 2008;90:1512-5.
25. Bor N, Herzenberg JE, Frick SL. Ponseti management of clubfoot in older infant. *Clin Orthop*. 2006;444:224-8.
26. Radler C, Suda R, Manner HM, Grill F. Early results of the Ponseti method for the treatment of idiopathic clubfoot. *Z Orthop Ihre Grenzgeb*. 2006;14:80-6.
27. Segev E, Keret D, Lokiec F. Early experience with the Ponseti method for the treatment of congenital idiopathic clubfoot. *Isr Med Ass J*. 2005;7:307-10.
28. Abdelgawad AA, Lehman WB, van Bosse SJ, Scher DM, Sala DA. Treatment of idiopathic clubfoot using the Ponseti method: minimum 2 year follow up. *J Paediatric Orthop B*. 2007;16:98-105.

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