MANAGEMENT OF CONGENITAL TALIPES EQUINOVARUS BY THE PONSETI METHOD - SHORT-TERM AND INTERMEDIATE EFFECTIVENESS OF THE TECHNIQUE AND FACTORS AFFECTING OUTCOME

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ABSTRACT

Objective: To evaluate the effectiveness of the Ponseti method of clubfoot management in neonates and infants and to see which factors affect outcome.

Study Design: Retrospective study.

Place and Duration of Study: Department of Paediatric surgery, Military Hospital, Rawalpindi, from October 2012 to September 2014.

Material and Methods: The Ponseti method for the management of congenital talipes equinovarus was applied in children of 7 days to 6 months age. While those with complex neurological problems, pathological clubfeet, syndromic clubfeet and older than 6 months at the time of presentation were excluded from the study. Assessment was done at presentation, at the removal of the last plaster cast and after one-year use of the foot abduction splint.

Results: A total of 124 clubfeet of 89 children, including 63 males (70.78%) and 26 females (43.82%) were treated as outdoor cases. Eighteen feet (14.51%) were of rigid (atypical) type whilst 106 (85.5%) were of flexible (typical) type. Bilateral involvement was seen in 35(37.31%) children. The mean pretreatment Pirani score was 5.4 and the mean number of plaster casts required was 5.8. The mean Pirani score at 1-year follow-up was 0.5 with successful outcome in 82.3 % of all cases (96.9 % of neonates). Poor compliance with the use of the foot abduction splint adversely affected outcomes.

Conclusion: The Ponseti method of treatment of congenital clubfeet is safe and easy to learn with effective and reproducible results. Early start of treatment and compliance with the use of the foot abduction splint during the maintenance phase are crucial to successful outcome.

Keywords: Congenital Talipes Equinovarus, Ponseti Method, Pirani score.

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INTRODUCTION

The congenital talipes equinovarus (CTEV) is a common congenital orthopaedic anomaly afflicting an estimated 1 to 2 newborns per 1000 live births. The male to female ratio is 3:1 and almost 40% cases are bilateral[1]. Various theories regarding its causes implicate muscular, viral, genetic and environmental factors in addition to maternal age, parity, smoking, diabetes, pathology at the talus or posteromedial soft tissue of ankle[2,3]. The aim of the management of the clubfoot is to obtain a painless, pliable, plantigrade foot and acceptable cosmetic appearance with minimal complications.

Operative treatment involving soft tissue release has several complications, e.g, wound breakdown, wound infection, recurrence of deformities, overcorrection and stiff feet due to the fibrosis. The Ponseti method of treating CTEV has become widely accepted over the past two decades[4]. This method of treatment has a success rate of more than 96% in short, midterm and long-term results[5-11].

The purpose of the study was to evaluate the effectiveness of the Ponseti method in the management of CTEV in neonates and infants and also to look for factors that affect outcome.

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MATERIAL AND METHODS

This retrospective study was conducted at the department of paediatric surgery, Military Hospital, Rawalpindi, from October 2012 to September 2014. Total 137 clubfeet of 98 consecutive neonates and infants were treated as outdoor cases using the Ponseti method, and the results were analysed retrospectively. Eighty-nine children younger than six months of age, with total of 124 feet, completed the follow-up and were included in the study. While those with complex neurological problems, pathological clubfeet, syndromic clubfeet and older than 6 months at the time of presentation were excluded from the study. The study was approved by the hospital ethical committee. A six member team of surgeons including consultants and registrars analysed the data. The relevant data, which included patient's bio data, physical examination, total number of casts applied and any procedural complications during treatment, were recorded. The six-point Pirani score was documented at the initial assessment of severity, at the completion of the serial casting and to assess the final outcome at one year post-casting. Casting end point was acceptable Pirani score (good to excellent), failure of compliance, or failure to achieve acceptable score after a maximum of twelve plaster casts. It was also noted whether the clubfoot was typical (the classic clubfoot found in otherwise normal infants and generally corrects in five casts) or atypical[12].

This study evaluated the short-term and intermediate effectiveness of the Ponseti treatment of CTEV. Further assessments will be at 3-4 years when the foot abduction splint is discontinued and at the time of skeletal maturity.

Table-1: Age related outcome - excellent: PS = 0, good: PS = 0.5 – 1.0, poor: PS = I.5 or more (PS: pirani score).

Age (days)	Number of feet	Mean number of casts applied	Mean pirani score at 1-year post casting	Outcome	
28 or less	97	5.5	0.28	Excellent: 56 Good: 38 Poor: 3	Successful: 96.9%
29 to 90	18	7.3	1.52	Excellent: 0 Good: 8 Poor: 10	Successful: 44.4%
91 to 180	9	7.9	2.0	Excellent: 0 Good: 0 Poor: 9	Successful: 0%

The technique followed was exactly the same as described by Ponseti (Clubfoot: Ponseti management, 3rd edition. Global- HELP Publications. Available from URL: http: //www. global-help.org/). It was ensured that all members of the team used a standard technique. After the removal of the last plaster cast the foot abduction splint was applied. It was worn full time day and night for first three months, followed by a minimum of 12 hours during the night and 3 to 4 hours during the daytime nap. The first follow-up visit after applying the splint was at one month. Subsequent visits were at 03 monthly intervals/earlier if required. The final results for this particular study were evaluated at 1 year after completion of the serial casting.

The outcome was graded as excellent if the Pirani score was 0, good if 0.5 to1 and poor if 1.5 or more. Compliance with the foot abduction splint was considered to be good if it was worn for 20 hours or more per day during the first 3 months and 14 hours or more thereafter; lesser use was considered poor compliance. The data was retrospectively analyzed using SPSS- 16. Mean ± SD was calculated for quantitative variables. Categorical variables were presented by frequencies and percentages.

RESULTS

The study comprised a total of 89 infants. There were 63 male (70.78%), having 39 (43.82%) unilateral and 24 (26.96%) bilateral feet, and 26 female (29.21%), having 15 (16.85%) unilateral and 11 (12.35%) bilateral feet.Male to female ratio was 2.4:1. About eighteen feet (14.51%) were of atypical (rigid) variety,of which 13 (10.48%) were male and 5 (4.03%) female whereas 106 (85.48%) were of typical (flexible) type having 74 (59.67%) male feet and 32 (25.80%) female feet.

The 106 typical clubfeet required an average of 5.6 ± 1.15 casts, the range being 3-9, whereas, the 18 atypical and rigid feet required an average of 7.7 ± I.49 casts with a range of 5-11. The overall mean number of casts required was 5.9 ± 1.49 (range 3-11). The mean Pirani scores at the time of removal of the last casts and at 1-year follow up was 0.7 ± 0.34 and 0.8 ± 0.39 respectively for the rigid feet, whereas, for the typical clubfeet they were 0.4 ± 0.51 and 0.5 ± 0.68. The mean number of casts required generally increased with the severity of the deformity (fig-2).

The mean number of casts applied to typical clubfeet in children aged 17± 6 days was 5.1± 0.98, in children with mean age 45 ± 13 days it was 7.7± 1.16 and for children 127 ± 17days it was 8.6 ± 1.17; the same figures for atypical clubfeet were 7.1, 9.7 and 0 (there being no atypical clubfeet in that age range) respectively (fig-2). Whenever mentioned, the age refers to age at the commencement of treatment.

	**Curvature of the Lateral Border** Straight = 0; Mild curvature = 0.5; Severe curvature = 1.0
	**Medial Crease** Normal medial curvature = 0; Moderately high curve = 0.5; Prominent medial crease = 1.0
	**Talar Head** Not palpable = 0; Partially palpable = 0.5; Fully palpable = 1.0
	**Posterior Crease** Multiple fine creases, heel contour unchanged = 0; 1 or 2 deep creases, heel contour unchanged = 0.5; 1 or 2 deep creases, heel contour changed = 1.0
	**Rigid Equinus** Passive dorsiflexion:; 10 degrees or more = 0; Up to plantigrade position = 0.5; Less than plantigrade position = 1.0
	**Empty Heel (feel the calcaneum)** Easily palpable = 0; Palpable deep = 0.5; Not palpable = 1.0

Figure-1: Pirani score for assessment of clubfoot deformity (from clubfoot: ponseti management, third edition, lynn staheli, MD; global health.

Nearly 56 neonates (58 %) had excellent whilst 38 infants (39 %) had a good outcome at 1-year follow-up (successful outcome in 97 % of neonates). This figure dropped to 44% (8 out of 18) good results and no excellent

outcomes in children between 1-3 months of age. In children between 3-6 months of age there were no successful outcomes (table-1).

The twenty patients with recurrent clubfeet had a mean age of 97.3 ± 41.18 days, required a mean of 7.9 ± 1.74 casts and had a mean Pirani score at 1-year follow-up of 1.75 ± 0.44, whereas it was 0.29 ± 0.43 for those treated primarily at our centre. Tenotomy was required in 119 (95%) feet.

Compliance with the use of the foot abduction splint was good in 95 feet (76.6%) with a mean age of 13.1 ± 8.33 days. Poor compliance was seen in 29 (23.4%) feet having a mean age of 72.1 ± 50.93 days. Good splint compliance showed improvement in mean Pirani scores from 0.29 to 0.24 over the 1-year follow-up; with poor compliance there was deterioration from 1.17 to 1.45.

The successful treatment at 1-year follow-up was seen in 106 feet with mean age of 13.9 ± 8.42 days (range 7 to 45 days) whilst poor outcome occurred in 18 with mean age of 103.1 ± 48.6 days.

Minor treatment related complications were seen in 17 feet (14 patients). These included minor pressure sores (15 feet) and toe swelling/discoloration requiring cast removal (4 feet) and plaster slippage (3 feet). Some of the feet had more than one of the complications mentioned. There were no major complications with morbidity.

DISCUSSION

Congenital talipes equinovarus or club foot is a common orthopedic anomaly afflicting the pediatric population. The disease has been present since ages. Various modalities of treatment including surgery were adopted to correct the deformity. The pitfalls of surgical intervention included extensive fibrosis, stiff feet and chronic pain. After 1990, the management of club feet took a paradigm shift. Ignacio-V-Ponseti devised a method of serial casting followed by foot abduction bracing for 04 years with excellent results and avoidance of surgery. The Ponseti method requires dedicated efforts by both the surgeon and the parents to ensure compliance with the correct usage of the foot abduction splint and regular follow-up[13]. Several studies published from the middle of the 20th century onwards promoted surgical treatment, and this trend predominated until the end of the 1990s[14].

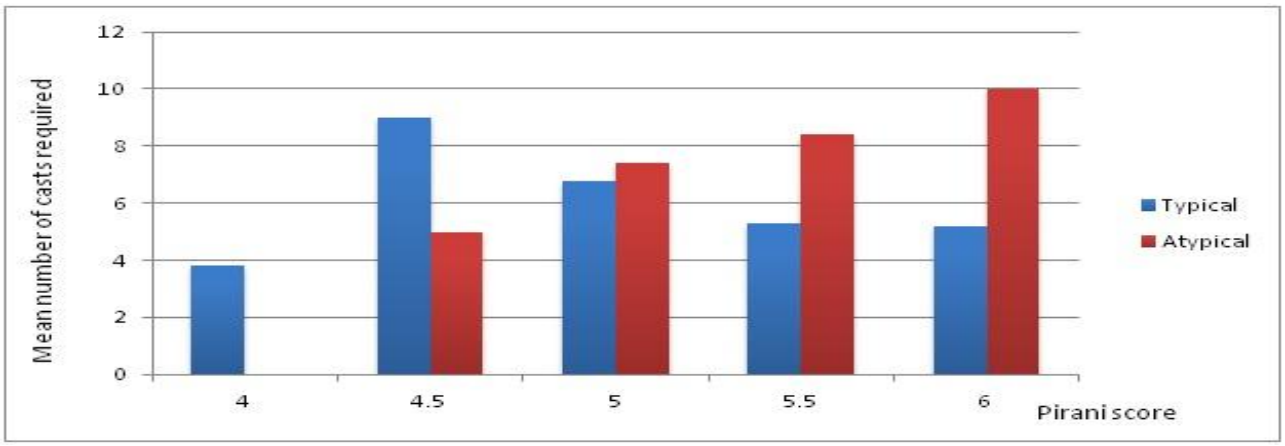

Figure-2: Mean number of casts required in relation to the Pirani score at presentation.

Overall successful outcomes with good to excellent results were seen in 82.3% of our cases. Considering only the neonates, 94 out of the 97 (96.9%) feet had a successful outcome, suggesting that delayed treatment and recurrent cases after previous incorrect method of casting

resulted in poor outcome. The atypical clubfeet generally required more casts per Pirani score than the typical ones. The discrepancy with the casts to Pirani score ratio for feet with score of 4.5 in figure-1 is because it includes older children (mean age 125 days) and those with recurrent deformity after non-Ponseti treatment. The cases of recurrent deformity after casting from other methods i-e non Ponseti treatment were not significant in number and did not influence the overall results. Poorer results with increasing age are probably due to relatively less pliable feet, greater difficulty in consoling and getting the child to relax during the manipulation and casting and decreased compliance with the abduction splint.

The pre- and post-treatment Pirani scores in our study were quite similar to the various series reported previously. The mean number of plaster casts used in typical clubfeet was 5.5 versus 5.0 in most other series. Some of our cases required reapplication of casts for any deformity that had not been fully corrected; atypical clubfeet generally required a greater number of casts and some children with plaster sores and all of those who had developed swelling and discolouration necessitating cast removals were usually given a week off and casting resumed by repeating the correction attempted earlier. Achilles tenotomy was required in 119 out of 124 feet (95%). Others have reported need for performing tenotomies in 91% to 95% of their cases.

The next essential, and perhaps the most difficult phase of treatment is the maintenance of the correction using the foot abduction splint[15]. Good compliance with the use of the splint was seen in only 95 out of the 124 (76.6%) feet. There was only one foot that had an unsuccessful outcome despite having good splint compliance. The remaining 29 feet (23.4%) with poor compliance fared less well with only 12 feet (41.3%) achieving a successful outcome. Factors causing clubfeet appear to remain active from 12 weeks of intrauterine life to 3-5 years of age; hence the need for continued use of the splints to maintain correction[16]. The age-matched data emphasizes the importance of early treatment in the neonatal period.

CONCLUSION

It can be concluded that the Ponseti method of treating congenital talipes equinovarus is safe, economical, effective and reproducible with a success rate of over 95% in the neonatal period and 80% in delayed recurrent cases with low complication rate. Strict compliance with the use of the foot abduction splint is the corner stone of the success.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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