

Two years audit of Ponseti technique for the management of clubfoot: Challenges encountered in a developing country

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Author's Contribution

¹ Conception of study

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Abstract

Objective: Idiopathic talipes equinus varus (TEV) or club foot is a common developmental disorder that affects about 1 – 2 per 1000 births. The Ponseti method for correction of the deformity has become the gold standard for club foot management. The objective of this study was to increase awareness of the high rate of success of the Ponseti technique for the management of club foot.

Materials and Methods: The study was conducted at Isra University, Hyderabad Sindh, from April 2017 to July 2018. It was a retrospective audit. Patients presenting with idiopathic Clubfoot between birth and 12 months of age of either sex were included. The patients were followed at 6 months, 12 months, and the final follow-up was done 24 months after the removal of their last cast.

Results: At twenty-four months follow-up, twenty patients (71.4%) showed no recurrence of deformity, one patient (3.6%) showed recurrence, and this patient too had a history of non-compliance with brace protocol. This case was also successfully treated with repeat castings. 7 patients (25%) were not available for follow-up at this point in time. Significantly higher chances of recurrence of deformity were noticed in patients who were non-compliant with the brace.

Conclusion: Ponseti technique is now considered the most efficient way to treat club foot deformity. For public awareness, our study reassures the families that the clubfoot deformity can easily be corrected with the casting technique, and correction may remain maintained if the brace-wearing protocol is followed. Furthermore, as this method is associated with a significant decrease in the number of extensive surgeries for correction of club foot, this may help tertiary care hospitals to pay attention to other surgical orthopaedic problems that may have crucial implications, especially in a developing country.

Keywords: Ponseti method, idiopathic club foot.

Introduction

Idiopathic talipes equinus varus (TEV) or club foot is a common developmental disorder that affects about 1 – 2 per 1000 births.¹ Severity of club foot deformity is most commonly determined by Pirani scoring system.² Maximum score is six which represents severe deformity while the minimum score is zero which indicates normal foot.

In the past, traditional treatment for the club foot may involve a combination of initial casting, extensive releases, and bony resections, followed by further casting.³ Subsequent studies have shown that this management has a higher incidence of foot pain, stiffness, and altered gait.^{4,6} In the 1950s, Ignacio Ponseti, a Spanish physician introduced a technique for the management of club foot which is now considered the gold standard of management.^{7,8} This technique consists of two phases namely treatment and maintenance phases. In the first phase, serial manipulations and weekly casting are done to progressively correct the deformity which may require percutaneous tendon Achilles tenotomy to correct the ankle equinus. The maintenance phase consists of wearing a brace that keeps the foot abducted for a period that may last for 2 to 3 years.⁹

While starting the management with the Ponseti technique, financial as well as geographical factors are important to consider, as they may affect compliance with the treatment. As the technique requires a weekly visit to the facility for around 8 to 10 weeks which may be at times difficult to manage by the family if they live far away or have other financial constraints.

This study aimed to assess the outcome of the Ponseti method at 2 years post last cast application and to increase the awareness of the effectiveness of the Ponseti technique in the correction of foot deformity

Materials and Methods

This study was conducted at Isra university hospital Hyderabad Pakistan. The study type was a retrospective audit which included all patients from birth to 12 months of age, with an idiopathic club foot who were managed from April 2017 to July 2018. Patients having other associated neuromuscular disorders or with a history of any surgical intervention for clubfoot were excluded from the study. The Ponseti method was explained and informed consent was taken prior to induction into the study. Furthermore, foot deformity was classified according

to the Pirani scoring system before starting the treatment. Once cavus and adduction deformity is corrected and adequate abduction is achieved then the foot is assessed for need of tendon Achilles tenotomy, which if needed to be performed under local anesthesia, and the foot is again cast for 2 weeks. Once the correction is achieved then a foot abduction brace is advised. Parents are instructed to use the brace for 23 hours a day for the first three months and then at night and during naps in day time till 3 to 4 years of age. Patients were followed till 2 years post their initial cast treatment. Our main outcome measure was the Pirani score. As we had problems with follow-up in one of our similar studies¹⁰ a few years back so we recorded patients' mobile numbers also, to have follow-up pictures in the case where the physical checkup was not possible.

Other variables which were observed during the study were age (in days) of the patient, gender, family history of clubfoot, unilateral or bilateral deformity, any previous treatment, number of casts before tenotomy, tenotomy required or not, the total number of casts done, duration required for correction in days, complications, Pirani score at 6, 12 and 24 months follow up, compliance with a brace at 6, 12 and 24 months follow-up, recurrence at 6, 12 and 24 months. Data were analyzed with the help of SPSS version 10.

Results

At presentation, the mean age of the patients was 19.36 days (2-70 days). Family history of club foot was present in 3 (10.7%) patients. Club foot was unilateral in 18 patients (64.3%) while it was bilateral in 10 patients (35.7%). Out of 28 patients, the right foot was involved in 11 patients (39.3%), the left foot was involved in 7 patients (25%) and the deformity was bilateral in 10 patients (35.7%). Considering previous treatment prior to presentation in our institute, 22 (78.6%) of patients had no treatment, 2 patients (7.1%) had manipulations only, 2 patients (7.1%) had a history of weekly casts application, and 2 (7.1%) patients had a history of use of a brace. The mean Pirani score at the presentation was 5.5 (range 4-6). Out of 28 patients, 23 patients (82.1%) required tendon Achilles tenotomy to correct the equinus. On average 6.9 (range 5-11) casts were done before tendon Achilles tenotomy. On average, the total number of casts required to achieve deformity correction was 8 (range 6 to 12). The average duration required to achieve correction was 64.28 days (50 to 100 days).

Considering complications during the study, 2 patients had superficial skin ulcers during casting which improved with a few days off from the cast.

At six months follow-up after the last cast removal, out of 28 patients, 24 (8.7%) were examined physically, 3 patients (10.7%) follow-up was taken on mobile and one patient (3.6%) was lost to follow-up. Pirani score was zero in 21 patients (75%), a score of 0.5 in 4 patients (14.3%), a score of 2.5 in 2 patients (7.1%) while 1 patient (3.6%) was not available for follow-up. Out of 28 patients, 24 (85.7%) patients showed compliance with the brace, 3 patients (10.7%) showed non-compliance, and 1 patient (3.5%) was lost to follow-up. Out of 28 patients, twenty-five patients (89.3%) showed no recurrence of deformity, two patients (7.1%) showed recurrence, and both of these patients were reported as non-compliant with the use of the brace. These patients were successfully treated with repeat castings.

At twelve months follow-up after the last cast removal, out of 28 patients, 22 (78.6%) were examined physically, 3 patients (10.7%) follow-up was taken on mobile while 3 patients (10.7%) were lost to follow-up. Pirani score was zero in 18 patients (64.3%), 3 patients (10.7%) had a score of 0.5, 4 patients (14.3%) had a score of 3 while 3 patients (10.7%) patients were not available for follow-up. Out of 28 patients, 22 (78.5%) patients showed compliance with the brace, 3 patients (10.7%) showed non-compliance, and 3 (10.7%) were lost to follow-up. Out of 28 patients, twenty patients

(71.4%) showed no recurrence of deformity, and four patients (14.3%) showed recurrence. Three out of these four patients showed non-compliance with the bracing protocol. Three of them were successfully treated with repeat castings while one was resistant to correction so referred for surgery.

At twenty-four months follow-up after the last cast removal, out of 28 patients, 15 (53.6%) were examined physically, 6 patients (21.4%) follow-up was taken on mobile and 7 patients (25%) were lost to follow-up. Pirani score was zero in 17 patients (60.7%), 3 patients (10.7%) had a score of 0.5, one patient (3.5%) had a score of 4 while 7 patients (25%) were not available for follow-up. 17 (60.7%) patients showed compliance with the brace, and 4 patients (14.3%) showed non-compliance. Out of 28 patients, twenty patients (71.4%) showed no recurrence of deformity, one patient (3.6%) showed recurrence and this patient too had a history of non-compliance with brace protocol. This case was also successfully treated with repeat castings (Figures 1 & 2).

To compare the recurrence of deformity between brace compliant versus non-compliant group, Fisher exact test was used and the result was found to be significant (Table 3).

Other variables were found to be non-significant in relation to the recurrence of deformity. For all analyses, a p-value of < 0.05 was taken as statistically significant.

Table 1: Demographics

1	Age at presentation	19.36 days (2-70 days)
2	Positive family history of club foot	3 (10.7%) patients
3	Side of involvement	
	• Right foot	• 11 patients (39.3%)
	• Left foot	• 7 patients (25%)
	• Bilateral	• 10 patients (35.7%)
4	History of previous treatment	
	• No treatment	• 22 patients (78.6%)
	• Manipulations only	• 2 patients (7.1%)
	• Weekly casts application	• 2 patients (7.1%)
	• History of use of the brace	• 2 patients (7.1%)
5	Mean Pirani score at presentation	5.5 (range 4-6)
6	Achilles tenotomy was done in	23 patients (82.1%)
7	Total number of casts required to achieve deformity correction	8 (range 6 to 12)
8	Average duration required to achieve correction	64.28 days (50 to 100 days)
9	Complications	
	• Superficial skin ulcers	• 2 patients (7.1%)

Table 2: Six months to two years follow-up

1	<p><i>Six months follow-up</i></p> <ul style="list-style-type: none"> • Patient checked physically • Follow-up taken with the help of mobile pictures • Lost to Follow-up 	<ul style="list-style-type: none"> • 24 patients (8.7 %) • 3 patients (10.7 %) • One patient (3.6 %)
	<p>Pirani score at six months</p> <p>Compliance with a brace at six months</p> <ul style="list-style-type: none"> • Compliant with brace • Non-compliant with brace <p>Recurrence at six months</p> <ul style="list-style-type: none"> • Recurrence • No recurrence <p>Twelve months follow-up</p> <ul style="list-style-type: none"> • Patient checked physically • Follow-up taken with the help of mobile pictures • Lost to Follow-up <p>Pirani score at twelve months</p> <p>Compliance with a brace at twelve months</p> <ul style="list-style-type: none"> • Compliant with brace • Non-compliant with brace <p>Recurrence at twelve months</p> <ul style="list-style-type: none"> • Recurrence • No recurrence <p>Referral for surgery at 12 months</p> <p>Twenty-four months follow-up</p> <ul style="list-style-type: none"> • Patient checked physically • Follow-up taken with the help of mobile pictures • Lost to Follow-up <p>Pirani score at twenty-four months</p> <p>Compliance with a brace at twenty-four months</p> <ul style="list-style-type: none"> • Compliant with brace • Non-compliant with brace <p>Recurrence at twenty-four months</p> <ul style="list-style-type: none"> • Recurrence • No recurrence 	<ul style="list-style-type: none"> • Zero in 21 patients (75%) • 0.5 in 4 patients (14.3%) • 2.5 in 2 patients (7.1%) <ul style="list-style-type: none"> • 24 patients (85.7%) • 3 patients (10.71%) <ul style="list-style-type: none"> • Two patients (7.1%) • Twenty-five patients (89.3%) <ul style="list-style-type: none"> • 22 (78.6 %) • 3 patients (10.7%) • 3 patients (10.7%) <ul style="list-style-type: none"> • Zero in 18 patients (64.3%), • 0.5 in 3 patients (10.71%) • 3 in 4 patients (14.3%) <ul style="list-style-type: none"> • 22 (78.5%) patients • 3 patients (10.7%) <ul style="list-style-type: none"> • Four patients (14.3%) • Twenty patients (71.4%) <ul style="list-style-type: none"> • One patient (3.6%) <ul style="list-style-type: none"> • 15 patients (53.6 %) • 6 patients (21.4 %) • 7 patients (25 %) <ul style="list-style-type: none"> • Zero in 17 patients (60.7%) • 0.5 in 3 patients (10.7%) • 4 in one patient (3.5%) <ul style="list-style-type: none"> • 17 patients (60.7%) • 4 patients (14.3%) <ul style="list-style-type: none"> • One patient (3.6%) • Twenty patients (71.4%)



Figure 1: A child with recurrence of deformity bilaterally at 24 months follow-up



Figure 2: Same child with correction of deformity after repeat castings

Discussion

In the past, the management of club foot remained surgical releases to achieve good results.^{11,12} But long-term results have shown that these procedures were associated with various complications.^{13,14} Ponseti first reported his technique of weekly casting followed by the use of a foot abduction brace, to correct the deformity in 1963¹⁵ but could not gain much acceptance by the orthopaedic community. Around

three decades later different institutes followed his technique and reported greater than 90 % initial correction rate^{16,17-21} when proper follow-up protocol of using a brace was followed. Complex nature of club foot requires not only skilled and dedicated healthcare providers but also patience and punctuality by the parents not only during casting period but in long term follow-up as well otherwise chances of recurrence is high in patients with non-compliance with brace protocol.^{15,22}

Considering the results of our study (Table 1 & 2), the average number of casts required to correct the deformity was 8 which is comparable to 7.6 as described by Ponseti et al¹⁵ and 7 as described by Laaveg et al.²² The duration of casts to correct the deformity was 64.28 days which is comparable to 68 days as described by Ponseti et al¹⁵ and 62 days as described by Laaveg et al.²² In our study tendon Achilles tenotomy was required in 82.1 % of the cases (23 patients) which is comparable to 78 % as described by Laaveg et al²² and 91% as described by Dobbs et al.²³ 10 patients (35.7%) out of 28, showed non-compliance with brace protocol (3 patients at 6 months follow-up, 3 patients at 12 months follow-up and 4 patients at 24 months follow-up). Noncompliance with the foot abduction brace is the major risk factor for the recurrence of the deformity.^{15,22} Relapse rate of 80% has been reported in patients who were non-compliant with a brace as compared to only a 6% relapse rate in patients who were compliant with the use of a brace.²⁴ Other studies have also shown high rates of relapses in patients who are non-compliant with brace protocol, like Ponseti et al¹⁵ showed a 56% relapse rate and 47% by Laaveg et al.²² Effective motivation of the parents regarding the continued proper use of a brace is utmost important to prevent the relapse.

Overall, at 2 years follow-up post last cast removal, out of 28 patients, deformity correction was maintained in 14 patients (50%). During these two years, seven patients (25%) showed a recurrence of the deformity. Six (21.4%) of them were successfully corrected with repeat castings. One patient (3.6%) was not responding to repeat casting so referred for surgery. Out of 28 patients, seven patients (25%) were lost to follow-up at the end of the study.

Our low rate of success as compared to other studies is likely due to the high rate of non-compliance with the use of brace during post cast period which is considered a major risk factor for recurrence and partly because of loss to follow-up patients which is 25% (seven patients) of the total study population. However, all of lost to follow-up patients had a full

correction and then they got lost. Most likely their deformity remained corrected and that is why they did not report for follow-up. These losses to follow-up may be due to financial implications as well, as follow-up would have cost them some money.

The limitations of our study include retrospective design and a relatively small number of patients. The strength of our study is mainly the relatively longer follow-up post-correction.

The main aim of the study was to increase awareness of the high rate of success of the Ponseti technique for the management of club foot. The complex deformity can easily be corrected by simple casting which is relatively cheap and the correction may remain maintained if the follow-up brace protocol is followed.

Conclusion

The Ponseti technique is now considered the most efficient way to treat club foot deformity. For public awareness, our study reassures the families that the clubfoot deformity can easily be corrected with the casting technique, and correction may remain maintained if the brace-wearing protocol is followed. Furthermore, as this method is associated with a significant decrease in the number of extensive surgeries for correction of club foot, this may help tertiary care hospitals to pay attention to other surgical orthopaedic problems that may have crucial implications, especially in a developing country.

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