INTRODUCTION

A documented condition since the time of the ancient Egyptians, idiopathic congenital talipes equinovarus (CTEV), often known as clubfoot, was independently described by Hippocrates and the Aztecs. The most prevalent congenital foot condition is CTEV.\[1\]

All of the initial therapy approaches consisted of different forms of manipulation and bracing. The first surgical procedure was Lorenz’s Achilles tenotomy in the late 1700s, but it was not until the development of anesthesia and aseptic technique in the late 1800s that successful soft-tissue releases, osteotomies, and tendon releases could be performed. Gentle manipulation and serial casting, which are still the go-to treatments, were made popular by Kite in 1930.\[2\]

The incidence of CTEV varies by race and geographic location and is 5–6/1000 live births. Any sort of CTEV

ABSTRACT

Background and Objectives: Congenital talipes equinovarus (CTEV), also known as clubfoot, is one of the most prevalent birth disorders affecting the musculoskeletal system and affects one in 1000 live births. The tried-and-true Ponseti method of therapy entails weekly adjustment of the deformity followed by a long-leg cast. Modified accelerated treatment protocols were designed to reduce the total duration of treatment. This study was conducted to compare the efficacy of accelerated Ponseti method versus standard Ponseti method. Methods: A randomized controlled study was conducted with participants randomized to two groups—Study group and Control groups. All feet were scored using Pirani score, recorded by an independent assessor at each visit. Plaster treatment was continued until clinical correction achieved. Results: The study had 100% subject retention in both the groups from baseline to follow-up. The current study had comparable demographic distribution between the groups. Accelerated Ponseti technique has relatively shorter duration of manipulation compared to the standard Ponseti technique. Total number of casts used is not significantly different for accelerated Ponseti technique compared to the standard Ponseti technique. Accelerated Ponseti technique for club foot management was found to be equally effective compared to the standard Ponseti technique in managing idiopathic CTEV assessed by Pirani scoring. Interpretation and Conclusion: According to the best evidence synthesis, no evidence exists to support the use of a cast change interval of 1 week. It can be concluded that the accelerated versions of the Ponseti method can safely be used in the treatment of clubfoot without risking any significant increase in the required number of casts.

Key words: Accelerated Ponseti method, congenital talipes equinovarus, Ponseti method

COMPARATIVE STUDY OF FUNCTIONAL OUTCOME OF IDIOPATHIC CONGENITAL TALIPES EQUINOVARUS TREATED BETWEEN PONSETI TECHNIQUE AND ACCELERATED PONSETI TECHNIQUE USING PIRANI SCORE

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therapy aims to lessen, if not completely eradicate, all aspects of the clubfoot deformity to achieve a mobile, pain-free, normal-appearing, plantigrade foot that is mobile, callus-free, and typically shoeable. For the management of clubfoot, a variety of therapy approaches are outlined, including strapping, stretching, and casting, surgical release of soft tissues, bony operations, and eventually arthrodesis. Female kid, hereditary, late age of presentation, degree of deformity, rigidity of foot, associated cavus, associated clawing of toes, and small heel are some of the features that have been linked to a poor prognosis in CTEV therapy.\(^{[3]}\)

Kite defended the conservative methods used to treat clubfoot as a whole. A number of workers have recently demonstrated positive results using the serial casting and Ponseti method of manipulation.\(^{[4]}\) The Ponseti methodology was first described in a 1963 publication; 15 years later, Ponseti had already started employing this technique. The rate of severe clubfoot surgery significantly decreased as the approach gained popularity over time. The Ponseti approach entails weekly deformity treatment followed by a long-leg cast. With the exception of the equinus, all aspects of the deformity can be fixed in around 4–5 weeks.\(^{[5,6]}\)

For patients who must travel great distances to receive therapy, the correction period must be shortened; this benefits the parents financially. Furthermore, maintaining a plaster clean and dry for a week might be difficult, especially for parents who are illiterate. Modified regimens for faster therapy were created: With the development of the 5-day protocol by Morcuende et al., which substituted the conventional 7-day protocol for manipulation and casting every 5 days, and the twice-weekly protocol by Xu, who performed manipulation and casting twice a week, researchers discovered that the feet were corrected much more quickly than with the traditional protocol while still achieving the same results.\(^{[6,7]}\)

There is only limited evidence available regarding the comparison of Ponseti technique with accelerated Ponseti technique especially among the Indian population. Hence, a randomized controlled study was conducted to determine effectiveness of a shorter duration of treatment so that most effective and economical strategies may be adopted in management of these patients.

**CONSERVATIVE METHODS**

Numerous treatment techniques are available, but the most prominent appear to be Ponseti’s, Kite’s, French and more recently accelerated Ponseti.

**Ponseti’s Method**

The Ponseti Method, developed by Dr Ponseti, an Orthopaedic Surgeon based at the University of Iowa in 1963 following extensive anatomical study of the foot,\(^{[9]}\) has been shown to be safer and more efficient than surgery for the treatment of clubfoot.\(^{[9]}\) The first study of the long-term outcomes of the Ponseti Technique, which led to the widespread popularization of the technique was published in 1995.\(^{[10]}\) This technique uses a very specific series of manipulations and castings to correct the foot deformity and complete tenotomy of the Achilles’ tendon in most cases to eliminate equinus deformity followed by a further 3 weeks in a cast. The patient must then wear a foot abduction orthosis, a set of boots set in abduction and dorsiflexion on an immovable bar, fulltime for 3 months and then at night at least until the age of four.\(^{[11]}\) Used correctly, results of the Ponseti Method can achieve full correction of the clubfoot deformity in up to 98% of cases.\(^{[12]}\) Long-term follow-up at approximately 30 years showed excellent treatment results, with “excellent or good”\footnote{This refers to the percentage of individuals achieving excellent or good results.} foot function demonstrated in 78% of individuals with clubfoot compared with 85% of matched individuals without congenital foot deformities.\(^{[10]}\) These outcomes have led to the current situation in most high-income countries where the Ponseti Method is the treatment of choice for clubfoot almost by most orthopedic surgeons.\(^{[13]}\)

**Kite’s Method**

This technique is a conservative method of treating clubfoot, which is now no longer widely used or accepted in the orthopedic community.\(^{[14]}\) The Kite method was developed by Dr. Kite in the USA in the 1930s.\(^{[15]}\) Kite sought to find a non-invasive treatment strategy for clubfoot after he became dissatisfied with the poor results of surgical treatment and the often traumatic outcomes following forcible manipulations of clubfoot deformity using the Thomas Wrench, popular at the time.\(^{[16]}\) Kite’s Method of treatment consists of a series of manipulations and castings followed by night splinting of the feet held in dorsiflexion and slight abduction.

Kite reported good outcomes with non-invasive treatment in 800 cases of clubfoot.\(^{[14]}\) These outcomes were not reproducible in further studies;\(^{[15]}\) however, up to 90% of children treated using the Kite method needed additional surgical, soft-tissue releases.\(^{[15]}\) These unsatisfactory outcomes were attributed to two main factors: anatomically inaccurate method of manipulation of the foot which prevents the deformity from resolving and the use of short leg (below knee) casts which are inadequate to hold the corrected position of the foot.\(^{[17]}\) The Kite method also requires high numbers of castings and it may be up to 2 years before the deformity is corrected.\(^{[18]}\)

**The French Method**

Readers may also wish to be aware of the French Functional (Physical Therapy) Method, a less commonly used technique for which there is a much smaller body of supporting research evidence.
The French Method consists of daily manipulations of the infant’s clubfoot, stimulation of the muscles acting on the foot to maintain the reduction achieved through manipulation, and foot immobilization using nonelastic adhesive strapping. Treatment usually lasts over a course of approximately 2 months and is then gradually reduced. Improvement typically occurs within the first 3 months and is achieved at a slower rate when compared to the Ponseti Method.[19]

Richards et al (2008) compared the Ponseti and French Methods and found after 51.4 months average follow-up that feet managed with the Ponseti Method demonstrated a trend toward a better clinical outcome versus those managed with the French Method (p = 0.31); however, the results were very close. For the Ponseti Method, outcomes were considered “Good” for 72%, “Fair” for 12%, and “Poor” for 16% of the participants, compared to 67%, 17%, and 16%, respectively, for the French Method. The authors...
report that this may have been attributed to the amount of substantial effort required to train the parents and have them implement the technique reliably (i.e., perform the stretching, taping, and splinting on a daily basis) for up to 2 years.\[19\]

**RESULTS**

A randomized controlled study was conducted to compare the efficacy of accelerated Ponseti with standard Ponseti technique in a tertiary care center, Bengaluru city. A total of 60 participants were enrolled into the study, out of which 30 were randomized into the study group and 30 were randomized into the control group (Chart 1). The study had 100% subject retention in both the groups from baseline to follow-up. There were a total of 40 feet samples included per group from 30 subjects for the intervention.

Among 40 samples of control group, 52.5% were in the age group of 1–12 weeks, and 47.5% were in the age group of 13–24 weeks. Among 40 samples of study group, 60% were in the age group of 1–12 weeks, and 40% were in the age group of 13–24 weeks (Table 1 and Chart 2).
Among control group, mean age was 12.5 ± 5.35 weeks while it was 10.86 ± 6.21 weeks, in study group. There was no statistically significant difference ($P = 0.21$) between the groups regarding age [Table 1 and Chart 2].

There were 65% males among the samples in study group and 60% males in control group. There was no significant statistical difference among the groups with respect to sex ($P = 1$) [Table 2 and Chart 3].

There were 25% bilateral and 75% unilateral samples among the study group and control group. There was no significant statically difference between the groups with respect to unilateral and bilateral ratio ($P = 1$) [Table 3 and Chart 4].

Among 40 samples of control group, 7.5% took <28 days for correction till tenotomy while 92.5% took more than or equal to 28 days. Among 40 samples of study group, 95% took <28 days for correction till tenotomy while 5% took more than or equal to 28 days. There were 10 bilateral and 20 unilateral in both study and control group [Table 4 and Chart 5].

Among control group, mean duration was 35.68 ± 5.44 days while it was 19.30 ± 3.91 days, in study group. There was
Majority (55%) of the samples in the control group needed 5 casts to complete the procedure followed by 27.5% with 4 casts, 10% with 6 casts, and 7.5% with 3 casts. Among the study group, 42.5% needed 6 casts, 27.5% needed 5 casts, 15% needed 4 casts, 12.5% needed 7 casts, and 2.5% needed 8 casts [Table 5 and Chart 6].

Among control group, mean casts used was 4.91 ± 0.74 while it was 5.2 ± 0.94 in study group. There was no statistically significant difference ($P = 0.076$) between the groups regarding number of cast used. On an average five casts were used in control group and 5.5 cast were used in study group [Table 5 and Chart 6].

Majority (70%) of the samples in the control group had an initial Pirani score of 5 followed by 17.5% with a score of 6, and 12.5% with a score of 4. Among the study group, 55% had an initial Pirani score of 5 followed by 32.5% with a score of 6, and 12.5% with a score of 4 [Table 6 and Chart 7].

Among control group, mean initial Pirani score was 5.06 ± 0.52 while it was 5.19 ± 0.67 in study group. There was no statistically significant difference ($P = 0.317$) between the groups regarding initial Pirani score [Table 6 and Chart 7].
Majority (52.5%) of the samples in the control group had a final Pirani score of 0, while 47.5% had a score of 1. Among the study group, 57.5% had a final Pirani score of 0, while 42.5% had a score of 1 [Table 7 and Chart 8].

Among control group, mean final Pirani score was $0.48 \pm 0.506$ while it was $0.43 \pm 0.501$ in study group. There was no statistically significant difference ($P = 0.658$) between the groups regarding final Pirani score [Table 7 and Chart 8].

Majority of the samples in control group (67.5%) and study group (65%) were undergone tenotomy and the difference between the groups was not statistically significant ($P = 0.9$) [Table 8 and Chart 9].

DISCUSSION

CTEV, also referred to as clubfoot, occurs in one in 1000 live births and is one of the most common birth defects involving the musculoskeletal system. It consists of four components: Ankle equines, hind foot varus, forefoot adductus, and midfoot cavus. Although clubfoot is recognizable at birth, the severity of the deformity can vary from mild to an extremely rigid foot that is resistant to manipulation.
When untreated, children with clubfoot walk on the sides and/or tops of their feet, resulting in callus formation, potential skin and bone infections, inability to wear standard shoes, and substantial limitations in mobility and employment opportunities.[22]

Clubfoot deformity may be associated with myelodysplasia, arthrogryposis, or multiple congenital abnormalities, but is most commonly an isolated birth defect and considered idiopathic.[23]

Surgeons have struggled over the years to identify the best method of treatment for the congenital clubfoot deformity. This struggle has lessened over the last decade as the Ponseti method of clubfoot manipulation and casting, Achilles tendon tenotomy, and foot abduction bracing has become the primary treatment for idiopathic clubfoot around the world.[24] This is due to both the excellent short-term results reproduced at multiple centers as well as the long-term results published from the University of Iowa using this method.[25]

CONCLUSION

1. Accelerated Ponseti technique for club foot management was equally effective compared to the standard Ponseti technique in managing idiopathic CTEV
2. Accelerated Ponseti technique has relatively shorter duration of manipulation compared to the standard Ponseti technique
3. Total number of casts used is not significantly different for accelerated Ponseti technique effective compared to the standard Ponseti technique
4. However, further studies with large sample size and more duration of follow-up is necessary to conclude the findings of this study.

REFERENCES


25. Ahmad MN, Ghiani A, Nissar SK. Management of Clubfoot with Accelerated Ponseti Casting Method at Tertiary Care Hospital, GMC Jammu India.

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