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Original Research Article

FUNCTIONAL OUTCOME OF PONSETI METHOD CASTING IN CONGENITAL TALLIPES EQUINO VARUS– OUR EXPERIENCE

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ABSTRACT

Background: Objective: To examine the CTEV correction outcome through Ponseti method.

Materials and Methods: This study aimed to evaluate the functional outcomes of congenital talipes equinovarus (CTEV) correction using the Ponseti method. A sample of 27 infants with idiopathic clubfoot were included, and treatment involved serial casting starting immediately after diagnosis, with weekly follow-ups. In cases of insufficient correction, a percutaneous Achilles tenotomy was performed, followed by a final cast for three weeks. Steen beek braces were prescribed to maintain the correction. The severity of the deformity was measured using the Pirani scoring system both before and after treatment.

Results: The study found significant improvement in deformity correction, as reflected by the reduction in the Pirani scores. The pre-treatment mean Pirani score was 5.23 ± 1.03, while post-treatment, it was reduced to 0.13 ± 0.22, with a highly significant p-value of less than 0.001. Minimal treatment-related complications were observed, with only two cases of mild skin irritation. Most of the cases required six to seven casts for complete correction, and all infants followed the post-treatment bracing protocol successfully.

Conclusion: The Ponseti method proved to be highly effective in treating idiopathic clubfoot, with significant improvements in deformity correction and minimal complications. The results of this study support the method's efficacy and safety, highlighting its importance as a non-invasive treatment option. Early intervention combined with appropriate bracing is essential for optimal long-term outcomes, and the Ponseti method remains a preferred treatment. Further studies are needed to explore long-term results and potential refinements to the treatment protocol.

Keywords: Congenital Talipes Equinovarus (CTEV), Ponseti Method, Clubfoot Correction, Pirani Scoring System, Non-Surgical Treatment.

INTRODUCTION

Congenital talipes equinovarus (CTEV) is another name for clubfoot, most frequently seen complication of congenital foot and ankle abnormalities. The three bones that comprise the anomaly are the ankle equines, the hindfoot varus, the forefoot adduction, and the midfoot cavus.[1] The prevalence of CTEV is about two times higher in males than it is in females, and it affects around 1in every 1000 live newborns. Approximately 50% of people have clubfoot on both feet.[2] Children who are born with clubfoot deformity in developing countries may not get the same degree of care as children who are born in affluent nations, which results in a reduction in the quality of lifestyle for these children.[3]

It is believed that Hippocrates, was the first to appropriately treat clubfoot. Initially, he also suggested bandaging and mild massage as potential treatments for clubfoot.[4] Two primary schools of thinking have influenced the treatment of clubfoot throughout the history of the condition. First and foremost, manipulation, strapping, and serial plaster therapy principles have been used significantly. Secondly, it is essential to note that various surgical treatments are recommended for treating clubfoot.[5] According to the most modern approaches, the Ponseti method has the potential to result in a foot that is not only functional but also painless and anatomically normal. Conservative methods of treating congenital clubfoot seem to be gaining popularity again.[6] This is because there are a lot of issues with CTEV surgical release techniques, such as ankylosis, discomfort, over-correction, recurrence, and stiffness. Dr Ignacio Ponseti is the one who came up with the conservative therapy for CTEV, and it starts as soon as possible after birth. The procedure involves performing a series of corrective manipulations followed by a surgical intervention known as a percutaneous Achilles tenotomy.[7] The first therapy for CTEV should always be non-surgical and start as quickly as possible.[9] The treatment primarily focuses on correcting all the components of clubfoot to achieve painless, plantigrade, malleable, and cosmetically and functionally excellent feet quickly. The parents of the children come from a low-income home, which is taken into consideration throughout the therapy.[10] When there is no improvement, most surgeons will opt for a treatment that involves soft tissue release. The soft tissue release process has several significant drawbacks, the most important of which are its rigidity and cost ineffectiveness.[11] Using the Ponseti method, this study investigated the functional results achieved with serial cast correction in CTEV. The primary purpose of this study was to examine whether the plaster cast application method developed by Ponseti is beneficial in treating idiopathic clubfoot. Utilising the Pirani scoring method, a tool used to assess the severity of clubfoot deformity, the secondary purpose was to determine the degree of deformity caused by the condition. This study is aimed to examine the CTEV correction outcome through Ponseti method.

Aim of the Study

This study is aimed to examine the CTEV correction outcome through Ponseti method.

Objective

To examine the CTEV correction outcome through Ponseti method.

MATERIALS AND METHODS

This prospective study lasted 18 months and involved a sample of 27 children. The primary objective of the research was to determine the efficacy of Ponseti's approach in treating babies born with idiopathic clubfoot deformity.

Inclusion Criteria

Infants diagnosed with idiopathic clubfoot deformity were allowed to participate regardless of their age (birth to 12 months). After acquiring a written informed consent from the parents or guardians to participate.

Exclusion Criteria

Children above 12 months of age, those with a history of previous clubfoot surgery, and cases diagnosed with atypical or secondary clubfoot deformity were excluded from the study.

Data Collection

A comprehensive medical history was gathered for every registered newborn; extensive general and local exams complemented this. At the beginning of the study and at each subsequent follow-up appointment, the degree of the clubfoot deformity was evaluated using Pirani's grading method. A significant aspect of the treatment process was the use of the Ponseti method serial manipulation and weekly corrective casting. During the weekly follow-ups, data were gathered to record any deformity changes, which were evaluated using the Pirani score. Finally , a percutaneous tendo Achilles tenotomy was performed under local anaesthesia with a final cast which is then applied for three weeks. In addition to this, steen beek brace, with comprehensive instructions on bracing techniques were also provided. During follow-up sessions, the assessment of the patient's adherence to the brace was carried out.

Data Analysis

The collected data were analysed using changes in Pirani scores to assess improvement in deformity over time. Statistical analysis was conducted to evaluate the efficacy of the intervention, with emphasis on long-term outcomes and rates of relapse.

RESULTS

Table 1 showed total of 27 individuals participated in this study that lasted for 18 months. 20 male babies were involved in the occurrences, which accounts for 74.1% of the total, and 7 female babies, which accounts for 25.9% of the total recorded patients. It was shown that the abnormality most often manifested itself in the form of bilateral clubfoot, which occurred in 15 cases (55.6%). A fair distribution of unilateral cases was ensured by the fact that six cases, which accounted for 22.2% of the total, affected both the left and right sides of the body.

During the first two months of life, a significant number of newborns had clubfeet deformity; fourteen incidences, accounting for 51.9% of the total. For nine instances, or 33.3% of the total, the affected individuals were children between the ages of two and six months. Among the total number of incidents, four occurred in babies older than seven months, accounting for 14.8% of the total.

When the order of birth was investigated, it was discovered that children born first were the most affected, accounting for 18 instances (66.7%), while children born second or later made up 9 cases (33.3%).

The findings indicated that consanguinity is an extremely rare condition. In the other 25 cases, which constitute 92.6% of the total, there were no instances of consanguineous marriages occurring within the families. This rarity should reassure you about the low risk of the condition. Only two cases were associated with consanguineous unions, which account for 7.4% of the total. [Table 1]

Table 2 presented a novel grading mechanism for the degree of clubfoot deformity in the individuals who participated in the study. To categorize anomalies into three distinct levels, i.e., mild, moderate, and severe, this assessment tool assigns values of 0 to 1 and 2 to each feature based on the severity of the abnormality. Forefoot anomalies were examined based on three elements: the degree to which the foot's outer edge curvature was evident, the presence of an inner crease, and the visibility of the talar bone.

During the research, each patient used these ratings to ascertain the extent of the deformity at the beginning of the study and to keep track of any modifications throughout treatment. Using the revised grading system, a systematic approach was established to monitor abnormalities' progression over time. This framework also provided standard documentation, instilled confidence in the study's methodology and made the study of treatment outcomes in the 27 babies who participated in the research possible. [Table 2]

Table 3 outlines the treatment modalities, number of casts required for complete correction, and complications observed during the study. Most infants received combined treatment, consisting of both cast application and tendon release, comprising 22 cases (81.48%), while 5 infants (18.52%) underwent treatment with casting alone. In terms of the number of casts required for full correction, the distribution was almost evenly split between those who required 4 to 5 casts (12 cases, 44.44%) and those who needed 6 to 7 casts (15 cases, 55.56%). Regarding treatment-related complications, only a few cases encountered minor skin irritation, which was observed in 2 infants (7.41%). However, the majority, 25 infants (92.59%), experienced no complications throughout the treatment process. This data provides insights into the efficacy of the combined treatment approach and highlights the relatively low occurrence of adverse effects in the study sample. [Table 3]

Table 4 presents the comparison between Pirani scores before and after treatment, highlighting the significant improvement in deformity correction. The pre-treatment Pirani scores ranged from 2.40 to 5.50, with a mean score of 5.234 ± 1.03. After the completion of treatment, the post-treatment scores showed a marked reduction, ranging from 0.00 to 1.20, with a mean score of 0.125 ± 0.215. The statistical analysis revealed a highly significant decrease in the scores, with a p-value of less than 0.001, indicating that the treatment effectively corrected the deformity. This data underscores the efficacy of the treatment protocol in reducing the severity of the clubfoot deformity in the study sample. [Table 4]

Table 1: Demographic and Clinical Characteristics of Infants with Idiopathic Clubfoot

Characteristic	Number of Cases (n = 27)	Percentage (%)
Gender		
Male	20	74.1%
Female	7	25.9%
Foot Affected		
Both Feet	15	55.6%
Left Foot Only	6	22.2%
Right Foot Only	6	22.2%
Age at Diagnosis		
0–2 months	14	51.9%
>2–6 months	9	33.3%
>6 months	4	14.8%
Birth Rank		
First Child	18	66.7%
Second or Later Child	9	33.3%
Parental Consanguinity		
Related Parents	2	7.4%
Unrelated Parents	25	92.6%

Table 2: Modified Clubfoot Severity Scoring System

Criteria	Mild (Score: 0)	Moderate (Score: 1)	Severe (Score: 2)
Forefoot Scores			
Outer curve of the foot	0	1	2
Inner foot crease	0	1	2
Exposure of talar bone	0	1	2
Rearfoot Scores			
Heel depression	0	1	2
Fold at the back of the heel	0	1	2
Stiffness in foot flexion	0	1	2

Table 3: Treatment Approaches, and Complication Incidence

Variable	Number of Cases (%)
Therapeutic Approach	
Cast application alone	5 (18.52%)
Cast application with tendon release	22 (81.48%)

Number of Casts for Complete Correction	
4-5 casts	12 (44.44%)
6-7 casts	15 (55.56%)
Treatment-Related Complications	
Mild skin irritation	2 (7.41%)
No complications	25 (92.59%)

Table 4: Comparison of Pirani Scores Before and After Treatment

Score Assessment	Pre-Treatment Score	Post-Treatment Score
Range	2.40 – 5.50	0.00 - 1.20
Mean ± SD	5.234 ± 1.03	0.125 ± 0.215
Statistical Significance (p-value)	$p < 0.001$	Significant decrease observed

DISCUSSION

A complex congenital malformation affecting the foot and ankle, congenital talipes equinovarus (CTEV), is often known as clubfoot. The hallmarks of this condition include:

- An ankle equines.
- A hindfoot varus.
- Forefoot adduction.

It often shows up as bilateral involvement, it affects around one out of every thousand live babies and is more common in males. A child's mobility and quality of life might be severely impaired if this deformity goes untreated. Many developing countries it is difficult for children born with congenital talipes equinovarus (CTEV) to get the care they need, increasing the likelihood that they may be permanently disabled.

Historically, there has been a lot of talk about how to treat clubfoot. The first forms of treatment were massage, bandaging, and manipulation, which originated with Hippocrates. The use of these methods has been around since ancient times. Several surgical and non-surgical methods have been used over the years. One of the most popular and effective non-surgical treatments is the Ponseti procedure. This method entails casting and manipulating the Achilles tendon over time, with a little surgical procedure performed afterwards to relax the taut tendon. It has been shown that the Ponseti method successfully produces functioning, painless, and anatomically standard feet. Therefore, it is a preferred therapy, particularly in settings with limited resources that can provide surgical care.

The Ponseti method, a non-invasive and highly effective approach, has gained popularity in recent years. Unlike traditional surgical procedures, which can lead to stiffness, over-correction, the Ponseti method involves early treatment, weekly cast placement, and the necessary Achilles tenotomy. This gradual correction process is particularly beneficial in developing countries where access to affordable surgical procedures is limited.

This study evaluated the practical outcomes of CTEV correction using the Ponseti method, paying particular attention to the degree of deformity and the efficacy of medical treatment. The study's goal was to determine whether the Ponseti method helped alleviate the symptoms of idiopathic clubfoot. There were 27 infants included in the research, and they had a history of idiopathic clubfoot. The secondary objective was to determine the extent of the deformity using the Pirani grading system, which ranks the severity of clubfoot using six clinical parameters.

Early diagnosis and treatment are key in managing CTEV. Most patients, ranging from birth to twelve months, were diagnosed within the first two months of life, highlighting the importance of early intervention. The study's inclusion and exclusion criteria ensured that only idiopathic cases were examined, minimizing the impact of confounding factors. The treatment plan after the diagnosis included immediate initiation of serial casting and weekly follow-ups. When the intended correction could not be achieved with casting alone, a percutaneous Achilles tenotomy was performed. After three weeks, a final cast was applied. The parents were instructed that infants must wear steen beek brace to keep the correction in place. By consistently using these braces, you may significantly reduce the risk of recurrence, a significant concern in the long-term management of clubfoot.

According to the clinical data, the deformity was much less severe, as measured by the Pirani score. It was observed that both groups had this improvement. The Pirani scale, which measures severity, showed a wide range of values before treatment. A standard deviation 1.03 was associated with the mean score, which was 5.234. Following therapy, the scores were much lower, averaging 0.125 ± 0.215, suggesting a significant reduction in the deformity compared to the first evaluation. The statistical analysis proved that the Ponseti method worked; a p-value less than 0.001 indicates that the clubfoot was considerably less severe after treatment. Two cases of mild skin irritation were reported, and no significant side effects were seen. The results supports the claim, that the Ponseti method is effective and safe, with few adverse effects compared to other invasive surgical techniques. The most common treatment method included tendon release in addition to casting; most patients needed six or seven casts to get complete correction with this approach. This emphasis on the minimal complications should instil confidence in the safety of the Ponseti method.

These results align with other research that has shown the efficacy of the Ponseti method in treating

idiopathic clubfoot. Studies carried out by Docker et al. and other researchers using the approach established by Ponseti have shown high rates of deformity healing and substantial improvements in foot function and appearance.[12] Another study that highlighted the long-term efficacy of Ponseti's method was carried out by Chueire et al.[13] According to the research, there were few functional impairments and recurrence rates associated with the surgery, providing reassurance about the success of the Ponseti method.

CONCLUSION

For congenital talipes equinovarus, the Ponseti method remains an effective non-invasive treatment option. More proof that the treatment helps fix clubfoot deformities in newborns, with minimal complications and significant long-term effects, comes from this study. Using the proper bracing techniques and intervening early drastically increases the chances of the treatment being effective and decreases the chances of recurrence. Because of its effectiveness and low cost, the Ponseti method is still preferred for treating idiopathic clubfoot, particularly in areas with few resources. However, the need for additional research on the treatments and potential side effects over the long term is urgent and important. This will guarantee the best possible results for babies born with this congenital disability.

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