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Original Research

Assessment of Deformity Correction in Club foot by using Ponseti Technique and Pirani scoring system

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Abstract

Background: This study was conducted for the Assessment of Deformity Correction in Club foot by using Ponseti Technique and Pirani scoring system.

Material and Methods:The Pirani Scoring System, facilitated by the Pirani Score Record Sheet, offers a straightforward and dependable method for evaluating the severity and tracking progress in Clubfoot assessment and treatment. This system utilizes various foot views to identify issues in the underlying soft tissue and bony anatomy, enabling a quick assessment in under a minute without requiring specialized equipment. Developed by Canadian Orthopaedic Surgeon Shafique Pirani, who contributed to Clubfoot Services in Uganda and Malawi, this tool provides an easy-to-use framework for assessing the severity of individual Clubfoot components. It serves as a valuable resource for both initial evaluations and ongoing monitoring of patient progress.

Results: 9 subjects aged from 1-4 weeks at the time of presentation, 10 subjects aged from 5-8 weeks at the time of presentation, 8 subjects aged from 9-12 weeks at the time of presentation, 3 subjects aged from 13-16 weeks at the time of presentation and 23 subjects aged over 16 weeks at the time of presentation. In 13 subjects, left side was involved, in 16 subjects, right side was involved and 24 subjects showed bilateral involvement.

Conclusion:Our study accurately concludes that Ponseti's method is a patient- friendly, cost-effective way to easily and quickly correct club foot deformity. It is founded on a solid scientific understanding of the causes and constituent parts of the deformity. The findings of our study closely resemble those found in the literature, which is proof that the correction can be repeated regardless of small differences. The method's creator outlined some fundamental principles that must be followed. As Ponseti describes it, there is a small but significant learning curve that must be overcome in order to perfect the method and avoid fundamental mistakes that are both committable and preventable. These mistakes always result in failure.

Keywords: Club foot, Congenital,Preventable

Introduction

Club footis refers to Congenital TalipesEquinoVarus (CTEV) which is very common congenital musculoskeletal disorder, which occurs in 1-2 per 1000 live births. In India, prevalence of club footis 0.9 per live births. In a normally developing foetus, the foot turns into a clubfoot during the 2nd trimester of pregnancy.First described by mechanical theory by “Hippocrates”. Talipesis a Latin word derived from Talus-Ankle, Pes-foot. Other theories like histological theory, theory of retraction fibrosis, germ plasm theory described Congenital talipesEquinoVarus but no theory clearly explained the response of club foot to treatment given.[2]Clubfoot can also present in association with other conditions like arthrogryposis, myelodysplasia, and other multiple congenital abnormalities. Most commonly it has been reported to be associated with distal arthrogryposis and myelomeningocele. It is multifactorial in origin, with 33% concordance of identical twins and approximately 25% reported cases have a familial predisposition or history.[3]

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Clubfoot is often detectable at birth, and its severity can vary widely, from a mild deformity to a more severe and rigid foot that resists manual correction or manipulation.CTEV is a complex deformity with four clinical components: Hind foot equinus, Hind foot varus, Mid/forefoot adductus and Cavus.

The deformity has the following features:

Equinus: Severe tibiotalar&talocalcaneal plantar flexion.

Adductus: Medial talar neck inclined

Different classifications have been used for initial evaluation of these deformities, example the Dimeglio et al classification and Piraniclassification. [4- 8]

Orthopedic surgeons have always had a difficulty in identifying the best method for the treatment. The Ponsetimethod of manipulation and casting has been advocated as the best primary management for idiopathic clubfoot worldwide.Different procedures designed for treating CTEV range from strapping, stretching, casting and surgical release of soft tissue, Boney procedure and at last arthrodesis.[5, 6- 9]

This study was conducted for the Assessment of Deformity Correction in Club foot by using Ponseti Technique and Pirani scoring system.

Material and methods

The Pirani scoring system, facilitated by the Pirani Score Record Sheet, provides a straightforward and effective method for evaluating Clubfoot severity and tracking treatment progress. This system employs multiple foot views to identify soft tissue and bony anatomy issues, enabling rapid assessment without specialized equipment. Developed by Dr. ShafiquePirani, a Canadian Orthopaedic Surgeon who contributed to Clubfoot services in Uganda and Malawi, this tool offers a user-friendly framework for assessing individual Clubfoot components. It serves as a valuable resource for initial evaluations and ongoing progress monitoring. The Pirani Clubfoot Score quantifies deformity severity, while sequential scores facilitate progress tracking. An increasing score between visits may indicate a relapse, highlighting the importance of regular monitoring. During Ponseti management, the Pirani Score Record helps identify normal correction or potential issues, guiding treatment adjustments.

Results

Table 1: Age at Presentation To Hospital

Age	Number	Percentage
<1 week	0	0
1-4 weeks	9	16.9
5-8 weeks	10	18.8
9-12 weeks	8	15
13-16 weeks	3	5.6
>16 weeks	23	43.7

9 subjects aged from 1-4 weeks at the time of presentation, 10 subjects aged from 5-8 weeks at the time of presentation, 8 subjects aged from 9-12 weeks at the time of presentation, 3 subjects aged from 13-16 weeks at the time of presentation and 23 subjects aged over 16 weeks at the time of presentation.

Table 2: Side Of Involvement

Side	Number of patients	Percentage
Left	13	24.8
Right	16	30
Bilateral	24	45.2

In 13 subjects, left side was involved, in 16 subjects, right side was involved and 24 subjects showed bilateral involvement.

Table 3: Progression Of Score From Pre-Treatment To 8weeks - Cohort Analysis

SCORE	MIN- MAX	MEAN + SD	DIFFERENCE FROM PRETREATMENT	p VALUE FROM PRETREATMENT
Pre-treatment	5 to 6	5.85 + 0.03	…..	…….
1st week	4 to 5.5	4.97 + 0.43	0.52	<0.001
2nd week	3 to 5	3.99 + 0.54	1.02	<0.001
3rd week	2 to 4.5	2.97 + 0.64	1.58	<0.001
4th week	1 to 4	2.03 + 0.699	2	<0.001
5th week	0 to 3	1.25 + 0.67	2.5	<0.001
6th week	0 to 2.5	0.75 + 0.51	3	<0.001
7th week	0 to 1.5	0.77 + 0	3.5	<0.001
8th week	0 to 1.5	0.96 + 0.5	3.5	<0.001

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Final score	0 to 1.5	0.56 + 0.45	3.5	<0.001

Discussion

There were altogether 53 patients included in the study. We evaluated the following variables.

- Age of the patient at first visit to our institution,
- Number of casts,
- Need for percutaneous tendo-achillestenotomy and
- Compliance with the foot –abduction brace

The identified variables had a significant impact on the requirement for comprehensive surgical intervention and the likelihood of recurrence. During the plaster treatment phase, emphasis was placed on educating parents about their crucial role in monitoring for potential vascular complications and other plaster-related issues, ensuring timely identification and prompt action.

Results of plaster treatment

Successful correction of Clubfoot was achieved in every patient, with none presenting with a deformity too severe to be corrected. The criteria for achieving full correction were met when the feet scored below 1.5, indicating complete resolution of equinus deformity.

Number of casts

A series of 6-8 casts was sufficient to achieve correction, with the majority of feet requiring 6 casts to reach optimal alignment. The final cast was typically retained for 2 weeks following tendoachillestenotomy. Only a small number of feet necessitated 8 casts due to minor complications or greater deformity severity. This finding aligns with global literature, which consistently reports that Ponseti's method typically achieves correction with 5-6 casts.

Duration

The average time from the first cast to the tendoachillestenotomy/full correction of the deformity was 42 days.

Percutaneous tenotomy

Our findings showed that percutaneous tendoachillestenotomy was required in 74% of the cases. The procedure was performed on a population of young infants, with an average age of under 1 month, and resulted in successful outcomes for all feet treated. Post-tenotomy assessments revealed an average ankle dorsiflexion of 15 degrees, confirming the effectiveness of the technique.

Bracing

The parents demonstrated exceptional adherence to the bracing protocol, showcasing their commitment to their child's treatment. They were thoroughly educated on their crucial role in sustaining the correction, including the importance of properly fitting shoes and regularly updating the shoe size to accommodate their child's growing feet.

Follow-up

All patients were followed up for a minimum of 12 months, with most achieving independent walking by 16-18 months. Thirty-five patients completed the 12-month follow-up, while 18 patients reached the 16-18 month milestone within the study timeframe. Adherence to Ponseti's follow-up protocol was strictly maintained throughout. Regular evaluations detected no early signs of relapse. Statistical analysis revealed significant improvements in initial and final scores ($p < 0.001$), indicating a substantial reduction in deformity severity post-intervention.

In a separate study, Jain et al. assessed the effectiveness of serial casting using the Ponseti method in 30 patients with clubfoot deformity. Patients were evaluated clinically using Pirani's scoring and radiologically through talo-first metatarsal and talocalcaneal angle measurements. The same assessments were repeated post-treatment before transitioning to foot abduction orthosis (FAO). Results showed an average of 5.56 casts applied over 6.65 weeks, with significant improvements in Pirani scores from 5.50 to 0.24. The Ponseti method demonstrated excellent efficacy in correcting the four deformities associated with congenital idiopathic clubfoot.[11]

Conclusion

Our study accurately concludes that Ponseti's method is a patient- friendly, cost-effective way to easily and quickly correct club foot deformity. It is founded on a solid scientific understanding of the causes and constituent parts of the deformity. The findings of our study closely resemble those found in the literature, which is proof that the correction can be repeated regardless of small differences. The method's creator outlined some fundamental principles that must be followed. As Ponseti describes it, there is a small but significant learning curve that must be overcome in order to perfect the method and avoid fundamental mistakes that are both committable and preventable. These mistakes always result in failure.

References

1. Dobbs MB, Gurnett CA. Update on clubfoot: etiology and treatment. Clinical orthopaedics and related research. 2009; 467(5):1146-47.
2. Davies RW. Family studies and the cause of congenital club foot, talipesequinovarus, talipescalcaneovalgus and metatarsus varus. J Bone Joint Surg Br 1964; 4(6):445–64.
3. Simons GW, Sarrafian S. The microsurgical dissection of a stillborn fetal clubfoot. Clinical orthopaedics and related research.1983; 17(3):275–83.

DOI: 10.69605/ijlbpr_13.9.2024.58

4. Pirani et al., 1995. Pirani S, Outerbridge H, Moran M, et al: A method of evaluatingthe virgin clubfoot with substantial interobserver reliability. Presented at the annual meeting of the Pediatric Orthopaedic Society of North America, Miami, Fla, 1995
5. Mckay DW. New concept of and approach to clubfoot treatment. Journal of Pediatric Orthopaedics. 1982; 2(4):347–56.
6. Bor et al., 2006. Bor N, Herzenberg JE, Frick SL: Ponseti management of clubfootin older infants. ClinOrthopRelat Res 2006.
7. Prasad P, Sen RK, Gill SS, Wardak E, Saini R. Clinico-radiological assessment and their correlation in clubfeet treated with postero-medial soft-tissue release. IntOrthop. 2009;33:225–9.
8. Bhaskar A, Rasal S. Results of treatment of clubfoot by Ponseti's technique in 40 cases: Pitfalls and problems in the Indian scenario. Indian J Orthop. 2006;40:196–9.
9. Changulani M, Garg NK, Rajagopal TS, Bass A, Nayagam SN, Sampath J, et al. Treatment of idiopathic club foot using the Ponseti method. Initial experience. J Bone Joint Surg Br. 2006;88:1385–7.
10. Brewster MB, Gupta M, Pattison GT, Dunn-van der Ploeg ID. Ponseti casting: A new soft option. J Bone Joint Surg Br. 2008;90:1512–5.
11. Jain AK, Kohli N, Bansal N, Sahni G, Aggarwal HO, Mathur M. Evaluation of Results of Ponseti Technique in Idiopathic Clubfoot using Clinical Evaluation and Radiological Assessment. Int J Appl Basic Med Res. 2022;12(1):43-46. doi:10.4103/ijabmr.ijabmr_281_21