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Original Research Article

Association of Change in Pirani Score and Need for Tenotomy in CTEV Ponseti Serial Casting

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Abstract

Aim: The aim of this study is to determine whether the percentage change in Pirani score predicts the need for Achilles tenotomy in Congenital talipes equinovarus (CTEV). The initial Pirani score was also taken into consideration for predicting need for tenotomy at the first visit.

Result: The study included 33 patients (54 feet). Tenotomy was performed on 40 feet (78% of patient treated). Sex, side and bilateral involvement did not make a significant difference. The probability of Achilles tenotomy is 2.4 times higher in babies who had Pirani score percentage change of less than 15 compared with babies who had Pirani score change percentage of at least 15 or higher.

Discussion: Dobbs et al reported that the more severe the initial foot deformity, the more the casts required to achieve correction. They also reported that the mean number of casts applied to achieve correction was 8. Moroney et al reported that the number of casts decreased as they gained experience with the use of the Ponseti technique. Patients received more than six casts in the early period before percutaneous Achilles tenotomy but most patients with idiopathic clubfoot require four or five casts to achieve adequate correction.

Conclusion: The percentage change in Pirani score after serial manipulation using Ponseti method can be used effectively for prediction of need for Percutaneous Achilles Tenotomy in CTEV.

Introduction

The treatment of idiopathic clubfoot with the Ponseti method [1], including serial casting, percutaneous Achilles tenotomy and foot abduction orthosis, has shown to be effective in providing initial correction, avoiding extensive soft tissue release and providing satisfactory long-term results in most cases. Idiopathic clubfoot is characterised by a large spectrum of severity [2]. Therefore, numerous scoring systems have been proposed to rate clubfeet at presentation. Ideally, a scoring system (with its constitutive components) should be reliable, feasible in a clinical setting and able to monitor correction and predict appropriate treatment, recurrence rate and long-term outcome.

The systems proposed by Dimeglio et al and by Pirani et al [3], routinely used in most centres are reliable and easily feasible in clinical setting without need of equipment. Moreover these systems have been validated and proven to be capable to monitor progression of correction. Conversely, the accuracy of these scores in predicting the short-term parameters (number of casts, need for tenotomy) of the Ponseti method and the medium- to long-term outcomes (relapse, residual deformities, symptoms and function) are still controversial.

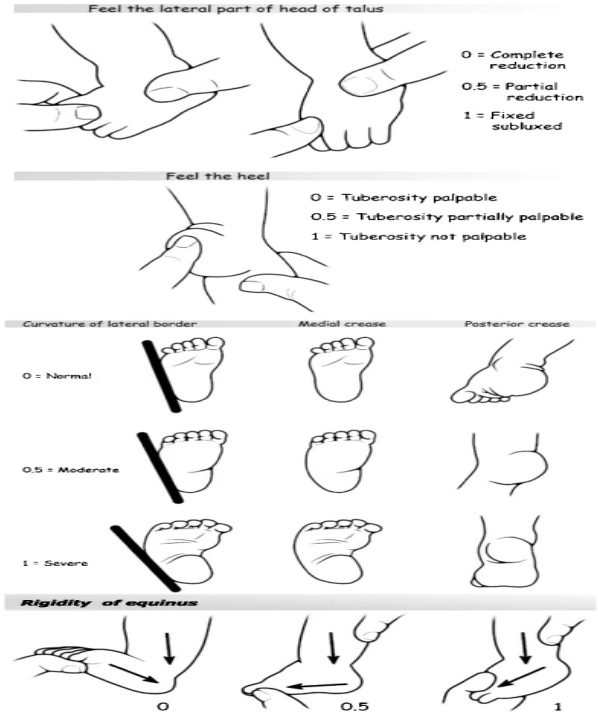
The aim of this study is to determine whether the percentage change in Pirani score predicts the need for Achilles tenotomy. The initial Pirani score was also taken into consideration for predicting need for tenotomy at the first visit.

Material and Methods

The study included 33 patients (54 feet).Children visited SRM medical college and hospital from March 2021 to February 2023 with CTEV were included in study.

The Pirani scoring system includes six different components of clubfoot deformity: posterior crease, emptiness of the heel, rigidity of equinus, medial crease, curvature of the lateral border of the foot and the reducibility of the lateral part of the head of the talus. Each item is given a score of 0 (no abnormality), 0.5 (moderate abnormality) or 1.0 (severe abnormality); consequently, the sum constitutes a total on a 6-point scale (Total Foot Score, TFS), where a higher score indicates a more

severe deformity. TFS is divided into two subtotal scores, expressing midfoot contracture (MidFoot Score, MFS: summing up medial crease, lateral curvature and reducibility of talus) and hindfoot contracture (HindFoot Score, HFS: summing up posterior crease, empty heel and rigid equinus), each ranging from 0 to 3.



Age at first casting, gender, bilaterality, the number of casts required for correction (from application of the first cast to the application of foot abduction orthosis for non-tenotomy group and to the operation for tenotomy group) and the need for tenotomy were determined.

Study Design and Period

A facility based retrospective study was conducted from March 2021 to February 2023.

Sample Size and Sampling Technique

Total of 33 infants with 54 feet were included in study. All clinical folders of children with clubfoot who started treatment since 2021 March at SRM medical college and hospital, Potheri Tamilnadu ,India are included in this study. Data Collection Tools Complete checklist was adapted from similar literatures modified based on the study context and its convenience to collect the data from existing sources.

Results

54 feet in 33 infants (22 boys, 11 girls; 12 bilateral) with idiopathic clubfoot met the criteria and were included in the study. At first casting, mean age of patients was 8 (range 5–21). Of the total number of children with clubfoot treated at the hospital, all had documentation on length of pregnancy, complication during pregnancy and delivery, order of child born and referral source. The mean number of weeks of gestational period is 36.58 and 3 of the children were preterm. Complication during pregnancy includes pregnancy induced hypertension and gestational diabetes. One child had a breech presentation during delivery and 12 children were born through cesarean section, others were per vaginal delivery. In the present study, 20, 10, and 3 children were the first, second, and third child of the family, respectively.A median of 4 (range: 2–6) casts was performed.. And regardless of statistically insignificant difference, the mean number of casts required for males is greater than females. The number of casts required between feet which had casting effect and non-casting effect is significantly different. And, all the 13 feet which encountered casting effect required tenotomy

Clubfoot Characteristics

10 children had a family history of clubfoot and a relatives like cousins, aunts, mother, uncle, and sister and aunts first child. 11 children had bilateral clubfoot. The finding of the present study shows that 13 of the feet were encountered different Ponseti casting effects during casting phase of treatment. For instance, 69.23% of feet had swelling on first day of cast and cast removed on the second day. Initial Pirani Score and Number of Casts Required Severity of the mean initial Pirani score for right and left feet were approximately similar with mean

severity of 5.212 (SD: 1.05) and 5.153 (SD: 1.17), respectively.

The mean number of cast required for correction of deformity was 5.54 (SD: 1.63). Significantly more number of cast were required in tenotomy group 5.89 (SD: 1.35) compared with non tenotomy group 3.81 (SD: 1.42) (P¼0.0001). The Pearson correlation coefficient is significant and showed moderate positive correlation between number of cast worn before correction of deformity and initial right Pirani score (r¼ 0.62, P<0.001) and initial left Pirani score (r¼ 0.675, P<0.001).

In the non-tenotomy group, there is strongly positive correlation between number of corrective casts required and initial right Pirani score (r¼ 0.724, P<0.001); and initial left Pirani score (r¼ 0.739, P<0.001).The tenotomy group also showed moderate correlation between initial right Pirani score and initial left Pirani score with number of cast required (r¼ 0.399, P<0.001) and (r¼ 0.443, P<0.001), respectively.

Achilles Tendon Tenotomy

The majority of the children (76%) required tenotomy either to the left (11.85%), right side (25.8%) or bilaterally (38.3%). Of the 54 feet which undergone tenotomy 42 feet had initial Pirani score 5–6 and 12 feet had Pirani score 3–4.5. Significant difference on overall initial Pirani score between tenotomy and non-tenotomy group (P value<0.001).

Discussion

Idiopathic congenital clubfoot is a common congenital foot deformity, treated by widely accepted and highly praised Ponseti technique to achieve early correction and better outcome. Pirani scoring is the most common method to track progress and to predict the need for tenotomy, and the number of casts of required for the treatment of clubfoot.

In the present study, clubfoot is more prevalent in males than females with a ratio of 2.05 to 1. Several previous studies have also reported similar results of male to female ratio with clubfoot deformity with minor exceptions. The mean number of Ponseti cast required for correction of clubfoot is 5.54 (SD: 1.63) which obeys to the gold standard postulated by Ponseti in which approximately 5 to 7 casts were suggested to correct the deformity. Findings of the present study also indicated that the number of casts applied is directly correlated with the initial Pirani. The use of Pirani scoring system for correlating the severity of clubfoot and the number of casts is supported by study conducted by different researchers, who found moderate to strong positive correlation between the initial Pirani score and the number of casts required to track the natural history of clubfoot and treatment effect.

This suggests higher Pirani score is indicative of higher number of casts required for the correction of clubfoot. Similarly, Mazlina[4] and collaborators reported no significant association between age and number of cast. However, studies conducted elsewhere reported significant correlation between age and the number of casts required for corrections of deformity and recommended that manipulation and casting should be started immediately or very soon after birth to guarantee high success rates. This difference may be because some of the contrary researches included children with age greater than 2 years in their study. The implication of this finding is age at the commencement of treatment may not significantly affect the number of cast as long as the child is less than 2 years of age Furthermore, Iltar and colleagues reported that children who start Ponseti manipulation and casting after the age of 1 month had better outcome than those who began before the age of one month. This is possibly due to the anatomy of the cuboid bone of tarsals, which is still not well ossified in the first month of life and may be compressed during the manipulations rather than corrected.

Study done in our institute reported that female required significantly (P¼ 0.019) less number of cast than males and female recover early than female. Nevertheless, in the present study the number of cast required is not significantly related with the gender[5] of children (P>0.05). Study focused on the assessment of severity and monitoring treatment of clubfeet in Children using the Pirani scoring system reported that the mean initial Pirani score of tenotomy group is significantly (P<0.001) different from non tenotomy group.

Those who underwent tenotomy had an average score of 5.5 compared to average of 4 for those who did not have tenotomy performed on them. Additionally, in the present study, a significant difference on the overall initial Pirani score between tenotomy and non-tenotomy group (P value<0.001) was observed. The study found a significantly higher initial Pirani score in feet requiring tenotomy and more number of casts, suggesting that the better feet correct without the need for surgical intervention. This showed that the Pirani scoring system can be used to clarify the need for tenotomy and allow estimating the number of casts per week. Clinically, this finding postulated that parents concern could be plausibly addressed during the pre-counseling sessions in respect to whether their children would require tenotomy or not and the estimated number of Ponseti cast their baby will require based on the initial Pirani score.

Dobbs et al reported that the more severe the initial foot deformity, the more the casts required to achieve correction. They also reported that the mean number of casts applied to achieve correction was

8. Moroney et al reported that the number of casts, decreased as they gained experience with the use of the Ponseti technique[6]. Patients received more than six casts in the early period before percutaneous Achilles tenotomy, but most patients with idiopathic clubfoot require four or five casts to achieve adequate correction.

Conclusion

The percentage change in Pirani score after serial manipulation using Ponseti method can be used effectively for prediction of need for Percutaneous Achilles Tenotomy in CTEV children.

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