

Analysis of Dimeglio Score with Modified Pirani Score for Assessment of Idiopathic Clubfoot Deformity in Infants: A Comparative Study!

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Abstract

Background: To evaluate Idiopathic clubfoot deformity of foot, several scoring systems have been proposed and modified Pirani score and Dimeglio score have stood the test of time. There is scarcity of literature comparing the two systems in depth. We tried to compare the scoring systems on user friendliness and predictability to find out whether any superiority exists, if any. We also tried out if Dimeglio score could be used as a guideline for performing tenotomy.

Methods: 82 feet of idiopathic clubfoot deformity were treated by Ponseti's Plaster technique and evaluated by both modified Pirani and Dimeglio score simultaneously with each cast until full correction was achieved. The scores were compared using standard statistical techniques comparing predictability and user friendliness. Tenotomy was done as per guidelines given by Pirani and corresponding Dimeglio score was assessed and evaluated.

Results: Dimeglio score took longer time as compared to Modified Pirani score. Strong positive correlation was found between corresponding Modified Pirani and Dimeglio Score. Pirani score had statistical significant Plateauing just prior to tenotomy. Dimeglio score of 5 or 6 was found in all cases where tenotomy was done with Equinus score 3 or 2, Curvature of lateral border and Derotation of carpedal block and Forefoot adduction score 0 or 1, with Cavus, Medial, Posterior crease, Muscle status score 0.

Conclusion: Both Dimeglio and Modified Pirani score have their advantages and shortcomings but most of the scoring correlate well. Dimeglio score can also be used to decide when to do tenotomy.

Introduction

Congenital talipes equinovarus (CTEV) or clubfoot is one of the most common congenital deformities. Congenital means by birth, the term talipes is derived from Latin, a combination of the words talus (ankle) and pes (foot), equinus – meaning horse like and varus literally means bent in Latin, actually where the heel is tilted toward midline [1]. It has an incidence of 1-2 per 1000 live births in Indian racial groups [2]. The ratio of male to female is 3 to 1 and 40% cases are bilateral [3].

In 1996, Dr. Ignacio Vincent Ponseti, work was published, who wrote about this low cost, effective method. Since then, this method got acceptance worldwide [4]. It has been a boon for children born with clubfoot deformity in developing countries like India. The Ponseti method of casting is reported to have 100% success rate with babies younger than 7 months old [5] and to be effective in the treatment of children up to 12 months of age [6].

There are various clinical assessment scoring systems such as Ponseti and Smoley [7], Catterall [8], Dimeglio [9], Harrold, and Walker [10]. Modified Pirani's method and Dimeglio scoring

methods are the two most commonly used scoring methods used in day-to-day practice. There is a scarcity of literature comparing the two evaluating systems.

We compared modified Pirani and Dimeglio scoring methods comparing the efficiency, predictability, and user-friendliness to find out mutual superiority if any.

Materials and Methods

The study was conducted at the premier Institute of Orthopaedics in New Delhi. The study period was conducted from October 2011 to March 2014. Children <1 year of age with clubfoot deformity; unilateral or bilateral attending CTEV clinic in the institute was included in the study (Picture 1-2).

Clearance from Hospital Ethical Committee was taken. All the advantages and disadvantages explained to the patient's attendant. Proper written consent was taken from patient's attendant.

All patients included in the study were evaluated thoroughly using detailed history and complete physical examination to rule out any associated deformities.

The individuals were then evaluated for severity using the modified Pirani scoring and Dimeglio scoring as a marker for the initial deformity and before each corrective cast, till complete correction is achieved by the same surgeon. Modified Pirani score comprises midfoot contracture score and hindfoot contracture score, and the maximum score is 6. Medial crease, curvature of lateral border of foot, and cavus, each is scored from 0, 0.5, and 1.0 depending on the severity of the

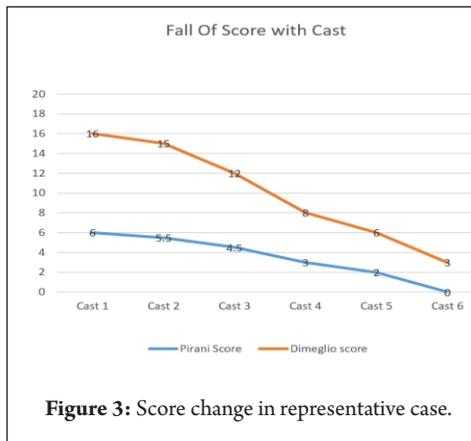
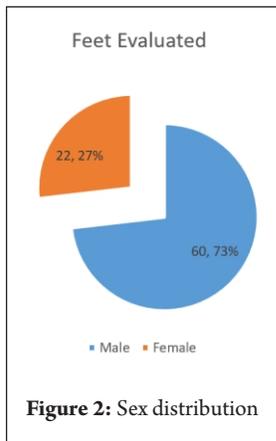
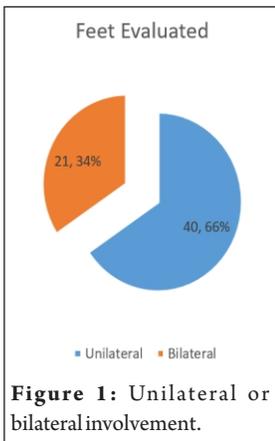
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deformity and total score is 3.

Posterior crease, heel pad, and equinus, each is scored from 0, 0.5, and 1.0 depending on the severity, and total score is 3.

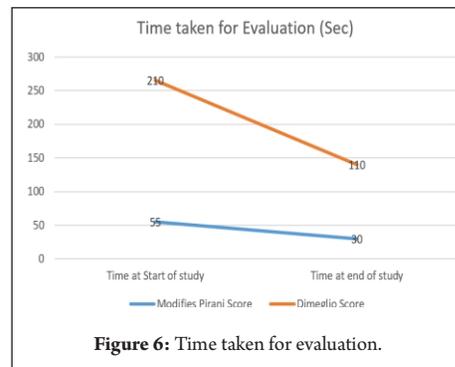
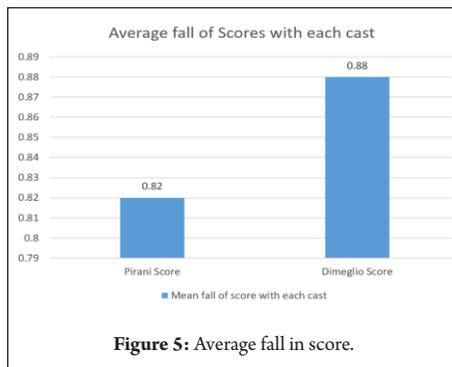
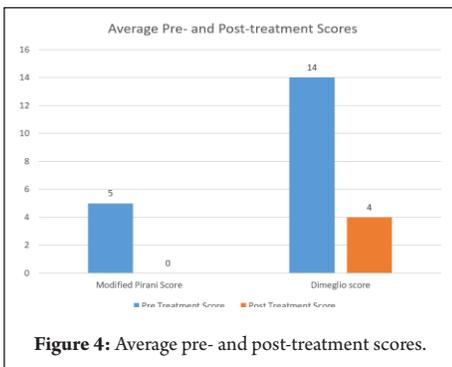
Dimeglio score

Dimeglio score [9] comprises 8 parameters. Equinus, derotation of carpedal block, forefoot adduction, and heel varus, each is quantified using a goniometer. From 90 to 45, it is scored 4, 45-20 quantified 3, 20-0 scored 2, 0 to -20 scored 1, and beyond -20 is scored 0. Cavus, posterior crease, medial crease, and muscle conditioned scored either 0 or 1. Max score being 20, minimum being 0.

Ponseti's method [11] was used for management. Ponseti method consists two phases, treatment phase and manipulation phase. The foot was manipulated before each cast was applied for about 2 min by the orthopedic surgeon, the thumb is positioned over the lateral aspect of the head of the talus, and the index finger is positioned behind the lateral malleolus. The cavus was first corrected by slight supination and by subsequent casts adduction, heel varus and equinus were corrected simultaneously.

After application of the first cast, the patients were called every week for a repeat of the procedure with increasing abduction. At the end of serial casting, the equinus, if any, was corrected by percutaneous Achilles tendon tenotomy which was done following guidelines are given by Pirani, i.e., when the hindfoot score was more than 1, midfoot score was <1, and the head of the talus was no longer palpable (Picture 3-4). The final cast was applied for 3 weeks and the patient reassessed.

The foot abduction brace was applied immediately after the last cast is removed (Picture 5). Foot abduction brace consisted of a



bar with shoes attached at the ends of 70° of external rotation for involved side and 40 on uninvolved side. The length of the bar was equal to the width of the child's shoulder. The brace was worn for as long time as possible preferably 23 h, but a minimum of 16-20 h for the first 4 months followed by night and nap time.

The child was followed up 1 week after removal of the last plaster cast (commencement of

brace application) for any complications related to the foot abduction brace. Thereafter, the child was followed up every 3 months. At each visit, the foot was assessed for any loss of correction, i.e., limitation of ankle motion, empty heel sign, and curving of lateral border of foot.

All the data were analyzed using SPSS version 10. Paired t-test was used to compare the significance of pre-treatment and post-treatment scores. Unpaired t-test was used to compare modified Pirani and Dimeglio score. Fisher exact test was used to evaluate the significance of plateau in scoring in modified Pirani and Dimeglio score.

Results

Total 61 patients were evaluated. 21 had bilateral affliction were as 40 had unilateral involvement (Table 1).

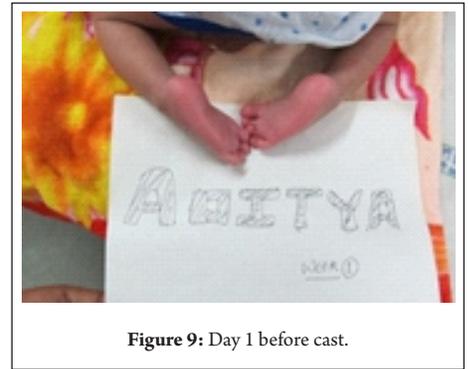
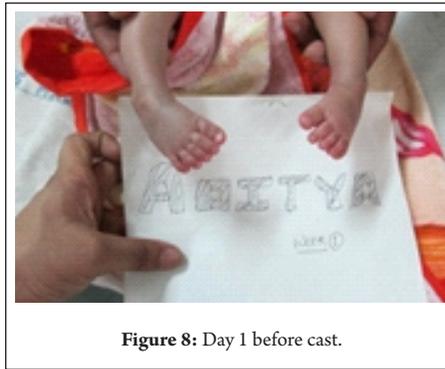
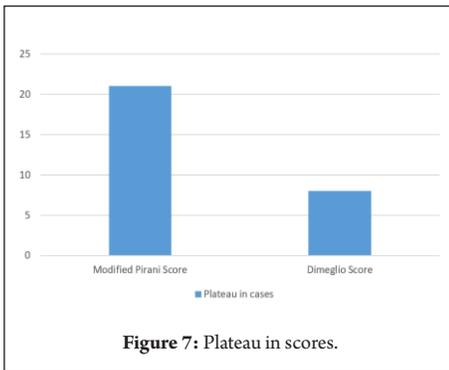
Out of 82 feet evaluated 60 were of male patients and 22 were of female patients (Chart 2).

Fall of one score with each cast correlated with fall in the other score, although was not a mirror image (Chart 3).

Pre-treatment mean Modified Pirani was found to be 4.86 ± 1.02 whereas Dimeglio score was found to be 14.93 ± 2.94 . Post-Treatment mean Modified Pirani score was 0. Post correction mean Dimeglio score was 3.88 ± 1.17 . (Chart 4).

Mean fall of Modified Pirani Score with each cast was 0.82 ± 0.23 and mean fall of Dimeglio score with each cast was 1.88 ± 0.46 (Chart 5).

Pirani scoring took an average 55 s for scoring one foot initially which reduced to 30 s at the end of study. Dimeglio scoring initially took 210 s and at the end of the study took 110 s (Chart 6).



Pre-treatment modified Pirani and Dimeglio score were found to have a strong positive correlation (p value = 0.001).

A positive correlation was found between initial Dimeglio score and number of casts required for correction of deformity (p value 0.041) and with Pirani score was not found to be statistically significant (p value=0.073).

Modified Pirani score did not change with subsequent casts (Plateau of score) just before tenotomy in 21 out of 82 cases as compared to 8 out of 82 with Dimeglio scoring (Chart 7). As per Fisher's Exact test the two-tailed P value = 0.0128 which was found to be statistically significant.

No other statistically significant difference was found between modified Pirani and Dimeglio score.

Discussion

Flynn et al. [12] conducted a study to assess Pirani scoring system and the Dimeglio score by two examiners simultaneously for intraobserver reliability and found correlation coefficients for both the systems comparable.

Chu et al. evaluated using Dimeglio/Bensahel and Catterall/Pirani classification systems found no difference between the Dimeglio/Bensahel and Catterall/Pirani classification systems when measuring their correlation with the number of Ponseti casts required for clubfoot correction [13]. Wainwright et al. evaluated 18 ft using four classifications, i.e., Catterall, Diméglio et al., Harrold and Walker, and Ponseti and Smoley and found Dimeglio scoring having greatest intraobserver reliability [14].

Cosma D and Vasilescu DE proved a good correlation between Pirani and Dimeglio score for evaluation of clubfoot deformity [15].

There are no guidelines regarding when to do tenotomy as per

Dimeglio score in literature, by our study, we could conclude that tenotomy can be safely done when Dimeglio score is ≤ 6 , with heel varus, forefoot adduction, derotation of carpedal block score 0 or 1, medial crease, cavus, muscle condition all scored 0 and equinus 1, 2, or 3, and posterior crease score as 1. Since modified Pirani score evaluates 6 deformities and Dimeglio score evaluates 8 and requires goniometric assessment, it takes longer to evaluate a foot by Dimeglio score than modified Pirani score.

Modified Pirani and Dimeglio score was found to have strong positive correlation; thus, a higher score in one score corresponded to a higher score in the other scoring system. Since the same foot was being scored by the two scoring methods, a positive correlation was an expected finding. Dimeglio score showed correlation ($P = 0.04$) with a number of casts required, whereas Pirani score did not have a statistically significant result ($P = 0.07$). Thus, initial Dimeglio score could be roughly used to predict the number of casts required for complete correction (though not with absolute accuracy). Statistically higher number of patients, when evaluated by modified Pirani score, had plateaued in their scoring (score did not change with one or more subsequent casts). This phenomenon was seen just before the tenotomy was required. Only 3 out of 82 ft evaluated had similar plateau when scored by Dimeglio score. This was probably due to the fact that in modified Pirani score when the foot is abducted beyond neutral, at around 20° talar head reduces and is no longer palpable and the score for talar head becomes 0. Further abduction (necessary for fulfilling the criteria for tenotomy, i.e., 70°), no longer changes the modified Pirani. Hence, sometimes 1 or 2 casts were required to achieve the required abduction (from 20° to 70°



abduction) before bracing/tenotomy could be carried out and during that period the modified Pirani score plateaus.

On analysis, both were found to be equally effective in the evaluation of Ponseti's method for correction of clubfoot deformity which is in accordance with the previous studies. Predictability of Dimeglio score was found to be better (stronger correlation with a number of casts required for full correction) than modified Pirani score.

Regarding user-friendliness, we found modified Pirani score too easy to use in day-to-day practice as it took less time and did not require goniometric assessment and had a smaller learning curve with comparative efficiency as compared to Dimeglio score.

We found Dimeglio score to be a better tool for research purposes as it did not have plateau of score (insignificant majority of cases) and did have a stronger correlation with a number of casts required.

Limitations of study and future prospect

Only 82 ft were evaluated. Study on larger number of feet needs to be done to further validate the findings.

Since both scoring methods were used by a single examiner, further study can be done where two examiners could use the same score to evaluate the reproducibility of the scores.

Clinical relevance

We feel since there is little difference between the two scoring systems and modified Pirani score takes less time during evaluation it is a better choice in clinics catering high volume of patients. On the other hand, Dimeglio score has low rate of plateau and the higher score has greater drop on each cast so can be a better tool for research purposes.

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