



Functional Results after Surgical Correction of Neglected and Relapsed Clubfeet

Authors

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Abstract

Introduction: Clubfoot is a common congenital deformity. Neglected clubfeet are not uncommon in the developing world where many children are brought late for initiation of treatment. The response to conservative treatment may not be adequate so as to achieve correction of deformity in all cases. Hence, some of these cases may require surgical treatment for correction of deformity.

International clubfoot study group (ICFSG) scoring system and the FRS system of Laaveg and Ponseti are validated instruments to evaluate the results of treatment in treated clubfeet. In this study we have used both the instruments to evaluate the results of treatment of operated clubfeet in neglected and relapsed clubfeet.

Material and Methods: 25 children, 16 with unilateral deformity and 9 with bilateral deformities comprising a total of 34 feet were evaluated for morphological, radiological and functional outcomes using the ICFSG scoring system and the FRS system of Laaveg and Ponseti. Children who had completed at least two years after the index surgical procedure were included in the study.

Results: 34 feet in 25 children were available for study after the inclusion and exclusion criteria had been met. The mean duration between the index procedure and evaluation was 2.95 ± 1.5 years (range 2-7.75 years).

The ICFSG score was at a mean of 6.029 ± 3.43 (range 2-14).

The FRS score of Laaveg and Ponseti was at a mean of 86.88 ± 9.47 for 25 male children and 87 ± 5.02 for 9 female children.

Discussion: A clubfoot is a congenital deformity with a reported incidence of 1-2/1000 live births. Weight bearing tends to aggravate the deformity making it stiffer and relatively resistant to conservative treatment. Many of these clubfeet that do not respond adequately to conservative line of management require surgery to achieve correction of the deformities.

In our study nearly half of the children (15 out of 34) scored excellent on the FRS score. 20 out of 34 feet scored excellent on the ICFSG scoring. A significant negative correlation was found between the two scores ($p < 0.002$).

Introduction

Clubfoot is a common congenital deformity⁽¹⁾. A neglected deformity is one in which there has been no treatment at all or inadequate attempts to

achieve correction. The fault for this may lie with the care providers' or health professionals. Once the child starts standing and cruising (that is decided primarily by the neurological develop-

ment in an infant), the deformity is made worse exaggerating its abnormal shape and leading to further deformation⁽²⁾.

Relapses after successful completion of treatment of idiopathic clubfeet is a problem that has plagued this disease since eternity. Relapses after Ponseti's technique are in the reported range of 5-35%^(2,3,4,5).

There have been some studies that have reported good results with conservative treatment of late presenting and relapsed clubfeet in the short to medium term evaluation^(6,7,8). However, surgical treatment remains a modality of treatment for neglected and relapsed clubfeet that fail to respond adequately to conservative treatment^(1,4,5,9,10).

To speak a universal language of clubfoot treatment and its results, the ICFSG (International Clubfoot study group) has devised a scoring system. It adds objectivity to the analysis of data available on this disease and also allows us to compare results across continents⁽¹¹⁾. Though comprehensive in its format, it lacks the narrative from the perspective of the major stakeholders in this journey, i.e. the children and their parents. The FRS by Laaveg and Ponseti lays emphasis on this aspect.⁽¹²⁾

At the outset, we wanted to test our hypothesis that a corrected deformity should look good in all aspects, morphological, radiological and functional and should also leave the children and their parents happy with the results. With this aim in mind we decided to evaluate the results of surgical treatment in neglected clubfeet using both ICFSG score and the FRS score of Laaveg and Ponseti.

Material and Methods

25 children, 16 with unilateral deformity and 9 with bilateral deformities comprising a total of 34 feet were evaluated for morphological, radiological and functional outcomes using the ICFSG scoring system and the FRS system of Laaveg and Ponseti. Children who had completed at least two years after the index surgical procedure were included in the study. There were

30 neglected in this study group. All relapses were after Ponseti treatment and had undergone tenotomy of the tendo Achilles in the past. All children with neglected clubfeet were initially approached conservatively and decision to operate was taken once the deformity was deemed to be unresponsive to manipulation and casting.

The FRS questionnaire is available only in English and the evaluator translated each question for the respondents into the local vernacular to the best of his capabilities. The appropriate answers were scored to the nearest possible score. Wherever there was a doubt, the result was downgraded to a poorer response.

Non-idiopathic clubfeet were left out of the preview of this study.

The technique of radiographic projection was standardized. The standing Antero-posterior radiograph of the foot was performed with an appropriate sized cassette placed beneath the foot and the tube angled 30 degrees from the vertical axis aimed from distal to proximal (toes to heel) at a distance of 90 cms from the foot. The standing lateral radiograph had the cassette placed parallel to the hindfoot and the tube parallel to the horizontal axis at a distance of 90 cms (65). On the AP film, axis of talus was drawn parallel to the medial border, axis of calcaneus parallel to the lateral border and the longitudinal axes of the first and the fifth metatarsals were drawn midway between the medial and lateral cortices of the metatarsals respectively. The angles measured on this view: talocalcaneal angle (TCA-AP) (20-40 *), angle between talus and longitudinal axis of first metatarsal (TALO M1 AP) (0- minus 20 *)^(13,14).

On the lateral radiograph the following axes were marked: longitudinal axis of talus (line bisecting the upper and lower margins of talus), axis of calcaneus (line tangential to the lower margin of calcaneus) and longitudinal axes of the first and the fifth metatarsals. The following angles were measured: talocalcaneal angle (TCA Lat) (35-50*), tibiocalcaneal angle (60-90*), Talo M1

angle (0-10*) and calcaneal- M5 angle (150-175*)⁽¹⁵⁾.

The calcaneo-cuboid alignment was determined as described by Thometz and Simmons⁽¹⁶⁾.

Mean and standard deviations were calculated for continuous variables. Independent T test or Mann Whitney was used to look for significant association between quantitative variables. The Kruskal- Wallis test was used to compare the results of functional rating system of Laaveg and Ponseti with radiological parameters. All tests were 2 tailed. The statistical version SPSS 20.0 (IBM SPSS statistics for window 20.0 Armonk NY>IBM Corp.) was used for analysis.

Observations and Results

This was a cross-sectional study conducted in a single institution on clubfeet operated by a single surgeon. In our study, there were 18 males and 7 female patients. In 16 children (64%) the deformity was unilateral and was bilateral in 9(36%) of patients.

34 feet in 25 children were available for study after the inclusion and exclusion criteria had been met. 21 patients had a right-sided clubfoot deformity and in 13 patients the deformity was on the left side. The age at the time of surgery ranged from 0.75 years to 6 years with the mean age at the time of surgery being 1.64+_1.52 years. The mean duration between the index procedure and evaluation was 2.95+_ 1.5 years (range 2-7.75 years). The mean age at surgery in 25 male feet was 1.58+_ 1.32years and in 9 female children it was 2.3+_ 2.31 years.

The ICFSG score was at a mean of 6.029+_ 3.43 (range 2-14). 20 feet (58.8%) were rated as excellent (score of 0-5) and 14 feet (41.2%) were graded as good (range of 6-15). 25 male children had a ICFSG score of 5.72+_3.26 compared to the 9 female children who had a score of 6.44+_4.04(Fig1)

The FRS score of Laaveg and Ponseti was at a mean of 86.88+_9.47 for 25 male children and 87+_5.02 for 9 female children. 15 feet (44.1%) were rated as excellent (score of 90-100), 15 feet

(44.1%) were rated as good (score of 80-89), 3 feet (8.8%) fair (score of 70-79) and 1 foot (2.9%) was rated poor (score of <70)(Fig2).

The female children had a relatively poorer ICFSG score of 6.44+_4.04 as compared to male children who had a score of 5.72+3.26 but scored better on the FRS scale (87+_5.02 for females as compared to 86.88+_9.47 for males) but both these values were found to be statistically insignificant on the Mann Whitney test.

The radiological parameters like TCA-AP, TCA-Lat, TCI, Talo M1 were divided into subgroups and compared using the Kruskal -Wallis test with FRS within the same subgroup. The correlation was found to be statistically insignificant.

The two scores were non-normal in distribution. Therefore the log transformation of the two scores was done before using Pearson correlation to assess the correlation between two scores. There was significant (p<0.002) negative correlation (-0.530) between two scores using two tailed tests. The coefficient of determination R² i.e. the proportion of variation that can be explained by the model was found to be 0.264(Fig 3).

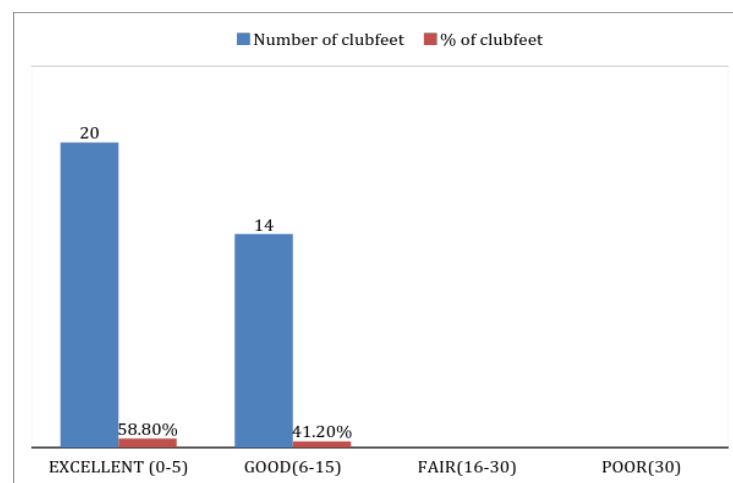


Fig 1 Clustered column chart showing results of assessment of operated clubfeet using the evaluation protocol by the ICFSG. The chart reads excellent to poor from left to right thereby conveying that a lesser score is a better outcome

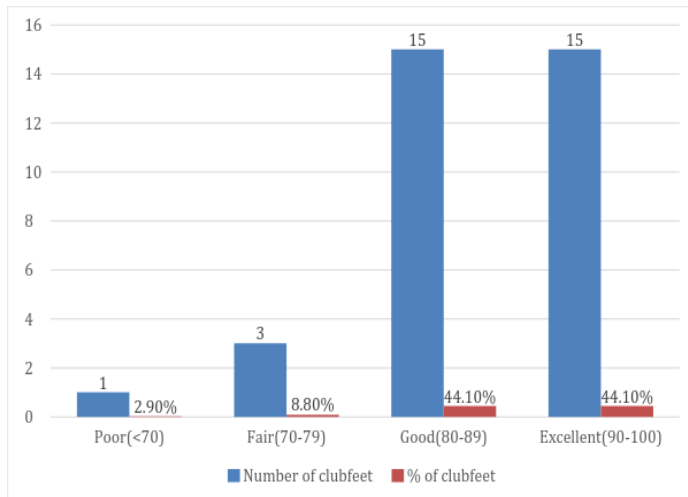


Fig 2 Clustered column chart showing results of assessment of operated clubfeet as per the functional rating system of Laaveg and Ponseti. The chart reads poor to excellent from left to right thereby conveying that a higher score is better outcome.

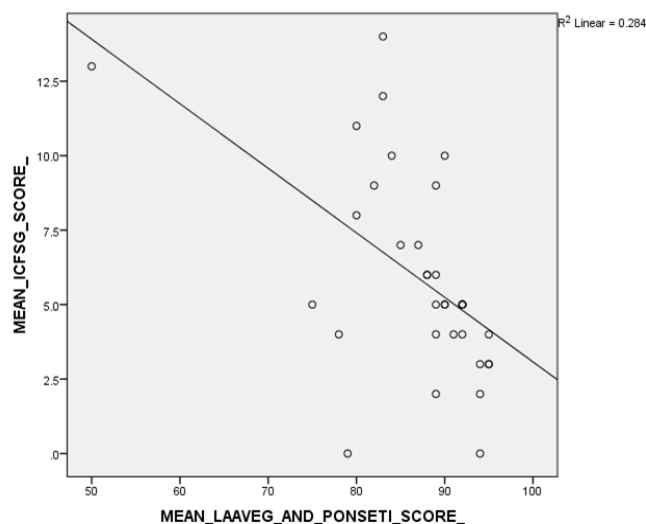


Fig 3 Scatter diagram showing correlation between the two scores. The two scores were non-normal in distribution. Therefore the log transformation of the two scores was done before using Pearson correlation to assess the correlation between two scores. There was significant ($p < 0.002$) negative correlation (-0.530) between two scores using two tailed tests. The coefficient of determination R^2 i.e. the proportion of variation that can be explained by the model was found to be 0.264

Discussion

A clubfoot is a congenital deformity with a reported incidence of 1-2/1000 live births ^(1,2).

Access to quality healthcare is a burning issue in many parts of the world. That coupled with lack of awareness amongst parents and primary health care professionals results in many children with clubfeet deformities being brought late for initiation of treatment. A neglected clubfoot is one on which the child has started standing and cruising. Weight bearing tends to aggravate the deformity by introducing bony changes in a deformity that is primarily a soft tissue problem to begin with. The treatment of a neglected and severe deformity is difficult with unpredictable results ^(2,3,5).

There is some suggestion in literature that if the primary treatment of idiopathic clubfoot is initiated after 7 months of age, the results of conservative treatment tend to be unpredictable ⁽¹⁾. Surgical treatment of neglected and relapsed clubfeet is an accepted modality of achieving deformity correction ^(4,5,10,17). The suggested technique of soft tissue release, “a la carte “ approach can effectively manage the various deformities while preventing an over do ⁽¹⁾. The hemi-Cincinnati incision permits the above aim to be achieved with few soft tissue complications ⁽¹⁸⁾. A single surgeon conducted all surgical procedures.

A closer look at the objective variables that are included in scoring systems available to evaluate the outcomes in clubfoot treatment show that they may be divided into (A) criteria that evaluate the function of the foot, (B) criteria that evaluate the tarsal relationships on radiographs and (C) criteria that evaluate the appearance of the corrected foot. The ICFSG (international clubfoot study group) recently published a scoring system that takes all the above three into account ⁽¹¹⁾. The inter observer and intra observer reliability of the score has also been validated ⁽¹⁹⁾.

Kite stated that to assess correction of a clubfoot deformity radiographically, the talus should be aligned with the first metatarsal and the calcaneus

with the fifth metatarsal but he never mentioned that the anteroposterior talocalcaneal angle can be used as a measure to define correction of the deformity. This angle was first described by Wisburn but has been erroneously attributed to Kite⁽²⁰⁾. In our study 13 (28%) fulfilled the criteria set by Kite. Radiology and functional outcomes have not correlated well with each other. Evaluation of the radiograph is difficult to reproduce due to difficulty in positioning the feet for examination. We believe that the various angles measured on the radiographs represent various components of the club foot in three dimensions and if studied together should be able to define whether the deformity is comprehensively corrected or not. The only issue in this premise is that the aim of deformity correction in clubfoot is to achieve a plantigrade foot and not a normal foot. It has been our experience that radiograph of the so-called normal side in a unilateral clubfoot demonstrate a wide variation in the values of the angles measured⁽²¹⁾.

The FRS score by Laaveg and Ponseti relies on the patient's satisfaction with the treatment rendered and the response thereof. In case of clubfoot treatment this most often is the parent's satisfaction as small and young children may not effectively able to answer all questions and even if they do so, their response may be biased by their parent's observations⁽¹²⁾.

It had been our premise at the beginning of this study that a child should score good or bad on both the ICFSG and FRS scores for a treatment to be labeled as a success or failure. In the subsequent endeavor we evaluated the results of operated neglected and relapsed clubfeet by a single surgeon and with at least two years of postoperative follow-up.

In our study nearly half of the children (15 out of 34) scored excellent on the FRS score. 20 out of 34 feet scored excellent on the ICFSG scoring. A significant negative correlation was found between the two scores ($p < 0.002$).

The treated children of this study group need to be followed till skeletal maturity to establish whether

the results obtained thus deteriorate over a period of time. We wish to report the same in due course of time.

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