The Rate of Recurrence of Club Foot Deformity in Patients Using
Dennis Brown Splint

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Abstract

Objective: To estimate the rate of recurrence of deformity in patients using Dennis Brown Splint and for the description of the issues related to non-compliance of the Dennis Brown Splint.

Material and Methods: It was a prospective descriptive case series study. 70 patients with corrected Club Feet were selected from APPNA Rehabilitation Department of Benazir Bhutto Hospital. The patients were given the Dennis Brown Splints for the maintenance of the correction followed by Ponseti method. Clubfeet were graded according to the Pirani scoring system check the recurrence of the deformity. Patients were called for routine follow-up to check the rate of recurrence of the deformity and parents were interviewed for the issues related to non-compliance to the bracing program. Duration of the study was 12 months followed by the bracing.

Results: It is founded that the recurrence of the deformity is about 24%. 17/70 reported with recurrence with the deformity after correction during bracing program. While the issues of non-compliance 47% reported with skin problems while 45% reported with residual adduction of the foot part due to loosening of the screw. 30 % reported that their babies withdraw the foot from the shoes by applying force. 70% of the families don’t have even basic education which also adds to the poor outcomes.

Conclusion: It was concluded that relapse rate is 24% because of the issues related to the non-compliance from which main issue is skin damage. The second other cause is repeated residual adduction due to the loosening of the screw. Most of the families have very low education so it was founded very difficult to counsel them. Some families also quit from bracing without informing the consultants.

Key words: Club Foot, Dennis Brown Splint.

Introduction:
The aims of the long-term treatment of clubfoot are a pain-free, flexible, pantigrade mobile foot, with tolerating ability of normal footwear \textsuperscript{(1)}. Untreated clubfeet may lead to the physical disability due to deformed feet, this disability will affects mobility of the individual. This will limit their potential productivity and degree of freedom. The un-treated clubfoot deformity results in disability for the individual, a reduced living standard for the entire family, and a burden not only for the community but also for the nation \textsuperscript{(2)}.

The traditional treatment of clubfoot may involve a combination of initial plaster of paris casting, extensive posterior medial soft tissue releases and bony procedures, followed by further casting.

Significant risks are associated with this treatment, complications, and potential for poorer prognosis and patients developing weak, stiff and scarred feet. Follow-up studies have also shown that these corrected feet have a higher incidence of pain and their normal gait cycle is affected\textsuperscript{4}. After adolescence, there is increase in pain and often becomes crippling \textsuperscript{(3)}. A Ponseti method has become the standard of care and completely give-
off the need of extensive operative correction in over 98% of patients when applied correctly. The treatment involves manipulation, a series of castings, percutaneous Achilles tenotomy and foot bracing (4). The Ponseti treatment technique for the correction of clubfoot deformity was introduced in North America in the late 1940s and now is has become a primary treatment option in many countries (5).

The Ponseti manipulations combined with the percutaneous tenotomy regularly achieved an excellent result, more ever without a well maintained follow-up of bracing program, relapse may occurs in more than 80% of non-compliant families while in contrast the relapse rate is only 6% in compliant families(6). The child must wear the Dennis Brown Splint day and night for 10 weeks and then during the sleep until the child is four years old to prevent the relapse of the deformity(7).

Lack of compliance causes the majority of relapse as the child may have problem in sleeping and in wearing the Dennis Brown Splint, that is why the parental counseling is vital and very much important in this regard(8).

Bracing plays very important role in the maintenance of corrected club foot and allows the foot to achieve normal position after tenotomy followed by serial casting. (6,7,9)Bracing holds the foot not in corrected but in over corrected position so that the normal position of the foot could be achieved after the correction. Without bracing it is almost impossible for the physician or the surgeon to maintain the correction. (9)

The purpose of this study was to evaluate the rate of relapse and Issues of Non-Compliance in Patients using Dennis Brown Splint for the maintenance of corrected clubfoot in our setup.

Material and Method

The study was conducted at APPNA Rehabilitation Institute of Benazir Bhutto Hospital Rawalpindi from April 2011 to 31st June 2012. It was a descriptive case series study. After correction with Ponseti Club Foot Management System, maintained the correction of the club feet with the help of Dennis Brown Splint, of either gender from birth till two and half years of age with Idiopathic clubfeet. Dennis Brown Splint was started immediately after the removal of final cast followed by the Tenotomy. Pirani Score was recorded on every visit of the patient to the Rehabilitation Department. Before including the patient in the study informed consent was taken.

Children older than 2 ½ years of age, and previous operative treatment were excluded from this study. To check the relapse of the deformity every clubfoot under study was graded according to the Pirani Scoring System(7) on every routine visit to the APPNA Rehabilitation Department of Benazir Bhutto Hospital. The deformities were corrected in the sequential order as described by Ponseti(6).

Immediately after removal of the final cast Dennis Brown Splint was started. On affected side the angle at the abduction bar was given 70 degrees while on sound side it was 45 degrees.

In case of a-typical club foot the abduction of 45 degrees given on both affected and sound side. For initial three months brace was used for 23 hours a day. After that 12-14 hours a day, 12 hours in night time and two hours at noon up to the three years. Patients were called for 1st follow-up after 15 days use of brace and after that monthly bases follow-up was maintained for initial 3 months to check the relapse of the deformity. After 1st three months of bracing program patients were called with three months interval to check the recurrence of the deformity and to check the issues of non-compliance of the Dennis Brown Splint.
Discussion

University of Iowa named Ignacio Ponsetiat was the pioneer of non-operative treatment of clubfoot; they practiced a method five decades back, which is different from Kite and others. Currently this method is the gold standard of clubfoot treatment. (4) There are two phases of Ponseti method, the treatment and maintenance phase. (5) Our aim was to find out the rate of relapse and issues related to non-compliance of Dennis Brown Splint in maintenance phase after correction of clubfoot deformity. Maintenance of corrected clubfoot in a foot abduction brace is a different phase of management that requires a long term follow-up, and in this study we follow-up the patients for minimum one year, who were using Dennis Brown Splint for the maintenance of Corrected clubfeet.

In a study by Morcuende et al. (6) Male ratio was 68% while in this study the ratio of male babies was 64.3%. The age of the patients vary from 2 months to 30 months. Maximum of the patients were treated within the 6 months of age.

Bilateral deformity was present in 45.7% of the patients and right side was most common involved side in unilateral deformity, where as in a study by Gupta et al. (3) bilateral involvement was present in 60% of patients.

17 patients of total 70 reported with the relapse of the deformity during maintenance phase after correction by the Ponseti technique. Morcuende et al. (6) has described in his study that relapse may occurs in more than 80% of non-compliant families while in contrast the relapse rate is obly 6% in compliant families. In our study we also founded that main reason of the relapse was the non-compliance of the parents to the Dennis Brown Splint.

Skin damage in most of the cases was mild, only damage to the superficial portion which was corrected by the cushioning of soft in-liners. It was

Dennis Brown Splint was used to maintain 10-15 degrees dorsiflexion and 70 degrees external rotation. Pirani scoring was regularly revised on each routine visit to check the recurrence/relapse of the deformity. The variables following variables were noted on every routine visit to the APPNA Rehabilitation Centre, Skin Damage, Self withdrawal of appliance and Internal Rotation.

Results

A total of 70 patients are presented and out of them 64.3% babies were male. Right side was affected in 35.7% of cases where bilateral involvement was seen in 45.7% of patients. Relapse was reported in 17 patients which were about 24.3% of total number of patients. Skin damage was present in 38 patients where 5 reported with severe damage which indicates that 54.3% patients had skin damage. Repeated removal of appliance was present in 22 cases, which were 31.4% of total patients. Repeated Internal Rotation was present in 32 cases, which were 45.7% of total number of cases. (Table I & Figure I)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Present</th>
</tr>
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<tbody>
<tr>
<td>Skin Damage</td>
<td>38</td>
</tr>
<tr>
<td>Repeated Removal</td>
<td>22</td>
</tr>
<tr>
<td>Repeated Internal Rotation</td>
<td>32</td>
</tr>
<tr>
<td>Relapse</td>
<td>17</td>
</tr>
</tbody>
</table>

Table I: Number affected cases

![Percentage of Affected Cases](image)

Figure I: Percentage of Affected Cases
severe in 5 patients and other suffered from moderate damage of the skin. There was also redness of the skin in many cases and a few of them also reported with small blisters. This redness and small blisters were the threatening signs for the parents and they discontinue the use of brace or reduced the wear timings of brace. That also added in the relapse of the deformity. 

The repeated internal rotation of the foot portion was reported. And that was mainly due to the parents of the child or by the child himself by applying inward forces. Parent loosens the screw for the comfort of their child. Some of them were also worried that there was excessive external rotation that’s why they reduced that.

Repeated withdrawal from the shoes was present in about 1/3rd of the patients and mainly it was due to the loosening of the shoes. It was also noted that these withdrawals from the shoes also cause the skin damage.

The other contributing factors in relapse were the social problems e.g different suggestions from different persons in the community and the use of personal experiences. Bracing program greatly disturbed in funeral and wedding ceremonies, due to lack of look after of the child by the parents and due to cosmoses as well.

Use of Dennis Brown Splint fabricated at APPNA Rehabilitation Centre was the limitation of the study. The follow-up was not more than 12 months included in this study while the bracing program is recommended up to 4 years of age.

Conclusion

It is concluded that the skin damage is from one of the main causes of non-compliance. By using appropriate skin friendly materials we can reduce the skin damage. Proper sizing must be considered in fabrication of appliance, so that self withdrawal can be decrease. By reducing self withdrawal from the foot part, we can also decrease the skin damage. To stop the reduction in external rotation, a fixed type external rotation may be given. There is need of proper counselling of the parents to maintain strict follow-up. Counselling is also important for the proper use of brace. Self adjustments or modification of bracing schedule should be discouraged. Need to design a brace which cover the issues of non-compliance so that recurrence may be decreased.

References


