

# Effectiveness of an Indigenous Orthosis for the Management of Congenital Talipes Equino Varus - A Case Study

Minakshi Behera<sup>1</sup>, A. Subha<sup>2</sup>, Surajit Kumar Sahu<sup>3</sup>

<sup>1</sup>Assistant Professor (P&O), National Institute for Empowerment of Persons with Multiple Disabilities (Divyangjan), ECR, Muttukadu, Kovalam Post, Chennai-603112, Tamil Nadu

<sup>2</sup>Ex-student, ISHWAR Institute of Prosthetics & Orthotics, AA-23, 3RD Street, 3RD Main Road, Anna Nagar, Chennai-600040, Tamil Nadu

<sup>3</sup>Ex-Assistant Professor (P&O), ISHWAR Institute of Prosthetics & Orthotics, AA-23, 3RD Street, 3RD Main Road, Anna Nagar, Chennai-600040, Tamil Nadu

Corresponding Author: Minakshi Behera

## ABSTRACT

**Background:** Although the orthotic treatment of CTEV has mixed evidence, still it remains the mainstay of conservative management (Ponseti Casting Technique) in economically developing countries, where bracing is a critical component of the current standard of treatment for CTEV or clubfoot.

**Objective:** Thus this study aimed to design a cost-effective Indigenous Orthosis for the Management of Congenital Talipes Equino Varus with Ankle foot orthosis. So that it can avoid unnecessary wearing of CTEV shoes.

**Study design:** A case report

**Methods:** The subject reported was a 2-year-old male child with a Pirani score of 5 congenital bilateral CTEV deformity. An Indigenous CTEV Orthosis with the combination of AFO and Denis Browne Splint was designed by the clinical team and the subject was followed prospectively for the next 1 year using the orthosis.

**Results:** The Pirani score of 2 was achieved after the use of this Indigenous CTEV Orthosis which was 5 before using the orthosis.

**Conclusion:** Indigenous Orthosis can be considered as a very excellent orthosis for the orthotic management of CTEV. As this orthosis fulfills all the desired function with some additions like lightweight, inexpensive, better correction of the angulations and the most important thing are that there is no need to wear any kind of shoes.

**Key words:** CTEV, Pirani Score, AFO, Denis Browne Splint, Indigenous CTEV Orthosis.

## INTRODUCTION

Congenital talipes equinovarus (CTEV) is defined as fixation of the foot in Cavus, adduction, varus, and equines (i.e. inclined inwards, axially rotated inwards, and pointing downwards) with concomitant soft tissue abnormalities<sup>[1]</sup>. It is a common deformity where the affected foot is turned inward. It occurs in every 1.2 in 1000 live births and is the most common

musculoskeletal congenital birth defect<sup>[2, 3]</sup>. The etiology of congenital clubfoot is largely idiopathic;<sup>[4]</sup> however; it can be associated with other conditions such as spina bifida, arthrogryposis, or other syndromes in approximately 20% of the cases<sup>[2]</sup>.

While the casting phase of the treatment is relatively short and has the most visible effect on the correction of the

deformity, the bracing phase that lasts for 4-5 years is essential for the success of the method. Bracing must be done every night, is mainly the responsibility of the parents, and is done with limited clinical supervision.

Bracing is a critical component of the current standard of treatment for clubfoot. Given the current state of knowledge, the present study aimed to design a cost-effective Indigenous Orthosis for the Management of Congenital Talipes Equino Varus with Ankle foot orthosis. So that it can avoid unnecessary wearing of CTEV shoes.

## METHODS

### Subject

A sample convenience of one patient (age 2 years) with bilateral CTEV leg took part in this study. The patient was recruited from Chennai, India. The age, gender, and other anthropometric data were collected from the patient's parents. A detailed explanation of the study was given to parents after they signed an informed consent form.

### Clinical Decision

We treated a 2-year-old child who sustained congenital CTEV. Physical examination revealed that both the leg had forefoot adduction and supination, plantar flexion of the ankle, high longitudinal arch, and tibial torsion. Though the patient was in his initial stages of Congenital CTEV deformity and belonged to a poor socio-economic group, the preferred treatment

was conservative in form of the Ponseti casting technique. Then the patient was referred to the orthotic department for brace management. At this time, it was determined to initiate an Indigenous Orthosis for the Management of Congenital Talipes Equino Varus.

### A New Design

Over the past several years, we have been using an orthosis that meets the functional requirements and one that also cosmetically acceptable. This orthosis is designed similar to the Denis Browne type splint without CTEV shoes. It is the combination of an Ankle foot orthosis (AFO) with Denis Browne splint. In the case of CTEV shoes, we are using Plastic Ankle foot orthosis (AFO) which will allow more correction with a certain period.

### Fabrication Procedure

#### AFO fabrication:

AFO was fabricated as per regular procedure (Figure 1).

#### Design of adjustable bar and rotation control plate:

Two Al bars of maximum length between the ASIS of the child were taken (approx. 8 inches or 20cm and width = 2.5 cm). Bars were grooved rectangularly for adjustable mechanism. Two Footplates were made up of with 4mm polypropylene sheet. Three holes of 4mm were drilled on two plates to control the rotation of the foot at 5°-15° medially and laterally. Plates are attached to the bars and AFOs.



FIGURE 1: AFO



FIGURE 2: Aluminium Bars



FIGURE 3: Foot Plates



FIGURE 4: Indigenous CTEV Orthosis

The biomechanical principle of this splint is the combination of the biomechanics of DB splint and AFO.

### Patient Evaluation on Orthosis and Follow-up

The patient was examined for foot deformity by Pirani score, use of new indigenous CTEV orthosis was noted. After correction, the patient was followed up first at 15 days and then at every month for 3 months and then every three monthly till 1 year.

Pirani score has high inter and intraobserver reliability and is used as a clinical tool for assessment of clubfoot. Pirani scoring system was used in this study to assess the severity of deformity and to assess the correction achieved.

### RESULTS

The Pirani score 2 was achieved after the use of this Indigenous CTEV Orthosis which was 5 before using the orthosis.

### DISCUSSION

CTEV is one of the commonest congenital deformities. It is a complex deformity comprised of equinus, varus, adduction, and cavus, which are difficult to correct. It requires meticulous and dedicated effort on the part of treating physicians and parents for the correction of the deformity [5]. The goal of treatment is to reduce or eliminate these deformities so that patient has a functional, pain-free, plantigrade foot

with good mobility without calluses and does not need to wear modified shoes [6].

Presently, there are three major categories of brace designs available in market: Ankle Foot Orthosis (AFO), Wheaton Brace or similar braces, and Foot Abduction Brace (FAB).

The AFO design follows a similar concept to braces described in the historical review, such as the tin rectangular varus night shoe. It fully covers both the foot and ankle, thus providing only the dorsiflexion built into the brace, which is usually set at neutral. Importantly, it does not provide abduction, which is important for the stretching of the medial structures.

The Wheaton Brace, and other similar devices based on the same construct, can provide some abduction of the foot. A Velcro strap is tightened against the apex of the deformity.

A FAB consists of two shoes connected by a bar. If the deformity is unilateral, the external rotation on the affected foot should be set to 60/70° and on the unaffected foot to 30/40°. The bar should be of the length between the child's shoulders and should be bent to allow for 10-15° of dorsiflexion. Traditionally these bars have been known as the "Denis Browne Splint." The Denis Browne Split utilizes an L-shaped bracket to hold the foot in significant dorsiflexion and is connected to open-toe boots.

This newly designed Indigenous CTEV orthosis is good in cosmetic appearance as well as provides more correction because of the corrective straps attached in AFO. This is a combined design of AFO & Denis Browne splint, so straps are required to fasten it. Some advantage of this orthosis is more comfortable for the child since the day of wear, less strain on foot and leg, fewer chances of developing a pressure sore, cost-effective, donning and doffing of orthosis is easier etc.

Although the satisfactory result was achieved in this case with the Indigenous CTEV orthosis, further investigation is

needed to prove the consistency of the result.

Future research should identify more populations in a variety of healthcare systems that may benefit from an Indigenous CTEV orthosis.

## CONCLUSION

It can be concluded that CTEV deformity can be effectively treated by this Indigenous CTEV Orthosis. The orthosis helps in ankle stabilization and controls the rotation of the foot only with the help of three control straps & AFO with a rotational control plate. This orthosis is simple, effective, light in weight, inexpensive, and the most important thing is that there is no need to wear any kind of shoes.

## Conflict of Interest

The author does not have any conflict of interest regarding research, authorship, and publication of this article.

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## Authors' Contributions

The entire clinical course of functional fracture bracing service delivery was done by Ms. A. Subha towards the fulfillment of a bachelor's degree research project under the guidance of Mrs. Minakshi Behera and Co-guidance of Mr. Surajit Kumar Sahu. The manuscript preparation is done by Mrs. Minakshi Behera. All the clinical service delivery to patient and

research study was carried out in the premises of IIPO, Chennai.

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