

Effect Of Ponseti Technique On Tibial Torsion In Unilateral Idiopathic Clubfoot Deformity

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Abstract

Background: CTEV is a common congenital deformity of foot. Incidence is 1 per 1000 live birth. Tibial torsion deformity with internal tibial torsion is associated with CTEV. Most of these deformities corrects as age advances, but residual deformity brings concern to parents. Patient walks with intoeing gait. So this deformity needs early diagnosis and assurance to the parents.

Material & Method: 18 unilateral CTEV were included in this study. All patients were treated with Ponseti technique and TA tenotomy for residual equinus deformity. Internal tibial torsion was measured with thigh foot angle (TFA) method after correction of CTEV and compared with normal foot.

Result: The degree of difference is insignificant (less than 3 degrees) in 16 patients, remaining 2 patients have 4 to 5 degrees difference in tibial torsion compare to normal side. Also the P score value is <0.001, which is significant.

Conclusion: Internal tibial torsion was significantly corrected after serial casting done by Ponseti method in CTEV patients. Method used for measurement of TFA in this study is cost effective and reproducible.

Key Words: CTEV, Thigh foot angle(TFA), Tibial torsion.

Introduction

Congenital talipes equinovarus (CTEV) or clubfoot is multidirectional complex foot deformity (1). The basic components of deformity are Equinus, Adduction, Varus and Cavus deformities, which are present along with tibial intorsion deformity (2). Torsional deformities in the long bones of the lower extremities is common in pediatric population (3). Torsional abnormalities may result from any deviation from normal intrauterine growth (4). These deformities often cause postural defect leads to abnormal gait which brings concern to both parents and clinicians. In some study torsional difference is seen which causes recurrence of deformity in treated clubfoot (5). The main goal while treating the idiopathic clubfoot is to achieve normal looking, functional, painless, plantigrade, supple foot by correcting all components of deformity. In literature, there are various methods to measure tibial torsion from ultrasonography, CT scan to clinical methods, but there is no consensus about normal range of the tibial torsion (6,7,8). Each method has its own advantages and disadvantages and no conventional technique for routine assessment of tibial torsion has gained wide acceptance yet (9,10). The aim of the present study was to measure tibial torsion with the help of TFA in children having unilateral CTEV and to compare it with

the tibial torsion of normal side in same child after correction by Ponseti technique. According to Ponseti technique, serial casting not only corrects foot deformity but also proper manipulation of the foot with knee flexed 90 degrees, provides effective resistance to correct the internal tibial torsion with an external rotation force about the axis of tibia (11). Till date many studies has been done regarding treatment of CTEV. There are plenty of anatomical studies regarding measurement of tibial torsion in general population, many studies are supporting the presence of tibial torsion in clubfoot and have linked tibial torsion to recurrence of deformity in treated clubfoot (9,12), but in our search of Medline, Index Copernicus, Google scholar, we could not find combined study of correction of internal torsion in management of CTEV. Hence we felt the need of this study. Also, the Pirani score does not take into consideration internal tibial torsion which is also an anatomical and cosmetic deformity which we thought is important for final functional result.

Material And Method

Study design is analytical cross sectional prospectivestudy. Approval of ethics committee of our college was obtained. The informed consent form from the parents was obtained Study was done between July 2015 and May 2017. Children below 24 months of age with unilateral clubfoot deformity were included. Children older than 24 months with other congenital deformities, syndromic clubfoot, previously treated by soft tissue release, neurological causes of club feet, relapse, recurrence, rigid, bilateral clubfeet, were excluded The clubfoot deformity is corrected by Ponseti technique of serial casting followed by percutaneous tendo-Achilles tenotomy in patients who has residual equinus deformity. The foot of the child was examined

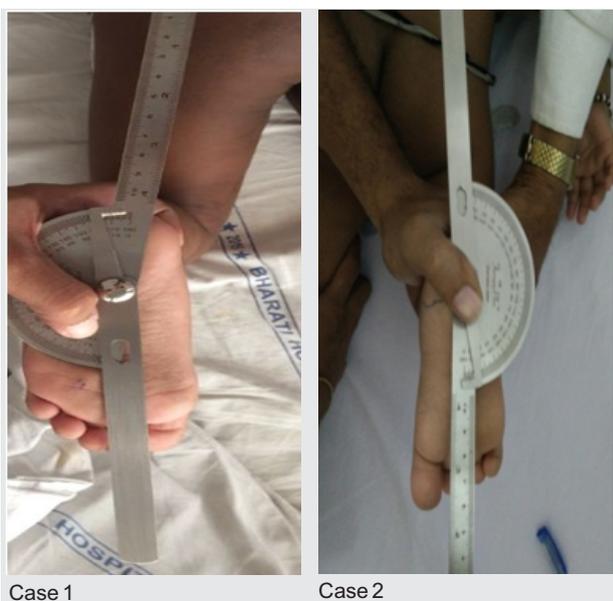
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clinically for Thigh-Foot angle (TFA) measurement, of both normal side and affected side after correction of foot deformity, which was calculated according to method described by King and Staheli(1984) using goniometer. Measurement technique: The patient was placed prone with the hip in extension, the knees together and flexed to 90 degrees. The ankle was carefully positioned in subtalar neutral (case 1 &2). A goniometer with 1-degree increments was aligned to the bisection of the approximate long axis of the femur and a line bisecting the calcaneus and ray of the second metatarsal. The difference of tibial torsion is calculated by comparing post correction affected foot with normal foot of same patient and unpaired t-test is used for statistical analysis.

Results:

There were 43 boys and 24 girls. Of these 48 had bilateral and 19 unilateral club feet totaling to 115 club feet. 18 unilateral club feet were included in the study with mean age of 2 months for comparing it to the normal unaffected side, of that 13 are male child and 5 are female

Table 1: Comparison Between Affected Side And Normal Side With Respect To Tibial Torsion In Unilateral Affected Cases:

	Affected Side	Normal Side
Number of patients	18	18
Min	6	5
Max	14	11
Mean	9.06	6.61
SD	2.34	1.61
Median	9	6
p-value	< 0.001*	

(* p-value significant, paired t-test used)

child. One patient was excluded from the study because of recurrence of the foot deformity. All children underwent treatment by Ponseti’s technique of casting, with or without Achilles tendon tenotomy for correction of residual equinus deformity. Study shows that after serial casting there is 2 to 3 degree of difference in 14 cases, 4 to 5 degree difference in 2 cases and absence or negligible difference (0 to 1 degree) in 2 cases between normal and affected side, which is after completion of treatment for CTEV. Out of 18 patients, 17 patients required tenotomy. Average number of plasters required to correct foot deformity is 4.5 and average number of weeks required to correct foot deformity is 6.5 weeks.

Discussion:

In order to treat bony deformity, knowledge of the development is necessary. In utero, lower extremity limb bud formation occurs during the 4th week of gestation. During the 7th week, there is medial rotation of the developing lower extremity, bringing the great toe in midline. Lateral or external rotation then occurs slowly throughout the remaining growth & development years until skeletal maturity (13). Torsional abnormalities may result from any deviation from normal intrauterine growth. As per literature data, the persistent of internal rotation can cause gait imbalance, disrupts the shock absorption function of the foot during loading response and compromise limb clearance in swing phase. It also contributes to medial compartment degenerative arthritis of the knee as the age progress (14). CTEV patients have internal rotation of Tibia but Pirani score does not measure it. We feel it could be important factor in long term results. Normal values of tibiofibular torsion have been established in past research via computed tomography, X-rays and ultrasound in different age groups. However, as most of the clubfoot patients managed in early age, generally treatment get completed by the age of 2 years, so we cannot depend on USG guided method, which is not possible below 4 years of age and also have not been shown to be reliable, so the clinical method of measurement of TFA is relevant and useful (12). Though this method has inter and intra observer error, but in our study it is found effective, as the P score value is <0.001 CT guided measurement of TFA is accurate but it is time consuming require elaborate equipment, costly to the patient and additionally causes radiation hazards in newborns (12). Since the TFA is a composite measurement of both tibiofibular rotation and hind-foot version, any talus or mid-foot abnormalities may interfere with accuracy, therefore we have measured affected foot after complete correction of clubfoot deformity, assuming opposite side normal for the individual. Despite previous research, there is currently an inadequate database of

normative values for tibiofibular torsion using the Thigh-Foot Angle (TFA) for congenital clubfoot deformity. Using a standard goniometer applied directly on the patient, the TFA can be used as quick screens that are appropriate for the clinical setting. The appropriateness of the TFA test for the clinical setting is based on their simplicity and time effectiveness. Therefore, more research related to the collecting of "normal" torsional data, using clinically appropriate measurement procedures is required (15). Engel and Staheli (1974), using the TFA test, determined the mean angle in skeletal maturity to average between 7 and 13 degrees of external tibiofibular torsion. Schwarze and Denton (1993) used the TFA on 1000 neonates less than 3 days old. They found a mean of 17 degrees internal torsion in boys and 15 degrees internal torsion in girls. One study compared the results of obtaining torsional data with a TFA versus computed tomography (Stuberg et al., 1991). Their data indicated that the mean difference between the two methods was 4 to 6 degrees.

They concluded that the degree of difference obtained by the two methods may not be clinically significant due to the five degrees of marginal error acquired with a TFA. The main drawback of the study is, it is pilot study. We unable to measure tibial torsion of affected side before starting the treatment so that we cannot comment level of effectiveness of serial casting on tibial torsion, but still the degree of difference compare to normal side is insignificant (less than 3 degree) in 16 patients. Also, this study does not include bilateral cases.

Conclusion

Our results show that internal tibial torsion is gets corrected in the affected leg of patient with congenital talipes equinovarus due to serial casting. Hence we propose that TFA measurement method described by King and Staheli is an inexpensive, readily measurable, non-hazardous and effective tool to find out the TFA for measurement of tibial torsion. This study is eye opener for future research.

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