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ORIGINAL RESEARCH

Assessment of Prognosis of Congenital TalipesEquinoVarus (CTEV) By Radiological Parameters-A Prospective Study

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Abstract

Background: Congenital TalipesEquinoVarus (CTEV) is one of the most common congenital anomalies, that needs timely intervention and proper maintenance treatment through meticulous follow up to obtain a satisfactory functional outcome. The type of intervention varies from case to case and it is determined by the severity of the deformity, the type of the deformity and the age at which the child seeks medical attention. Hence clinical as well as radiological evaluation of the deformity is essential before the commencement of treatment in CTEV, as it can contribute to the Outcome of Treatment and its prognosis.

Materials and Methods: The present Cohort study was conducted in theOutpatient Division of the Department of Physical Medicine & Rehabilitation, Government MedicalCollege, Thiruvananthapuram,Kerala.50 children with CTEV in the age group of 1 month to 5 years who received Conservative mode of treatment from the Department were studied.

Results:

In Children with Idiopathic Congenital TalipesEquinoVarus(CTEV), in the age group of 1 month to 5 years,who underwent Conservative mode of treatment with maintenance of correction using an Orthosis,it was found, after Clinical and Radiological Serial assessment, thatInitial TaloCalcaneal Angle of more than 10 degrees,Presence of Normal Cuboid Sign and Absence of InterSegmental Joint break in Radiograph of Foot of Children with CTEV have Significant Positive association with Prognosis in terms of Final Outcome of Treatment (Good and Favourable Prognosis)

It is also shown that CTEV has Male preponderance and Inverted Cuboid Sign in Radiograph of Foot indicates Severity of the Deformity.

Conclusion:

This is a Prospective Study of Children with Idiopathic CTEV in the age group of 1 month to 5 years,having undergone Conservative treatment as mentioned with Maintenance of correction using an Ankle Foot Orthosis. They were followed up for one year period from the

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start of treatment and assessed clinically on monthly basis and radiologically every three months.It is found that Radiological Parameters, viz. TaloCalcanealAngle, Normal/Inverted Cuboid Sign and InterSegmental Joint break have Prognostic significance in terms of Final Outcome of Conservative Management of Idiopathic CTEV.
(Initial TaloCalcaneal Angle of more than 10 degrees, Normal Cuboid Sign and Absence of InterSegmental Joint break are Radiological findings indicative of Good and Favourable Prognosisof Outcome)
Keywords: TalipesEquinoVarus,Talocalcaneal angle,Bilateral,Inverted Cuboid sign.

Introduction

Congenital TalipesEquinoVarus (CTEV) is one of the most common congenital anomalies, that needs timely intervention and proper maintenance treatment through meticulous follow up to obtain a satisfactory functional outcome.[1,2] The type of intervention varies from case to case and it is determined by the severity of the deformity, the type of the deformity and the age at which the child seeks medical attention. Hence clinical as well as radiological evaluation of the deformity is essential before the commencement of treatment in CTEV.[3-5]
The importance of roentgenography in CTEV is often underestimated. It gives a clear idea regarding the severity of the deformity, the type of the deformity and the presence of joint breaks orsubluxation/dislocation of Talocalcaneo-navicular joint, all of which contribute to the final outcome of treatment. It provides an accurate guide to progress, during the course of closed non-operative treatment and also helps differentiate true CTEV from postural club foot.[6]
The broad aim of the study is to assess the prognosis (finaloutcome) of Congenital TalipesEquino Varus (CTEV) deformityusing Radiological parameters. The Specific aims of the study are:

a) To assess the Severity of the deformity in CTEV using certain Radiological Parameters.
b) To study the bony changes and certain Angles seen in the Radiograph of Feet of children with CTEV and relate them to prognosis.
c) To evaluate the importance of proper Maintenance of correction in the Conservative management of children with CTEV.

Materials & Methods

Study setting
The Outpatient Division of the Department of Physical Medicine & Rehabilitation, Government Medical College, Thiruvananthapuram,Kerala.

Participants
Patients who received treatment from the Department of Physical Medicine & Rehabilitation, Government Medical College, Thiruvananthapuram, Kerala.

Study population
50 children with CTEV in the age group of 1 month to 5 years who received treatment from the Department were studied.

Study design
Cohort study

Inclusion criteria
- Children in the age group of 1 month to 5 years
- Children with Idiopathic Congenital Clubfoot.

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- Children who have undergone some form of primary conservative treatment with partially corrected or uncorrected deformity.

Exclusion criteria

Clubfoot secondary to other conditionslike Arthrogryposis,Myelomeningocele,Poliomyelitis etc.

Methodology

Detailed history including antenatal, natal, postnatal and treatment history is taken. The deformity is first assessed clinically and the initial severity of the deformity is studied radiologically using specific parameters. Clinical examination is done in every three months. TheRadiological examination of the Foot includes the study of A-P view and Lateral view of the X-ray foot, taken in the maximal corrected position. The Radiological parameters studied include Talo-Calcaneal angle, Talo-first metatarsal angle and Cuboid sign in A-P view and Talo-calcaneal angle, Tibio- talar angle and Tibio-calcaneal angle in Lateral view of the X-ray foot taken with the ankle held in maximum dorsiflexion. The presence of Intersegmental joint break is also noted. The maintenance treatment is advised depending on each case and regular follow-up including radiographic evaluation is being done (every 3 months). The results are analysed one year after commencement of treatment in each case and the results are classified into Good, Fair and Poor Correction, based on the following criteria.

1. Good Correction-Cases with Forefoot adduction 80% correction and Inversion &Equinus full correction.
2. Fair Correction- Cases with Forefoot adduction 60% correction, inversion&Equinus 80% correction
3. Poor Correction- Cases with Forefoot adduction< 80% correction or Uncorrected cases.

The Statistical Significance can be tested by applying the Chi-square formula.

Results

A total of 50 cases were analysed after conservative management and the following observations were made.

1. Age Distribution

Sl. No.	Age Group	Number of Cases	Treatment method used
1	1 month-1 year	14	Manipulation & Serial casting followed by DB splint application
2	1 year-2 years	22	Manipulation and Casting followed by Clubfoot boot or AFO
3	2 years-4 years	10	Correction maintained with AFO or Ankle boot
4	4 years-5 years	4	AFO after assessing severity

Table 1: Age Distribution

2. Sex Distribution

Total number of males-39

Total number of females-11

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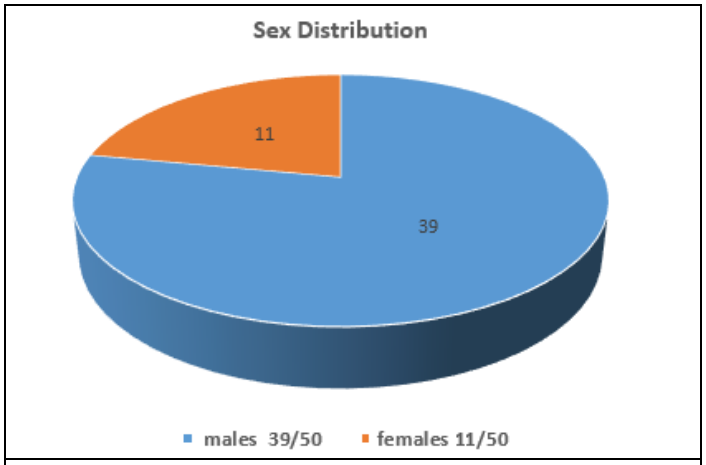

Figure 1: Sex Distribution

3. Laterality

Out of the 50 cases studied, 32 children (64%) had Bilateral deformity of foot, whereas 18 cases (36%) were Unilateral.

It is diagrammatically represented in Figure-2

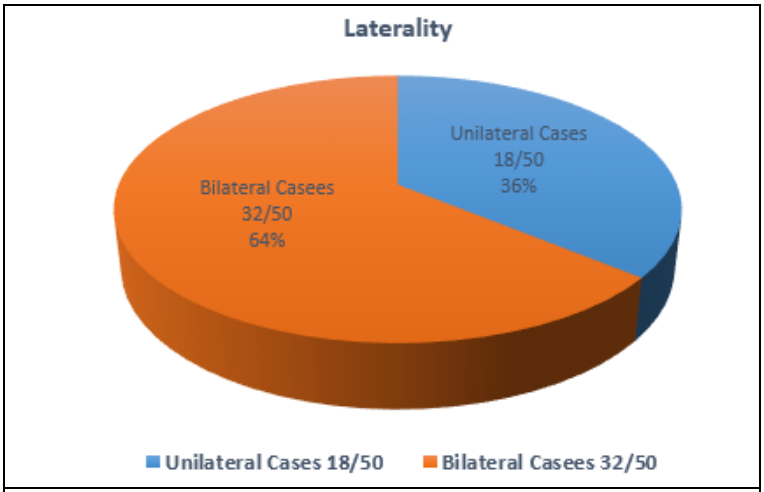

Figure 2: Laterality

4. The Relationship between Talocalcaneal angle(TC Angle) and final outcome

In those cases with TC angle < $10^{\cdot o}$, 33 % showed Good, 20% Fair and 47% Poor results.

Cases with TC angle >$10^{\cdot o}$ Good results were seen in at least 75% cases.

Fair results in 15 to 20% and Poor correction only in1 to 5% cases (as shown in Table-2)

Talocalcaneal angle in degrees	**Number of cases with the degree of correction attained in percentage (5)**		
	Good	**Fair**	**Poor**
0-10	33	20	47
11-20	75	20	5
21-30	78	21	1
>30	85	15	0

Table 2: Talocalcaneal angle & Outcome

'P' value=0.01

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The relationship between T.C angle and final outcome is diagrammatically represented in Figure 3.

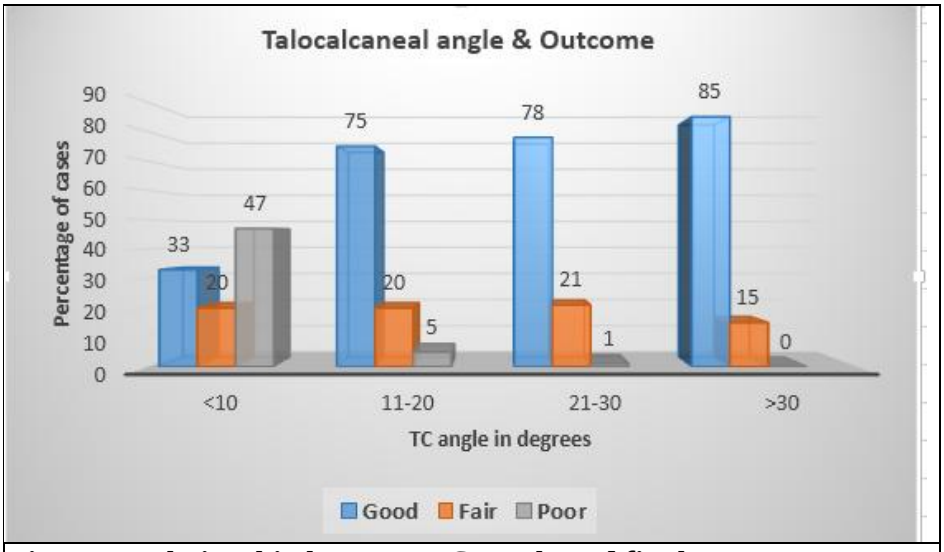

Figure 3: relationship between T.C. angle and final outcome

5. The Relationship between Normal / Inverted Cuboid sign and final outcome

Number of cases with Normal cuboid sign= 35 (70%) of which 29 cases (83%) showed Good, 5 cases (14%) Fair and 1 (3%) Poor results (correction)

Number of cases with Inverted cuboid sign=15 (30%) of which 5 cases (33%) showed Good, 4 cases (27%) Fair and 6 cases (40%) Poor results (correction)

It is shown in Table 3 and Figure 4.

Cuboid sign	**No. of cases**	**Results**		
		Good	**Fair**	**Poor**
Cases with Normal Cuboid sign	35 70%	29 83%	5 14%	1 3%
Cases with Inverted Cuboid sign	15 30%	5 33%	4 27%	6 40%

Table 3: Normal and Inverted Cuboid sign and Final Outcome

'p' value=0.01

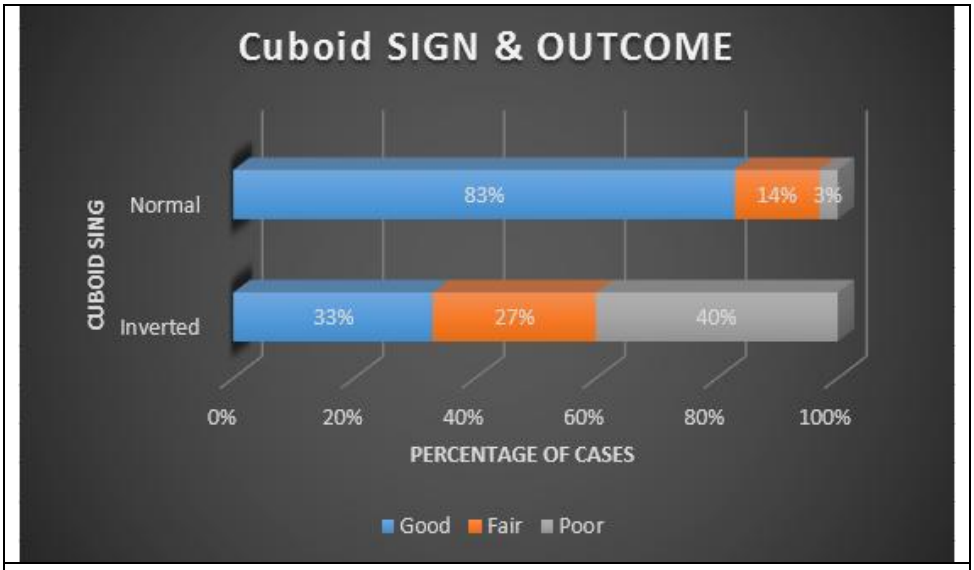

Figure 4

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6. The Relationship between Intersegmental joint break and final outcome

Number of cases without joint break = 36 (72%), of which 32 cases (89%) showed Good, and 4 cases (11%) Fair results of correction.

Number of cases with joint break = 14 (28%), of which 4 cases (29%) showed Good, 4 cases (29%) Fair and 6 cases (42%) Poor outcome.

The relationship between Joint break and outcome is shown in Table 4 and Figure 5.

JointBreak	Number of cases	Results		
		Good	Fair	Poor
Absent %	36 (72 %)	32 (89)	4 (11)	 0%
Present %	14 (28 %)	4 (29)	4 (29)	6 (42)

Table 4: Joint break & outcome

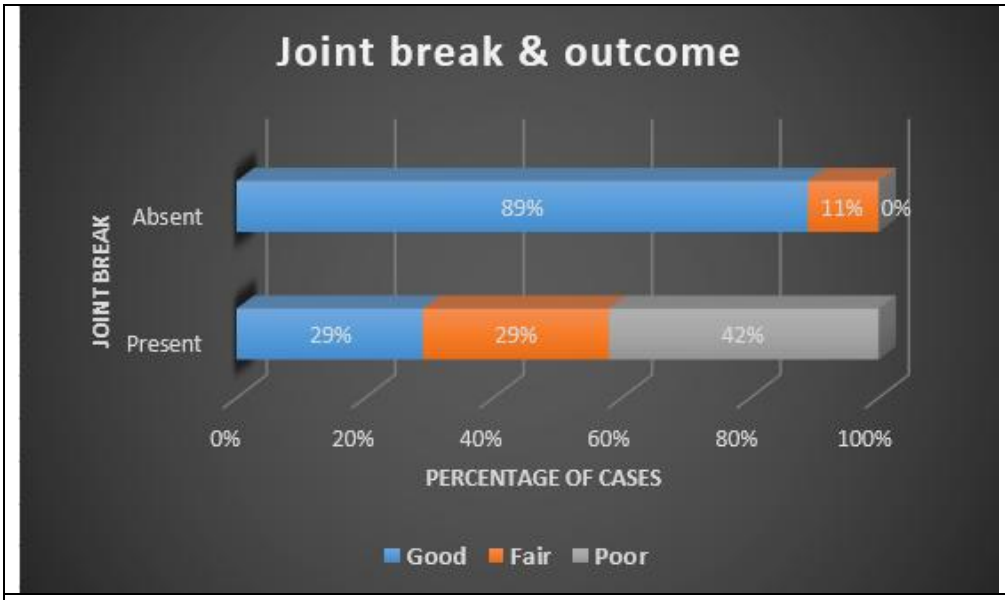

Figure 5

Radiologically,

Talocalcaneonavicular subluxation or dislocation was present in 40% (20 cases).

Most of the children under study were using DB splint (if < 1 year), Ankle Foot Orthosis (AFO) or Club foot boot for maintenance of correction.

Discussion

Congenital TalipesEquinoVarus (CTEV) is a complex deformity that is very difficult to correct fully. The mode of treatment (conservative or surgical or both) needs to be planned and Radiographic evaluation helps to a great extent in reaching at a definite & timely decision on correct plan of management, depending on the severity of individual cases. In this study, an attempt has been made to prognosticate the Final Outcome of the deformity in CTEV by specific Radiological Parameters.[7,8]

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1. Sex distribution

It has been found from the study that the male/female ratio of CTEV cases is 3:5:1. The literature gives a male preponderance with a male/female ratio of2:5:1 that may vary from race to race.

2. Bilaterality of the Cases

As per the literature, more than 50% cases are Bilateral. 64% cases have been shown to be bilateral in this study consisting of a total of 50 cases.

3. The Relationship between TaloCalcaneal Angle and Final Outcome of treatment

It is described in the literature that the TaloCalcaneal angle will be decreased from normal in children with clubfoot. In this study, an attempt has been made to highlight the significant relationship between the TaloCalcaneal Angle measurement and the final outcome. It has been seen that those cases with TC angle $< 10^{o}$ give unsatisfactory results, i.e., 33% cases showing Good correction. 20% Fair correction and 47% Poor correction, whereas those cases with TC angle $> 10^{o}$ give more satisfactory results with at least 75% cases showing Good correction and at least 15% showing Fair results. This observation has been found statistically significant with 'p' value 0.01.[9-14]

4. The Relationship between Normal and Inverted Cuboid sign and final outcome

Inverted cuboid sign is a sign of severe deformity. The study supports this fact, referring to Table 3, which shows that cases with Inverted cuboid sign resulted in 33% Good, 27 % Fair and 40% Poor correction, whereas cases with Normal cuboid sign (70% of total cases studied) showed 83% Good, 14% Fair and 3% Poor results. Hence Inverted cuboid sign portends a Bad prognosis (outcome).

5. The Relationship between the presence of Joint Break in radiograph of foot and final outcome

Referring to Table 4, it has been found that cases with Joint break gives Unsatisfactory results, i.e., only 29% cases showed good correction, whereas those cases without joint break have more satisfactory correction giving good results in 89% cases. These findings are supportive of the fact that the presence of joint break implies a bad prognosis as far as the final outcome is concerned.[15-20]

6. It has been proved beyond doubt that the Maintenance treatment with DB splint or modified ankle boot or AFO with medial upright, depending on each case, has a major role in the prevention of recurrence of the deformity and success of conservative management in children with CTEV.

7. Regarding management of CTEV, majority of cases required only Conservative treatment, whereas only a few cases needed surgical correction to achieve a more favorable outcome.

8. Radiological evidence of Talo-calcaneo-navicular subluxation or dislocation was noted in 40% of the cases studied.

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Conclusion

This is a Prospective study of fifty children with Idiopathic CTEV in the age group of 1 month to 5 years, who have either undergone some form of primary treatment with partial or no correction or have got uncorrected foot deformity. All cases were analysedclinically and radiologically. The treatment plan was decided depending upon each case and maintenance treatment was given for all cases. They were followed up monthly for a period of one year, radiological evaluation being done every three months, and the following conclusions were made.

1. There is significant association between the initial Talo-Calcaneal Angle (TC angle) and the final Outcome. Cases with TC angle less than 10^{o} is associated with less favorable or unfavorable outcome, whereas **Caseswith TaloCalcaneal Angle more than 10 degrees** is associated with more satisfactory correction, **hence a Better Prognosis.**

2. **Normal Cuboid Sign** correlates well with prognosis of Outcome.

3. Inverted Cuboid sign and InterSegmental Joint break are Radiographic indicators of Unfavourable Outcome of Treatment and hence suggests a Bad prognosis.

4. The Maintenance of correction does have a great role in the prevention of recurrence of the deformity and the success of treatment in CTEV (club foot).

5. The Radiological evidence of Talo-calcaneo-navicular subluxation or dislocation is prognostically significant.

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