



## Orthopaedics

## A PROSPECTIVE STUDY OF PREVALENCE OF THE CALCNEO-CUBOID JOINT DEFORMITY AND IT'S CORRELATION WITH OTHER RADIOGRAPHIC ANGLES IN IDIOPATHIC CTEV

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**ABSTRACT** The Clubfoot is one of the most common congenital deformities affecting the lower limbs. It still presents controversial aspects regarding etiology and treatment. Calcaneo-Cuboid joint deformity is one of the most important deformity and has been overlooked in the past. Objectives: To assess the prevalence of Calcaneo-Cuboid joint deformity and to correlate it with other radiographic angles in idiopathic CTEV. Methods: This is a prospective study of 125 feet in 80 patients of CTEV, who were investigated radiologically and analyzed for deformities. Results: In our study of 125 feet, the overall prevalence of Calcaneo-Cuboid joint deformity was found to be 40%, with severe grade deformity present in around 19% of the feet. A strong correlation with Talo-calcaneal angle and Talo-metatarsal angle on AP view, and not with Talo-calcaneal angle on lateral view was found. Conclusion: The importance of Calcaneo-cuboid joint deformity in CTEV should not be overlooked.

**KEYWORDS :** Clubfoot, CTEV, Calcaneo-Cuboid joint, deformity

### Introduction

Idiopathic Congenital Talipes Equino Varus (CTEV) is one of the oldest and commonest congenital orthopaedic anomalies that still challenge the skills of paediatric orthopaedic surgeons today. This is due to the fact that it has a notorious tendency to relapse, irrespective of conservative or operative treatment. Success of any treatment depends on the understanding of the pathoanatomy of the deformities involved.

Both past and recent literature reveals the importance of the Calcaneo-Cuboid joint in the pathoanatomy and correction of the Calcaneo-Cuboid joint deformity in moderate and severe grades of resistant CTEV. In the past, considerable attention has been given to both the talonavicular and the subtalar joints with relatively little consideration being given to the calcaneocuboid joint.

With the view of highlighting the importance of the Calcaneo-Cuboid joint in the surgical treatment of CTEV, we conducted this study to assess the prevalence of deformity of the Calcaneo-Cuboid joint and to correlate the radiological Calcaneo-Cuboid joint alignment with other radiographic angles in idiopathic CTEV.

### Materials and Methods

This study was done at "Dr. B. Mukhopadhaya Club foot Clinic" conducted every Tuesday in Out Patient Department of the Department of Orthopaedics, Mahatma Gandhi Memorial Medical College and Maharaja Yeshwantrao Hospital, Indore.

The study was a prospective study undertaken from September 2003 to July 2005 and included 80 patients (125 feet). Detailed personal history was recorded including the age, sex, father's & mother's name, address, date of first reporting, age of reporting, detailed history of previous treatment, etc. A thorough general & local examination was carried out & the deformity was scored according to Pirani's classification.

All these patients were assessed radiologically by the Technique of analytical radiography given by George W. Simons in 1977. This includes taking Antero-Posterior (AP) and Lateral stress X-rays, and Talo-calcaneal and Talo-metatarsal angle in AP view and Talo-calcaneal angle in lateral view were calculated. All patients were also grouped according to radiological classification of Calcaneo-Cuboid joint deformity given by John G. Thometz to assess the alignment of the joint. Parallel lines are drawn on the AP stress radiograph, through the mid longitudinal axis of calcaneum (the longitudinal axis of the calcaneus) and along the medial border of the calcaneus (the medial tangent).

When ossification of the sustentaculum tali begins, a flare, which also ossifies, develops on the medial border of the calcaneus. If this has occurred, the medial tangent should be drawn parallel with the long axis of the calcaneus through the point where the medial flare arises from the body of the calcaneus. The midpoint of the ossification center of the cuboid is then identified. Grading was done as follows:

**Grade 0 :** Midpoint of the cuboid center lies on the longitudinal axis of the calcaneum.

**Grade I :** Midpoint lies lateral to the medial tangent but medial to the longitudinal axis of the calcaneus.

**Grade II :** Midpoint lies on or medial to the medial tangent of the calcaneus.

The grades of Calcaneo-Cuboid joint deformity were correlated with the Talo-calcaneal and Talo-metatarsal angles on AP and Talo-calcaneal angle on Lateral stress radiograph.

### Results

In our study, we evaluated 125 feet in a total of 80 patients 45 patients had bilateral clubfoot. 62.5% cases presented in the first 2 months of life. The incidence of CTEV was found to be three times more common in males as compared to females. Bilateral cases are as common as unilateral. Right clubfeet are twice as common as left.

Of the 125 feet, 75 feet (60%) had a Grade 0 Calcaneo-Cuboid joint deformity, 26 feet (21%) had a Grade-I deformity and 24 feet (19%) had a Grade-II deformity. Thus, the overall prevalence of the Calcaneo-Cuboid joint deformity was found to be 40 %, with severe grade deformity present in around 19% of the feet.

Our study demonstrates a strong correlation of Calcaneo-Cuboid joint deformity with Hind-foot varus and forefoot adduction deformity as represented by Talo-calcaneal angle and Talo-metatarsal angle on AP stress radiograph respectively. However, it does not demonstrate a correlation of the deformity with Hind-foot equinus deformity as represented by the Talo-calcaneal angle on the Lateral stress radiograph.

### Discussion

Clubfoot has been existent and known since time immemorial, and similar is the duration of controversies it carries with itself. In 1818, Scarpa<sup>1</sup> reported that the position of the talus was relatively normal within the ankle joint in CTEV and that the primary deformity was secondary to the shifting of the other bones of the tarsus around the talus. Other authors since have reported similar findings: the navicular,

the cuboid, and the anterior part of the calcaneus are rotated around the head of the talus.<sup>2,3</sup>

In the past, considerable attention has been given to both the talonavicular and the subtalar joints with relatively little consideration being given to the calcaneocuboid joint.

Tubby<sup>4</sup> alluded to the etiology of the calcaneocuboid joint deformity, and others<sup>3,5,7</sup> described pathological changes in the calcaneocuboid joint. Carroll<sup>8</sup> recently recommended partial release and Malan<sup>9</sup> and Thomas<sup>10</sup> advocated complete release of the calcaneocuboid joint for all surgically treated clubfeet.

Simon<sup>11</sup> stressed over the facts that gross malalignment of the calcaneo-cuboid joint is present in some, but not all, clubfeet. This deformity appears to be the result of medial angulation of the anterior calcaneus and/or subluxation of the cuboid on the head of the calcaneus. Failure to include calcaneocuboid release with an extensive soft tissue release results in valgus of the heel. Partial release of the calcaneo-cuboid joint, leaving only the lateral capsule intact, results in "spin out" (severe rotary valgus of the hind foot) and hence, is never indicated.

LeNoir<sup>12</sup> described the cuboid sign (the abnormal position of the cuboid on the anteroposterior radiograph) and stressed the importance of reduction of the Calcaneo-Cuboid joint in order to hold the middle segment of the foot correctly in line.

A relatively simple radiographic classification of deformity at the calcaneocuboid joint was developed by John G Thometz<sup>13</sup> that measures both the medial displacement and the proximal migration of the cuboid. Whereas grade 0 deformity did not require release of the calcaneocuboid joint, grade I deformity required subtalar release as well as release of the calcaneocuboid joint, and grade II deformities may also require bone surgery.

The calcaneo-cuboid joint deformity results in an abnormal increase in the talo-calcaneal divergence and in the talo-calcaneal angle. If the calcaneo-cuboid joint is markedly displaced, the navicular will force the cuboid laterally when reduced, in turn forcing the anterior aspect of the calcaneus in a lateral direction leading to an increased talo-calcaneal angle and increased talo-navicular angle with malalignment of the calcaneo-cuboid joint on the Antero-Posterior radiograph.

In accordance, our study also demonstrate a strong correlation of the Calcaneo-Cuboid joint deformity with the Hind-foot varus and forefoot adduction clinical deformity as represented by the Talo-calcaneal angle and the Talo-metatarsal angle on the AP stress radiograph respectively. However, our study does not demonstrate a correlation of the Calcaneo-Cuboid joint deformity with the Hind-foot equinus deformity as represented by the Talo-calcaneal angle on the Lateral stress radiograph.

## Conclusion

We believe that the calcaneo-cuboid joint deformity is an important deformity in feet with resistant idiopathic CTEV and has been overlooked in the past. The overall prevalence of Calcaneo-Cuboid joint deformity in our study was found to be 40%, with severe deformity present in 19% of the feet.

Correlation of calcaneo-cuboid joint with the other three radiographic angles showed strong association with the Talo-calcaneal angle and the Talo-metatarsal angle on the AP stress radiograph, which represent the Hind-foot varus and forefoot adduction clinical deformity respectively.

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