



Treatment of Congenital Vertical Talus by Dobbs Technique

*A Systematic Review for Partial Fulfillment of Master Degree in **Orthopedic Surgery***

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

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Moustafa Mohamed Kandeel



To:

My parents

*for their endless love, support,
and continuous care*

*My Wife
&
My Family*



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List of Abbreviations

Abb.	Full term
<i>AFO</i>	<i>Ankle foot orthosis</i>
<i>AP T1st</i>	<i>Anteroposterior talo-first metatarsal angle</i>
<i>AP TC</i>	<i>Anteroposterior talocalcaneal angle</i>
<i>AP</i>	<i>Anteroposterior view</i>
<i>CCJ</i>	<i>Calcaneocuboid joint</i>
<i>CVT</i>	<i>Congenital vertical talus</i>
<i>Lat T1st</i>	<i>Lateral talo-first metatarsal angle</i>
<i>Lat TC</i>	<i>Lateral tibiotalar angle</i>
<i>Lat Tibiocalc</i>	<i>Lateral the talocalcaneal angle</i>
<i>MC</i>	<i>Manipulation and casting</i>
<i>MRI</i>	<i>Magnetic resonance imaging</i>
<i>NA</i>	<i>Not Available</i>
<i>PODCI</i>	<i>Pediatric Outcomes Data Collection Instrument</i>
<i>STJ</i>	<i>Subtalar joint</i>
<i>TAMBA</i>	<i>Talar axis-first metatarsal base angle</i>
<i>TNJ</i>	<i>Talonavicular joint</i>

INTRODUCTION

Congenital vertical talus is a rare flatfoot deformity that is present at birth and is characterized by a fixed dorsal dislocation of the navicular on the talus with associated Achilles tendon and dorsolateral soft-tissue contractures as well as calcaneocuboid joint subluxation and/or dislocation resulting in a rigid flatfoot deformity ⁽¹⁾. The estimated prevalence of vertical talus is one in 10,000 ⁽²⁾.

It occurs as an isolated deformity (idiopathic) in approximately half of all cases and is associated with neuromuscular and genetic disorders in the remaining cases including arthrogryposis and myelomeningocele. Fifty percent of children have bilateral involvement and there is no sex predilection ^(2, 3).

Without treatment, vertical talus can lead to significant disability, including foot and ankle pain as well as medial plantar callus formation on the foot around the prominent talar head ⁽⁴⁾.

Ambulation is usually not delayed but the gait is usually awkward with difficulty balancing. The shoes often show abnormal wear and pain often develops in early adolescence ⁽⁵⁾. Since the heel does not touch the ground, the patients have poor push-off and are forced to weight bear on the talar head, which develops painful callosities.

Etiology

In most cases, the etiology of vertical talus deformity remains unknown. Approximately one half of cases of vertical talus occur in conjunction with neurologic disorders or known genetic defects and/ or syndromes ⁽⁶⁾.

The other half occur in children without other congenital anomalies and are considered idiopathic or isolated cases.

Associated neurologic abnormalities can be divided into two broad categories: central nervous system defects or neuromuscular disorders. The most common congenital central nervous system defects associated with vertical talus are myelomeningocele, sacral agenesis, and diastematomyelia ⁽⁷⁾. Neuromuscular disorders associated with vertical talus include arthrogryposis, spinal muscular atrophy, and neurofibromatosis. ⁽⁸⁾ Vertical talus deformities associated with neurologic disorders tend to be more rigid and difficult to treat than idiopathic vertical talus ⁽⁹⁾.

Congenital vascular deficiency of the lower extremities has also been proposed as a potential cause of vertical talus based on magnetic resonance angiography findings that demonstrated congenital arterial deficiencies of the lower extremity in a group of patients with isolated vertical talus ⁽¹⁰⁾.

The most common genetic defects include aneuploidy of chromosomes 13, 15, and 18 ⁽¹¹⁾. Vertical talus is also

commonly associated with a variety of syndromes, including Stanton, Yassir, and Rasmussen syndromes ⁽¹²⁾ and split hand and split foot limb malformation disorders ⁽¹³⁾.

Of the 50% of cases of vertical talus that are isolated, almost 20% have a positive family history of vertical talus. In most of these cases, the condition is inherited in an autosomal dominant fashion, supporting the theory that a significant number of isolated cases have a genetic etiology, as well ^(14, 15).

Through the study of multiple families with vertical talus, a mutation in the *HOXD10* gene was found to be responsible for vertical talus in one of these families consisting of six individuals with isolated congenital vertical talus ⁽¹⁴⁾.

A mutation in the cartilage-derived morphogenetic protein-1 (CDMP-1) gene has been also identified in a large family with variable hand and foot abnormalities, including a child with isolated vertical talus ^(16, 17, 18).

Pathoanatomy:

Both autopsy and surgical findings have contributed to the understanding of the pathologic anatomy of vertical talus ⁽¹⁹⁾. Contractures of the tibialis anterior, extensor hallucis brevis, peroneus tertius, peroneus longus, peroneus brevis, and the Achilles tendon are present ⁽²⁰⁾.

The talonavicular joint capsule is dorsally contracted. The navicular is displaced both dorsally and laterally with

respect to the head and neck of the talus. Due to lack of appropriate articulation with the talus, the navicular is hypoplastic and wedge shaped. The talar head and neck are flattened and medially deviated. The extreme plantar flexed position of the talus results in attenuation of the calcaneonavicular, or spring ligament. The calcaneus is plantar flexed and externally rotated. The angle between the axes of the talus and calcaneus is increased. The middle and anterior subtalar joint facets are hypoplastic and absent in severe cases. In severe deformities, the cuboid is laterally displaced resulting in dorsolateral subluxation or dislocation of the calcaneocuboid joint. The posterior tibial tendon is often subluxed anteriorly over the medial malleolus while the peroneus longus and peroneus brevis may be subluxed over the lateral malleolus; the subluxed tendons may function as dorsiflexors rather than plantar flexors ⁽⁹⁾. Drawing of the pathoanatomic features is shown in figure (1)

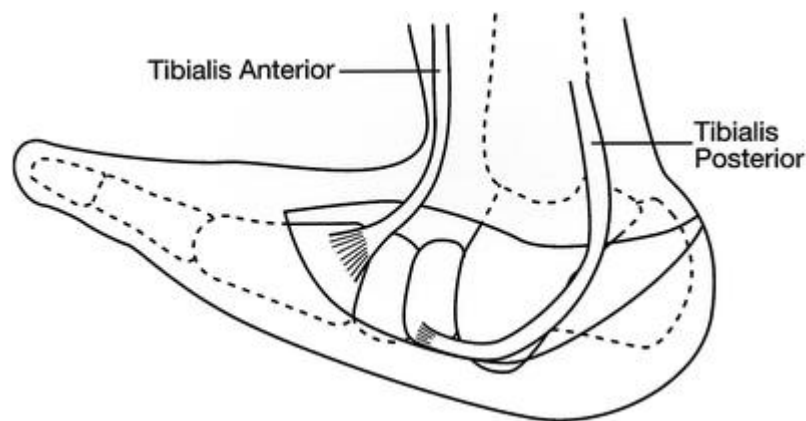


Figure (1): Line drawing of the exposed medial side of a congenital vertical talus through a Cincinnati incision showing the dorsal dislocation of the navicular on the vertically orientated talus, the calcaneus in equinus, and the position of the tibialis anterior and posterior tendons ⁽²¹⁾.

Clinical evaluation

Hindfoot equinus, hindfoot valgus, forefoot abduction, and forefoot dorsiflexion are present in all newborns with vertical talus. The rigidity of the deformity is the key to distinguishing between vertical talus and more common conditions, such as calcaneovalgus foot, posteromedial bowing of the tibia, and oblique talus. Hindfoot equinus, hindfoot valgus, forefoot abduction, and forefoot dorsiflexion are present in all newborns with vertical talus.

If hindfoot equinus is not a clinical feature, then the deformity is not vertical talus and is likely positional in nature ⁽²²⁾.

In congenital vertical talus, the plantar surface of the foot is convex creating a rocker-bottom appearance. (Figure 2a).

There are deep creases on the dorsolateral aspect of the foot anterior and inferior to the lateral malleolus (Figure 2b)



Figure (2): Clinical photographs of a newborn's feet demonstrating the features of vertical talus. The plantar aspect of the feet (A) show forefoot abduction deformities, and the dorsolateral aspect of the feet (B) demonstrate deep creases on presentation secondary to forefoot and midfoot dorsiflexion ⁽²²⁾.

Radiological evaluation:

Anteroposterior and lateral radiographs of the foot should be taken in the neutral position for infants and standing for those children old enough. The lack of ossification of many of the bones in the foot at birth can make the diagnosis of congenital vertical talus challenging on plain radiographs. The talus, tibia, calcaneus, and metatarsals are ossified at birth. The cuboid ossifies in the first month of life while the cuneiforms and navicular usually ossify around the ages of 2 and 3 years, respectively ⁽²³⁾.

Since most children with vertical talus are seen in the newborn period, the radiographic evaluation is focused on the