## **CLUBFOOT**

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# Introduction

- Also known as talipes equinovarus
- A developmental deformity of the foot in which one or both feet are excessively plantar flexed, with the forefoot swung medially and the sole facing inward
- An easy way to remember the deformity is the mnemonic CAVE
  - **Cavus** (plantarflexion of the first ray)
  - Adductus (of the fore foot/midfoot)
  - Varus (of the hindfoot) foot is maintained in fixed inversion
  - **Equinus** (of the hindfoot) foot is placed in plantar flexion

## Introduction

- Can be categorized as congenital, syndromic, or positional
  - Congenital: affects bones, muscles, tendons, and blood vessels of one or both feet
  - Syndromic: with associated anatomic malformations and/or chromosomal or genetic abnormalities
  - Positional: due to the baby's position in the uterus, likely due to restrictive uterine environment (oligohydramnios, uterine anomalies)
- Positional clubfoot is **flexible**, rather than rigid, and can be positioned into a neutral position easily by hand



INTRINSIC		EXTRINSIC
Chromosomal	Muscular	Amniotic bands or synechiae
Trisomy 18	Myopathy	Early amniocentesis
Deletions of chromosomes 18q, 4p, 7q, 9q, 13q	Myotonic dystrophy	Intrauterine crowding
Connective tissue	Skeletal dysplasia	Fibroids
Arthrogryposis	Campomelic dysplasia	Multiple gestation
Collagen defects	Chondrodysplasia punctata	Oligohydramnios
Joint synostosis	Diastrophic dysplasia	Potter sequence
Neurologic	Ellis-van Creveld	Malposition
Anencephaly	Syndromes	Breech
Anterior motor horn cell deficiency	Escobar syndrome	
Hydrancephaly	Hecht syndrome	
Holoprosencephaly	Larsen syndrome	
Myelomeningocele	Meckel-Gruber syndrome	
Spina bifida	Multiple pterygium	
	Pena Shokeir	
	Smith-Lemli-Opitz	
	Zellweger syndrome	

#### **Congenital Clubfoot**

- Congenital clubfoot is seen in approximately 1 in 1000 live births, most likely from multifactorial polygenic inheritance
- Risk is 1 in 4 when both a parent and a sibling have clubfeet
- 50% unilateral, 50% bilateral
- Involves abnormal tarsal morphology (plantar and medial deviation of the head and neck of the talus), abnormal relationship between the tarsal bones in all three planes, and the associated contracture of soft tissues on the plantar and medial aspects of the foot
- May also have congenital absence of certain tendinous structures in some instances

#### **Congenital Clubfoot**

- Should be differentiated from other foot deformities (e.g., those due to neurological issues, spinal cord tethering, or isolated metatarsus adductus, a common cause of intoeing among infants)
- Transvaginal US can sometimes detect the abnormality as early as 12-13 weeks of gestation
  - Now up to 80% are detected prenatally
  - Can find associated anomalies in at least 10% of patients with clubfoot
- Upon delivery, perform a complete physical examination to rule out coexisting neurological and musculoskeletal issues
  - Degree of flexibility
  - Atrophy

#### **Congenital Clubfoot**

- While XR is not needed to be performed routinely for idiopathic clubfoot, it may be helpful if suspicious for syndromic features
- Typical finding on XR is "parallelism" between lines drawn through the axis of the talus and the calcaneus on lateral radiograph



FIG. 694.3 Talipes equinovarus in a newborn. A, Clinical appearance of an untreated clubfoot. B and C, Initial radiographic appearance of bilateral untreated clubfeet. (From Ricco AI, Richards BS, Herring JA: Disorders of the foot. In Herring JA, editor: *Tachdjian's pediatric orthopaedics*, ed 5, Philadelphia, 2014, Elsevier, Fig. 23-42.)



**Figure 22.100** Clubfoot. This deformity has three primary components. **A**, The foot is positioned in plantar flexion (equinus). Note the pathologic skin creases over the heel and arch. **B**, The heels or hindfeet are fixed in inversion (varus). **C**, The forefeet are fixed in an adducted and supinated position.



**D**, In the anteroposterior

radiograph, the talus overlies the os calcis (stacking) and the forefoot is adducted. A line drawn through the longitudinal axis of the talus normally aligns with the first metatarsal, and one drawn through the axis of the os calcis normally aligns with the fifth metatarsal.



45-degree angle.





Figure 22.101 Normal foot. Anteroposterior (A) and lateral (B) views of the foot of a slightly older child show the normal orientation of the tarsal bones, as compared with the findings in congenital clubfoot (shown in Fig. 22.100D and E).

## Management

- Should be started as soon as possible after birth
- Ponseti technique has largely replaced extensive surgery, which was previously the standard of care management
  - Technique for manipulation and serial casting
  - Order of correction follows CAVE mnemonic
  - Weekly cast changes performed x 6 weeks, then percutaneous tenotomy of Achilles tendon (either in office or in OR), then another set of casts for 3-4 weeks
  - Then child wears Ponseti shoes and brace (bar between the shoes) for 3 months, and then at nighttime only for 3 years
  - Compliance is very important



## Management

- Result has been excellent, up to 40 years of follow up
- Despite casting, children do not have much dysfunction or delay in achieving normal motor function
- Surgery reserved for the minority of cases that failed nonoperative or minimally invasive methods



#### References

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