

CAVUS FOOT

Definition

Abnormal elevation of the medial arch of the foot is a cavus foot.
Development of the forefoot equinus is in relation to the hindfoot.

Types

Calcaneocavus:	Polio, Weak Gastro, No varus component Hindfoot deformity is a primary deformity
Cavo-varus:	Imbalance between Tibialis anterior and Peroneus longus Varus present; forefoot is primary deformity
Equinocavovarus:	Partially corrected club foot

Components

- Plantarflexed first ray
- Tight Plantar fascia
- Paralyzed intrinsic muscle
- Paresis of Peroneal brevis and Tibialis anterior

Anatomy

1. Windlass effect of Plantar Fascia
2. Shock absorber: a. Quadriceps
b. Eversion of heel on heel strike

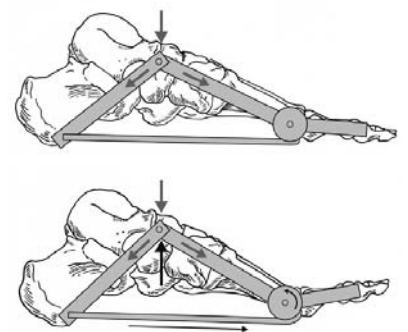
Pathomechanics

1. Cavus

Weak muscles: Tibialis anterior and Peroneus Brevis and Intrinsic.
Results in: Clawing of toes which increases cavus due to Wind lass effect

Wind lass effect is exaggerated, therefore increases cavus

Imbalance of Peroneus longus and tibialis anterior increases cavus further



2. Heel varus is secondary deformity to the forefoot.

In a dropped first metatarsal in cavus, to get the V metatarsal plantigrade, there had to compensatory hindfoot varus. This is called "Tripod effect"

Causes

1. CNS: Cerebral palsy
Hemiplegia
Friedreich's
2. Spine: Spina bifida (myelodysplasia)
Diastematomyelia
Syringomyelia
Polio
Spinal cord tumors
3. PNS CMT = Hereditary sensorimotor neuropathy (HSMN) in all Pes cavus

HSMN I	AD	Hypertrophic CMT: PMP 22 (Chr17)
HSMN II	AD	Axonal CMT
HSMN III	AR	Djegerine Sottas
HSMN IV		Refsum [Phytic storage]
HSMN V		Neuropathy with spastic paraplegia
HSMN VI		Optic atrophy with peroneal muscle atrophy
4. Miscellaneous Sciatic nerve division
Compartment syndrome
Residual clubfoot
5. In one-third of cavus: Idiopathic

Clinical

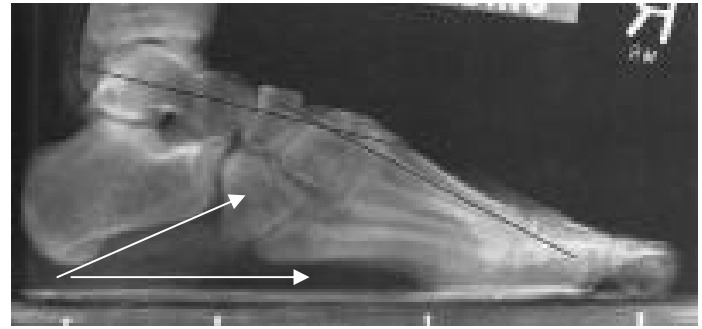
Inheritance: AD for Type I and II and AR in type III
Age of Diagnosis 10 years
Usually bilaterally symmetric muscle involvement
Stork leg appearance
Gait [Marionette gait ie., pelvic elevation on the swing side compensation for foot drop]
Peg leg gait = poor push off]
Neurological assessment
Weak motor: Intrinsic, Tibialis anterior and Peroneus Brevis
Wasting and deformity
Deformity: Untreated flexible becomes fixed deformity
Sensory, reflexes and joint sensation assessment
Keratosis
Birth history, Family history
Examine: Spine, small muscles of the hand
Coleman's block test [Check foot examination]

Determines whether hind foot deformity is flexible

X ray

Foot AP and Lateral [standing]
Spine

Look for Apex: usually at Lisfranc joint
Sometimes Naviculo-cunieform joint



Meary's angle

Angle between talar axis and I Metatarsal
Normal = 5° and in CMT 18°

0° to 15° is a mild deformity

15° to 30° is moderate

30° is severe.

Calcaneal pitch >30° calcaneus deformity

MRI spine and CT

4. EMG

Type I	Marked slowing motor and sensory
Type II	Conduction normal and EMG [Denervation]
Type III:	Marked motor

5. Biopsy: Rarely needed. Sural nerve

6. Genetics:

DNA Duplication Detection Test (Athena Diagnostics Inc, Worchester, MA).

The probability of a patient with bilateral cavovarus feet being diagnosed with Charcot-Marie-Tooth disease, regardless of family history, was 78%.

A family history of Charcot-Marie-Tooth disease increased the probability to 91%.

Management

1. Treat the cause: eg: Tethered cord
2. Genetic counseling [AD]
3. Neurology referral
4. Non-operative: Shoe insert to support lateral forefoot and thus preventing hindfoot going into inversion with or without metatarsal bar

Advanced cases: extra depth shoes and observe.

Discuss progressive deformity and need 6 monthly observations

5. Surgery: Symptomatic or progressive deformity

6 Recurrence: repeated procedure

7 Cavus foot: nonprogressive with intact sensation has better prognosis

Surgery

I. Soft tissue release [Plantar fascia and small muscle release, capsulotomies of midfoot joints]

II. Tendon transfer [Jones procedure, extension diversion procedures]

III. Osteotomies: Japas, Coles, Calcaneal osteotomy

IV Fusion: Mid tarsal, triple

Type of surgery

Flexible Soft tissue release +/- Tendon transfer

Fixed; No arthritis Osteotomy

Fixed arthritic joints Arthrodesis

Correction should be obtained at the location of maximum deformity

Prognosis

Is the deformity multiplanar or single-planar?

Is the deformity primarily forefoot, midfoot, hindfoot, or a combination of these?

Is one or more of the components fixed?

Is the underlying cause one of a progressive, severe course, with or without treatment?

Are tendon transfers required to maintain the correction gained by arthrodesis or osteotomy?

Is there a sensory deficit?

Type of Surgeries

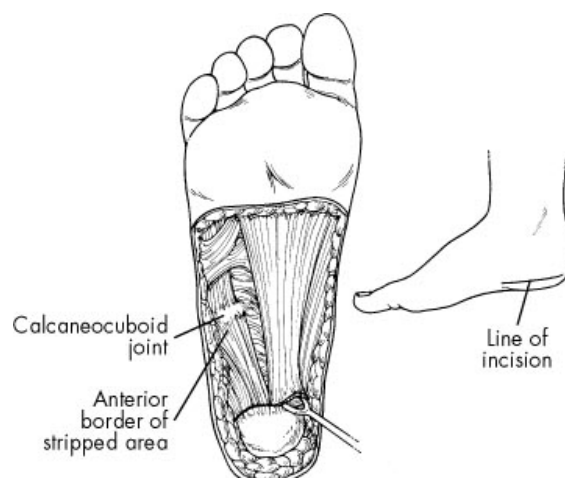
STEINDLER'S PLANTAR RELEASES

Indications: Early cavus deformity
 With other osteotomies

Medial longitudinal incision

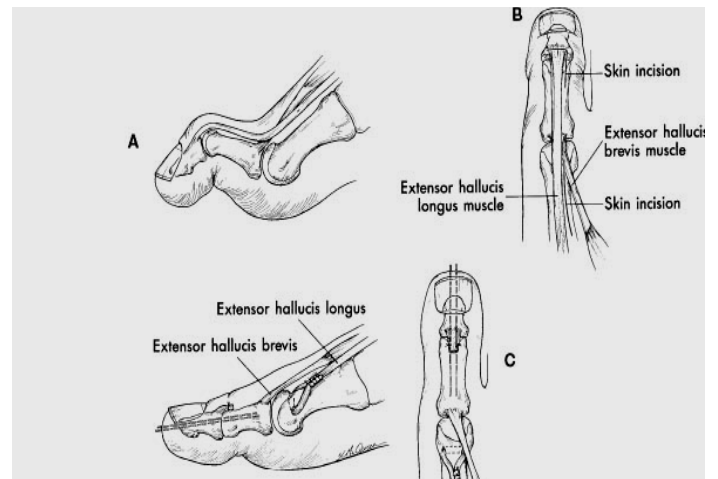
Then incise the fascia transversely close to where it blends into the plantar surface of the calcaneus.

Place a periosteal elevator or retractor on the deep surface of the fascia as it is released



CLAW GREAT TOE

Greater toe [Jones procedure]
Fusion of IP joint [screw fixation]
EHL is transferred to the neck of metatarsal



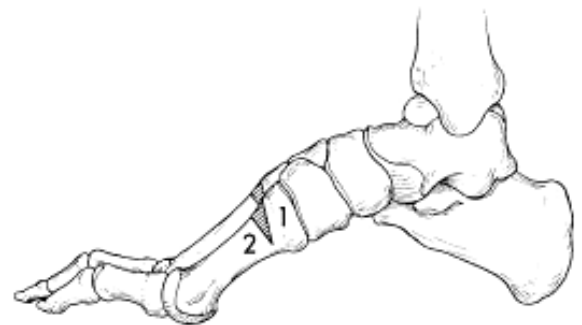
CLAWING OF LESSER TOES

PIP fusion and EDL lengthening;
Capsulotomy of MTP
EDL is diverted to the neck of the I metatarsal

OSTEOTOMIES

DORSAL WEDGE OSTEOTOMY

Through the dorsal incision
Expose base of the metatarsal
With a thin-bladed power saw, make the proximal cut vertical, two thirds to three fourths of the way through the bone.
Make the distal cut about 4 mm from and angled toward the first cut, again cutting about 2/3 of the way through and joining the first cut.
Remove the intervening wafer of bone.

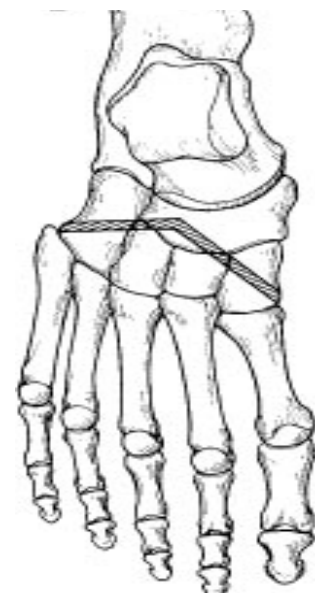


JAPAS OSTEOTOMY

Advantages: Produce a more normal-appearing foot.

Disadvantages: Shortens the foot in children < 10Year
Pseudarthrosis 30%

It consists of a V-osteotomy in which the apex of the V is within the navicular.
One limb of the V extends laterally to cuboid and the other medially through the first cuneiform.



No bone is excised;

The proximal border of the distal fragment of the osteotomy is depressed plantarward while the metatarsal heads are elevated

COLE'S OSTEOTOMY

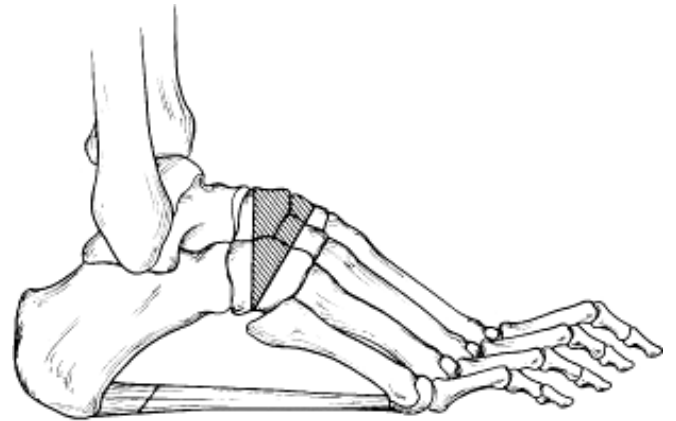
Dorsal wedge osteotomy

Advantages: correction of deformity

Disadvantages:

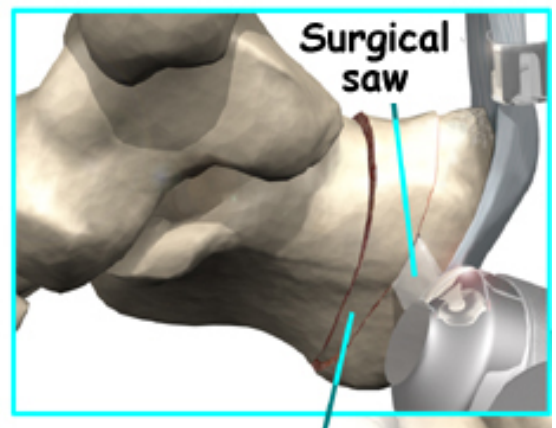
Produce a short and an unattractive foot

High incidence of NU



CALCANEAL WEDGE OSTEOTOMY:

Dwyer's lateral closing wedge for fixed hind foot varus and a Plantar fascia release.



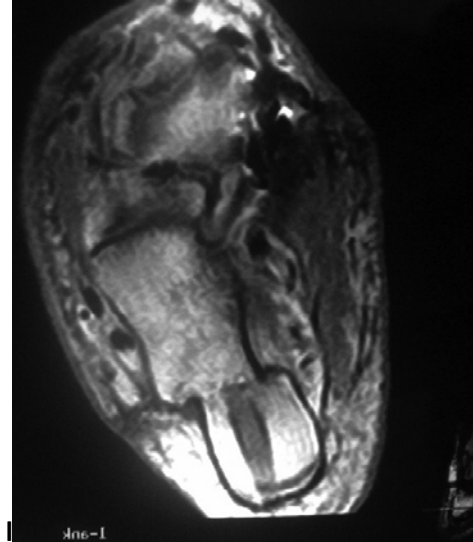
Dwyer's osteotomy

Calcaneal slide osteotomy

CALCANEAL SLIDE OSTEOTOMY

Indication is fixed varus deformity:

Lateral approach; single cut and
the heel segment is slid laterally



Triple arthrodesis

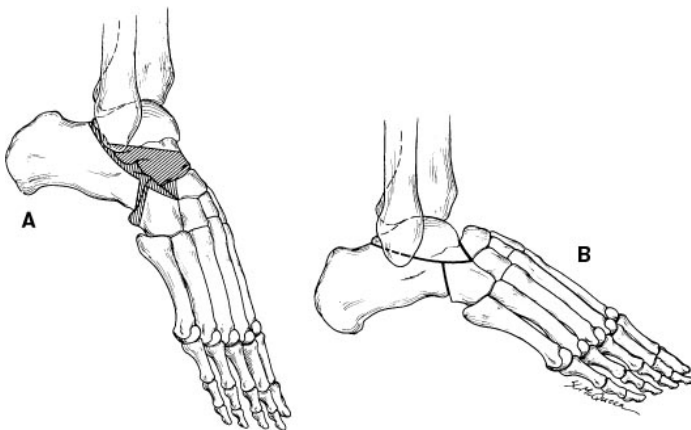
FIXED DEFORMITY WITH MIDTARSAL OR SUBTALAR ARTHRITIS

Triple arthrodesis

And tendon transfer [Tibialis posterior]



LAMBRINUDI [FOR GROSS EQUINES DEFORMITY]



NEUROMUSCULAR FOOT DEFORMITIES

Brain

- I Cerebral palsy
- II Fredrick's ataxia

Spine

I. Spinal Dysraphism: Spina bifida occulta

Spina bifida manifesta

L1-3	Equinovarus
L4	Cavovarus
L5	Calcaneovarus

II Polio: any deformity

III Arthrogryposis

IV Peripheral Nerve

Hereditary sensorimotor deficiency

Muscle

Pseudomuscular dystrophy	Equinus
Becker's dystrophy	Equinus
Fascioscapulothoracic, Limb girdle	Equinus
Myotonia: equinus	
Fibrodysplasia ossificans	

FRIEDRICH' ATAXIA

AR

Fratexin protein is defective

Spinocerebellar tract is involved

Pes cavus, Scoliosis, Ataxia

Death is usually due to cardiomyopathy