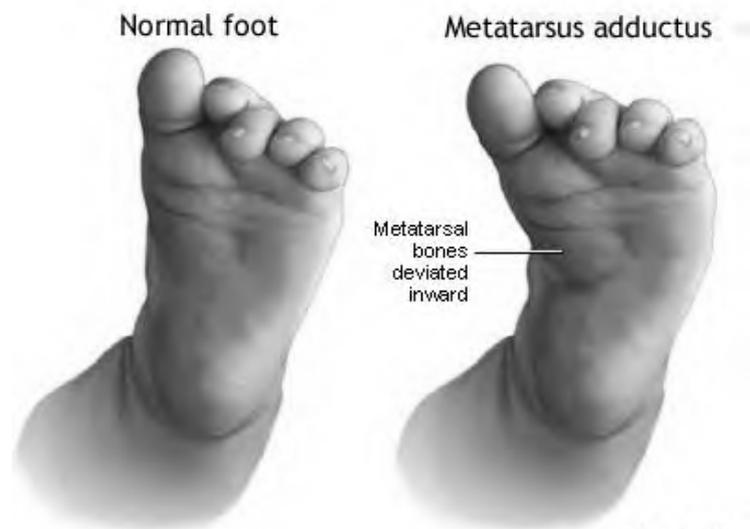


Metatarsus Adductus and the Pediatric Patient' Surgical Options

--Robert Einhorn



Met Adductus (MA)

- Adduction of metatarsal bones with foot inversion at Lisfranc's Joint
- Medial displacement of the metatarsals on the cuneiform; forefoot is adducted at the TMTJ

- Can be Bilateral or Unilateral
 - Lateral border of foot convex
 - Medial border of foot concave
- Base of fifth metatarsal (styloid) often prominent

What causes metatarsus adductus?

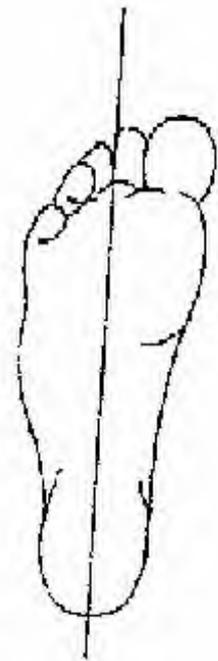
- The cause of metatarsus adductus is not known.
- Other causal factors include the following:
 - family history of metatarsus adductus
 - position of the baby in the uterus, especially with breech presentations
 - sleeping position of the baby (babies sleeping on their stomach may increase the tendency of the feet to turn inward)
 - Absence of a medial cuneiform/ abnormal growth of medial cuneiform
 - Abnormal muscle position
 - Arrest of normal ontologic rotation of the foot (arrested fetal development)

- More common in female infants
- Left-side more commonly affected than right
- The hindfoot is completely normal (for child their age)
- V-Finger Test
 - Infant's heel in examiner's hand second webspace
 - Medial foot rests against index finger
 - Lateral foot rests against middle finger
 - Foot observed from plantar aspect
 - Observe for medial deviation of forefoot
 - Forefoot deviates away from middle finger

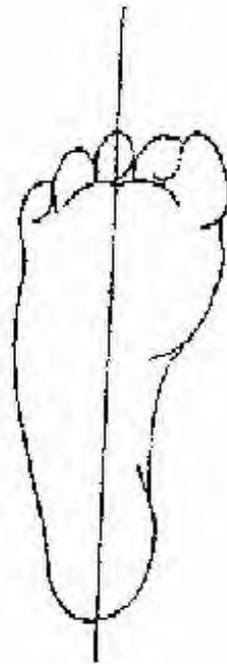


Bleck's Test **Clinical:**

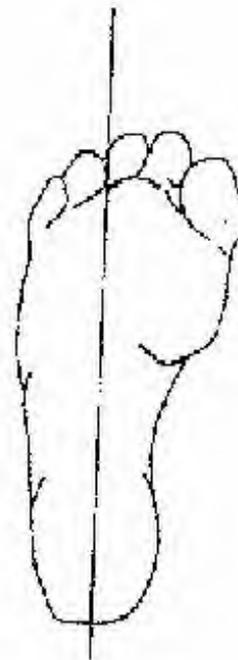
Determine whether the forefoot deformity is passively correctable past neutral. Grade accordingly as Mild, Moderate or Severe (rigid)



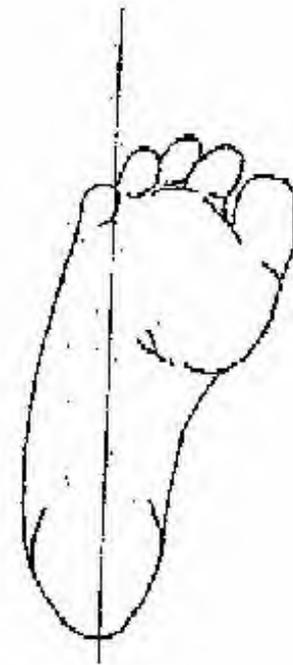
NORMAL



MILD

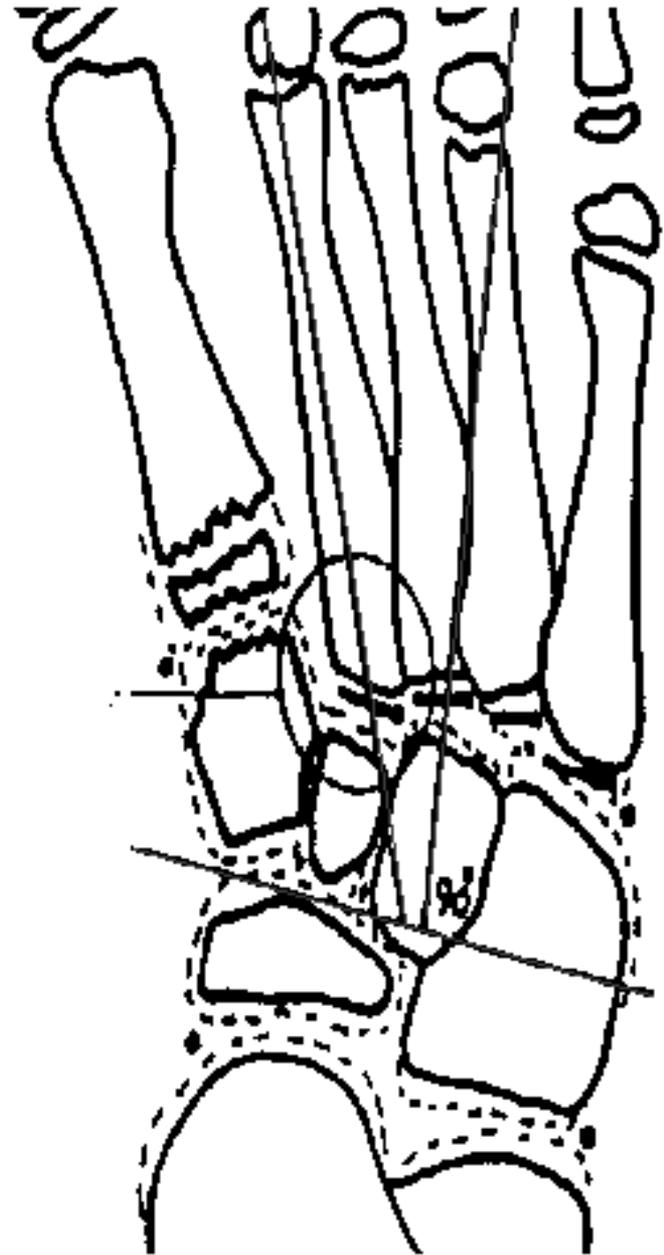


MODERATE



SEVERE

- The metatarsus adductus angle is the most significant angular relationship in the diagnosis of metatarsus adductus. Often referred to as the metatarsus adductus angle as the relationship between the longitudinal axis of the lesser tarsus and the line bisecting the second metatarsal.
 - Generally perceived that metatarsus adductus angles of:
 - 15-20 degrees indicative of a mild deformity
 - 21-25 degrees representative of a moderate deformity
 - values greater than 25 degrees signifying severe deformity



Differential Diagnosis

- In-Toeing
- Femoral Anteversion
- Internal Tibial Torsion
- Clubfoot

Treatment

Specific treatment for metatarsus adductus will be determined by your child's physician based on:

- your child's age, overall health, and medical history
- the extent of the condition
- your child's tolerance for specific medications, procedures, or therapies
- expectations for the course of the condition
- your opinion or preference

Management

Category A: Mild/flexible deformity (Most common)

Parents Stretch child's foot

Firmly stabilize heel

Stretch forefoot laterally (everting foot)

Hold for count of 5 (baby will wince, not cry)

Do for 5 repetitions at each diaper change

Category B: Moderate/fixed deformity

Evaluation by pediatric specialist

Serial corrective casts

Cast every 1-2 weeks for 3-4 casts

Avoid casting too late (after 4-6 months)

Late casting is more difficult due to stiff foot

Child also kicks more at older age

- Category C: Severe/rigid deformity (rare)
 - Serial casts in first few weeks of life
 - Takes advantage of neonates ligament laxity
 - Corrective Surgery if above not effective (2-4yo)
 - Age <7: Soft tissue release tarsometatarsal joint
 - Age >7: Metatarsal Osteotomy

Surgical Options

Failure of conservation therapy is an indication for surgery. Surgical treatment at an early age has been targeted at soft tissue release, where as osseous procedures are advocated for those that are older.

Soft Tissue Procedures

- Abductor Release
 - The severe contraction of the abductor hallucis is present in some cases of MA (also present in hallux varus and hallux adductus)
 - The adductor hallucis can be sectioned, lengthened, or removed.
 - This procedure is for an isolated hallux adductus or met primus adductus and not strictly for a MA deformity.
 - Therefore it is often an adjunctive procedure

Soft Tissue Procedures continued...

- Tarsometatarsal Release
 - Described by Heyman, Herndon and Strong (HHS)
 - A dorsal transverse incision is made over the bases of the metatarsals and capsulotomies and ligaments are released from the tarsometatarsal joint (liz franc)
 - Also a syndesmotomy of the naviculocuniform joint and release of the TA tendon.
 - The mets are manipulated into a rectus position and casted
 - Now a days the dorsal transverse incision is not made but rather 3 dorsal longitudinal incisions to preserve underlying neurovascular structures.

HHS

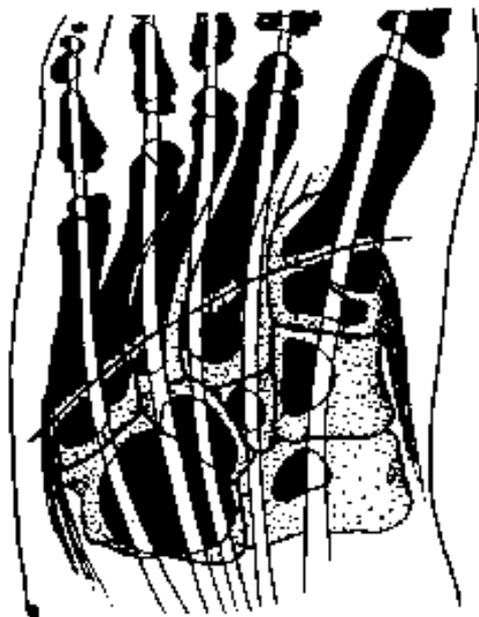


FIG. 1-A

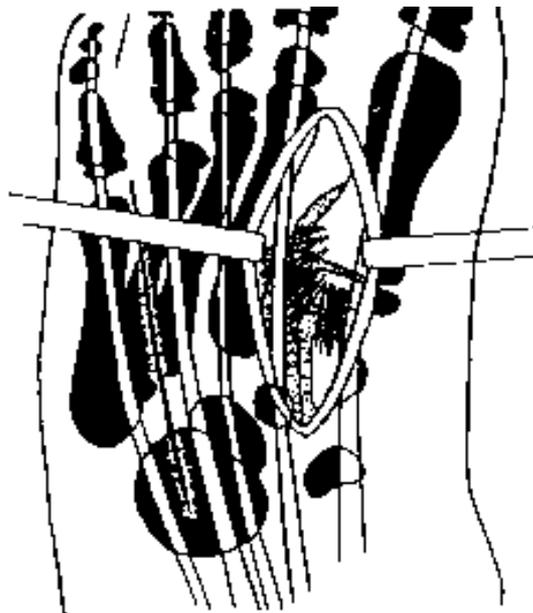


FIG. 1-B

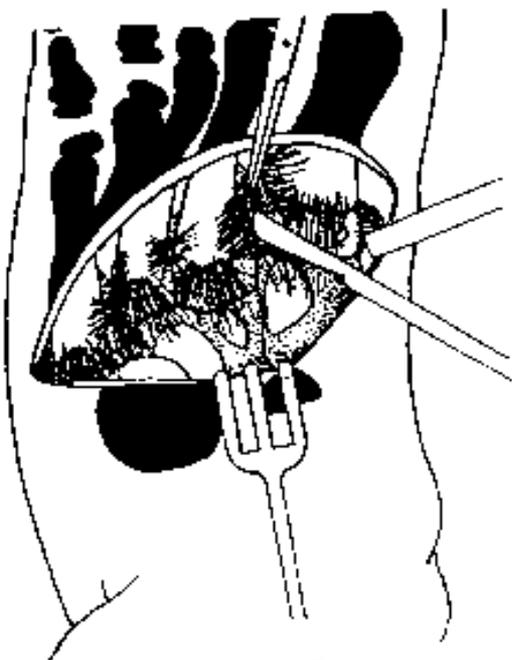


FIG. 1-C

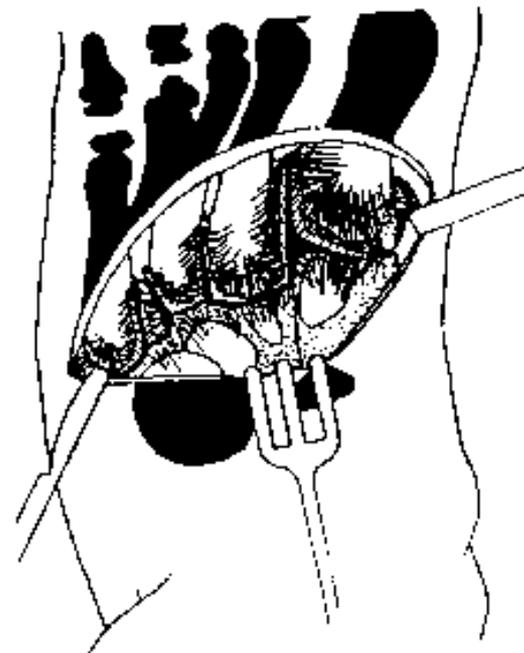
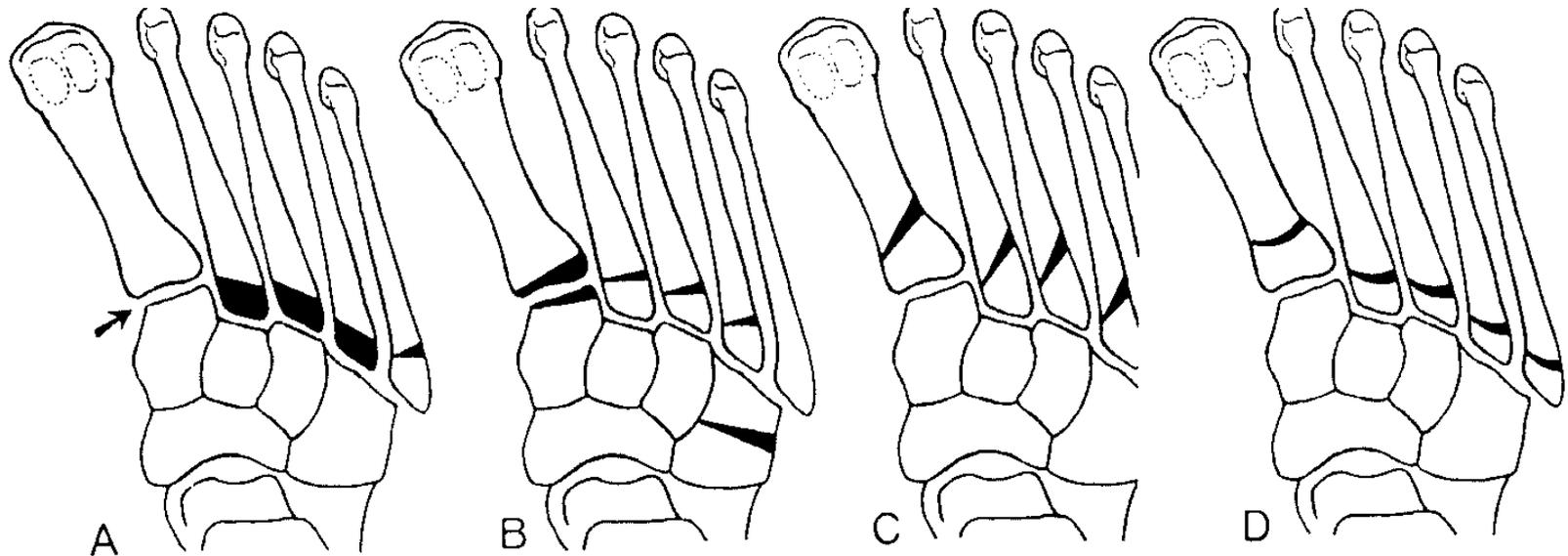


FIG. 1-D

Osseous procedures

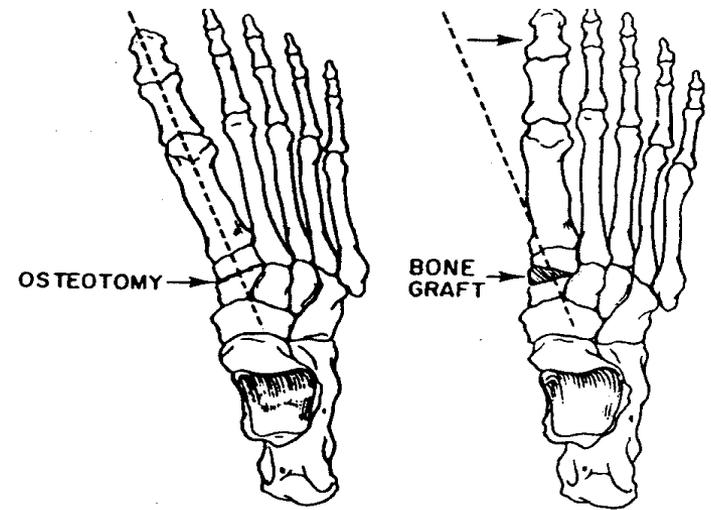
- With the persistence of metatarsus adductus for 6 to 8 years, pronounced osseous adaptation will be evident, and soft tissue procedures will fail to provide adequate correction of the deformity. A variety of osseous procedures have been reported:
 - Bankart proposes total excision of the cuboid bone to compensate for the anatomical fault, of the congenital absence of the medial cuneiform.
 - Peabody and Muro recommend excision of the bases of the central three metatarsals, osteotomy of the fifth metatarsal, mobilization and reduction of subluxation of the first metatarsal cuneiform joint.
 - McCormick and Blount achieved successful results following arthrodesis of the first metatarsocuneiform joint, together with osteotomy of the central three metatarsals. In severe cases addition of a wedge resection of the cuboid bone is performed.
 - Steytler and Van Der Walt performed V-shaped osteotomies of each metatarsal, for correction of the metatarsus adductus foot.
 - Berman and Gartland advocate dome shaped osteotomies through the bases of all metatarsals, with the apex of the dome positioned proximally.



- **(A) Peabody and Muro**
- **(B) McCormick and Blount**
- **(C) Steytler and Van Der Walt**
- **(D) Berman and Gartland procedures**

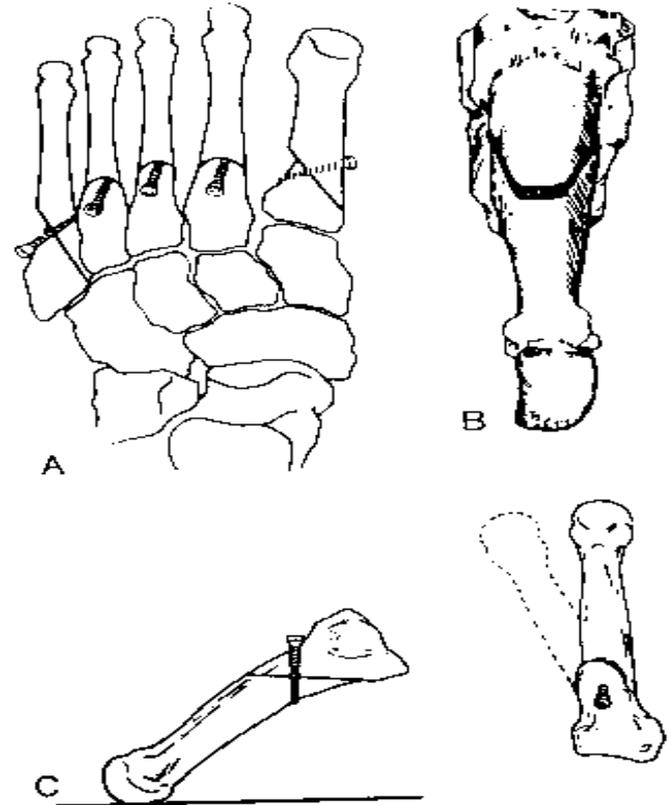
Fowler Procedure

- Opening-wedge osteotomy of the first cuneiform. The defect is replaced by a triangle-shaped bone graft.



Lepird procedure

Oblique wedge osteotomy of the first and fifth metatarsals are performed with through and through rotational osteotomy of second, third and fourth metatarsals.



Medial column lengthening and lateral column shortening procedures

- If medial angulation of the cuneiform is the principal abnormality (deviated Lisfranc articular set angle), open wedge cuneiform osteotomy may work well. If made at the midpoint, it may be deepened through the second cuneiform, without harm to base of the second metatarsal.
- If deformity is fixed and the foot rigid, it may not be possible to gain adequate correction via cuneiform osteotomy alone. Additional correction may be gained by removing a wedge of bone from the cuboid. The apex is directed toward the medial cut.

CASE STUDY

- **8 y.o. ? (with parents) presented to FCNY Peds clinic to pick up orthosis. The mother noted that her daughters feet have an unusual shape (they look like they “turn in”) and have looked that way since birth. The patient also complains of pain in her feet and legs. The patient pointed to the dorsum of her feet B/L as the area of pain and the posterior compartment B/L. The pain was described as aching/dull, and patient/parent can not recall how long the discomfort has been present. The mother states that her daughter can not keep up with her friends physically b/c she seems to fall down a lot (6-8x a day) and has been getting worse over the last month.**
- **The parent says that she has taken her daughter to other specialists who a few years ago said that any problems her daughter had would correct themselves.**

- The last visit for this patient was 2 years ago, and they were just now getting to pick p their orthosis. So being that we had not seen them in a while, we treated them as if they were an initial patient.
- PMH PSH: unremarkable
- MEDS: parent denies
- NKFA/NKDA
- FAMILY HISTORY: unremarkable
- BIRTH HISTORY: pt. born with feet turned in
- Milestones: normal development
- ROS: unremarkable

Physical Exam

- Vascular/ Neurological Status: intact
- Dermatological Status: unremarkable
- Orthopedic Exam:
 - patient was noted to have severe MA (as noted by a Bleck's test of 3rd i.s on left and 4th toe right. The inward splaying between the hallux and 2nd toe B/L.
 - The deformity is reducible b/c with passive motion the foot can be straightened back into rectus position/
 - All other tests were WNL for a patient her age

So we took an xray:



These are actually not her x-rays, I had trouble transferring hers from our system to my presentation.

We attempted to locate this patient's orthosis but because they were cast so long ago they were MIA.

So we scheduled the patient to return next week to be re-cast for functional orthosis.

We lost the patient to follow-up, as was expected.

If we expected her to show we would have referred her to Sx dept for an evaluation and surgical management of her condition.