Functional Foot Orthoses

Functional Foot Orthoses

- While all foot orthoses are, by definition, functional, for the purposes of this module we will be discussing the low-profile, rigid, ¾-length base, foot orthosis preferred by many in the podiatry community.

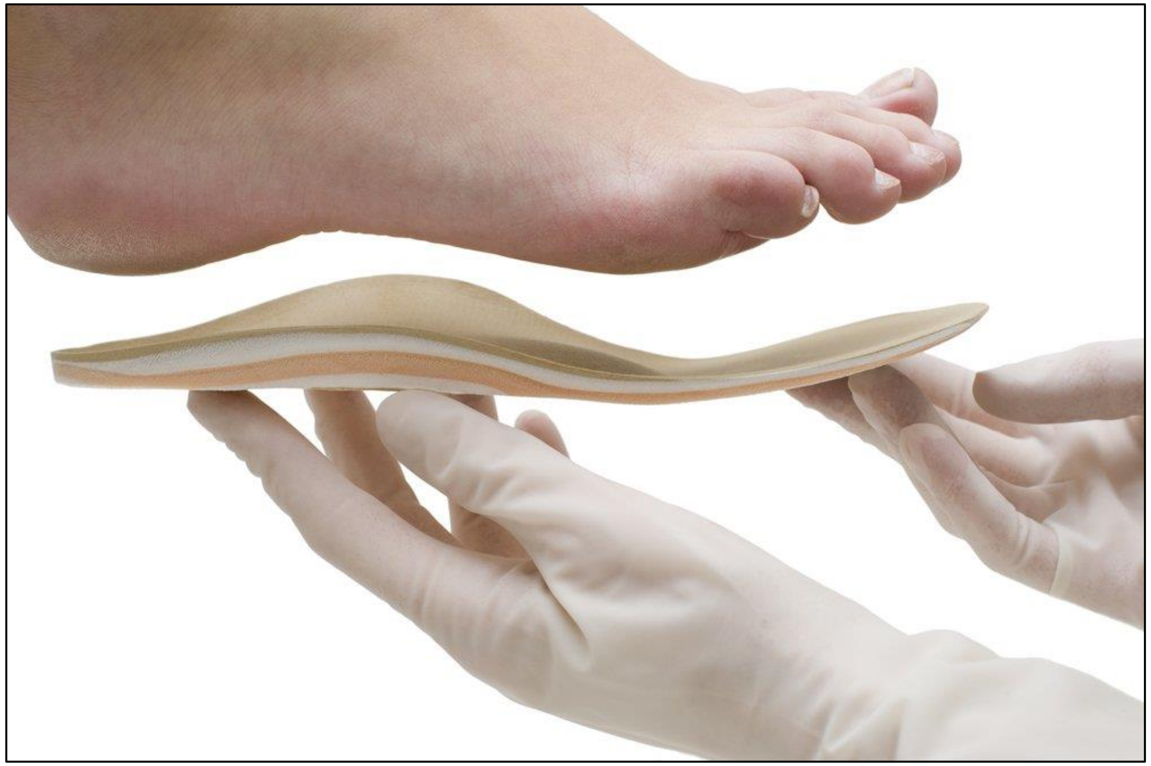
How do FFOs work?

How do functional foot orthoses work?

- Although there is ample scientific research literature demonstrating that foot orthoses do, in fact, work (and work quite well) in the treatment of foot pathologies, there is no consensus as to precisely how they accomplish this.
- There are many theories, but scant few that are both theoretically coherent and biomechanically plausible.
- The two most logical are the *Direct Mechanical Effect* and the *Neuromotor Effect*.
- We will discuss Root theory biomechanics solely because of the (still) great many adherents to the theory, not because it is biomechanically sound.

Direct Mechanical Effect

- The direct mechanical effect is defined as the kinetic and kinematic effects acting on and within the foot and leg which are a result of changes in the location, magnitude, and temporal patterns of ground reaction force acting on the plantar foot.[1]
  - Kinetic – forces and moments
  - Kinematic – position and motion



1. Kirby KA: Foot and Lower Extremity Biomechanics IV: Precision Intricast Newsletters, 2009-2013. Precision Intricast, Inc., Payson, AZ, 2014, pp. 53-54.

Direct Mechanical Effect

- An example of this would be the action of an FFO designed to prevent over-pronation. The device would have a higher, stiffer medial longitudinal arch and a medial heel skive.
- “Anti-pronation” functional foot orthosis:
  - The higher, stiffer medial longitudinal arch will serve to increase the ground reaction force on the medial midfoot while decreasing it on the lateral midfoot. This shift in ground reaction force lateral to medial, helps to reduce the amount of medial longitudinal arch flattening in stance phase. Additionally, the medial heel skive will increase the varus heel cup contour of the orthosis which shifts ground reaction force away from the lateral plantar heel and toward the medial plantar heel.
  - Increasing the GRF on the MLA with the higher, stiffer MLA and on the medial aspect of the plantar heel with the medial heel skive in the “anti-pronation” orthosis will produce a direct mechanical “anti-pronation” effect from the orthosis by altering the locations and magnitudes of GRF acting on the plantar foot.

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Direct Mechanical Effect

- Foot orthoses may also exert a direct mechanical effect in preventing the excessive bending moments that can cause stress reactions and fractures within the long bones of the lower extremity such as in the femur, tibia, and metatarsals.
- Foot orthoses have also been shown in numerous studies to exert a direct mechanical effect in relieving the pain and disability of:
  - Medial knee osteoarthritis
  - Plantar fasciitis
  - Patellofemoral pain
  - Low back pain
- In summary, the net result of the direct mechanical effect of foot orthoses is to alter the locations, temporal patterns, and directions of the pushing forces from ground reaction force that would normally occur from weightbearing on a flat surface and convert them into different locations, temporal patterns, and directions of plantar pushing forces that will be beneficial for the patient.
- Ultimately, the goal of these direct mechanical effects of foot orthoses is to alter the plantar foot pressures and/or plantar foot forces so that any pathological internal forces and moments acting within the foot that are causing pain are reduced.

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Neuromotor Effect

- The neuromotor effect of foot orthoses is more complicated since it is mediated by the central nervous system.
- It is defined as the kinetic and kinematic effects on the foot and lower extremity that are caused by changes in sensory input to, and motor output from, the central nervous system.

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Neuromotor Effect

- Inputs into the central nervous system may come from sensory organs within the skin, joints, muscles, tendons, eyes, inner ears, or other areas of the body.
- The mechanical interaction of the foot orthosis with the plantar foot may cause, for example, changes in plantar foot pressures, changes in stretching forces within the joint capsular ligaments and tendons, and other mechanical effects that all have the potential to be relayed as afferent (external conducted inward) stimuli via the peripheral nervous system to the central nervous system.
- These changes in afferent sensory stimuli that result from mechanical interaction of the orthosis with the plantar foot may result in the central nervous system altering the magnitudes and temporal patterns of efferent motor signals to the muscles of the foot and lower extremity during weightbearing activities to decrease the metabolic energy used during locomotor activities, to maintain balance and to prevent injury.
- Countless times a day, the central nervous system processes afferent signals from the peripheral nervous system and then sends out “corrective” efferent (internal directed outward) motor output to the muscles of the foot and leg to optimize weightbearing dynamics and prevent injury.

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Neuromotor Effect

- Using our previous example of an "anti-pronation" foot orthosis, the neuromotor effect means that even though an "anti-pronation" foot orthosis may be designed to directly push the foot toward a supinated position, the central nervous system may respond to any excessive STJ supination moment caused by the orthosis by increasing the pronation motion of the STJ, via peroneal muscle activation, during the late midstance phase of gait.
- It is quite likely that the neuromotor effects of foot orthoses play a significant role in how they may be able to change the position and/or motion patterns and/or change the forces and moments acting across the joint axes of the foot and lower extremity during weight-bearing activities.
- There has also been much research done demonstrating the positive neuromotor effects of foot orthoses on balance.

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Subtalar Joint Neutral Position and Root Theory

Functional Orthoses

Root and “Functional” Foot Orthoses

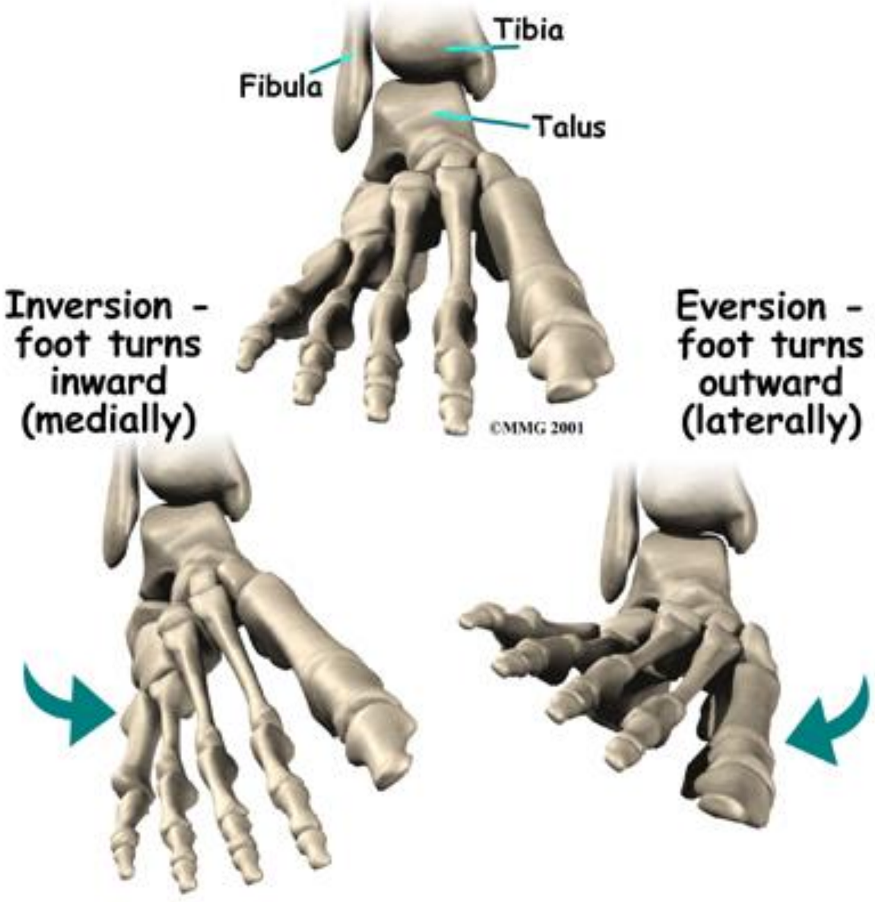
- The term “functional foot orthosis” was coined by Merton Root, DPM as he developed his original orthotic design in 1958 and 1959.
- His first attempts were actually semirigid.
- In 1959, he began using Plexiglas®
- Shortly thereafter, he realized Plexiglas® was too rigid and switched to alternate materials – mainly acrylics.
    - Langer Acrylic Lab was first real producer of these orthoses
- The primary novel feature his use of forefoot posting, which no one had been doing prior to Root. He also incorporated a “triplanar” heel post.

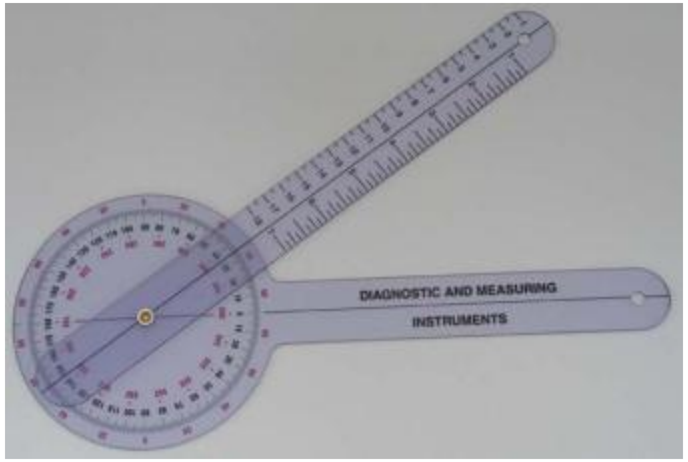
- *"… About 80% of foot pathology can be treated with a good custom orthotic, 10-15% you needed true skill for casting and manipulating the foot with modifications, and about 5-10% you could never truly fix them, you had to take them to surgery."*

- No podiatrist in 2024

Subtalar Joint Neutral

- Normal STJ ROM
  - Inversion = 20^0-25^0
  - Eversion = 10^0



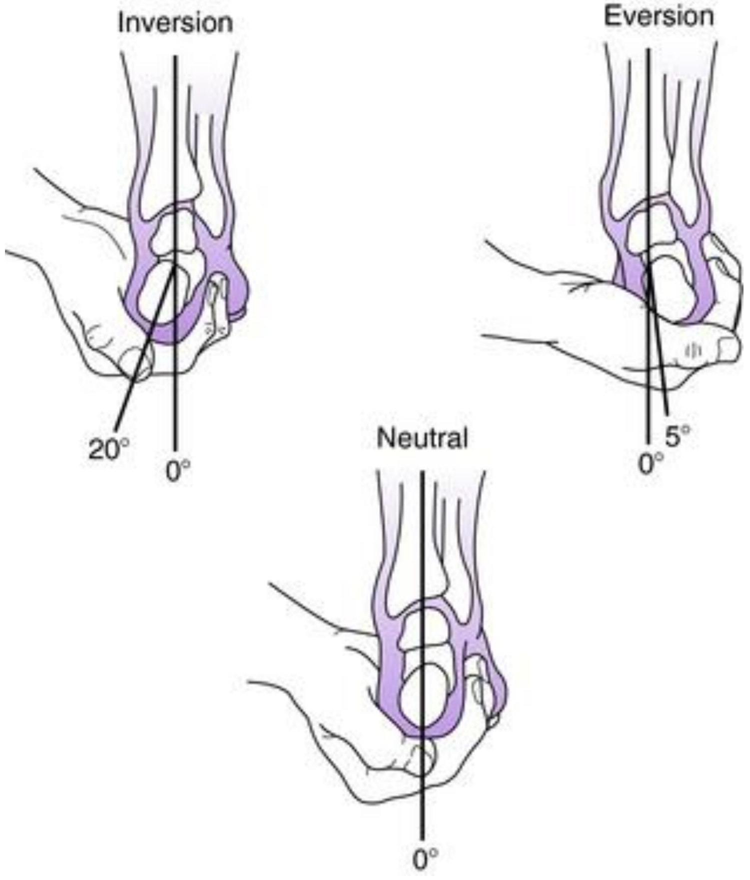


Subtalar Joint Neutral Position

- Much of traditional podiatric orthotic ideology is built upon the concept of STJN.
- The problem lies in the fact that there is not, and has never been, a gold standard scientific definition of the position.
- Podiatry schools teach at least six vastly different ways to determine the position:
    - palpation of the talonavicular joint
    - palpation of the talocalcaneal joint
    - matching the curves superior and inferior to the lateral malleolus
    - looking for relaxed skin lines in the sinus tarsi
    - feeling for a “flat spot” within the STJ range of motion
    - Root’s theory - the 1/3rd - 2/3rd method
        - He claimed that “from the neutral position, the calcaneus inverts with supination twice as many degrees as it everts with pronation.”

Subtalar Joint Neutral Position

- Dr. Root defined the STJ neutral position as being “the point at which the foot is neither pronated nor supinated.”
    - “Pronation” and “Supination” describe triplanar, rotational motion that is, for all intents and purposes, impossible to measure accurately.
- Akin to SCOTUS Justice Potter Stewart’s definition of “obscenity”.
    - “I can’t define it, but I know it when I see it.”



Root Theory

- Developed in 1970’s by Drs. Root, Weed and Orien
- Theory presupposes that STNP is attainable, repeatable and truly the ideal functional position of the hindfoot.
- Goal is to “correct” hindfoot to neutral during stance phase of gait
- $b-((a+b)/3)$=STJ neutral
  - a = Max degrees of inversion
  - b = Max degrees of eversion
- In other words:
  - Add degrees of inversion and eversion, divide that number by 3 and subtract that value from the degrees of eversion and that is how many degrees you’d have to post the hindfoot to get to STJ neutral

Root theory

- Root's theory of foot biomechanics is quite complex, but in a nutshell it says:
    - Subtalar joint neutral and a locked midtarsal joint represents the ideal biomechanical position of the human foot. There is a critical mechanical relationship between the subtalar joint (STJ) and the midtarsal joint, and that this relationship could be the origin of mechanical foot dysfunction.
- Questions to ask:
    - Is the STJN position really the optimum reference point for "normal" foot function?
    - If the foot is only in STJ neutral for a fraction of the gait cycle during heel contact, why should the cast and the orthotic be built around this single position?
    - Is the STJN method of casting reliably accurate and repeatable across practitioners?
    - Can a round heel really be expected to stand vertically inside a rounded heel cup when rotational forces are present?
    - Given that the heel has significant soft tissue and a fat pad, how much control can an extrinsic wedge really provide?

Root Theory

- Upon further review…
  - Entire formula based on subjective measurements
  - Kirby KA, *Are Root Biomechanics Dying?* Podiatry Today 22(4), April 2009
    - “The answer is a definite yes.”
    - Flaws include:
      - STJ neutral is a rotational position that has never been adequately defined
      - Intra- and interclinician unreliability in assessment render measurements essentially meaningless
      - Doubt as to whether STJ neutral is indeed the ideal position of function
      - No scientific evidence to support the idea that one may predict gait function or pathology via measurements advocated by Root
      - The idea of the “locking” midtarsal joint is not mechanically consistent with the actual spring-like function of the medial longitudinal arch

Root Theory

- Upon further review…
  - Elli K, et al, *Reliability of the Subtalar Joint Neutral Position*. (2008) Proceedings GCMAS 13th Annual Meeting:208-209
    - 3.3^0 inter-rater variability
  - Chuter V, et al, *Variability of Neutral-Position Casting of the Foot*. JAPMA 93(1): 1-5, 2003.
    - 16.5^0 inter-rater variability in rearfoot-forefoot ratio
    - Concluded that perhaps an accurate cast was unnecessary and/or functional FOs are effective for reasons other than the supposed importance of STJ neutral and the “locking” of the midtarsal joint
  - Ball KA, Afheldt, *Evolution of foot orthotics-part 1: Coherent theory or coherent practice?* J Manipulative Physiol Ther. 2002 Feb;25(2):116-24
    - Clinical successes have been achieved both inside and outside the classic Root paradigm.

Subtalar Joint Neutral

- Picciano AM, et al, *Reliability of open and closed chain subtalar joint neutral positions and navicular drop test*. J Ortho Sports Phys Ther 1993 Oct; 18(4): 553-8.
    - "[These] measurements are not reliable when performed by inexperienced testers."
- Buckley RE, Hunt DV, *Reliability of clinical measurement of subtalar joint movement*. Foot Ankle Int. 1997 Apr;18(4): 229-32.
    - Methods used were those previously described by Root, et al.
    - "…potential average loss of range of motion of 20% simply because of variablity in measurement."
    - "It was also determined that a learning curve did not exist within examiners in this study."
    - "Both inter- and intraexaminer reliability are so poor as to suggest that this method of examination no longer be used to determine or document the measurement of subtalar movement."

Subtalar Joint Neutral

- Pierrynowski MR, Smith SB, *Rear foot inversion/eversion during gait relative to the subtalar joint neutral position*. Foot Ankle Int. 1996 Jul;17(7):406-12
    - "…the [normal] rear foot is rarely near the STNP during stance [phase]."
- McPoil T, Cornwall MW, *Relationship between neutral subtalar position and pattern of rearfoot motion during walking*. Foot Ankle Int. 1994 Mar;15(3):141-5
    - "…the "neutral" position of the rearfoot…was found to be resting standing foot posture rather than subtalar joint neutral position."

Functional Foot Orthoses

Functions of a Foot Orthosis

1. Provide maximal and even distribution of weight-bearing stresses over entire sole
2. Reduce stress and strain on the LE and spine by controlling motion and absorbing GRF
3. Provide relief for sensitive and painful areas
4. Support arches of foot
5. Decrease amount, degree and rate or pronation
6. Correct abnormal foot position
7. Provide accommodation for partial foot
8. Serve as an addition to AFO
9. Equalize leg length discrepancies
10. Limit motions and WB stresses of symptomatic joints
11. Minimize pressure and irritation from external and internal sources

Adapted from: Foot Orthoses: Principals and Clinical Applications. Kent Wu. 1990 © Williams & Wilkins

Desirable Properties of a Foot Orthosis

1. Provides support, pain relief and biomechanical correction
2. Has no harmful effects
3. Has reasonably good appearance so as to increase patient acceptance
4. Fits properly and is comfortable to wear
5. Lightweight and durable
6. Affordable
7. Should be relatively easy to fabricate
8. Easy to adjust, maintain or service
9. Has good breathability
10. Is radiolucent
11. Resists damage caused by water, urine, oil, temperature changes and UV light

Adapted from: Foot Orthoses: Principals and Clinical Applications. Kent Wu. 1990 © Williams & Wilkins

Cast Modifications: Intrinsic Forefoot Posting

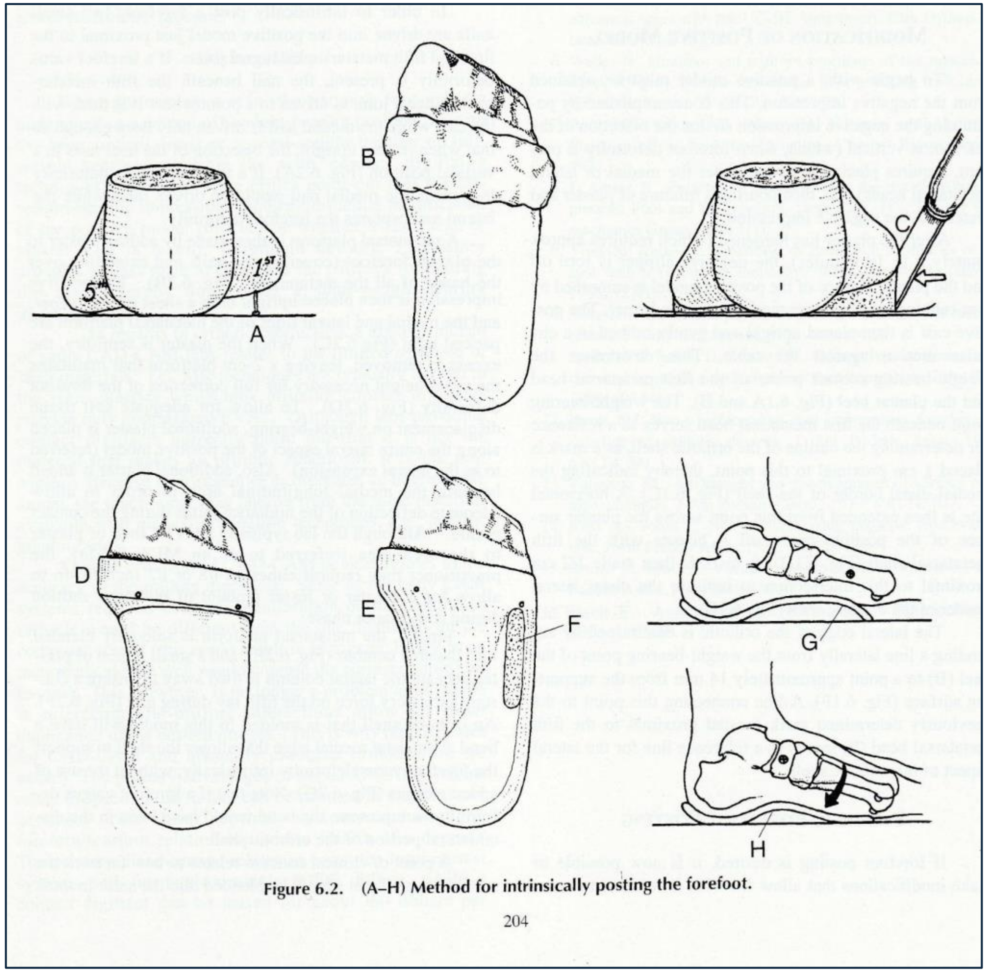


Figure 6.2. (A–H) Method for intrinsically posting the forefoot.

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A. Two small nails driven into cast just proximal to 1st and 5th MTHS

B. Plaster added to cover nails to create MT platform

C. Medial and lateral sides of MT platform filled in with plaster

D. A 2cm platform created to maintain correction of forefoot varus/valgus

  - At this point, the arch fill is performed. Typically ¼’ of plaster is added to medial longitudinal arch.

E. Metatarsal platform blended into arch fill

F. A small region of plaster removed beneath lateral column to ensure pronatory force on 5th ray

From: Foot Orthoses. Michaud, TC. 1997 ©Thomas Michaud

Materials

Early Rigid FOs

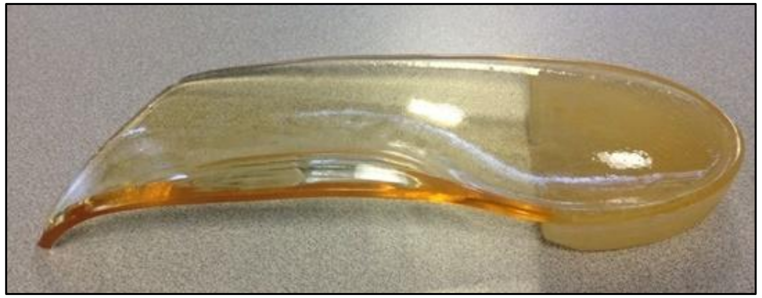
- Metal
  - Shaffer plates
  - Spring steel
  - In the late 1800’s, Royal Whitman used 18-gauge steel to make his foot orthoses.

Early Rigid FOs

- Leather
  - The original material used for "arch supports."
  - Shoemakers took sole leather and wet-molded it to casts.
  - Still used when patients want good support but cannot tolerate firmer plastics.
  - Bulky and heavy.

Early Rigid FOs

- Acrylics
  - Rohadur, Polydur, and Plexidur
  - Made from methyl methacrylate polymers.
  - Very prone to cracking.
  - Search for alternatives took on great urgency when it was discovered that the production process was carcinogenic.



Thermoplastics

- Commonly used thermoplastics
    - Homopolymer polypropylene
    - Copolymer polypropylene
    - High density polyethylene

Thermoplastics

- Polypropylene (homopolymer)
  - Economical material that offers a combination of outstanding physical, mechanical, thermal, and electrical properties not found in any other thermoplastic.
  - A plastic with a low specific gravity and high stiffness.
  - Good weight-to-strength ratio makes it ideal for manufacturing rigid foot orthotics.
  - Any notch or groove on the finished shell can create a stress point that may eventually crack.
  - Available in many colors and thicknesses.

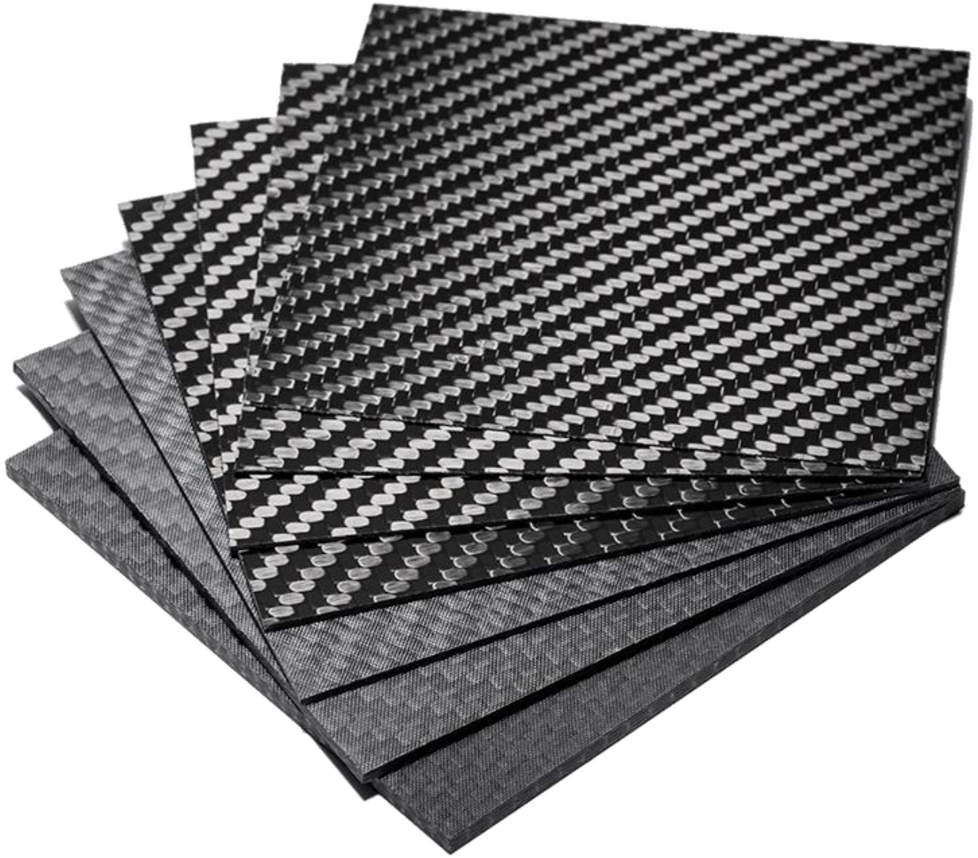
Thermoplastics

- Polypropylene (copolymer)
  - Copolymer blend of polypro and polyethylene
  - PP >>> PE
  - A bit softer than HPP
  - Better impact strength, is tougher and more durable than HPP.
  - CPP tends to have better stress crack resistance and low temperature toughness than HPP.
  - Susceptible to “cold flow”.

Thermoplastics

- High density polyethylene (HDPE)
- Higher impact strength than PP.
- Inferior working temperature and tensile strength than PP.
- Subortholene™
  - Lightweight, strong, flexible, excellent stress crack resistance.
  - Molds well over deep heel cups and flanges.
  - Can be thinned without cracking.
  - Does not retain molded shape as well as PP.

Polycarbonates



Polycarbonates

- Combining acrylic plastic with carbon fibers creates a rigid sheet material.
- Known by various trade names such as Exos®, Carboplast, Graphite, and the TL-series.
- “Carbons" are good for thin, functional orthotics.
- They can be difficult to work with, requiring a higher softening temperature, faster vacuuming, and complete accuracy during the process as they cannot be “re-worked”.

Compare and Contrast

Polypropylene

- Polypropylene is an organic polymer made from propylene through a catalytic reaction.
- Good temperature resistance, good fatigue resistance, good chemical and environmental stress cracking resistance, good detergent resistance, high hardness, ease of processing by injection molding and extrusion are its properties.
- Less expensive
- Low impact strength

Polycarbonate

- Polycarbonate is a thermoplastic elastomer formed from the reaction between Bisphenol A and phosgene.
- Heat resistance, inherent flame retardance, ease of process, and clarity are properties of polycarbonate.
- More expensive
- High impact strength

Compare and Contrast

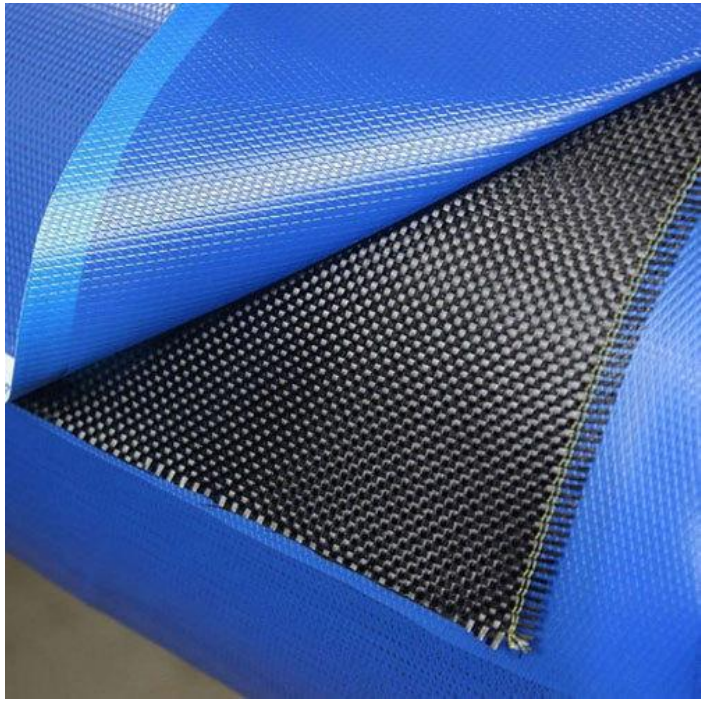
- Ductility and strength measured by a tensile test
- Fracture toughness = impact resistance

Typical Tensile Strength, Elongation, and Tensile Modulus of Polymers

Polymer Type	Ultimate Tensile Strength (MPa)	Elongation (%)	Tensile Modulus (GPa)
ABS	40	30	2.3
ABS + 30% Glass Fiber	60	2	9
Acetal Copolymer	60	45	2.7
Acetal Copolymer + 30% Glass Fiber	110	3	9.5
Acrylic	70	5	3.2
Nylon 6	70	90	1.8
Polyamide-Imide	110	6	4.5
Polycarbonate	70	100	2.6
Polyethylene, HDPE	15	500	0.8
Polyethylene Terephthalate (PET)	55	125	2.7
Polyimide	85	7	2.5
Polyimide + Glass Fiber	150	2	12
Polypropylene	40	100	1.9
Polystyrene	40	7	3

Carbon Composites Used in O,P&P

- Prepreg
  - Sheets of carbon fiber weave fabric preimpregnated with epoxy resin
  - Maximum strength properties
  - Variable strength and mechanical properties based on number and orientation of layers
  - Awesome strength-to-weight ratio
  - Pricey
  - Used in AFOs and prosthetic feet for dynamic energy return properties
  - Cannot be adjusted once formed



Carbon Composites Used in O,P&P

- TenCate Cetex® TL-2100
- Popular material in podiatry applications
- Continuous Fiber Reinforced Thermoplastic (CFRT®) composite laminate with carbon fiber and modified polymethylmethacrylate (PMMA) resin.
- Designed specifically for orthotics.
- Available in three four rigidities (thicknesses).
- Not adjustable once formed.

Carbon Composites Used in O,P&P

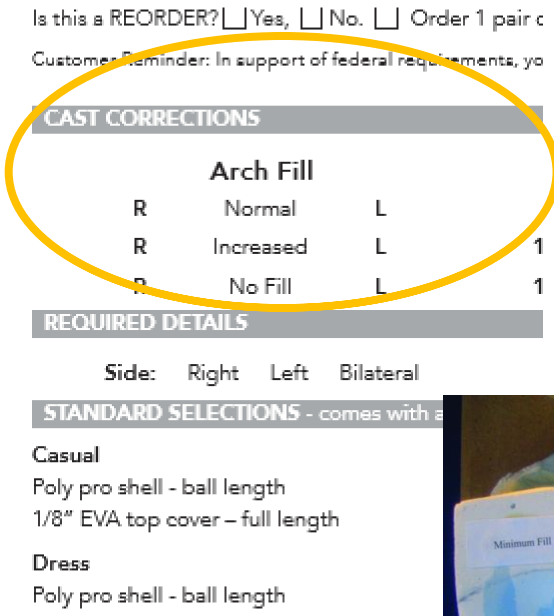
- Exos™
  - The patented Exos™ carbon nano-tube technology is a lightweight, low temperature thermoformable material allowing for quick, easy adjustments.
  - It's easy to form and bend to any curvature for deep heel cups and unusual arch shapes.
  - Reformable as many times as needed.
  - Available in 4 levels of rigidity.

Modifications, Add-ons and Accommodations


CHOOSE FROM...
Extrinsic Rearfoot Posting
Intrinsic Rearfoot Posting
Heel Lift
Extrinsic Forefoot Posting
Morton's Extension
Medial Flange
Lateral Flange
Lateral Wedge
Heel Spur Cut Out
First Met Cut Out
First Ray Cut Out
Plantar Fascial Groove
Navicular Shell Accommodation

Arch fill vs arch fill

- Arch fill on positive model



Is this a REORDER? ☐ Yes, ☐ No. ☐ Order 1 pair c

Customer Reminder: In support of federal requirements, yo

CAST CORRECTIONS

	Arch Fill		
R	Normal	L	
R	Increased	L	1
R	No Fill	L	1

REQUIRED DETAILS

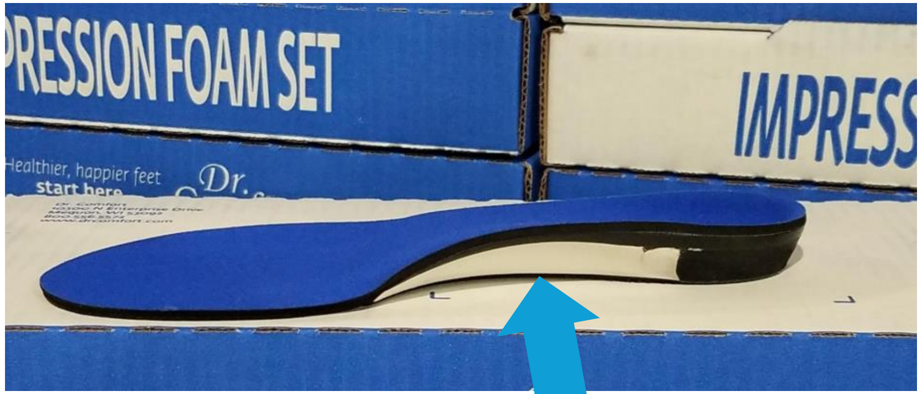
Side: Right Left Bilateral

STANDARD SELECTIONS - comes with a

Casual
Poly pro shell - ball length
1/8" EVA top cover – full length

Dress
Poly pro shell - ball length

- Arch fill on orthosis



COLLECTION 3 - SPECIALTY FUNCTIONAL ORTHOSES

MARATHONER: Semi flexible Polypropylene shell, soft arch fill, dual density heel post, and neoprene top

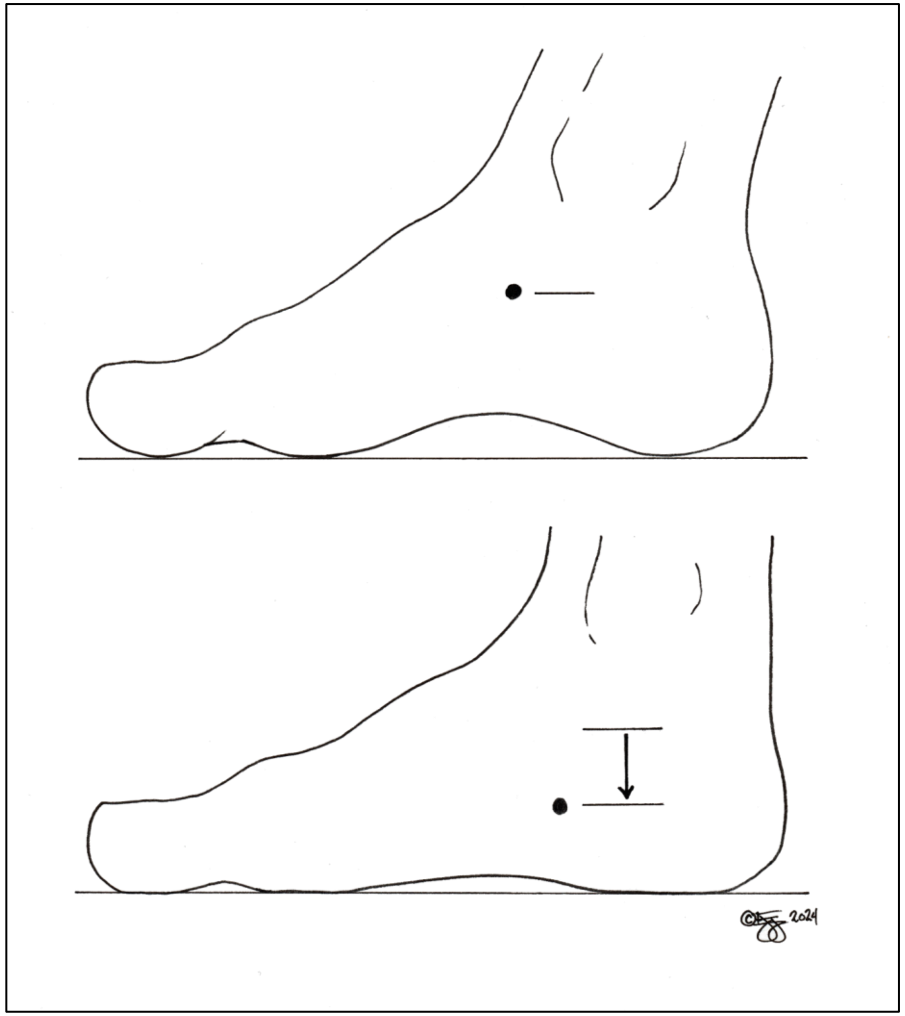
Consider for:
Heel toe runners, Long distance runners, Greater dynamic response than standard functional orthotic

Material
- Top cover – 1/8" Neoprene Fabric
- Arch fill – Soft EVA
- Posting – Dual Density EVA
- Shell – Polypro 3mm – ball length
- Bottom – Sole Cap + Pseudo suede

SEMI RIGID

Why fill in the arch of the cast?

- A normal foot, functioning normally, has a navicular drop of 5-9mm during stance phase of gait.
- If the plastic contacted the navicular when the foot is in its neutral weightbearing position, not only would the foot not function properly but the orthosis would be painful to wear.

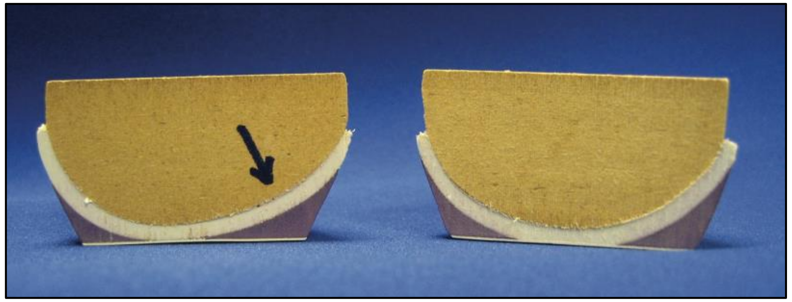


Confusing Terminology

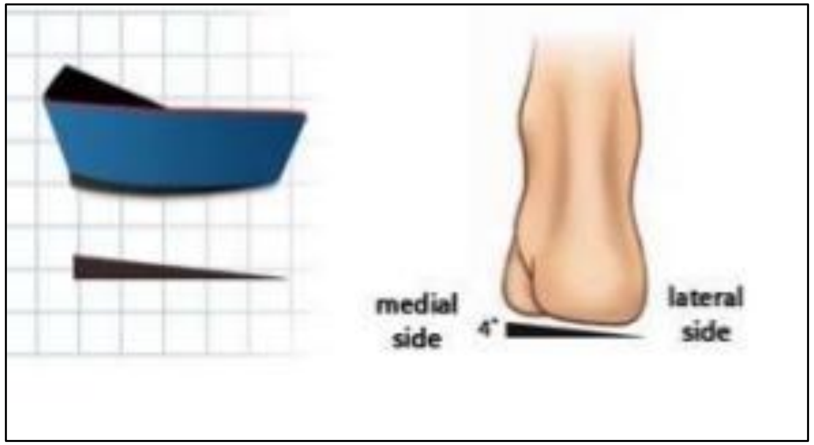
- Skive vs Wedge vs Post
  - OP&P community typically uses the term *wedge*.
  - Occasionally, they'll call it a *post* depending on their training.
  - The term *skive* is primarily used by the podiatric community.

Skive vs Wedge vs Post

- Skive:
  - The cast or positive model is modified.
  - Material is removed from the cast or positive 3D model under one side of the heel.
  - Ex: Medial heel skive = Material removed from underside of medial heel.



- Wedge:
  - The FO itself is modified.
  - Additional material added to the underside of the orthosis. May be external/extrinsic (readily apparent) or it may be built-in/intrinsic (not visible).
  - Ex: Medial heel wedge = Thickness under medial aspect of the heel is greater than the lateral aspect.
- Post: Another name for a wedge



- Functionally speaking, a wedge and a skive are two ways to skin the same cat. Just depends on your training/discipline.

Wedges and Posts

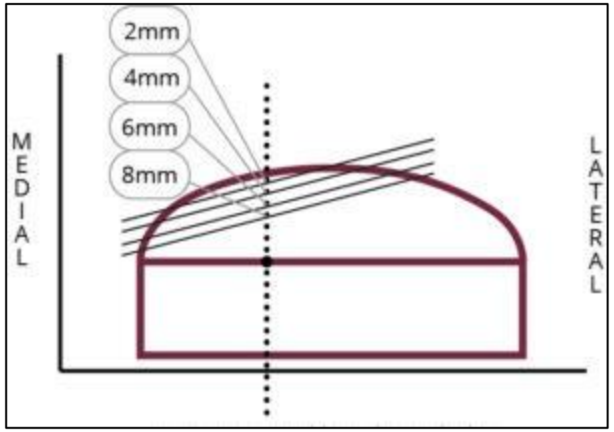
- Make sure that you, the referring physician and the technician making the orthosis are all speaking the same language when it comes to wedging or posting a section of the foot.

- A medial heel wedge (where the added material is thicker on the medial side and thins out to nothing on the lateral side) can also be referred to as a:
  - Varus wedge – meaning the hindfoot is in valgus and the wedge should move it into varus
  - Valgus wedge – meaning the hindfoot is in valgus and that is the deformity you wish to influence/correct
- Vice versa with lateral wedges

- It can be very confusing as pedorthists, podiatrists, orthopedic surgeons and physical therapists all seem to speak their own languages…

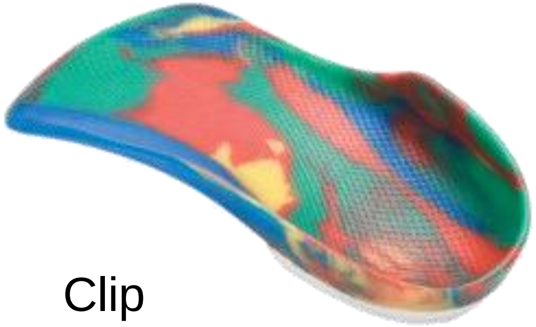
Functional FO Modifications

- Kirby Skive
  - Material is removed from the medial heel of the positive model to create a sort of intrinsic wedge



- Flanges and Clips
  - Vertical medial or lateral extensions from the footplate to provide additional supinatory or pronatory control.

Flange



Clip

Functional FO Modifications

- Reverse Morton's Extension
  - Extension of shell material under 2-5 MTHs
  - Increase motion at 1st MTPJ

- Morton's Extension
  - Extension of shell material under 1st ray
  - Reduce motion at 1st MTPJ
  - Note: May cause sesamoiditis

Fabrication Techniques

Indications and Examples

(for commonly encountered pedorthic patients)

Plantar Fasciitis

- Research demonstrates fairly conclusively that a great many types, styles and designs of foot orthoses are equally effective in the treatment of plantar fasciitis.
- Is this because all FOs are truly effective for plantar fasciitis? Or is this because plantar fasciitis is a self-limiting pathology?
- The theory behind use of a total contact foot orthosis for plantar fasciitis is that by filling in the medial longitudinal arch with a firm base, it reduces the downward flex of the midfoot during late stance and early toe-off phases of gait thereby reducing stress and strain on the plantar aponeurosis. That does sound logical.

Plantar Fasciitis

- Functional foot orthoses
  - Medium density topcover
  - +/- softer midlayer (PU foar
  - Some literature suggests m
    post/wedge

Overpronation/Post Tib Tendinopathy

- Functional foot orthosis
  - Heel post +/- medial wedge
  - Medial heel skive
  - Deeper heel cup
  - Higher lateral flange

Peroneal Tendinopathy

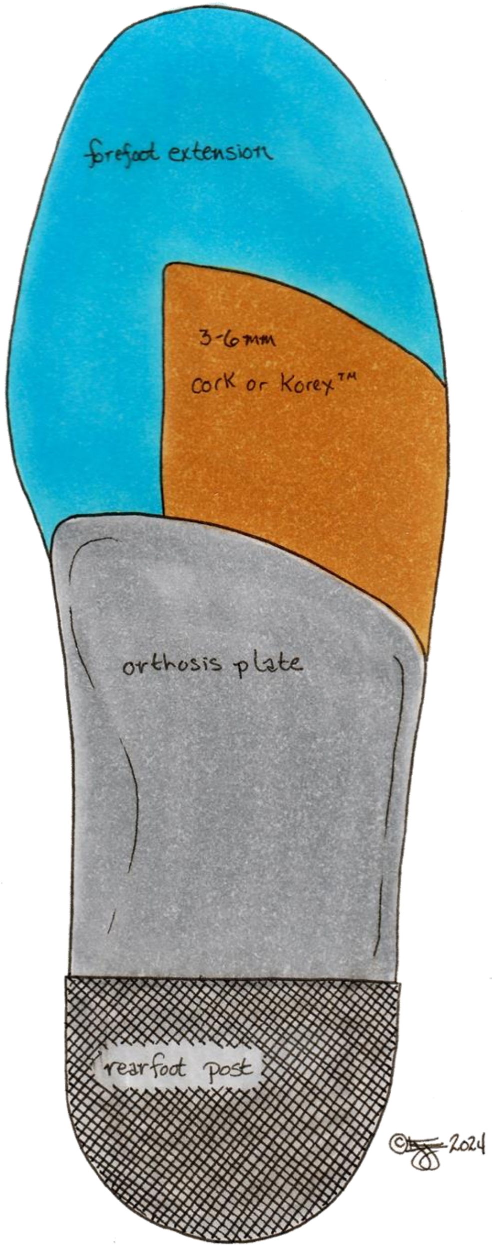
- Functional foot orthosis
  - Soft or medium density topcover, especially if pain is more distal
  - Heel post +/- lateral wedge
  - Lateral heel skive
  - Deeper heel cup
  - Higher lateral flange

Metatarsalgia/Interdigital Neuroma

- Functional foot orthosis
  - Soft full length topcover
  - Metatarsal pad
  - Possible cutout or horseshoe pad for particularly painful MTH
  - Low heel cup

Sesamoiditis

- Functional foot orthosis
  - Soft topcover
  - Forefoot posting to load 2-5, unload 1st MTH
    - 3-6mm firm cork or Korex™
  - Neutral heel post

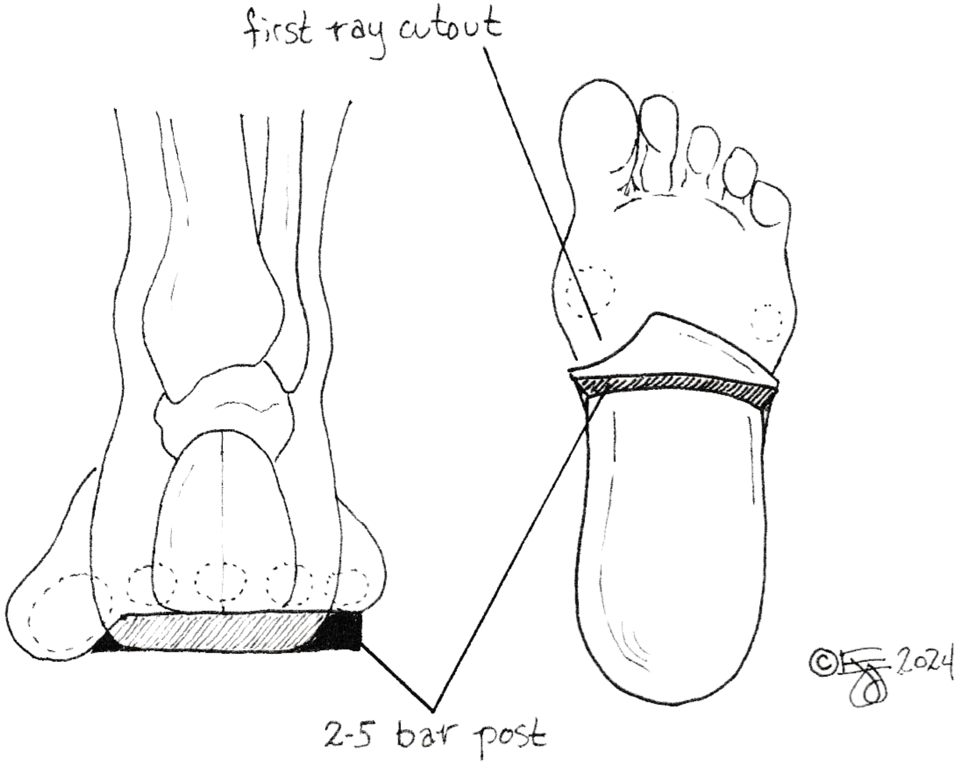


Dropped Cuboid Syndrome

- Functional foot orthoses
  - Goal is to relieve stress and strain on cuboid joint capsule.
  - Not much evidence to suggest that FOs will prevent cuboid syndrome, however custom foot orthoses with soft cuboid padding and lateral hindfoot posting can be effective in treating an episode.

Plantarflexed 1st Ray

- Functional foot orthosis
  - First ray cutout
  - 2-5 bar post – allows forefoot to load smoothly from lateral to medial MTHs as the plantarflexed 1st MTH no longer strikes the ground prematurely



Gait Plates

- Functional foot orthoses
  - Pediatric use only
  - Used to promote(or combat) either in-toeing or out-toeing
  - Rigid 3mm Polypropylene shell
  - Soft 4° varus rearfoot post
  - No top cover
  - The shell has a lateral clip and also a distal extension under the fifth metatarsophalangeal joint to promote out-toeing *or* a distal extension under the first MPJ to promote in-toeing

The options are endless...

KevinRoot MEDICAL

Custom Patient Specific Functional Orthoses **Order Form**

www.kevinrootmedical.com
hello@kevinrootmedical.com
Tel: 1 800 496 0987
Fax: 1 866 919 9268

Date MM....../DD....../YYYY........
Rush production
3 days 4 days

Clinician

Account Name/Number
Location
PO Number
Clinician
Contact me before processing

Side

Design Functional Orthoses

(Defaults in **bold**)

Performance (P)
for athletic/comfort shoes default 3mm prolite top cover to toes, suede bottom cover, ext rearfoot post
- POLYPRO
- EVA
- XT CARBON
- TL CARBON

Dress (D)
for dress/fashion shoes default protex top cover to sulcus suede bottom cover, intrinsic rearfoot post
- POLYPRO
- XT CARBON
- TL CARBON

Control (C)
for athletic/therapeutic shoes default 3mm prolite top cover to toes, suede bottom cover, extrinsic rearfoot post
- POLYPRO
- EVA
- XT CARBON
- TL CARBON

UCBL fit (U)
for athletic/therapeutic shoes default protex top cover to mets, suede bottom cover, extrinsic rearfoot post
- POLYPRO
- EVA

Quantity of pairs to order

Rigidity (per weight)

- Semi flexible (Recommended for pes cavus)
- **Semi rigid** (Recommended for normal structure)
- Rigid (Recommended for pes planus structure)
- Very rigid (Recommended for severe pes planus)

OR

Specialty Model

(See page 3 - 4 for reference)

Top cover length (optional - for changing defaults)

- Mets
- Sulcus
- **Toes**

Top cover material (optional - for changing defaults)

- **Prolite** mm
- Neoprene mm
- Protex
- Glove leather
- Suede
- Plastazote mm

Bottom cover material (optional - for changing defaults)

- **Vegan Suede**
- Grip: Grip Heel plate Smooth Heel plate
- Suede bottom wrap
- Myolite mm

Patient

First Name
Last Name
Gender: M F DOB MM........./DD........./YYYY.........
Height Weight Shoe size
Dx
Ship to Patient
Street Address
City
State Zip

Congruency (optional - for changing defaults)

- **Foot captured in desired position**
- OR
- Balance forefoot to rearfoot (Root style) 90°
  - Lower arch height (mm)
  - Raise arch height (mm)
  - Asymmetrical feet

Rearfoot posting (optional - for changing defaults)

- Extrinsic R L
- or Intrinsic R ° L °
- Heel skive R L / R mm L mm
- Heel lift (mm) R L

Forefoot posting (optional - for changing defaults)

- Extrinsic R L
- or Intrinsic R ° L °
- or Met wedge

Extensions to sulcus (optional - for changing defaults) More options on 2nd page

THICKNESS (mm)

- Morton's R L
- Reverse morton's R L

Pads (optional - for changing defaults) More options on 2nd page

- Metatarsal pad R L
- Heel pad R L
- Myolite layer R L
- Met balance pad (select all that apply) R L — METATARSAL HEAD

Indicate as needed

Plantar view

Special instructions

Frame modifications (optional - for changing defaults)

RIGHT / LEFT

- Heel Cup Depth (mm)
- Frame Filler (Myolite)
- Filler Skive
- 1st Ray Cut Out
- 5th Ray Cut Out
- Navicular B. Out (mm)
- 5th Button Out (mm)
- Fascia Groove
- Heel Aperture
- Wide Arch Profile
- Medial Flange
- Lateral Flange
- Valgus Frame Filler (Myolite)
- Device Undercut
- Width of Frame

Post modification (optional - for changing defaults)

- Grip Heel Plate
- Proximal Grind off
- Heel Lift Tapered (mm)
- Heel Elevator (mm)
- Varus Motion Post

Pads & Cushions (optional - for changing defaults)

- Plastazote Layer (mm)
- Met Punch ☑ ☑
- Medial Flap
- Scaphoid Pad (mm)
- Slot Accomodation
- Met Bar 1-5 (mm)
- Dancer's Pad (mm)
- Toe Crest
- Neuroma Pad interspace
- Cuboid Offload (mm)
- Heel spur pad (mm)
- Carlton Saddle (mm)
- Valgus Onlay Pad

Forefoot extensions (optional - for changing defaults)

Sulcus extension

- Sulcus Extension Myolite (mm)
- Foot Cookie Ext. Myolite (mm)

To toe extension

- Morton's Ext.
- Rev. Morton's Ext.
- Toe Extension Myolite (mm)
- Dynamic Wedge (mm)
- Varus Extension (mm)
- Valgus Extension (mm)
- Toe Filler
- Detached Carbon Foot Plate to Toes

SPECIALTY MODELS

Dress

- L1 Fashion
- L2 Princess
- L3 Ultra Slim
- L4 Subo-Flex LP
- L5 Supporter LP
- L6 Perseus
- L7 Cobra
- L8 DAS LP
- L9 Coleman LP

Active

- A1 Pro Sport
- A2 Carbon Sport
- A3 Classic Sport
- A4 Subo-Flex
- A5 Supporter
- A6 Cork & Leather
- A7 Pro EVA
- A8 DAS
- A9 Coleman
- A10 Easy Flex
- A11 Cushion Plus
- A12 Unit

UCBL

- T4 UCBL
- T5 Modified UCBL
- T6 Pediatric UCBL
- T9 EVA UCBL

Therapeutic

- T1 Care Soft
- T2 Care Firm
- T3 Premium Diabetic
- T7 Diabetic Inserts

Military

- M1 Field
- M2 Garrison
- M3 Leisure

Root

- Blake (inv. options: 25° 35° 45°)
- Cushion-Flex™
- Cushion-Flex-Control™
- Diaba-Flex™
- Diaba-Flex-Control™

Pathology

- P1 Achilles Tendinitis
- P2 Adult Acquired Flatfoot
- P3 Lateral Ankle Instability
- P4 Hallux Limitus
- P5 Hallux Rigidus
- P6 Heel Spur
- P7 Intoeing Gait
- P8 Metatarsalgia
- P9 Neuroma
- P10 Pediatric Flatfoot
- P11 Pes Cavus
- P12 Pes Planus
- P13 Plantar Fasciitis
- P14 Sesamoiditis

Sports

- S1 Ski
- S2 Ski Pro
- S3 Snowboard
- S4 Basketball
- S4.5 Equipe Basketball
- S5 Football
- S5.5 Lineman
- S6 Baseball
- S7 Soccer
- S8 Jogging
- S9 Marathoner
- S10 Volleyball
- S11 Tennis
- S12 Water
- S13 Skateboard
- S14 Track & Field
- S15 Golf
- S16 Road Cycling
- S17 Mountain Biking
- S18 Trail Running
- S19 Figure Skating
- S20 Ice/Roller Hockey
- S21 Hunting & Fishing
- S22 Hiker
- S23 Ultralite Runner

Conclusions

- *adjective*: **functional**

  1. of or having a special activity, purpose, or task; relating to the way in which something works or operates.
  2. designed to be practical and useful, rather than attractive

- By definition, all FOs are *functional*!
- Don’t stress over subtalar joint neutral position when casting for foot orthoses. Go for the most functional position for that particular foot.
- We know foot orthoses work, but more research is needed as to how and why.

The End