

## SECTION 5 – LABORATORY PROCESS

### THE SHAPE OF THE SHELL IS DERIVED FROM THE SHAPE OF THE CAST

Thermo-forming plastic for orthopedic intervention was originally developed at the University of California Laboratory, Berkley (U.C.B.L.).

#### NEGATIVE TO POSITIVE

##### Calcaneal Bisection to Vertical

The slipper impression cast is set up so the calcaneal bisection is vertical, before liquid plaster is poured into the negative mold.



##### Liquid Seeks Level

Liquid plaster achieves level after it's poured into the negative mold, making a flat, perpendicular surface to the calcaneal bisection..



## STANDARD PLASTER ADDITIONS

### Widen Lateral Border & Heel Seat

Plaster is added to side of lateral aspect (border) of the cast, from the 5<sup>th</sup> metatarsal head bisection proximal to the heel, then continuing around heel area to its medial aspect. This is done to accommodate for an expanding fat pad not captured in the off-weight bearing impression mold.



#### Used to:

Plaster expansion allows for fat pad displacement/expansion when the foot lands/loads onto the shell.

### Lower Longitudinal Arch (L.A.)

Plaster is added to the arch area, from behind the base of the first extending proximal to the distal medial aspect of the calcaneus. The plaster is thickest under 1<sup>st</sup> metatarsal and taper laterally to the 3<sup>rd</sup> metatarsal. An  $\frac{1}{8}$ " of plaster is a standard specification, although lab specifications and preferences vary greatly.



#### Used to:

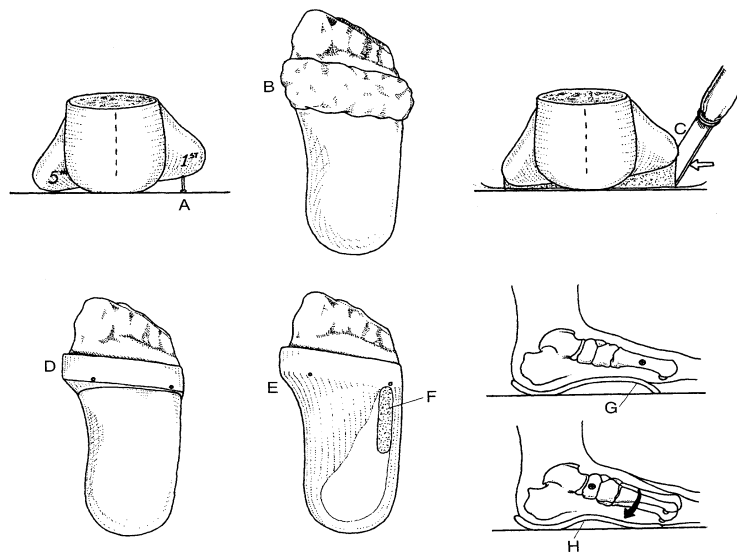
Allow for navicular drop to occur during mid-stance. Also assists with patient tolerance of plastic in contact with arch.

## Intrinsic Forefoot Post

The best-known element of the Root Cast Technique, intrinsic forefoot posts, is constructed across the forefoot of a positive cast. Intrinsic forefoot posts produce more gradual contours on the shell, which are easier for patients to tolerate.

A nail (post) is driven into the met head area to a depth sufficient to maintain the calcaneal bisection at a vertical position. Plaster is spread onto the supporting surface and the forefoot of the cast is placed into the plaster. Excess plaster is trimmed away from the met area, leaving a platform angled from one side of the foot to the nail.

Forefoot posting supports (maintains) the frontal plane deformity, reducing rearfoot compensation into and through mid-stance.



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### Used to:

Create a subtle drop off at the distal edge of the device, or to incorporate posting angles that employ less material across the instep, when shoe volume is a concern.

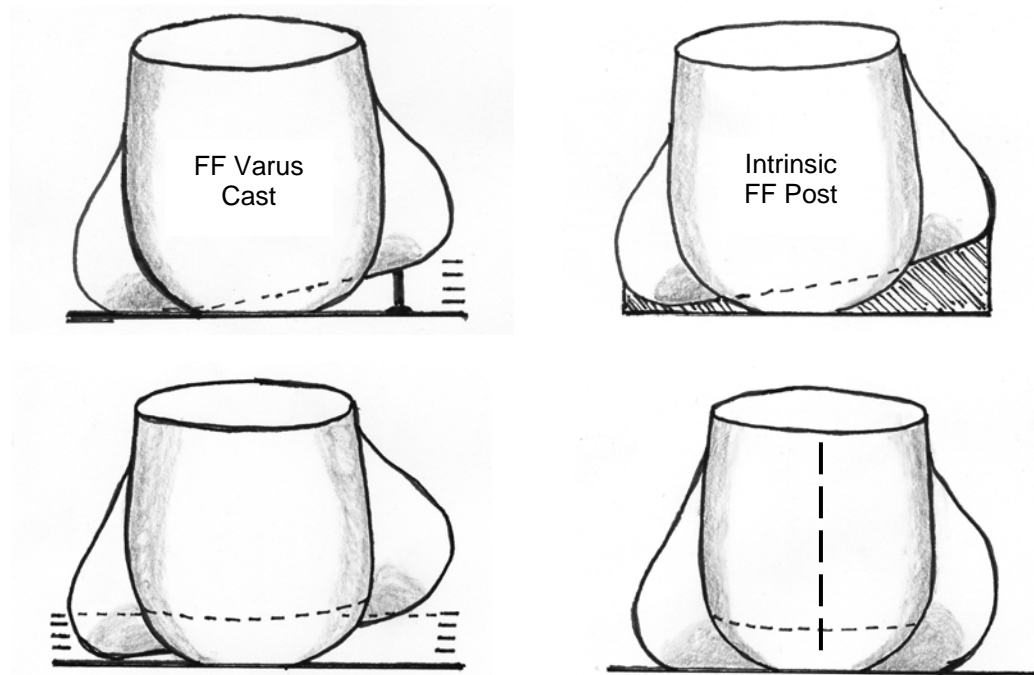
**Modify Forefoot Perpendicular ( $\perp$ ) to Rearfoot**

The forefoot plane (1<sup>st</sup> to 5<sup>th</sup> Met head) is altered, by way of both removing and adding plaster, to bring it into perpendicular alignment with the calcaneal bisection.

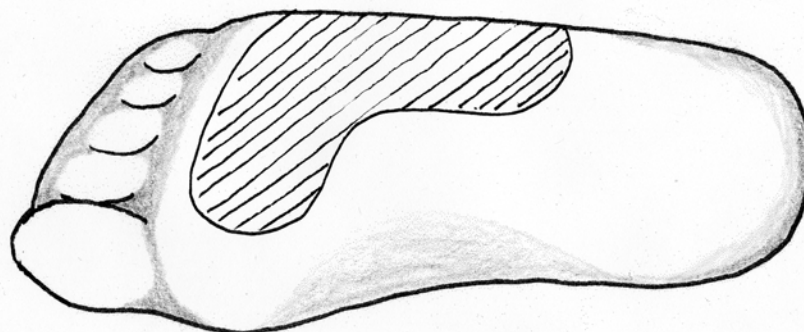
In the case of an inverted forefoot to rearfoot alignment, this causes the forefoot to evert and the 1<sup>st</sup> Ray to plantarflex during mid-stance. This will impart an additional dorsiflexory force along the lateral column during loading response. The 5<sup>th</sup> Ray compensate around it's own axis in tandem with OMJA compensation (abduction and dorsiflexion).

**Used to:**

Model (re-shape) the foot during weight acceptance/loading response (mid-stance) through the principle of Newtonian Dynamics.



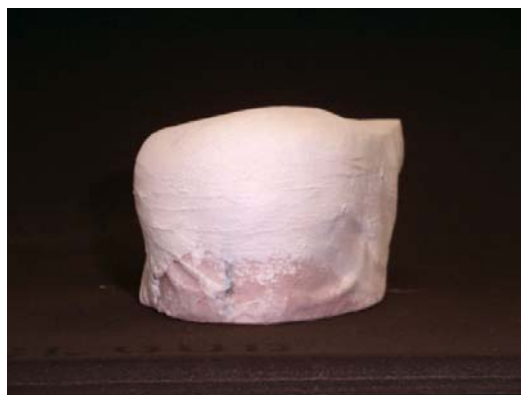
Filing Area for Modifying Positive Cast  
FF Perpendicular to Calcaneal Bi-Section



## RESHAPING THE HEAL CUP

### Heel Skive

A flat spot, at a 5°, 10° or 15° angle to the supporting surface, is filed into the heel area plantar to the condyle.



### Used to:

Increase the ground reactive force delivered into the medial condyle of the calcaneus. This increases rearfoot control without having to increase the extrinsic post amount.



**Cross Section:**  
Heel Skive Heel Seat

**Cross Section:**  
Heel Slope Heel Seat

## RESHAPING THE HEEL CUP

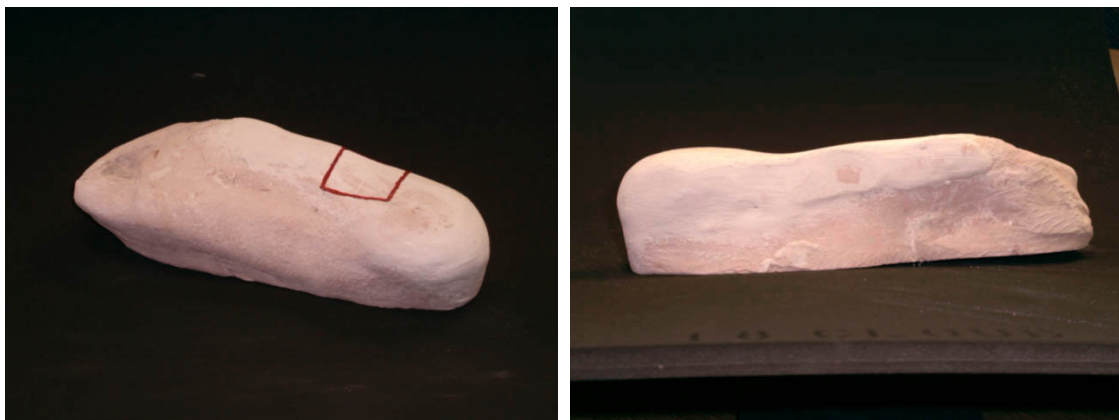


## RESHAPING THE LATERAL COLUMN

### I.C.A. (Increased Calcaneal Angle):

A short, narrow arch is filed into the cast along the lateral half of the foot, extending from the distal aspect of the lateral calcaneal condyle to the styloid process of the 5<sup>th</sup> metatarsal. The apex is under the anterior portion of the calcaneus, around the calcaneal/cuboid joint.

Pushing up under the calcaneal/cuboid joint maintains articular integrity (congruity) and increases oblique axis stability.



### Used to:

Improve mid-tarsal joint stability, especially at the oblique axis.

## RESHAPING THE LONGITUDINAL ARCH

### M.A.P. (Medial Arch Platform)

Patients with forefoot abduction during gait, where the navicular becomes noticeably prominent, may not find a vertically shaped arch comfortable.

Plaster is added to create a flattened (horizontal) medial aspect in the arch. The medial side of the cast is modified along where the trim line of the shell will be.



### Used to:

Reduce the edge affect that can irritate a foot with OMJA compensation that causes the navicular to protrude medially. Will also reduce the amount of volume taken up by the shell along the apex of the arch.

**Root Cast Technique (Includes “Root Heel & M.A.P.)**

Merton Root, DPM devised the original method for using a positive cast to modify contours of a foot model. He originated the concept of intrinsic posting and realignment of the forefoot plane.

His original technique employed a shallow, flattened contour at the heel and in the arch. This permitted the foot to sit down in the heel counter by allowing the fat pad around the calcaneus to expand under body weight. Also, the medial side of the cast was modified, where the trim line of the shell would be, by adding plaster to create a flattened medial edge on the device, without lowering the lateral arch. This made for a lower profile shell, while still maintaining longitudinal and oblique axis control.



**Used to:**

Create a lower profile device, with posting angles to control for frontal plane deformities, when shoe volume is a concern.



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**ADDITIONAL CAST/SHELL MODIFICATIONS****Plantar Fascia Groove**

Used to: Relieve plantar fascia irritation, for twat, “bow string” fascias.

**Concavity in Shell**

Used to: Relieve exostosis (bone spurs), nodules or lumpy soft tissue anomalies.

**Cut Out in Heel**

Used to: Relieve plantar fascia irritation, heel spurs and infra-calcaneal bursitis.

**Cut Out in Shell**

Used to: Relieve exostosis (bone spurs), nodules or lumpy soft tissue anomalies.



Pressing - Thermoforming Shell, Modules, Plates



Finishing - Trimming to Fit the Foot



Coverings, Pads and Accommodations



Coverings, Pads and Accommodations (Cont.)



## Additional Covering/Component Accommodations

### Balance Cut Out in FF to Sulcus

Used to: Relieve plantar pressure under a metatarsal head.



### Navicular Flap

Used to: Relieve medial edge irritation at the navicular when it may potentially drift medially.



### Medial Wrap Top Cover

Used to: Reduce the potential of the top cover peeling away from the shell during lateral motion sports/activities.

