



## **Optimizing DAFO Braces for Correctable Pronation or Supination**

# Optimizing DAFOs for Pronation and Supination

When a DAFO brace has been created from an accurate cast of a foot that has been adequately corrected (good fit - good position), mild to moderate correctable pronation or supination can be comfortably controlled. When a patient's feet have stronger pronation or supination tendencies, however, the "Standard" DAFO features are not always enough to maintain improved foot position. The following practices and options have proven valuable in optimizing DAFOs for maximum control of pronation or supination.

## As Always:

**Do not expect to correct the uncorrectable.** If the positional corrections you are seeking are beyond the range of the patient, an aggressive approach to corrections could compromise patient comfort and safety. Go slow, be conservative, build patient compliance, increase corrections over the longer term.

**A DAFO that fits poorly, controls poorly.** Accurate casting results in a more accurate "custom" fit. The more intimate and comfortable the brace is, the more pressure can be applied to make the necessary positional corrections. Fit issues need to be corrected to optimize brace function.

## Pronation

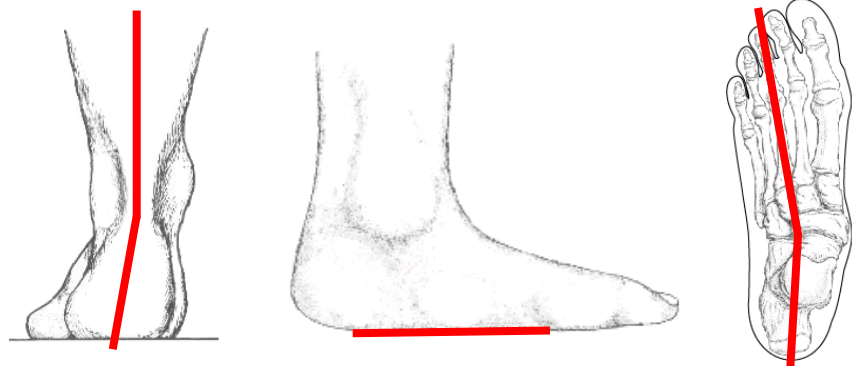
### Low Tone Pronation

Muscles, tendons and ligaments that control foot alignment are not strong enough to maintain correct alignment while supporting the weight of the body. Eventually, the body's weight will force the ankle to rotate inward (medially) and the hindfoot to move outward (evert). The medial arch collapses / flattens, causing the entire medial side to lengthen. This lengthening causes the forefoot to bend or splay outward into abduction. Over time, this change of posture can cause the medial malleolus and the navicular bones to become more prominent, depending on the degree of pronation. The low tone pronator relies primarily on the medial side of the foot for support. To compensate for the collapse of the medial side of the foot, the ankle increases dorsiflexion. This leads to an increase in the flexion of the hip and knee and a general change in posture from the hips down.

### High Tone Pronation

Unlike low tone pronation, where body weight causes the structure of the foot to collapse into pronation, high tone pronation is driven by over active muscles pulling the foot into a pronated position (the foot is externally rotated). The misalignment is often exacerbated by body weight and muscles that are weak despite high tone.

The Pronated Foot	
<b>Hindfoot:</b>	Everted
<b>Med. Arch:</b>	Dropped - Elongated Navicular is often prominent
<b>Forefoot:</b>	Abducted



# Optimizing DAFOs for Pronation and Supination

## Degree of Pronation

### Standing Barefoot:

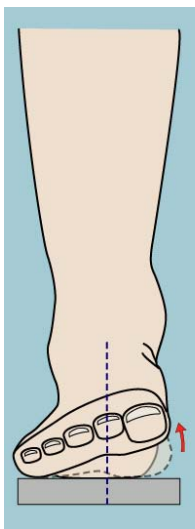
- **mild pronation:** noticeable flattening of medial arch (some gap visible); navicular above floor – very little prominence; heel slightly everted; slight abduction of forefoot.
- **moderate pronation:** medial arch flattened (no gap); navicular prominent – may contact floor; heel noticeably everted; abduction; inconsistent external rotation.
- **strong pronation:** medial arch flattened (no gap); navicular very prominent with regular floor contact and weight bearing; heel significantly everted with gap between floor and lateral side of foot; severe abduction; consistent external rotation.

## Optimizing for Heel Eversion

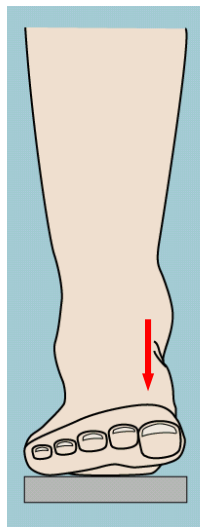
### Casting:

Rehearse hindfoot correction prior to casting. Slightly over correct heel position (if possible) when eversion tendency is very strong. Massage hindfoot region of cast during the cure cycle to more accurately capture heel contours in corrected position.

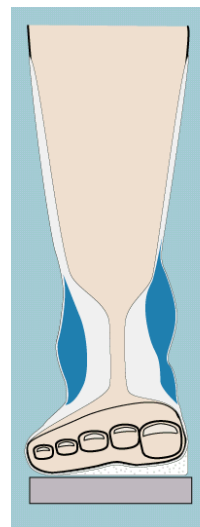
If correcting the forefoot to horizontal (with the hindfoot held at vertical) causes significant eversion force on the hindfoot, plan on leaving the forefoot in a varus alignment in the cast and in the finished brace. It is more important the hindfoot be held securely at vertical, directly under the body's weight, than maintaining the forefoot at horizontal.



Correction of everted heel causes forefoot to rotate into significant varus alignment.



Forefoot varus alignment is corrected to the limit of hindfoot control.



Brace is made with varus forefoot alignment. Bottom stabilization maintains forefoot varus position.

Request the forefoot alignment you want for the brace on the order form. No matter what forefoot alignment you have actually captured in the cast, the finished brace will be manufactured with the alignment you have requested.

RIGHT FOOT			LEFT FOOT		
VALGUS	VARUS	NEUTRAL	NEUTRAL	VARUS	VALGUS
<input type="checkbox"/>	<input checked="" type="checkbox"/> 3/16	<input type="checkbox"/>	<input type="checkbox"/>	3/16 <input checked="" type="checkbox"/>	<input type="checkbox"/>

• See Note Below Regarding Stabilization of Posted Forefoot •

### FOREFOOT ALIGNMENT

NOTE: Drawings Depict Finished Orthosis

1. Check box below to indicate required forefoot alignment.
2. Include height at Met. Head for varus or valgus choices (in inches).

# Optimizing DAFOs for Pronation and Supination

## Brace Selection:

The DAFO 5 is suitable for mild to moderate pronation when forefoot and ankle control is not required. The DAFO 4 is suitable for mild to moderate pronation when additional forefoot control with free ankle movement is required. Select a brace style with a strapped proximal component (DAFO 2, 3.5, 8, Turbo) for extra leverage in controlling strong eversion.

## Features Selection:

Select "Heel Stabilized" as a minimum for bottom stabilization. Add midfoot stabilization for increased medial support / pronation control.

- **Minimum Bottom Stabilization**
- **For Additional Support Along Medial Side**

**Bottom Stabilization**

None—Standard

Heel  Midfoot  
(Select one or both)

Entire bottom stabilized

Entire bottom stabilized

NOTE: Varus or valgus forefoot alignments will receive stabilization.

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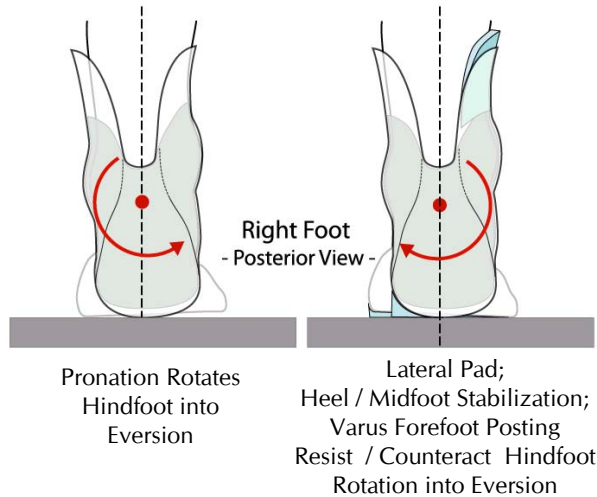
**Bottom Stabilization**

None—Standard

Heel  Midfoot  
(Select one or both)

NOTE: Varus or valgus alignments will receive stabilization on bottom (posted / raised)

To gain additional heel / eversion control with a DAFO 4, a wedge shaped pad can be added to the lateral 'ear' to resist eversion/pronation. Adding height to 'ears' (1/2 to 1 inch) increases the effect of the pad. Request additions in 'Special Instructions' section of order forms.



**SPECIAL INSTRUCTIONS:** (Continue on Backside if Required)

**Send self-stick shims for lateral ears.**

MORE ON BACKSIDE →

## Optimizing for Medial Arch Collapse

### Casting:

Rehearse arch correction prior to casting. Maximize hindfoot and forefoot correction to maximize arch correction. Use a footplate (modified if needed) to help establish and hold the corrected arch during casting.



**Foot Uncorrected:** Hindfoot everted; arch collapsed – navicular moderately prominent (under thumb); forefoot in contact with floor.

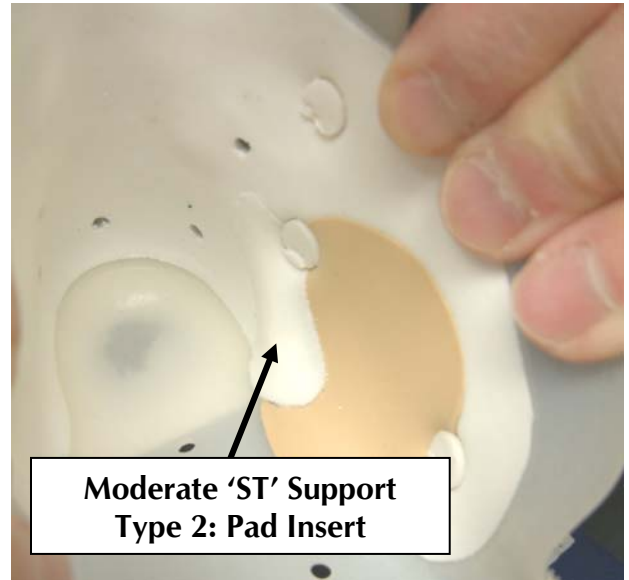
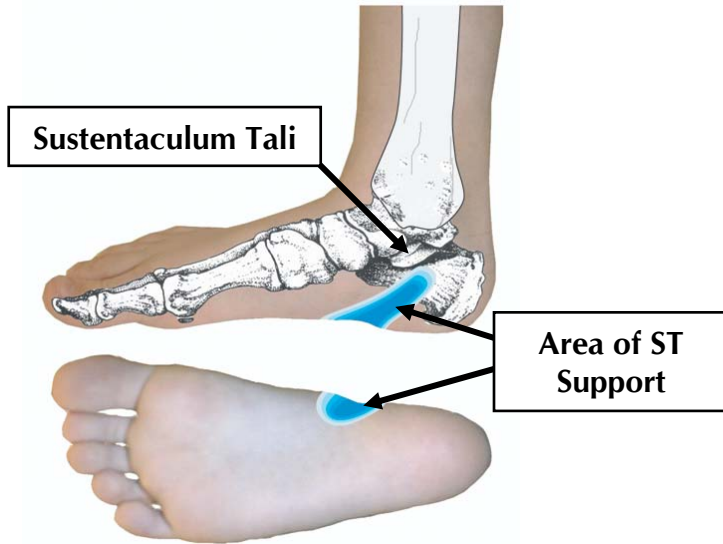


**Foot Corrected:** Hindfoot vertical; arch lifted – navicular prominence reduced; forefoot rotated into varus – corrected to limit of hindfoot control.

## Optimizing DAFOs for Pronation and Supination

### Features Selection:

ST support helps prevent the longitudinal arch from collapsing, helps “unload” navicular pressure and applies upward/inward force on the Sustentaculum Tali (upper calcaneal) region which helps maintain heel correction. A pad insert is added to the brace.



To request ST support for a brace order, write “Add ST Support” in the ‘Special Instructions’ box on the order form. The plaster positive is accentuated in the ST region. A firm foam pad is mounted on the brace in the area adjacent the accentuated ST region.

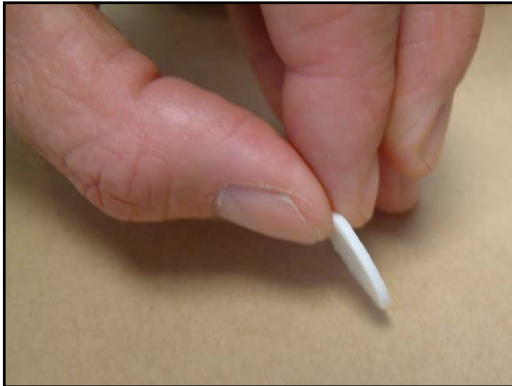
CONSTRUCTION & FEATURES	SPECIAL INSTRUCTIONS: (Continue on Backside if Required)
<p>The diagram shows a lateral view of a foot in a brace. Labels include "MEDIAL (Left)", "LATERAL (Left)", "Elastic Anterior Strap (Standard)", "Add ST Support" (with a red arrow pointing to a red shaded area on the heel), "Instep &amp; Forefoot Straps (Standard)", and "Toe Strap (Optional)". Dimensions "Height" and "Length" are also indicated.</p>	<p><b>Add ST Support</b></p> <p><input type="checkbox"/> MORE ON BACKSIDE →</p>

# Optimizing DAFOs for Pronation and Supination

## Optimizing for Prominent Navicular

### Casting:

Use thin foam 'buttons' to add relief volume to a boney prominences (like the navicular) in the cast. While waiting for the casting tape to cure, continue to 'massage' the tape around the boney prominence or anatomical variation to capture the shape accurately in the cured cast. Identify unusual surface anatomy by marking locations on the cast and on the order form.

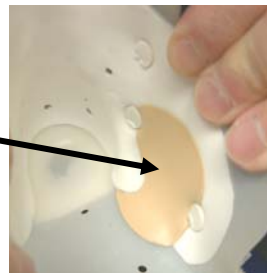


### Features Selection:

If the navicular is still prominent after correction of the medial arch / midfoot, request additional relief and / or additional padding for the navicular area.

PADDING:  STANDARD (Shaded Areas Depicted Above are Standard)  
 Add Extra Navicular Padding (Recommended for boney pronators only)  
PADDING COLOR: ( STANDARD = White)

PPT pad added to brace over navicular region



### SPECIAL INSTRUCTIONS: (Continue on Backside if Required)

**Prominent navicular. Add extra relief.**

#### Relief:

A small 'dome' of additional plaster is added over the prominence on the plaster model of the foot. When the brace shell is made, this area will be slightly larger than the prominence on the actual foot. This relieves any point pressure that would have irritated the prominence.

## Optimizing for Forefoot Abduction

### Casting:

Rehearse general foot correction prior to casting. Maximize arch correction (lift) to shorten length of medial side of foot. Use a footplate (modified if needed) to help establish and hold the corrected arch and improved forefoot alignment during casting.

### Features Selection:

Add a 'Toe Abduction Strap' to the brace. The toe strap will help pull the forefoot medially for maximum arch correction. To make the toe strap more effective and comfortable, sew a 'V' between the 1<sup>st</sup> and 2<sup>nd</sup> toes of the patient's sock, then cut between the 'V' to separate the toes.



<b>STRAPS:</b>	
<input type="checkbox"/> STANDARD (See Drawing Above)	<input checked="" type="checkbox"/> Add Toe Abduction Strap
<input type="checkbox"/> Add Non-Stretch Anterior Strap	OR <input type="checkbox"/> Add Elastic Anterior Strap (Anterior Strap NOT Recommended When Free Dorsiflexion is Desired)
<b>STRAP COLOR:</b> ( STANDARD = White) _____	
<b>INSTEP STRAP</b> _____	
<b>RIBBON TRIM:</b> ( STANDARD = No Trim) _____	

Select 'Soft Foam (Flexible)' within the 'Lateral Containment' option. Contoured soft foam will be added on the lateral side of the brace along the toe shelf. The padding will help control the abduction by containing the forefoot along the lateral side.

**Note:** Forefoot containment pads add bulk to the brace, making insertion into a shoe more difficult. If the bulk / fit becomes a problem, the containment pad can be removed.



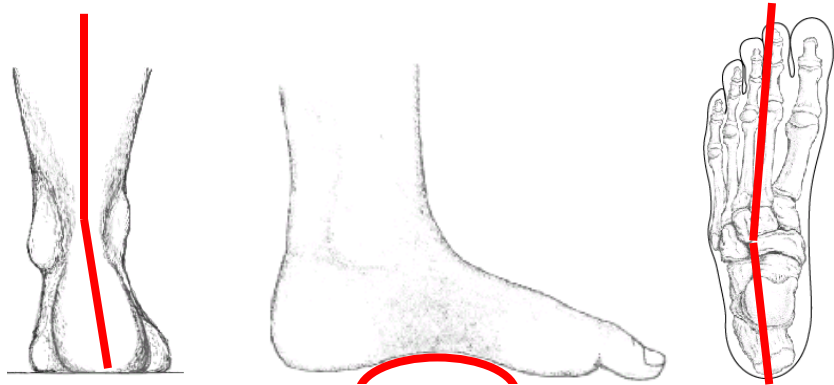
TOE SHELF	
<input type="checkbox"/> STANDARD Flexible No Containment	<input type="checkbox"/> Soft Foam (Flexible)
	<input type="checkbox"/> Stiff Plastic (Rigid)
AND / OR	
<input type="checkbox"/> LATERAL CONTAINMENT:	<input checked="" type="checkbox"/> Soft Foam (Flexible)
	<input type="checkbox"/> Stiff Plastic (Rigid)

## Supination

### High Tone Supination

High tone supination is driven by over active muscles pulling the foot into a supinated position. The medial side of the foot is pulled such that it rotates inward (internal rotation). This pulls the hindfoot into inversion and raises the medial arch, shortening the length of the medial side. This pulls the forefoot into adduction. The lateral malleolus and the base of the 5<sup>th</sup> metatarsal become more prominent. The high tone supinator relies primarily on the lateral side of the foot for support. To compensate for the lowered lateral side of foot, the hip and knee extend and the ankle increases plantarflexion.

The Supinated Foot	
<b>Hindfoot:</b>	Inverted
<b>Med. Arch:</b>	High Arching
Base of 5 <sup>th</sup> is often prominent	
<b>Forefoot:</b>	Adducted



## Degree of Supination

### Standing Barefoot:

- **mild supination:** medial arch well defined; heel slightly inverted; base of 5th – slight protrusion; slight adduction of forefoot.
- **moderate supination:** noticeably ‘high’ medial arch; base of 5th protruding; heel noticeably inverted; adduction; inconsistent internal rotation.
- **strong supination:** noticeable ‘high’ medial arch; base of 5th protruding and bearing weight; heel significantly inverted with gap between floor and medial side of foot; severe adduction; consistent internal rotation.

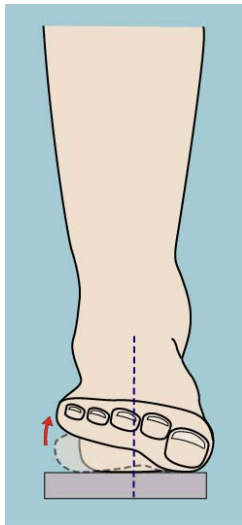
## Optimizing for Heel Inversion

### Casting:

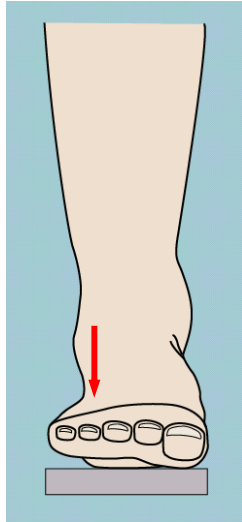
Rehearse hindfoot correction prior to casting. Slightly over correct heel position (if possible) when inversion tendency is very strong. Massage hindfoot region of cast during the cure cycle to more accurately capture heel contours in corrected position.

## Optimizing DAFOs for Pronation and Supination

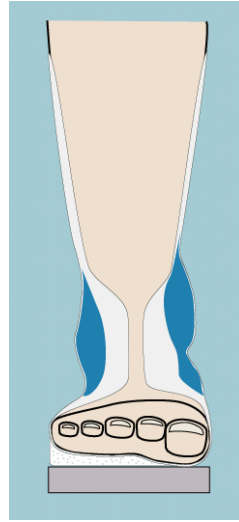
If correcting the forefoot to horizontal (with the hindfoot held at vertical) causes significant inversion force on the hindfoot, plan on leaving the forefoot in a valgus alignment in the cast and in the finished brace. It is more important the hindfoot be held securely at vertical, directly under the body's weight, than maintaining the forefoot at horizontal.



Correction of inverted heel causes forefoot to rotate into significant valgus alignment.



Forefoot valgus alignment is corrected to the limit of hindfoot control.



Brace is made with valgus forefoot alignment. Bottom stabilization maintains forefoot valgus position.

Request the forefoot alignment you want for the brace on the order form. No matter what forefoot alignment you have actually captured in the cast, the finished brace will be manufactured with the alignment you have requested.

RIGHT FOOT			LEFT FOOT		
VALGUS	VARUS	NEUTRAL	NEUTRAL	VARUS	VALGUS
3/16 <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> 3/16

NOTE: Drawings Depict Finished Orthosis  
 1. Check box below to indicate required forefoot alignment.  
 2. Include height at Met. Head for varus or valgus choices (in inches).  
 • See Note Below Regarding Stabilization of Posted Forefoot •

### Brace Selection:

The DAFO 5 is suitable for mild to moderate supination when forefoot and ankle control is not required. The DAFO 4 is suitable for mild to moderate supination when additional forefoot control with free ankle movement is required. Select a brace style with a strapped proximal component (DAFO 2, 3.5, 8, Turbo) for extra leverage in controlling strong inversion.

## Optimizing DAFOs for Pronation and Supination

### Features Selection:

Select "Heel Stabilized" as a minimum for bottom stabilization. If you request valgus forefoot alignment, requesting heel and midfoot stabilization (box 2) will result in bottom stabilization from the posted forefoot to the heel. This will increase lateral support and help control supination. If the forefoot is not posted in valgus, the heel stabilization will be extended as far forward as possible without "wedging" the lateral side of the foot.

- **Minimum Bottom Stabilization**
- **For Additional Support Along Lateral Side**

**Bottom Stabilization**

None—Standard NOTE: Varus or valgus forefoot alignments will require stabilization.

Heel  Midfoot  
(Select one or both)

Entire bottom stabilized

Entire bottom stabilized

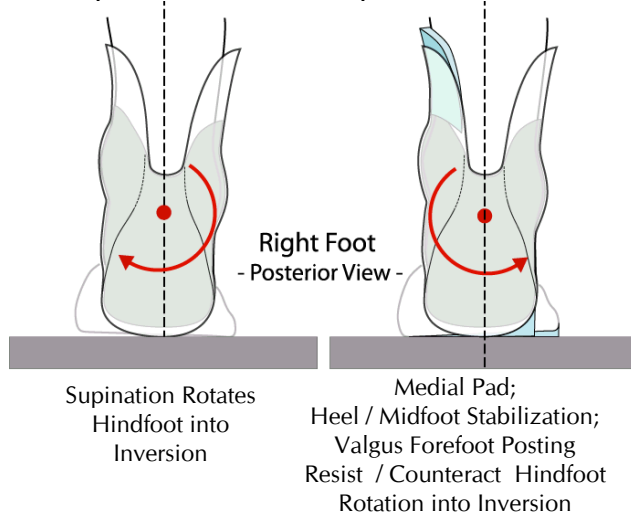
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**Bottom Stabilization**

None—Standard NOTE: Varus or valgus alignments will require stabilization on bottom (posted/raised).

Heel  Midfoot  
(Select one or both)

To gain additional heel / inversion control with a DAFO 4, a wedge shaped pad can be added to the medial 'ear' to resist inversion/supination. Adding height to 'ears' (1/2 to 1 inch) increases the effect of the pad. Request additions in 'Special Instructions' section of order forms).



**SPECIAL INSTRUCTIONS:** (Continue on Backside if Required)

**Send self-stick shims for medial ears.**

MORE ON BACKSIDE →

## Optimizing for Prominent Base of 5<sup>th</sup> Metatarsal

### Casting:

Use thin foam 'buttons' to add relief volume to a bony prominences (like the base of the 5<sup>th</sup> metatarsal) in the cast. While waiting for the casting tape to cure, continue to 'massage' the tape around the bony prominence or anatomical variation to capture the shape accurately in the cured cast. Identify unusual surface anatomy by marking locations on the cast and on the order form.



# Optimizing DAFOs for Pronation and Supination

## Features Selection:

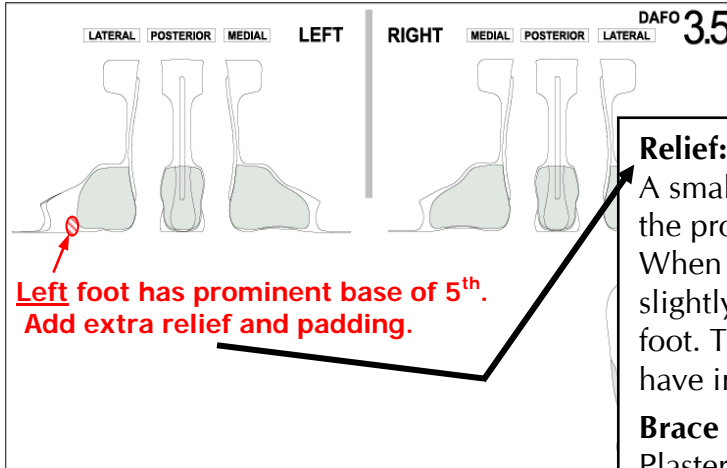
If the base of the 5<sup>th</sup> metatarsal is still prominent after correction of the foot alignment, request additional relief and / or additional padding for the base of 5<sup>th</sup> area.

Special Instructions:  
Back side of Order

Special Instructions: Front side of Order Form.

**SPECIAL INSTRUCTIONS:** (Continue on Backside if Required)

**Left foot has prominent base of 5<sup>th</sup>. Add extra relief and padding.**



**Relief:** A small 'dome' of additional plaster is added over the prominence on the plaster model of the foot. When the brace shell is made, this area will be slightly larger than the prominence on the actual foot. This relieves any point pressure that would have irritated the prominence.

**Brace Features:** Plaster positive will be modified and PPT pad will be added to brace over base of 5<sup>th</sup>.

## Optimizing for Forefoot Adduction

### Casting:

Rehearse general foot correction prior to casting.

### Features Selection:

Select 'Soft Foam (Flexible)' within the 'Medial Containment' option. Contoured soft foam will be added on the medial side of the brace along the toe shelf. The padding will help control the adduction by containing the forefoot along the medial side.

**Note:** Forefoot containment pads add bulk to the brace, making insertion into a shoe more difficult. If the bulk / fit becomes a problem, the containment pad can be removed.



**TOE SHELF**

**STANDARD**  
Flexible  
No Containment

**MEDIAL CONTAINMENT:** Soft Foam (Flexible)

Stiff Plastic (Rigid)

AND / OR

**LATERAL CONTAINMENT:** Soft Foam (Flexible)

Stiff Plastic (Rigid)

## Summary

### Optimizing for Pronation:

#### 1. Heel Eversion

- Cast Accurately – Capture the true shape of the corrected heel in the cast.
- Plan on leaving the forefoot in a varus alignment if correcting it to horizontal causes the hindfoot to evert.
- Select a brace style that is capable of controlling the degree of pronation present.
- DAFO 4: Add wedge pads to lateral ‘ears’ of brace.

#### 2. Medial Arch Collapse

- Rehearse arch correction prior to casting. Use a footplate to help establish and hold the correction during casting.
- Add ‘ST’ support.

#### 3. Boney Prominence (Navicular)

- Use thin foam button to identify and add relief volume to boney prominence.
- Request additional relief on plaster model.
- Request additional padding.

#### 4. Forefoot Abduction

- Rehearse foot correction prior to casting. Maximize arch correction (with modified footplate) during casting.
- Add toe strap to brace.
- Request ‘Soft lateral containment’ be added to brace.

### Optimizing for Supination:

#### 1. Heel Inversion

- Cast Accurately – Capture the true shape of the corrected heel in the cast.
- Plan on leaving the forefoot in a valgus alignment if correcting it to horizontal causes the hindfoot to invert.
- Select a brace style that is capable of controlling the degree of supination present.
- DAFO 4: Add wedge pads to medial ‘ears’ of brace.

#### 2. Boney Prominence (Base of 5th)

- Use thin foam button to identify and add relief volume to boney prominence.
- Request additional relief on plaster model.
- Request additional padding.

#### 3. Forefoot Adduction

- Rehearse foot correction prior to casting.
- Request ‘Soft medial containment’ be added to brace.

### Assuming adequate positional correction was captured during casting ....

**If the patient continues to pronate or supinate inside the brace, then** 1) the brace has not been adequately secured to the foot to control position (appropriate sock, foot well seated, straps secure); **OR** 2) the brace does not fit well enough to apply sufficient force to control position; **OR** 3) the brace style does not offer enough support to control position; **OR** 4) the foot has become too fixed to be correctable by the forces applied by the brace.

**If the brace fits well, but the patient and brace are ‘rolling over’ into pronation or supination, then** 1) the brace style does not offer enough support to control position; **OR** 2) the brace needs additional optimization to enhance support and control.