Novel Orthotic Adjustments in the Office or the Lab
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Peter G. Guy  B.Sc., D.Ch.
Private Practice - Whitby & Peterborough, ON
Professor Chiropody Faculty - Michener Institute
Council Member - College of Chiropodists of Ontario
Professional Advisory Board - Paris Orthotics

Even the best designed and properly casted foot orthoses may require a modification.

The inability to perform an in-office modification can leave your patient dissatisfied and without their foot orthoses.

Patient satisfaction can be enhanced when the appropriate orthotic modification can be performed in office in a timely fashion.

In office modifications will increase patient satisfaction and outcomes.

The main goal of orthotic therapy is to address the patient’s foot complaint by reducing the tissue stresses that causes pain.
“Tissue dysfunction could be said to occur when:
1. a healthy tissue is loaded in an ‘abnormal’ way,
2. an unhealthy tissue is loaded in a ‘normal’ way or worst of all
3. an unhealthy tissue is loaded in an ‘abnormal’ way”.


It has been postulated that each of the body’s tissues has a zone of optimal stress and the tissue must be loaded within this zone to remain healthy”.

Picture courtesy of Kevin Kirby DPM


Foot orthoses are most likely altering the forces applied to tissues by…..
1. Altering the magnitude of the reaction forces
2. Altering the vector of the reaction forces
3. Altering the temporal patterns of the reaction forces
4. Altering the plantar locations of the reaction forces acting on the foot.
Any orthotic modification we introduce is changing the surface geometry, device stiffness or cushioning.

**Cast modifications performed at lab as per your prescription.**
- Expansions
- Fill
- Intrinsic forefoot position
- Heel expansion
- Heel pitch
- Arch contour
- Wedging

**Shell modifications performed at the lab**
- Thickness and flexibility of material
- Arch flexibility
- 1st ray flexibility
- Arch reinforcement
- Anterior edge length
- Forefoot width
- 1st ray cut out
- Heel post flare
- Heel spur aperture
- Type of post
- Cobra design
- Non beveled anterior edge
- Low bulk grind
- Hour glass design
- Heel seat depth
- Heel raise
- Sweet spot
- Fascial groove

**Topcover modifications that can be fabricated by the lab or performed in office**
- Type of fabric/material
- Thickness
- Length
- Met. Dome
- Preload hallux
- Morton’s extension
- Reverse Morton’s
- Gluing of topcover
- Lesion accommodations

**Shell Flexibility Tips**

Understand the materials you choose alone or in combination.
Posting the shell increases the rigidity of the shell. The shape of the shell due to patient foot type and heel depth will dictate the flexibility of the shell.

Simple fix to increase shell flexibility is to lower the heel cup height. Is the prescribed foot orthotic shank dependent or independent?

A shank stiffens the shoe under the arch which makes the middle portion of the shoe more resistant to torsion and flexion.

EVA devices are shank dependent as well as most prefabs. Plastic CFOs are shank independent.

The top 5 adjustments requested within the first few months after manufacture:
1. Remove/lower met. pads
2. Lower/raise MLA height
3. Extend top cover to toes
4. Reduce shell width to fit shoes / trace / insole /old devices provided
5. Add EVA fill to stabilize device/ increase rigidity

List of requested modifications received that could be done in office.
1. Remove RF post/strike plates
2. Trim top cover to match insole/shoe provided
3. Increase sidecut/undercut
4. Remove/reduce met pads
5. Hourglass shells
6. Add 1st met cut-out
7. Trim top cover to sulcus or met’s (from full length)
8. Remove rigid 1st extension
Some other modifications performed by the lab on returned foot orthoses

• Shell accommodations (plantar fascia, navicular, fibroma)
• Extrinisc post modifications (skive in heel post, modify motion)

If you talk to a lab owner about successful orthotic therapy they will tell you……

Keep it simple!

Casting is Key

Understand your labs arch fill parameters

What you need to get started

Orange sol™ dissolve it products will help to remove glue from shell

The Orthotic Modification Matrix

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<th>Lab (L)</th>
<th>Column (C)</th>
<th>Increased Metatarsal Head Pressure</th>
<th>1st MPJ Ray Mods</th>
<th>Shoe Volume Mods</th>
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<tr>
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<td>Medial</td>
<td>Advanced instalar RF post</td>
<td>9th met bunion</td>
<td>Extrinsic and intrinsic, met angle</td>
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<tr>
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<tr>
<td>Medial</td>
<td>Lateral</td>
<td>Sometimes a foot orthotic won’t do</td>
<td>Peroneal insufficiency and extensor digitorum longus</td>
<td>Chubby wedge</td>
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Acknowledgements

Medial Column Overload
Advanced medial or lateral RF post

- RF post extended anterior - medially or anterior - laterally into either the medial or lateral long arch
- Increased RF control through increased shell stability and rigidity

Topcover valgus extension with or without valgus pad

Extended the top cover medially in the shape of a valgus pad will apply a force via the shoe upper to help create supination moment. A valgus pad can be added under the topcover.

Vertical grinds to lateral RF post effective control of supination +/- lateral EVA Fill

- lateral sidewalls of these EVA components are ground perpendicular to supporting surface
- often combined with Lateral Flange + Valgus FF posting extended to sulcus

Medial heel skive and inverted reafoot

Heel skive
Heel stabilizer
Heel stabilizer

Medial heel skive Korex modification

Kirby STJ rotational equilibrium
Medial heel skive with arch fill

5th Met Cut-Out

- Shell material removed at distal lateral aspect of shell
- Used to accommodate tailor’s bunion + 5th MPJ lesions

Lateral heel skive Korex modification

Sometimes an foot orthotic won’t do!

| Pain in right ankle for past two years |
| Has been advised to get triple arthrodesis |
| Barefoot gait analysis |

Peroneal tendinopathy

2 mm - 4 mm lateral heel skive

Full length topcover

20-22° forefoot extension

3/16” - 4/16” polypropylene sheet

Korex lateral arch fill

Valgus 2-5 forefoot extension

Increased talus/ FF valgus correction

Fiatt rearfoot post

Photos courtesy of Larry Huppin DPM
Richie Articulated AFO

Coronal CAT scan R Foot

Slices 176 to 180 out of 241
The cuboid raise is a very stabilizing and under-used orthotic modification for high arch foot types and for lateral ankle sprainers.
Extrinsic Plantar Met Raise

- Equal offloading from 1<sup>st</sup> to 5<sup>th</sup> MT heads by elevating distal end of shell
- Since no material is applied to the dorsal aspect of the shell, the shell maintains its original MLA profile

![3mm EVA applied to plantar aspect of distal shell edge and tapered on the dorsal surface](image)

Intrinsic (within shell) Met Raise

- Leaves distal shell material full thickness with no tapering on dorsal aspect
- Creates drop off which will equally offload 1<sup>st</sup> to 5<sup>th</sup> MT heads
- Effectiveness dependent on shell material selection (not compatible with PRX)
- Maintains the MLA profile of the device

![Pictures courtesy of Kevin Kirby DPM](image)

Metatarsal pad to off load painful plantar metatarsal head

![15 mm Metatarsal Pad](image)

Capsulitis or plantar plate injury

![Pictures courtesy of Kevin Kirby DPM](image)

Distal End of Topcover Unglued

- Topcover is not laminated at the distal end of the shell or to any extensions/bottom covers
- Gives clinician ability to modify or add components such as met pads/bars, lesion accommodations, sulcus crests, neuroma pads

![Top cover removed to allow for marking of plantar fibromas. Shell has pre-glued as well as top cover](image)

Top cover removed to allow for marking of plantar fibromas. Shell has pre-glued as well as top cover
Pre-glue topcovers and shell to allow lesion accommodations

Jobs that involve kneeling, stooping or squatting require the proximal transfer of pressure off of the metatarsal heads
- Minimum cast fill
- Positive cast inversion
- Flexible to semi-flexible polypropylene or EVA
- Non beveled anterior edge or Poron metatarsal bar
- Deep parabola of anterior edge
- 3-6 mm neoprene or PPT/leather top cover with or without Poron forefoot extension to sulcus
- Offloading of any overloaded met.head

1st MPJ/Ray modifications

Morton’s extension and Reverse Morton’s extension

Plantar fascia accommodation cork onlay

Plantar fascial accommodation shell grind

Photos courtesy of Larry Huppin, DPM
Marking the plantar fascia prior to casting

1. Place subtalar joint in neutral and fully pronate midtarsal joint
2. Dorsiflex halux to resistance
3. Look for bowstringing of plantar fascia
4. Estimate height of fascia at apex of bowstring
5. Palpate fascia for tension (firmness)
6. Mark outer margins of fascia, if prominent
7. Accommodate when prominent, especially if firm (typically 2 to 6 millimeters in depth)
8. Lines will transfer to plaster cast, or can be drawn on cast or Rx form

Cluffy™ wedge is helpful when other methods of getting the 1st ray to plantarflex don’t appear to be effective

The valgus onlay by John Weed is a good in office modification to use to try to salvage an orthosis that isn’t providing enough valgus correction/support in the forefoot

John Weed valgus onlay modification was used prior to the heel skive modification

John Weed observed some patients pronated excessively off of their orthoses he theorized these patients were not controlled well enough since they were pronated at STJ hence the MTJ was unstable. He developed the valgus inlay. The forefoot is directed into valgus position.

“Richie wedgy” helps to offload the plantar fascia

Sarrafarian Twisted Plate

Use 1/8 inch Korea and skive all three sides except lateral with height point under mid shaft of the fifth metatarsal.
Valgus wedges reduce the strain on the plantar fascia

Case of the Internal Metatarsal Rocker

Combination of poly-carbon stiffener and EVA rocker

Shoe volume modifications

Medial RF post only

• Reduces device control at heel strike but maintains medial control through midstance
• Reduces device volume, often effective in design of dress devices

Posterior Heel Bumper

• 3mm to 6mm EVA wrapped around heel cup of device to advance shell distally within shoe
• Full EVA thickness maintained at posterior aspect of heel and tapered to 0mm at medial and lateral edges
• Effective when dealing with shoe heel counters which advance the heel slightly forward in the shoe
Heel rim irritation modifications

You can also grind the inside edge of heel cup rim with dremel burr

Miscellaneous Modifications

Custom foot orthotic with deep heel cup and cushioned area at the bottom of the heel seat

Jobs that involve carrying, pushing and pulling loads on uneven surfaces require stabilization

- High top boots provide most of stabilization
- Steel shank if using ladders or shovels
- Orthotic device with flat posts, deeper heel cups and wider shell
- 3mm neoprene or Poron/leather top cover
- Restaurant and retail workers semi-flexible or flexible device with arch reinforcement along with padded top cover

Jobs involving standing in place for lengthy periods require offloading from calcaneus and metatarsals heads

- Shell to be inversely flexible to the firmness of the shoe and the surface
- Other factors: foot stiffness, amount of equinus, weight and age
- Polypro, EVA or Plastazote #3
- Deep heel cups and wide shell with congruent medial and lateral arch contour,
- Non bevelled anterior edge or met bar
- 3 to 6 mm neoprene or PPT/leather top cover
- In some cases a lower arch with more shell flexibility is required but may not suitable for exercise.

Top cover bunion accommodation

Pictures courtesy of Brian Cragg BSc DCh

Superthotic

- Direct milled shell, 3mm puff top cover to toes, agoflex bottom cover to toes
- Useful for devices used in extreme conditions (temperature/dirt/debris exposure)
Bottom covers help to stiffen top covers to allow for easy transfer in/out of shoes

- Agoflex, vinyl, 1.5mm cork/puff bottom covers are effective
- Bottom covers also create sandwich effect at distal end of shell which improves component durability via improved lamination

Heel bursitis or heel spur accommodation

A Simple Cure for Morton's Neuralgia

Acknowledgments

Brian Cragg
Larry Huppin
Paul Paris
Doug Richie
Jeff Root
Lief Royle

Books by Kevin Kirby DPM that discuss and illustrate orthotic modifications


In office modifications will increase patient satisfaction and word of mouth referrals to your practice.

http://www.dpmlab.com/html/bookreview.html