

# CADCAM Orthotic Prescription and Design

## Session 5

Orthotic Issue, Adjustment and Review

**StepForce**  
Training

Presented By  
Paul Graham

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## Orthomechanical Treatment

### Its ALL about the Patient



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## Issuing the Orthotics



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## Issuing the Orthotics

### Step 1. Set the expectations

Remind the patient why the orthomechanical therapy is so important:

- The aim:
  - Total Contact Orthotics – how they will help?
  - Corrective orthotics - what are we trying to achieve ?
- The crucial role of footwear choice in the outcome
- Provide your Orthotic / Footwear 'wearing-in' Information



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## Issuing the Orthotics

### Step 2. Preparing the Orthotics

- Ensure you have the shoes the orthotics will be worn in
- Check the fit, especially with EVA orthotics as they are shank dependent to function correctly



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## Issuing the Orthotics

### Step 3. Footwear issues

- The effect on the orthotics from GRF and worn shoes
- Are the shoes part of the therapy using modifications or design criteria?



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## Issuing the Orthotics

### Step 3. Footwear issues

- Will the correction be enough or too much in different shoes?
- What to do if the orthotic cannot fit the shoes?



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## Issuing the Orthotics

### Step 4. Testing the effect of the orthotics

#### Total Contact Orthotics

- Do they exactly contour the foot?
- Do they feel comfortable to the patient?
- Are they pronating / supinating the foot?
- Do they improve or worsen their balance?



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## Issuing the Orthotics

### Step 4. Testing the effect of the orthotics

#### Corrective Orthotics (Custom and Rehab Types)

- Do they maintain the STJt axis correctly?
- Is the 1<sup>st</sup> Metatarsal in the correct alignment?
- Does the weight trajectory move correctly? in the Frontal and Sagittal plane?



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## Issuing the Orthotics

### Step 5. "Road Testing" the orthotics

- Are there any fitting issues when first fitting the shoes with the orthotics?
- Watch the patient walking. Are they pronating / supinating more than you wish?
- Does the patient feel any discomfort when walking?
- Are there some shoes that the orthotics are not working well in? What are the options?



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## Issuing the Orthotics

### Step 6. "Finishing" the orthotics

- Temporary Cambrelle cover during the wearing in period
- Apply adhesive lightly to ensure easy removal
- Pleat the material in the posterior aspect



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## Issuing the Orthotics

### Step 7. Explaining what happens next

- What's normal to feel and expect and what's not?
- What happens if there is a problem or if they have a concern?
- How do the orthotics work alongside other complimentary therapies?
- What is the next step? e.g. When to Review?



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## Reviewing the Orthotics



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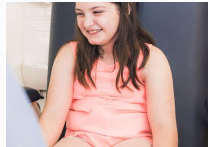
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## Reviewing the Orthotics

### Step 1. Focus on the patient

- How the patient feels about their progress (focus on them)
- Is the pain resolved, better, changed or worse?
- Have they been able to wear the orthotics for all activities?
- What is their understanding of their progress?



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## Reviewing the Orthotics

### Step 2. Testing the efficacy of the orthotics

#### Static test

- Is the orthotic folding the foot in the desired position?
- How does the foot contour to the Orthotic?
- Does it initialise the windlass mechanism?  
Is it easier and earlier?



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## Reviewing the Orthotics

### Step 2. Testing the efficacy of the orthotics

#### Dynamic test

- Does the 1<sup>st</sup> MTP Joint function correctly at terminal stance?  
(Both in static and dynamic function)
- Does the weight transfer from low gear to high gear?



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## Reviewing the Orthotics

### Step 3. Testing the changes in overall function



Joint ROM measurement



Intrinsic Muscle Testing



Extrinsic Muscle Testing

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## Reviewing the Orthotics

### Step 3. Testing the changes in overall function



Balance Assessment



Soft tissue Elasticity

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## Reviewing the Orthotics

### Step 4. Testing changes in normal gait parameters



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## Reviewing the Orthotics

### Step 5. Report and next steps

- Discuss their experience and how we will help them achieve the next milestone toward their goal
- Report on the results of the assessment, positive and negative
- Plan with them the next steps based on the outcome of the review



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## Adjusting the Orthotics



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### Orthotic adjustments

#### BEFORE Adjusting...

Ask yourself, are the orthotics the problem, or:

- Is it because the shoes are worn?
- Is the patient compliant with their exercise program
- Are they expecting too much too soon?
- Do you need to adjust the complimentary therapy program?



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### Orthotic adjustments

#### 1. 1<sup>st</sup> Metatarsal blisters / pain

- Dorsiflexed 1<sup>st</sup> metatarsal
- Orthotic not letting 1<sup>st</sup> MTPJt plantarflex
- Orthotic causing FhL
- Poor shoe sole function
- Lack of accommodation of correction in the midfoot



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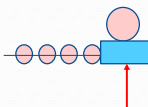
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### Orthotic adjustments


#### 1<sup>st</sup> Metatarsal Blisters / pain

##### > Dorsiflexed 1<sup>st</sup> Metatarsal Adjustment

Current Alignment



Use soft material where possible;  
e.g. 3mm soft poron



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### Orthotic adjustments

#### 1<sup>st</sup> Metatarsal Blisters / pain

➤ FHL and 1<sup>st</sup> Metatarsal Alignment Adjustment

**This is a GOOD change to make!**

- Re-check 1<sup>st</sup> Metatarsal alignment and FHL limit point
- Stand patient on their orthotic and:
  - Recheck Jacks test and note amount of plantarflexion of 1<sup>st</sup> metatarsal
  - Mark this on the orthotic
  - Carefully remove material under this section
  - Recheck if this allows correct function



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### Orthotic adjustments

#### 1<sup>st</sup> Metatarsal Blisters / pain

➤ Other Adjustment ideas

- **Poor shoe sole function**
  - Ensure correct flex point in the forefoot
  - Ensure adequate heel counter support
  - Ensure Orthotics are working well in shoes and are positioned correctly
- **Lack of accommodation of correction**
  - Exercise and mobility program to address cause
  - Short term use of a 4-6mm Bilateral heel lift



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### Orthotic adjustments

#### 2. Overloading of 2<sup>nd</sup> and 3<sup>rd</sup> MTP Joints

- Dorsiflexed 1<sup>st</sup> MTPJt not accommodated
- Forefoot supinatus not accommodated or corrected
- Short 1<sup>st</sup> Metatarsal not accommodated
- Orthotic not moving weight onto 1<sup>st</sup> MTPJt enough
- Orthotic causing FhL as a by-product of correction



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### Orthotic adjustments

#### Overloading of 2<sup>nd</sup> and 3<sup>rd</sup> MTP Joints

➤ Orthotic not moving weight onto 1<sup>st</sup> MTPJt enough

**Using a metatarsal dome can help by:**

- Dorsiflexing the 2 - 4<sup>th</sup> MTPJoints thus facilitating plantarflexion of the 1<sup>st</sup> Metatarsal and 1<sup>st</sup> MTPJt to weight bear
- Assisting the windlass and reverse windlass mechanism to function
- Stimulating the somatic sensor receptors facilitating the plantar muscle function, especially timing
- Redistributing load off inflamed and/ or calloused tissues providing direct relief



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### Orthotic adjustments

#### Overloading of 2<sup>nd</sup> and 3<sup>rd</sup> MTP Joints

➤ Short 1<sup>st</sup> Metatarsal not accommodated

**This structure needs special design features:**

The main issue here is that low gear to high gear function has never been able to occur, causing dysfunctional habit.

- Reduce the arch height
- Make the distal aspect of the arch as short as possible, to facilitate medial transfer of the force
- Using taping interventions, assess the effect with Pressure analysis and make changes based on this



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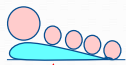
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### Orthotic adjustments

#### Overloading of 2<sup>nd</sup> and 3<sup>rd</sup> MTP Joints

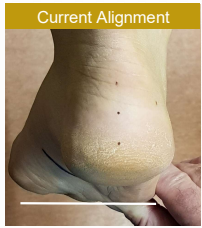
➤ Forefoot Supinatus Correction

**Current Alignment**



Use wedge of soft material where possible; e.g. 3 - 5mm soft poron

**Current Alignment**



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### Orthotic adjustments

#### 3. Arch / Midfoot pain

- Arch too aggressive
- Orthotic riding up in Shoes
- Forces remaining too Medial
- Lack of ankle dorsiflexion
- Lack of accommodation of correction in the midfoot



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### Orthotic adjustments

#### Arch / Midfoot pain

➤ Orthotics Riding up in shoes

The inside dimension of shoes in girth, length and width differs from shoe to shoe and can cause fitting issues

- If the orthotic floor is wider than the floor it will ride up the arch
- It is solved by reducing the width of the floor. But be careful, in fitting to one shoe type might cause poor fitting in others
- It may be better to look at changing shoes



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### Orthotic adjustments

#### Arch / Midfoot pain

➤ Forces remaining too medial

This occurs when the material choice is too soft to resupinate the foot or the rearfoot correction is not sufficient to manage the medial forces.

- Fill in the arch area making the orthotic more stiff
- Increase the medial correction particularly under the rearfoot to resist the forces
- Add a 4mm bilateral heel lift to reduce the forces plantarflexing the rearfoot



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### Orthotic adjustments

#### Arch / Midfoot pain

➤ Lack of accommodation from insufficient compensatory motion

- Program of joint mobilisation
- Soft tissue therapy
- Home Exercises / Supervised Program
- Plantar fascial accommodation
- 4 - 6mm bilateral heel lift



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### Orthotic adjustments

#### 4. Lateral Column pain / slippage

- Too aggressive correction
- Not accommodating structure anomalies
- Orthotic riding up in shoes
- Lack of accommodation from insufficient compensatory motion
- Uncorrected Leg Length difference



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### Orthotic adjustments

#### Lateral Column pain

➤ Too aggressive correction

- Always assess the CoP trajectory and areas of tissue loading with pressure mapping
- Look for wear patterns on the shoe upper and on the sole in regularly worn shoes
- Test the strength of the peroneals compared with the invertors – check for contractions
- Check the Inferior Tibiofibular joint for restriction as it can inhibit peroneal function if jammed
- Adjust orthotics or make a new pair



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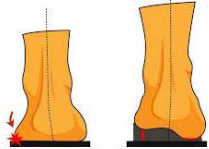
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### Orthotic adjustments

#### Lateral Column pain

➤ Not accommodating structure

- Use a metatarsal dome or pad to accommodate a plantarflexed 1<sup>st</sup> Metatarsal (as indicated in the graphic)
- Watch for metatarsus adductus foot type as this will cause lateral weight bearing
- Use cuboid and forefoot valgus corrections combined with reduced arch and cut-outs under the first metatarsal to move weight from low gear to high gear through the midfoot



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### Orthotic adjustments

#### Lateral Column pain

➤ Uncorrected Leg Length difference

- Use plantar pressure analysis to assess the dynamic longer limb
- Use imaging or referral to diagnose whether the LLD is functional or structural
- Structural: add a heel lift of 50% of the actual difference to the orthotic if lift is less than 10mm and have patient trial  
(If lift required is more than 10mm use shoe modification)



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### Orthotic adjustments

#### 5. Medial ankle pain

- Correction not enough or not in the appropriate position to address the overloading
- Lack of ability of the foot to accommodate the correction
- Wrong type of orthotic used
- Footwear issues



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### Orthotic adjustments

#### Medial Column pain

➤ Correction not enough or not in the appropriate position to address the overloading

- Using the Subtalar Joint axis line, note where the correction to invert the foot will need to be placed on the orthotic
- Note the area that pronates the foot
- Design the orthotic correction using this as one of the key decision processes taken into account
- Consider a rearfoot model, to move the correction point from the talonavicular Joint to sustentacula tali



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### Orthotic adjustments

#### Medial Column pain

➤ Lack of ability of the foot to accommodate the correction

The best orthotic design in the world won't work unless the rearfoot and midfoot joints have enough ROM to accommodate the correction

- Start a program of joint mobilisation and soft tissue therapy
- Use a material with less density if the condition is medium term and re-make when conditions allow
- Add 4 - 6mm bilateral heel lifts to reduce the forces on the rearfoot and midfoot



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### Orthotic adjustments

#### Medial Column pain

➤ Wrong type of orthotic used

Once the midfoot support provided by the Peroneus Longus and Tibialis Posterior muscles is lost the driver becomes the internal tibial rotation

- Change from an orthotic to a Richie brace type if the patient:
  - is having callouses under the medial ankle or along the medial arch, or
  - is slipping laterally off the orthotic (with normal midfoot and rearfoot joint ROM)



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## Orthotic adjustments

### Medial Column pain

➤ Footwear Issues

- Sometimes patients wear sloppy shoes around the home not laced up
- Sometimes they have their gardening shoes that are old favourites
- Sometimes they have their 'old friends' that they are so comfortable

These shoes may never be shown to you but may be the reason for the medial ankle pain!



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## Q and A Discussion



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