Alpine Skiing - The Role of the Podiatrist

What Role Should the Podiatrist Play?

- Most skiers will likely do fine with good boot fitting and ski shop insole.
- Skiers with pain deserve a medical diagnosis and intervention.
- Some conditions best treated with medical intervention and functional orthosis:
  - Plantar intrinsic stress syndrome
  - Morton's neuroma
What Role Should the Podiatrist Play?

- Approximately 300,000 skiers and snowboarders in Washington *
- 25 – 50 visits per 100 people *

* National Ski Areas Association. 2008 - 2012

“Skiers Plantar Myalgia”

- Overuse syndrome of the intrinsics
  - “Skier’s plantar myalgia”
  - “Plantar intrinsic stress syndrome”
- Pes planus
- Boot compression

Ski Turn Mechanics
Pes Planus
- Lack of medial column stiffness
- Medial column dorsiflexes with increasing force
- Difficulty initiating and maintaining turn
- Excessive internal rotation / adduction of knee

Pes Planus = Weak Intrinsics

Treatment Plan
- Stabilize feet with orthoses
- Strengthen intrinsics
- Ensure general ski fitness
- Ensure proper boot fit

Orthosis for pes planus foot
- Material: Rigid to resist deformation
- Deep heel cup and medial flange to increase surface
- Minimum cast fill
- Medial heel skive and rear foot post


Kirby K. Rotational Equilibrium around the STJ axis. JAPTA. 1987
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Kirby, K. The Medial Heel Skive Technique. JAPMA, April 1991

Ski Boot Orthoses

- Minimum fill
- Medial flange
- No heel cup / intrinsic post
- Varus heel wedge in place of medial skive
- Liner skive
- Cover: optional, but rigid used

Ski Specific Orthosis Prescription
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Intrinsic Strengthening

- Which are most important
  - EMG studies show abductor hallucis best supports MLA
  - Navicular drop will increase when the abductor hallucis is fatigued.

Huang DS. Fatigue of the plantar intrinsic foot muscles increases navicular drop. *Electromyogr.
Kinesiol.* 2008
Intrinsic Strengthening

- Loaded the distal femur in nine seated people with weights ranging from 0 to 150 percent body mass in 25 percent increments.
- Measured EMG activity of the abductor hallucis, flexor digitorum brevis and quadratus plantae muscles under varying loads.
- As load increased, longitudinal arch decreased in height and resulted in increased EMG activation of plantar intrinsics.
- Researchers also found that as the plantar intrinsics had electrical stimulation, the longitudinal arch height increased.
- With abductor hallucis and flexor digitorum brevis stimulation, the calcaneus inverted and abducted.
- With stimulation of the abductor hallucis, flexor digitorum brevis and quadratus plantae muscles, the forefoot plantarflexed and adducted.
- These experiments showed that plantar intrinsics can actively supinate the subtalar joint and raise the longitudinal arch in response to increased foot loading.


Intrinsic Strengthening

- Short foot exercise

- Short foot more effective than toe curl
- Contract the intrinsics to raise the MLA


Intrinsic Strengthening Plan

1. Sitting + hold 1st met. head down
2. Sitting – one foot at a time
3. Sitting – two feet
4. Standing – one foot at a time
5. Standing – two feet
6. Standing – balancing on one foot

Intrinsic Strengthening Plan

- 2 months prior to ski season
- Continue through season if not skiing more than once per week
- 5 – 10 minutes per day

Short Foot Exercise + Foot Orthoses

- The purpose of this study was to examine the effects of foot orthoses and a short-foot exercise intervention on the cross-sectional area (CSA) of the abductor hallucis (AbdH) muscle and strength of the flexor hallucis (FH) in subjects with pes planus.
- Assigned to a foot orthosis (FO) group or a combined foot orthosis and short-foot exercise (FOSF) group.
- Results from this study demonstrate that foot orthoses combined with short-foot exercise is more effective in increasing the CSA of the AbdH muscle and the strength of FH compared with foot orthoses alone. Therefore, foot orthoses combined with short-foot exercise are recommended for improving strength of AbdH muscle in subjects with pes planus.
- Argument to have patients wearing pes planus orthoses all of the time not just when skiing.

General Ski Specific Strengthening

- Eccentric Training
  - Quadzilla Complex
  - Mountain Tactical Institute
  - YouTube: Tony Horton Quadzilla
  - Leg Lactate Complex

Koller A. Decrease in eccentric quadriceps and hamstring strength in recreational alpine skiers after prolonged skiing. BMJ Open Sport Exerc Med. 2015 Aug

Sellers J. The relationship of heart rate and lactate to cumulative muscle fatigue during recreational alpine skiing. J Strength Cond Res. 2009 May

Ski Boot Fit

- Foot Width vs. Boot Width
  - The width of the inside of the ski boot at the MPJs is called last width or footbed width
  - Ranges from 97mm to 106mm
  - A tighter fit is considered more responsive for higher performance
  - Many boots too narrow for foot

- Find Width of Specific Boots
  - Caliper measurement of forefoot
  - Compare to forefoot width of boot
  - Google width

Foot Width vs. Boot Width
Wider Boots for Width and Splay

- Rossignol Alias Sensor
  - 100mm–106mm forefoot
  - Very adjustable shell

- Salomon X Pro Series
  - 100mm–106mm forefoot

- Tecnica Ten.2
  - 106mm forefoot

Walkable Boot-in-Frame Systems

Apex Boots

Other Skiers Conditions

- Dorsal neuritis
- "Shin bang"
- Morton's neuroma
- Subungual hematoma

Dorsal Neuritis
Shin Bang

Other Problems Treated in Skiers
- Dorsal neuritis
- "Shin bang"
- Morton's neuroma
- Subungual hematoma

Summary - Skiing
- Most skiers will likely do fine with ski shop insole
- Skiers with pain deserve a medical diagnosis and intervention
- Some conditions best treated with functional orthosis and medical intervention
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Summary
- Treat the pathology first
- Adapt to foot gear and specific sport

More……
- AAPSM Stand Alone Meeting
  - September 14 – 16, 2017
  - Chicago
- Clinical Biomechanics Bootcamp Online Course
  - PodiatryCpdAcademy.com

Thank you lhuppin@gmail.com