Shared health Soins communs Manitoba

Methods of Off-Loading Diabetic Foot Wounds

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No Disclosures

Photos are presented with patients' consent.

Any photos that are not my own are cited

Clinic/business information provided at the end is done with the consent of those businesses.

Outline

1. Acute Offloading
2. Identifying Loads
3. Offloading Devices
    a. Shoes
    b. Custom Foot Orthoses
    c. Shoe Modifications
    d. Custom Ankle Foot Orthoses
4. Funding
5. Where to Get Devices

Introduction

- Orthotist at the Health Sciences Centre.

- Orthotist is a healthcare specialist who treats conditions of the neuro-muscular skeletal system with custom made/fit orthoses.

  (Orthotics Prosthetics Canada)

- For this presentation I'll focus on my work assessing for, designing, building, and modifying various devices to unload diabetic foot wounds once they have healed.

Examples of Acute Care Offloading Devices

- Total Contact Cast
- Cast Boot
- Off-loading Diabetic Shoe
- 1st, 2nd, 4th best options of offloading wounds.

(Bus et al, 2019)

The Wound is Healed – How do we keep it that way?

Identify what loads are applied to the foot.

Implement Devices that reduce those loads.

* Assumes some biomechanics factor into the cause of the wound.

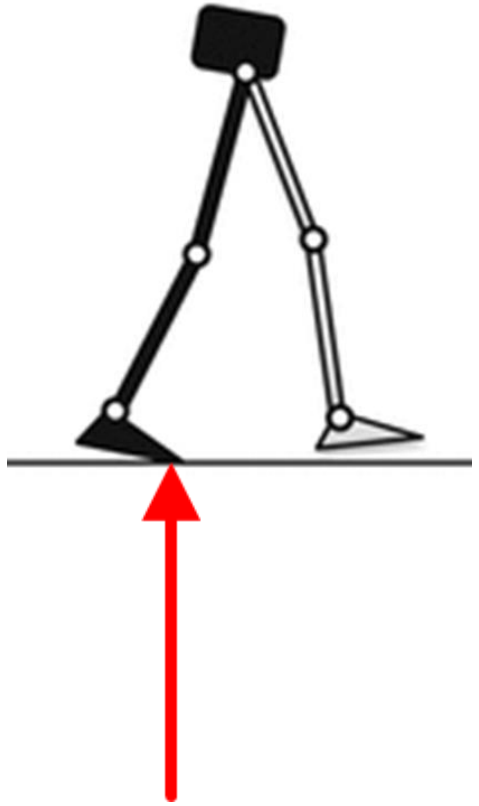
Identifying Loads

1. What loads are applied to the wound site?
    a. Pressure
    b. Shear

2. When are they applied?
    1. Weight bearing
    2. Phases of gait
    3. Activities of Daily Living

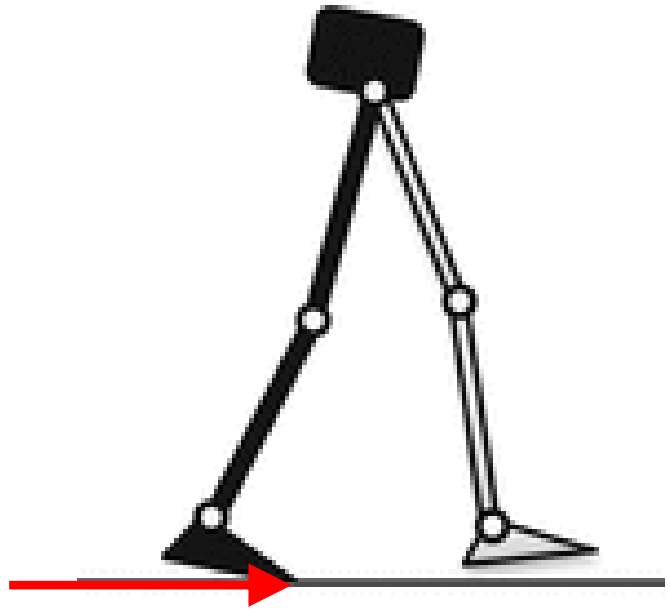
Identifying Loads
Pressure

- Applied perpendicular to the skin.
- Pressure = Force/Area.
- These occur with weight bearing, gait, and various ADLs.



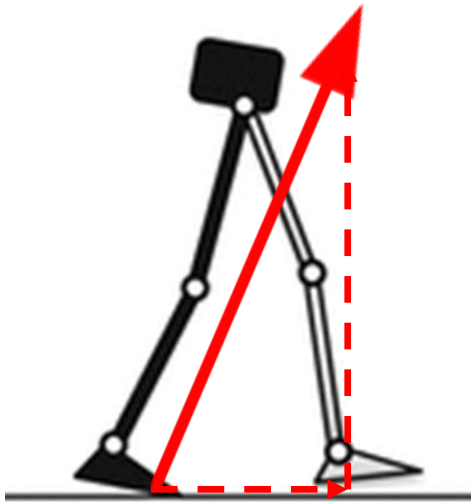
Identifying Loads
Shear

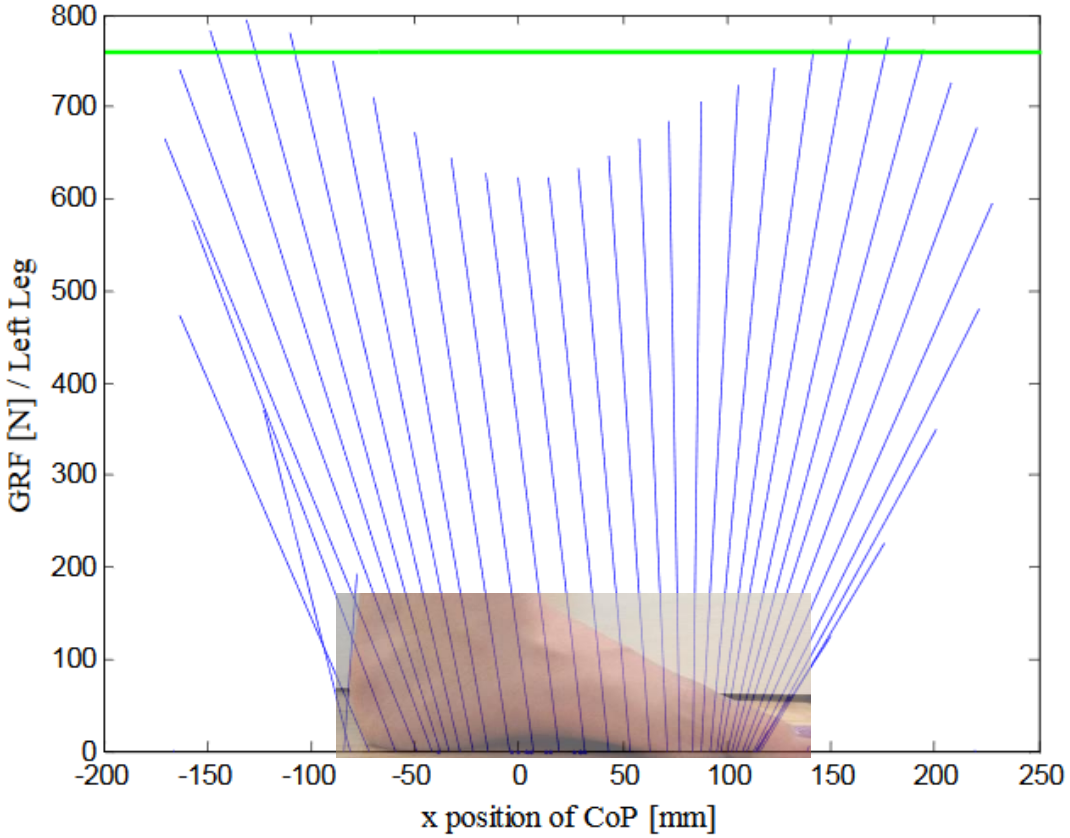
- Applied parallel to skin surface.
- $\tau = F/A$
  - F is parallel to skin's surface.
- Friction vs internal shear stress.



Identifying Loads

- Peak pressure and shear loads often occur at the same point in the gait cycle.





(Marasović, T., Cecić, M., & Zanchi, V., 2009)

Identifying Loads

- Pressure Gradient
- The rate at which plantar pressure changes with distance.

  (Meuller et al., 2005)
- This increases internal shear stress which can contribute to tissue breakdown.

Offloading Devices

1. Shoes
2. Custom Foot Orthoses
3. Shoe Modifications
4. Ankle Foot Orthoses
    a. CROW
    b. Leather Gauntlet
    c. Thermoplastic AFO

Offloading Devices - Shoes

- Shoes provide
  - Protection
  - Shock absorption
  - Pressure Distribution
  - Support and Stability

(Nielson, C., Jorge, M., & Lusardi, M. M., 2013)

- Starting Point for offloading

- **None of the following devices work properly without proper fitting shoes.**

Offloading Devices – Custom Foot Orthoses

- Custom molded insoles
- Cast, impression, or scan taken of the foot.
- Thermoformable materials vacuum formed to cast of patient's foot.

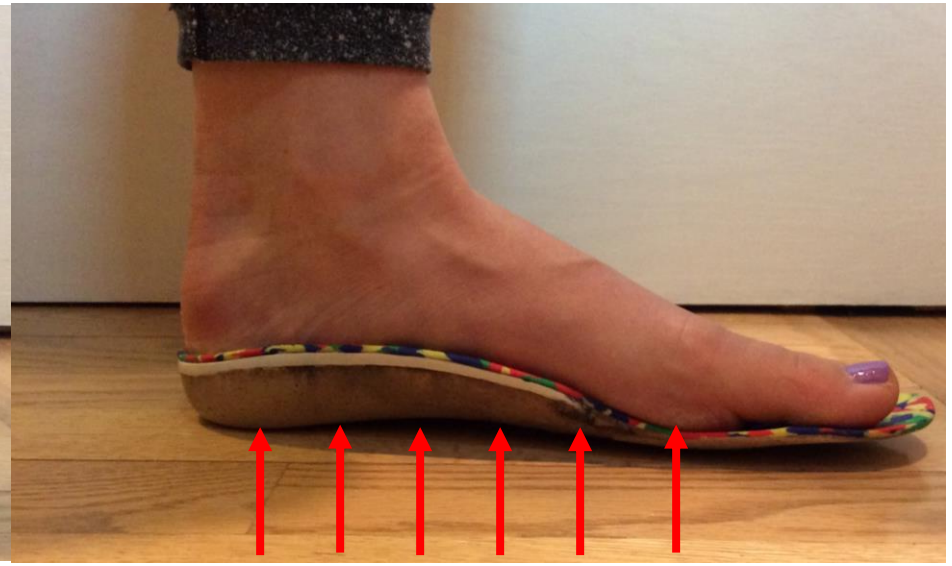
Offloading Devices – Foot Orthoses

Pressure Reduction

- Distribute the load applied to the foot.

- Total contact design

- P = F/A



Offloading Devices – Foot Orthoses
Pressure Reduction

- Targeted pressure off loading.
  - Metatarsal pad
  - Relief for bony prominences
  - Depressed 1st ray

- Shock absorbing materials.

Offloading Devices – Foot Orthoses
Shear Reduction

- Reduce pronation.
- Add lower friction surfaces.
- Reduce movement within shoe.

Offloading Devices – Custom Foot Orthoses

- **Custom** foot orthoses indicated for high-risk feet (IWGDF category 2 and 3)

  (National Hansen's Disease Program, 2019)

- Foot orthoses should be custom made AND adjustable over time.

- Provided by orthotists and pedorthists in facilities that allow this.

Offloading Devices – Shoe Modifications
Rocker Profile

- Rolling decreases push-off forces.
- Reduces terminal stance pressure and shear applied to forefoot.

  (Nielson, C., Jorge, M., & Lusardi, M. M., 2013)
- Serves to allow heel rise/tibial progression without MTP joint extension.
  - Accommodates hallux rigidus.

Offloading Devices – Shoe Modifications
Rigid Shank

- Steel or carbon fiber inserted into the sole of the shoe.
- Does not allow MTP extension or midfoot break.
- Reinforces rocker profile.
- Unloads hallux rigidus.

Offloading Devices – Shoe Modifications

Buttress/Flare

- Corrects frontal plane alignment.
- Increases stability.

(National Hansen's Disease Program, 2019)

Offloading Devices – Shoe Modifications
Bubble Patch

- Accommodates deformity.
- Often used in the toe box to relieve hammer toes.
- Or in the midfoot for Charcot deformity.

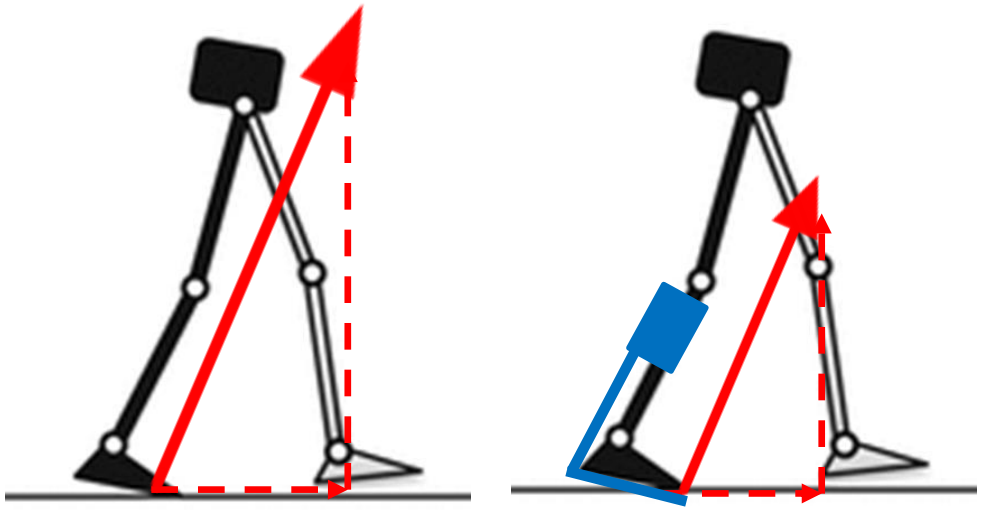
Offloading Devices – Ankle Foot Orthoses

- Custom orthosis that encompasses and supports the lower leg, ankle, and foot.
- Focus is on AFOs with a rigid ankle.
- 3 Types.
  - Charcot Restraint Orthotic Walker (CROW)
  - Leather Gauntlet
  - Thermoplastic

Offloading Devices – Ankle Foot Orthoses
Pressure Reduction

- Goal is to reduce loads applied to foot during gait.
- Rigid ankle prevents effective push-off and thus peak pressures.
- Transfers some of the forefoot load to the proximal tibia via rigid ankle section.

(Nielson, C., Jorge, M., & Lusardi, M. M., 2013)



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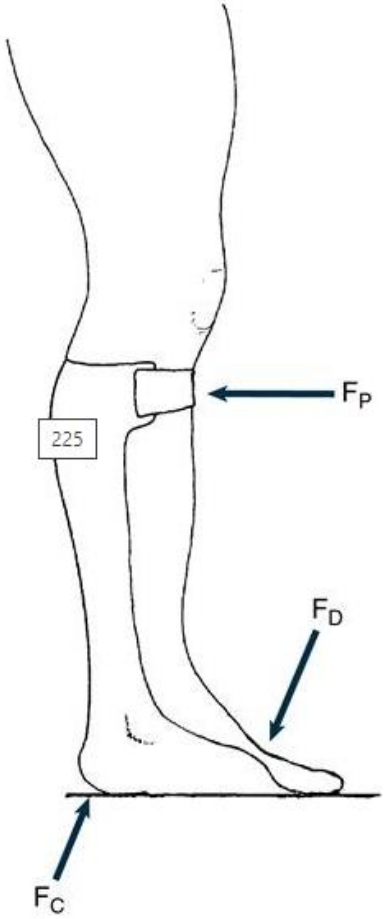

Offloading Devices – Ankle Foot Orthoses
Pressure Reduction

- Total contact design .
  - P=F/A

- Targeted pressure off loading.
  - Met pad
  - Relief for bony prominences

Offloading Devices – Ankle Foot Orthoses
Shear Reduction

- Reduces push-off loads.
- Prevents movement within brace.
- Reduce pronation.
- Add lower friction surfaces.

Offloading Devices – Ankle Foot Orthoses CROW

Pros

- Most closely mimics Total Contact Cast (TCC).
- Accommodates almost any deformity.
- Greatest stiffness.
- Design attempts partial WB.
- Includes functional shoe modifications.

Cons

- Restrictive
- Bulky
- Low Cosmesis
- Heavy
- Does not accommodate volume fluctuation well
- Hot

Offloading Devices – Ankle Foot Orthoses
Leather Gauntlet

Pros

- Accommodates some midfoot deformity
- Accommodates volume fluctuation
- Shear reduction
- Comfortable
- Lightweight
- Fits in a shoe

Cons

- Shoe fit
- Cosmesis
- Donning can be challenging
- Hot

Offloading Devices – Ankle Foot Orthoses
Thermoplastic AFO

Pros

- Accommodates mild deformity
- High midfoot support
- Fits in a shoe
- Lightweight
- Coolest temperature

Cons

- Restrictive
- Shoe fit
- Poorly accommodates moderate-severe deformity

Funding

Shoes

- Not covered by Manitoba Health (MH), Non-Insured Health Benefits (NIHB).
- Covered by Employment Income Assistance (EIA).
- Some private insurance available.

Foot Orthoses (Orthotists and Pedorthists)

- MH coverage for Charcot foot, partial foot amputations, but not for wounds.
  - (Orthotist only)
- NIHB and EIA coverage for most diagnoses, including wounds.
- Lots of private insurance available.

Funding

Shoe mods (Orthotists and Pedorthists)

- MH coverage for Charcot foot, partial foot amputations, but not for wounds.
  - (Orthotist only)
- NIHB and EIA coverage for most diagnoses, including wounds.
- Lots of private insurance available.

AFOs (Orthotists Only)

- MH, NIHB, and EIA coverage for most diagnoses.
- Private Insurance available but rarely needed.

Funding

In order to access funding, patients require,

1. Prescription
   a) Must include relevant diagnosis.

      Example: “Type-2 Diabetes Mellitus with peripheral neuropathy and metatarsal head ulcer”
   b) List the type of device required,

      Example: “custom foot orthoses”, “shoe modification”, “ankle foot orthosis”
2. Certified Provider
   a) Certified Orthotist (MH, NIHB, EIA)

      FOs, Shoe Modifications, AFOs
   b) Certified Pedorthist (NIHB, EIA)

      FOs, Shoe Modifications

Where to Get These?

- Orthotics Clinics (FOs, Shoe Mods, AFOs)

HSC Orthotics

- 59 Pearl Street, Winnipeg MB
- Phone: 204-787-2202
- Fax: 204-787-5099

Health Sciences Centre Winnipeg
A Shared Health facility

Winnipeg Prosthetics and Orthotics Specialty Co.

- 188 Marion Street, Winnipeg MB
- Phone: 204-233-3942
- Fax: 204-231-2148

WINNIPEG PROSTHETICS & ORTHOTICS
Innovative patient focused care.

Where to Get These?

- Orthotics Clinics (FOs, Shoe Mods, AFOs)

Anderson Orthopedic

- 1818 Portage Avenue, Winnipeg MB
- Phone: 204-837-7190
- Fax: 204-837-9469

- 602 1st Street, Brandon MB
- Phone: 204-729-8216
- Fax: 204-725-2762

Snider Orthotic Design

- 880 Harrow Street, Winnipeg MB
- Phone: 204-927-1610
- Fax: 204-927-1615

Where to Get These?

- Pedorthics Clinics (Shoes, FOs, Shoe Mods)

  Canadian Footwear
  - 128 Adelaide Street, Winnipeg MB
  - Phone: 204-944-7464
  - Fax: 204-947-0801

  Prothotics/Healthwest
  - 270 Enfield Crescent, Winnipeg MB
  - Phone: 204-783-3355
  - Fax: 204-783-3356

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Thank You!!

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