

New Perspectives in Diabetic Limb Preservation

Surgical and Non-Surgical Approaches to Offloading the Diabetic Foot

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Speaker Disclosure

- James Hill, DPM FACFAS
- Relationships with commercial interests:
 - Grants/Research Support: none
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Disclosure of Commercial Support

- This presentation has NOT received financial support from any organization
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- Potential conflict(s) of interest: N/A

Mitigating Potential Bias

- [Explain how potential sources of bias identified in slides 1 and 2 have been mitigated]

At the end of this session, participants will be able to:

- 1 Describe the evidence supporting as a treatment for diabetic foot complications.
- 2 Explore common non-surgical and surgical approaches to offloading the diabetic foot and treat Charcot foot and their indications, contraindications and effectiveness.
- 3 Describe strategies to offload the diabetic foot in resource limited settings.

Question 1

What is the MOST appropriate method of offloading a diabetic, neuropathic patient with a plantar FOREFOOT ulcer, MODERATE infection and NO ischemia?

A

Non-removable knee-high offloading device

B

Removable knee-high offloading device with encouragement

C

Felted foam and appropriately fitted footwear

D

Achilles tendon lengthening

Non-removable Offloading Devices

- Total Contact Cast
- “Non-removable” Controlled Ankle Motion (CAM) boot

Non-removable Offloading Devices

- Total Contact Cast



Non-removable Offloading Devices

- Controlled Ankle Motion (CAM) boot
 - Rendered irremovable by applying a layer of cast or tie wrap around the device.



Removable Offloading Device

- Knee-high CAM boot



- Ankle-high CAM boot



Removable Offloading Device

- Felted Foam
- Standard Therapeutic Footwear
 - Diabetic Shoes



Non-Surgical Offloading of the Diabetic Foot Ulcer

- International Working Group on the Diabetic Foot
 - 2019 IWGDF Guideline on offloading foot ulcers in persons with diabetes

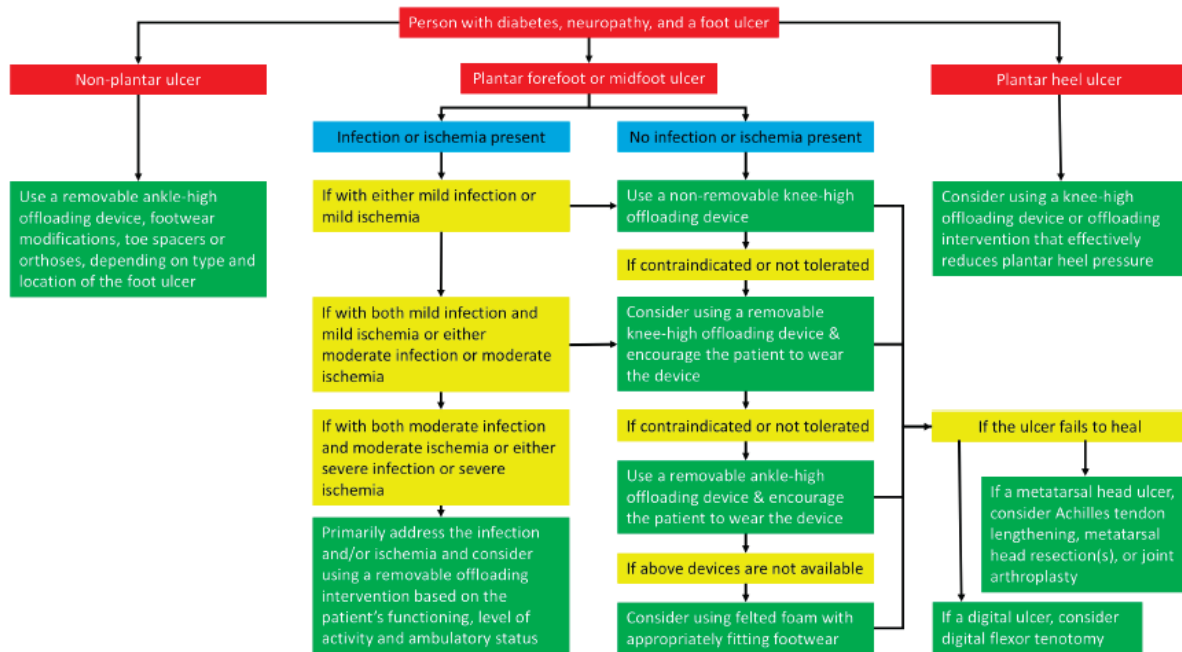


Non-Surgical Offloading of the Diabetic Foot Ulcer



FIGURES

Figure 1. Flow diagram on the recommended offloading treatment for a person with diabetes and a foot ulcer.



Offloading the Diabetic Foot



IWGDF Recommendation 1

a. In a person with diabetes and a neuropathic plantar forefoot or midfoot ulcer, use a non-removable knee-high offloading device with an appropriate foot-device interface as the first-choice of offloading treatment to promote healing of the ulcer. (*GRADE strength of recommendation: **Strong**; Quality of evidence: High*)

b. When using a non-removable knee-high offloading device to heal a neuropathic plantar forefoot or midfoot ulcer in a person with diabetes, use either a total contact cast or non-removable knee-high walker, with the choice dependent on the resources available, technician skills, patient preferences and extent of foot deformity present. (***Strong**; Moderate*)

Offloading the Diabetic Foot



IWGDF Recommendation 2

In a person with diabetes and a neuropathic plantar forefoot or midfoot ulcer for whom a non-removable knee-high offloading device is contraindicated or not tolerated, consider using a removable knee-high offloading device with an appropriate foot-device interface as the second choice of offloading treatment to promote healing of the ulcer. Additionally, encourage the patient to consistently wear the device. (**Weak**; Low)

Offloading the Diabetic Foot



IWGDF Recommendation 3

In a person with diabetes and a neuropathic plantar forefoot or midfoot ulcer for whom a knee-high offloading device is contraindicated or not tolerated, use a removable ankle-high offloading device as the third-choice of offloading treatment to promote healing of the ulcer. Additionally, encourage the patient to consistently wear the device. (**Strong**; Low)

Offloading the Diabetic Foot



IWGDF Recommendation 4

a. In a person with diabetes and a neuropathic plantar forefoot or midfoot ulcer, do not use, and instruct the patient not to use, conventional or standard therapeutic footwear as offloading treatment to promote healing of the ulcer, unless none of the above-mentioned offloading devices is available. (**Strong**; Moderate)

b. In that case, consider using felted foam in combination with appropriately fitting conventional or standard therapeutic footwear as the fourth choice of offloading treatment to promote healing of the ulcer. (**Weak**; Low)

Offloading the Diabetic Foot



IWGDF Recommendation 5 - SURGICAL

In a person with diabetes and a neuropathic plantar metatarsal head ulcer, consider using Achilles tendon lengthening, metatarsal head resection(s), or joint arthroplasty to promote healing of the ulcer, if non-surgical offloading treatment fails.
(*Weak*; Low)

Offloading the Diabetic Foot



IWGDF Recommendation 6 - SURGICAL

In a person with diabetes and a neuropathic plantar digital ulcer, consider using digital flexor tenotomy to promote healing of the ulcer, if non-surgical offloading treatment fails. (*Weak; Low*)

Offloading the Diabetic Foot



IWGDF Recommendation 7

a. In a person with diabetes and a neuropathic plantar forefoot or midfoot ulcer with either mild infection or mild ischemia, consider using a non-removable knee-high offloading device to promote healing of the ulcer. (**Weak**; Low)

b. In a person with diabetes and a neuropathic plantar forefoot or midfoot ulcer with both mild infection and mild ischemia, or with either moderate infection or moderate ischaemia, consider using a removable knee-high offloading device to promote healing of the ulcer. (**Weak**; Low)

Offloading the Diabetic Foot



IWGDF Recommendation 7

c. In a person with diabetes and a neuropathic plantar forefoot or midfoot ulcer with both moderate infection and moderate ischaemia, or with either severe infection or severe ischemia, primarily address the infection and/or ischemia, and consider using a removable offloading intervention based on the patient's functioning, ambulatory status and activity level, to promote healing of the ulcer. (*Weak; Low*)

Offloading the Diabetic Foot



IWGDF Recommendation 8

In a person with diabetes and a neuropathic plantar heel ulcer, consider using a knee-high offloading device or other offloading intervention that effectively reduces plantar pressure on the heel and is tolerated by the patient, to promote healing of the ulcer. (*Weak; Low*)

Offloading the Diabetic Foot



IWGDF Recommendation 9

In a person with diabetes and a non-plantar foot ulcer, use a removable ankle-high offloading device, footwear modifications, toe spacers, or orthoses, depending on the type and location of the foot ulcer, to promote healing of the ulcer. (**Strong**; Low)

Question 2

Surgery on the Diabetic Foot is indicated under which circumstance(s)?

A

Elective

B

Preventative

C

Curative

D

Emergent

E

B, C & D only

F

D only

G

All of the above

Surgical Offloading of the Diabetic Foot

- Classification of Diabetic Foot Surgery
 - **Class I:** Elective. Reconstructive procedures on patients who do not have loss of protective sensation (LOPS)
 - **Class II:** Prophylactic. Reconstructive procedures performed to reduce the risk of ulceration or re-ulceration in patients who have LOPS and do not have a wound present
 - **Class III:** Curative. Procedures performed to assist in healing of open wounds
 - **Class IV:** Emergent. Procedures performed to arrest or limit progression of infection

Reference: D.G. Armstrong, R.G. Frykberg. *Classifying diabetic foot surgery: toward a rational definition Diabet Med*, 20 (2003), pp. 329-331

Surgical Offloading of the Diabetic Foot

- Ankle Equinus

- Insufficient ankle joint dorsiflexion for normal gait, resulting in lower extremity compensation, pathology or a combination of both.
- Reported normal values of ankle joint dorsiflexion are varied with ranges as large as -10 to +22 degrees.
- Despite this variability, authors generally agree that a normal gait requires more than 10 degrees of dorsiflexion with the knee extended.

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- Root ML, Orien WP, Weed JH. *Clinical Biomechanics. Vol II: Normal And Abnormal Function Of The Foot*, Clinical Biomechanics Corp, Los Angeles, 1977.
- Aronow MS, Diaz-Doran V, Sullivan RJ, et al. *The effect of triceps surae contracture force on plantar foot pressure distribution*. *Foot Ankle Int.* 2006;27(1):43-52.
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Surgical Offloading of the Diabetic Foot

- Evaluation of Ankle Equinus
 - Silfverskiöld Test
 - Measures the angle between the lateral aspect of the foot in relation to the lateral aspect of the leg
 - Consistent evaluation methodology using a goniometer with the subtalar joint in neutral position and midtarsal joint supinated while dorsiflexing the ankle with knee extended provides a consistent clinical examination.



Reference: Deheer P. Equinus and Lengthening Techniques. Clin Podiatr Med Surg. 2017 Apr;34(2):207-227.

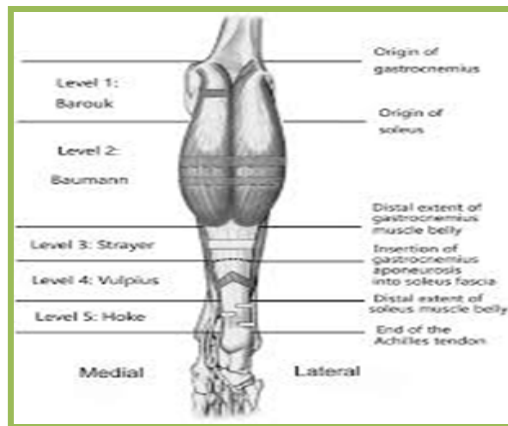
Surgical Offloading of the Diabetic Foot

- Evaluation of Ankle Equinus
 - Weight-bearing lunge test



Surgical Offloading of the Diabetic Foot

- Gastrocnemius recession/Achilles
 - Baumann
 - Strayer
 - Endoscopic gastroc recession
 - Triple hemi-section

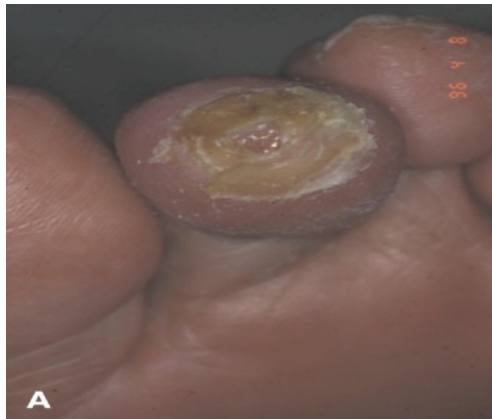


Reference: Kai Rong, Wen-tao Ge, Xing-chen Li, and Xiang-yang Xu. Mid-term Results of Intramuscular Lengthening of Gastrocnemius and/or Soleus to Correct Equinus Deformity in Flatfoot. James Hill, DPM FACFAS

- Percutaneous Flexor Tenotomy

References:

- Scott JE, Hendry GJ, Locke J. Effectiveness of percutaneous flexor tenotomies for the management and prevention of recurrence of diabetic toe ulcers: a systematic review. *J Foot Ankle Res.* 2016;9:25.
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- Tamir E, Vigler M, Avisar E, Finestone AS. Percutaneous tenotomy for the treatment of diabetic toe ulcers. *Foot Ankle Int.* 2014;35(1):38-43.
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Surgical Offloading of the Diabetic Foot

- Charcot Foot

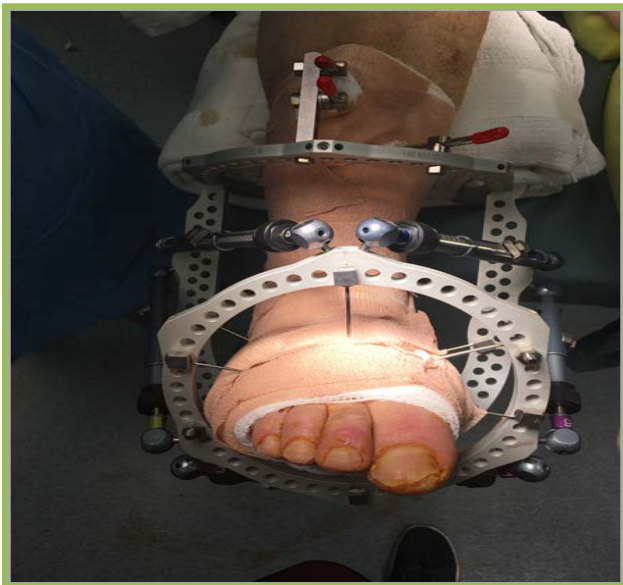


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- Short DJ, Zgonis T. Circular External Fixation as a Primary or Adjunctive Therapy for the Podoplastic Approach of the Diabetic Charcot Foot. *Clin Podiatr Med Surg.* 2017 Jan; 34(1):93-98.
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Surgical Offloading of the Diabetic Foot

- Charcot Reconstruction



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- Ramanujam CL1, Zgonis T2. An Overview of Internal and External Fixation Methods for the Diabetic Charcot Foot and Ankle. 2017 Jan;34(1):25-31.

Surgical Offloading of the Diabetic Foot

- Minor Amputation
 - Digit
 - Ray
 - Transmetatarsal

References:

- Izumi Y, Satterfield K, Lee S, Harkless LB, Lavery LA. Mortality of first-time amputees in diabetics: a 10-year observation. *Diabetes Res Clin Pract.* 2009;83:126–31.
- Evans KK, Attinger CE, Al-Attar A, Salgado C, Chu CK, Mardini S, et al. The importance of limb preservation in the diabetic population. *J Diabetes Complications.* 2011;25:227–31.
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Surgical Offloading of the Diabetic Foot

- Major Amputation
 - Below Knee
 - Above Knee

References:

- Izumi Y, Satterfield K, Lee S, Harkless LB, Lavery LA. Mortality of first-time amputees in diabetics: a 10-year observation. *Diabetes Res Clin Pract.* 2009;83:126–31.
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Question 3

A Diabetic with a neuropathic foot ulcer with no ischemia or infection should be primarily referred to:

A Foot Care Nurse

B Vascular Surgeon

C Orthopedic Surgeon

D Podiatrist/Podiatric Surgeon

E Pedorthist

Barriers to Practice Change



Hard “cap” on Podiatrist class registrants with the College of Chiropodists of Ontario



Scope of practice for Podiatrists in Canada is limited in all but Alberta and British Columbia.



Limited funding for offloading devices



Access to competent prescribers is limited



Confusion regarding the terms "Podiatrist", "Chiropodist" and "Podiatric Surgeon"

Scope of Practice Comparisons

BC, ALBERTA, USA, ETC.

- Order Lab Tests
- Take/Prescribe X-Rays
- Order/Administer “forms of energy”
- Set or Cast Fractures
- Prescribe Controlled Drugs and Substances.
- Refer to Specialists

ONTARIO





- No
- Podiatrists and DPMs Only
- No
- No
- Very limited; podiatrists only
- No

Funding An Obstacle To Integration

- No public funding per se for chiropodists
- Public funding for Podiatrists limited (co-pay) – Last revised in 1993

Solutions to Overcome Barriers

Canadian Government(s) should

-  Remove the “cap” on registrants to the Podiatrist class of the College of Chiropodists of Ontario
-  Remove scope of practice restrictions on Podiatrists
-  Include Podiatrists and Podiatric Surgeons on the multi-disciplinary team and remunerate them on the same pay scale as other physicians and surgeons according to their competencies and the complexity of their service
-  Increase government funding for the prevention and TREATMENT and subsequent research of the Diabetic Foot in Canada

Key Take-Away Points

- Appropriate offloading is necessary in order to heal the Diabetic Foot Ulcer.
- Research on Diabetic Foot Ulcers in Canada is limited.
- Both Podiatrists and Podiatric Surgeons are key members of the multidisciplinary team evaluating and treating the Diabetic Foot and access to their full range of competencies is severely limited in Canada.
- We MUST DEMAND a “New Perspective in Diabetic Limb Preservation” from the Government of Canada and the Ontario Government.



References

- D.G. Armstrong, R.G. Frykberg. Classifying diabetic foot surgery: toward a rational definition *Diabet Med*, 20 (2003), pp. 329-331 *Root ML, Orien WP, Weed JH. Clinical Biomechanics. Vol II: Normal And Abnormal Function Of The Foot, Clinical Biomechanics Corp, Los Angeles, 1977.*
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THANK YOU!



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