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Learning Objectives

- Prescribe appropriate offloading therapy for diabetic foot ulcers.
- Recognize when to refer patients for total contact casting of diabetic foot ulcers.
- Perform multilayer compression bandages for venous leg ulcers.

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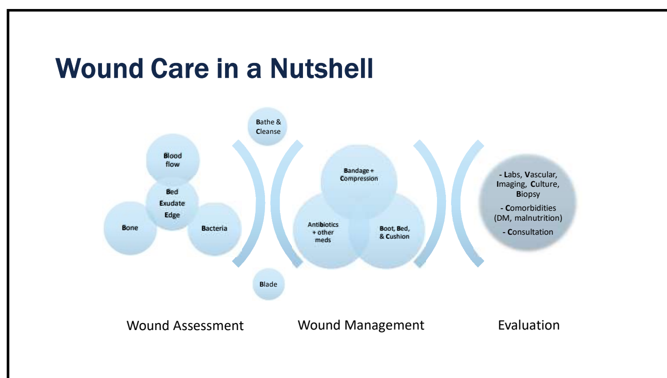

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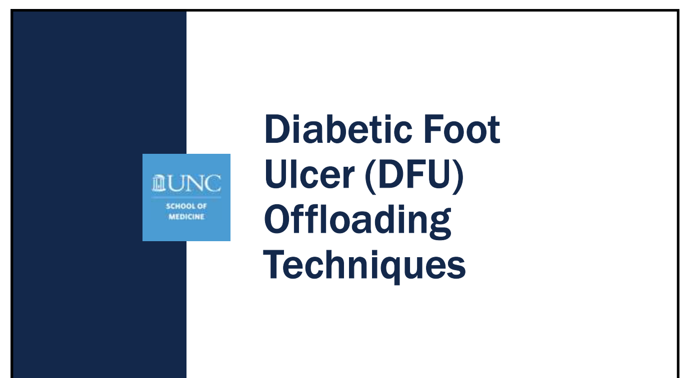

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Clinical Question

Which diabetic foot ulcer treatment is supported by the strongest evidence?

A. Offloading with removable cast walker
B. Offloading with non-removable cast walker
C. Surgical debridement
D. Debridement with larval therapy

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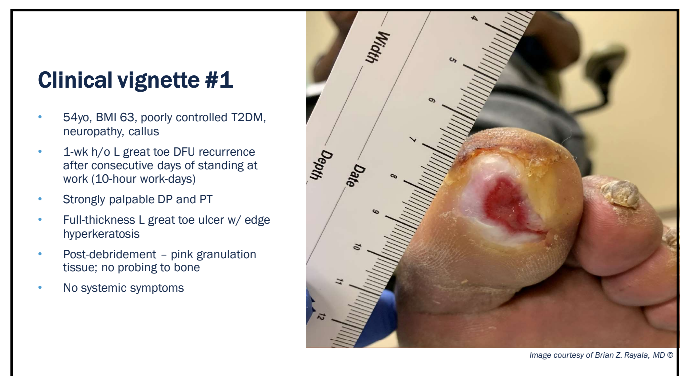

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Wound & Patient Characteristics

- Wound location
  - Forefoot
  - Midfoot
  - Hindfoot
  - Other areas (dorsum, medial, lateral)
- Patient characteristics
  - Strength (contralateral limb, core, upper body)
  - Gait and balance
  - Home and work needs (including driving)
  - Resources (social support, health insurance, barriers to care, etc.)
  - Preferences

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Evidence for Efficacy of Offloading

- Plantar diabetic foot ulcers (**DFUs**)
  - Offloading w/ non-removable cast better than removable cast[1]
    - RR 1.17, 95%CI 1.01-1.36; *P*=0.04
  - Achilles tendon lengthening surgery *plus* non-removable cast better than non-removable cast alone[1]
    - RR 2.23, 95%CI 1.32-3.76 (7 mos)
    - RR 3.41, 95%CI 1.42-8.18 (24 mos)
- Heel pressure ulcers (**PUs**)
  - Insufficient evidence for pressure-relieving devices[2]

1. Cochrane Database Syst Rev. 2013 Jan 31;(1):CD002302.
2. Cochrane Database Syst Rev. 2014 Feb 12;(2):CD005485.

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Offloading Devices

- Non-removable[1]
  - Total contact cast (**TCC**)
    - Custom-made, minimal padding, plaster or fiberglass shell
    - Pressure redistribution
    - Contraindication: infection, severe PAD, *patient barriers*
  - Instant TCC (**iTCC**)[3]
    - Removable cast walker rendered non-removable using plaster, fiberglass, or cohesive bandage wrap
- Removable[1]
  - Removable cast walkers (**RCWs**)
  - Therapeutic footwear
    - Temporary
    - Custom-made shoes & orthoses (*bespoke*, *semi-bespoke*)
  - Padding
    - Various materials (eg, felt)
    - Adherent to skin or footwear

1. Cochrane Database Syst Rev. 2013 Jan 31;(1):CD002302.
3. J Am Podiatr Med Assoc. 2002;92(7):405-408.

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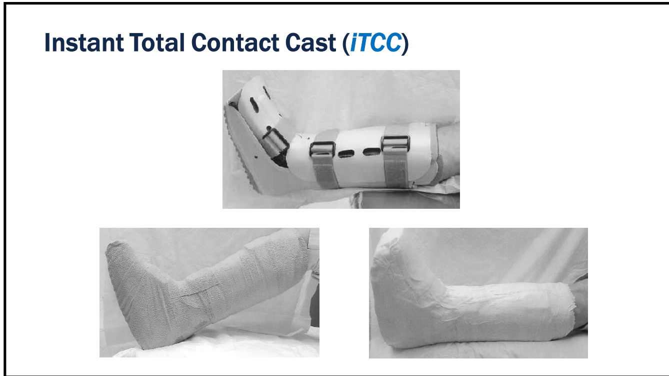

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Removable Cast Walkers

Cam walker boot | Bledsoe boot | Aircast boot

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Therapeutic Footwear (*Temporary*)

DH shoe | Medical walking shoe | Forefoot offloading shoe

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Therapeutic Footwear (*Custom-made*)

Diabetic shoes and inserts | Charcot Restraint Orthotic Walker (**CROW**) boot | Ankle foot orthosis (**AFO**)

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Heel Offloading Devices

Podus boot (*compatible w/ ambulation*) | Heelift suspension boot (*not for ambulation*)

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Management Pearls

- Do not forget about primary and secondary dressings!
- Monitor progress closely (ie, weekly appt initially).
- Address other healing barriers aggressively (eg, blood flow, infection, periwound edema, uncontrolled sugars, etc.).
- Monitor for compliance. *Significant edge hyperkeratosis is a sign of ongoing pressure.*
- Be ready to switch to another offloading device, or use combination strategies.
- Remember, offloading is a means to healing. Once healed, they need a more durable offloading strategy.
- Be mindful of costs!

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Other Offloading Devices

Knee scooter | Crutches | Wheelchair

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Offloading Prescription

- Name of device:
  - DH shoe (or similar forefoot offloading shoe)
  - Cam walker boot, tall (or similar offloading boot)
  - DM shoes/inserts (pls eval/tx)
- Sig: use daily for ambulation
- Dx: DFU, T2DM, diabetic neuropathy, preulcerative callus, foot deformity, h/o amputation

*in EHR – I order *Miscellaneous Medical Supply*, then use Free Text to manually enter above info. You can save this to your Favorites list.

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Practical resource: Offloading Devices

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Clinical Question

Which venous leg ulcer treatment is supported by the strongest evidence?

A. Compression therapy
B. Foam dressings
C. Hydrogel
D. Surgical debridement

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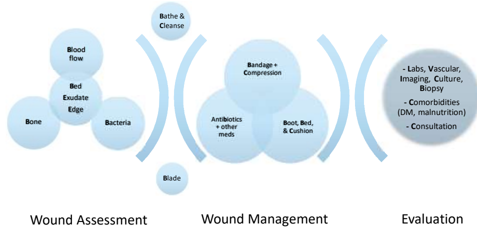
Wound Care in a Nutshell



Wound Assessment Wound Management Evaluation

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Clinical vignette #3

- 68yo, w/ T2DM, HTN
- 4mo h/o L medial ankle nonhealing traumatic wound
- DP and PT pulses palpable
- ABI 0.9 on LLE
- Irregular, full-thickness ulcer w/ moderate biofilm, edge margination, and periwound edema
- Severe venous stasis changes
- No systemic symptoms

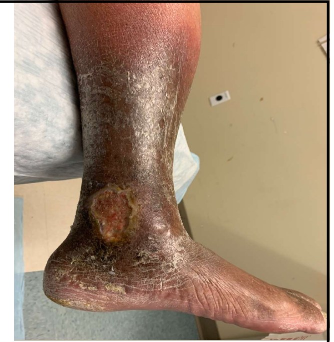

Image courtesy of Brian Z. Rayala, MD ©

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Clinical vignette #4

- 50yo female with T2DM, CAD, HFrEF
- 2-wk h/o L lateral leg ulcers w/ recent onset mild pain, warmth and redness
- DP palpable, but PT difficult to palpate
- ABI 0.7 on LLE
- Several partial thickness wounds with heavy serous exudate, mild tenderness, warmth, and 3cm periwound erythema
- No purulence, sinus tracts, fluctuance, crepitus, or pus pockets
- No systemic symptoms

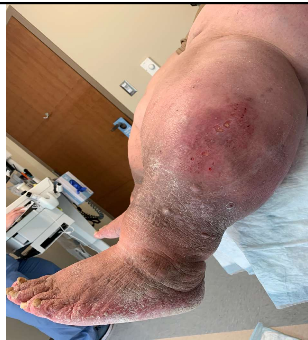

Image courtesy of Brian Z. Rayala, MD ©

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Caution with compression when:

- ABI < 0.8[5]
- Infected wounds
- Uncontrolled pain
- Severe swelling, esp. unexplained acutely asymmetric legs
- Volume overload in the setting of cardiomyopathy
- Inconsistent follow-up, esp when using multilayer compression
- Other patient barriers (eg, ability to remove wraps independently)

5. FP Essent. 2020 Dec;499:11-18.

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Evidence for Efficacy of Compression

- Venous leg ulcers (VLUs)
  - **Compression** *better* than no compression for VLU healing[6,7]
  - **Compression** *improves* pain and disease-specific quality of life.[7]
  - **Multicomponent systems** *better* than single-component systems[6]
  - Multicomponent systems w/ **elastic** bandage *better* than those with inelastic component.[6]
  - **Four-layer bandages** *better* than short stretch bandage (SSB).[6]
  - **High-compression stockings** *better* than SSB.[6]

6. Cochrane Database Syst Rev. 2012 Nov 14;11(11):CD000265.
7. Cochrane Database Syst Rev. 2021 Jul 26;7(7):CD013397.

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Types of Compression Therapy

- Compression stockings[7]
  - *Class 1* (14-17 mmHg), *2* (18-24), *3* (25-35)
- Compression bandages[7]
  - *Light* (14-17 mmHg), *moderate* (18-24), *high* (25-35), *extra-high* (36-60)
  - EXAMPLES:
  - Inelastic + elastic bandage (eg, bandage roll + short-stretch bandage; inelastic paste bandage + cohesive elastic bandage)
  - 3-layer or 4-layer bandage

7. Cochrane Database Syst Rev. 2021 Jul 26;7(7):CD013397.

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Examples of Compression Devices

Compression Stockings

Compression Bandage

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Types of Compression Therapy

- Compression garments
  - Multilayer compression garments[9]
- Intermittent pneumatic compression (IPC) device[8]
  - IPC hastens healing of VLUs
  - IPC + compression bandages may improve healing
  - Rapid IPC better than slow IPC

8. Cochrane Database Syst Rev. 2014 May 12;(5):CD001899.
9. FP Essent. 2020 Dec;499:19-24.

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Examples of Compression Devices

Compression Garments

Image courtesy of Brian Z. Rayala, MD ©

Intermittent Pneumatic Compression (IPC) Device

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Clinical Question

What other venous leg ulcer treatments are supported by strong evidence?

A. Aspirin and clopidogrel
B. Calcium alginate and foam dressings
C. Pentoxifylline and endovenous ablation for superficial venous reflux
D. Aspirin and cilostazol

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Management Pearls

- Do not forget about primary and secondary dressings!
- Monitor progress closely (ie, weekly appt initially).
- Strongly consider *pentoxifylline*[10] and *eval for superficial reflux*[11,12].
- Monitor for compliance. ***Unchanged limb edema may mean insufficient adherence to compression.***
- Be ready to switch to another compression modality, or use combination strategies.
- Remember, compression is a means to healing. Once healed, they need a more durable compression strategy.
- Be mindful of costs!

10. Cochrane Database Syst Rev. 2012 Dec 12;12(12):CD001733.
11. FP Essent. 2020 Dec;499:25-28.
12. Cochrane Database Syst Rev. 2023 Jul 27;7(7):CD009494.

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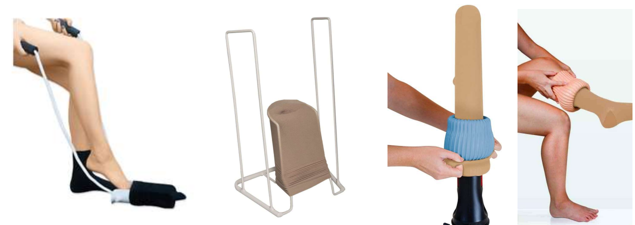
Compression Stockings Application Aid



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Compression Therapy Prescription

- Name of device:
  - Knee-high compression stockings, 20-30mm Hg
  - Inelastic paste bandage + cohesive elastic bandage
  - Bandage roll + short-stretch bandage
  - 4-layer bandage
- Sig: use daily for compression
- Dx: VLU, chronic venous insufficiency w/ varicose veins, leg edema, lymphedema

*in EHR – I order *Miscellaneous Medical Supply*, then use Free Text to manually enter above info. You can save this to your Favorites list.

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Practice Recommendations

- Among patients with adequate mobility, treat diabetic foot ulcers with pressure-relieving interventions, preferably with *non-removable casts*.[1] (*SOR A*) Use removable offloading devices for patients with contraindications to non-removable casts or based on patient preference. (*SOR C*)
- Prescribe *custom-made therapeutic footwear* for patients with history of plantar DFU to prevent recurrence.[13] (*SOR A*)
- Treat and prevent VLUs using compression therapy.[6,7,14] (*SOR A*)

1. Cochrane Database Syst Rev. 2013 Jan 31;(1):CD002302.
6. Cochrane Database Syst Rev. 2012 Nov 14;11(11):CD000265.
7. Cochrane Database Syst Rev. 2021 Jul 26;7(7):CD013397.
13. Diabetes Metab Res Rev. 2016 Jan;32 Suppl 1:84-98.
14. Cochrane Database Syst Rev. 2014 Sep 9;2014(9):CD002303.

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1. Cochrane Database Syst Rev. 2013 Jan 31;(1):CD002302.
2. Cochrane Database Syst Rev. 2014 Feb 12;(2):CD005485.
3. J Am Podiatr Med Assoc. 2002;92(7):405-408.
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8. Cochrane Database Syst Rev. 2014 May 12;(5):CD001899.
9. FP Essent. 2020 Dec;499:19-24.
10. Cochrane Database Syst Rev. 2012 Dec 12;12(12):CD001733.
11. FP Essent. 2020 Dec;499:25-28.
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