

# Off-loading & Activity Monitoring Strategies

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Management of the High Risk Diabetic Foot Conference

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# Off-loading & Activity Monitoring Strategies

## Objectives:

- Describe the various off-loading devices and strategies
- Discuss how activity monitoring affects patient outcomes
- Present successful strategies for off-loading

# Off-loading & Activity Monitoring Strategies

- ◆ Life time incidence of foot ulcers in diabetics may be as high as 25%
- ◆ Foot ulcers are costly to treat \$18,000. to \$34,000. And cause substantial emotional, physical, productivity and financial losses.
- ◆ 85% of the time limb amputation is preceded by a foot ulcer



Singh et al Preventing Foot Ulcers in Diabetes JAMA Vol. 293, #2 2005

# Off-loading & Activity Monitoring Strategies

The healing of a diabetic foot ulcer necessitates a comprehensive approach as one or more factors may impair or prevent healing:

- ◆ Adequate vascularity
- ◆ Infection: bone or soft tissue
- ◆ Optimal glycemic control
- ◆ Optimal nutrition
- ◆ Optimal management of co-morbidity
- ◆ Patient adherence to the treatment plan

# Off-loading & Activity Monitoring Strategies

The development of foot ulceration in a diabetic is a pivotal point and has the potential for disaster.

Of importance is to determine early if the ulcer is predominately neuropathic in origin or is neuroischemic. Healing shoes and other off-loading methods are indicated in either situation but the treatment plan for ischemic foot disease incorporates strategies to address tissue perfusion.

# Off-loading & Activity Monitoring Strategies

## Shifting thoughts on improving vascularity

We are realizing that that anatomic definition of arterial disease (Using infrapopliteal MR/CT/routine angiography) in patients with CLI can aid the determination of appropriate targets for revascularization and lead to improved outcomes.

Shah et al Clinical Outcomes Using Aggressive Approach to Anatomic Screening and Endovascular Revascularization in a Veterans Affairs Population with Critical Limb Ischemia Accepted for publication in *Catherization and Cardiovascular Interventions*

# Off-loading & Activity Monitoring Strategies

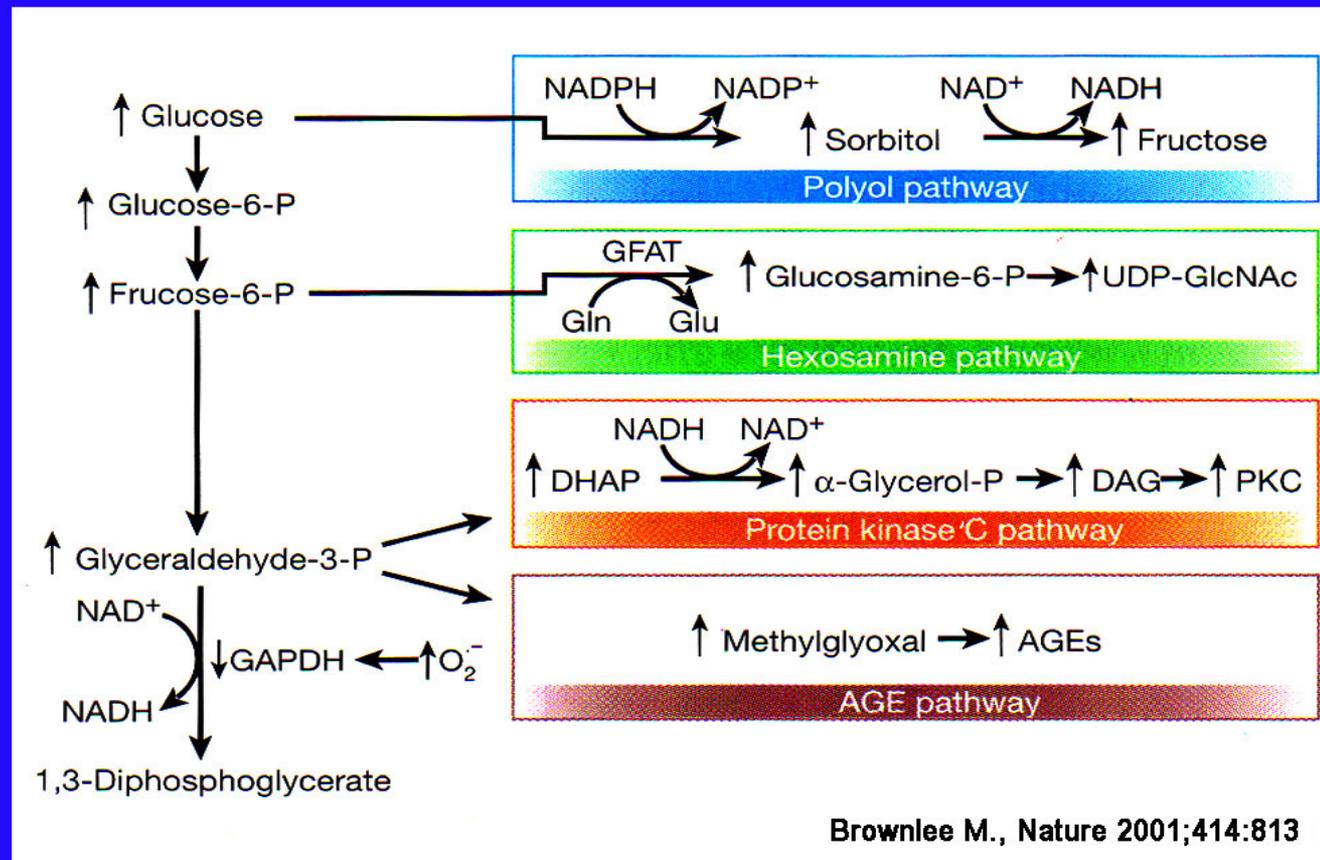
## Infection:

Soft tissue- wound bioburden creates an environment for emergence of infection.

Osseous- probing to bone or presence of exposed bone in an ulcer presumes osteomyelitis until proven otherwise.

# Off-loading & Activity Monitoring Strategies

## ◆ Optimal glycemic control



# Off-loading & Activity Monitoring Strategies

## Optimal nutrition

Besides standard measures of nutritional adequacy. Supplements to reduce oxidative stress and support cellular functions may well prove to be of greater value in this patient population that currently believed.

# Off-loading & Activity Monitoring Strategies

## Optimal management of co-morbidity

Kästenbauer in a multivariate logistic regression, found significant predictors for foot ulceration were an elevated vibration perception threshold (VPT) (relative risk [RR] = 25.4), an increased plantar pressure (RR = 6.3), and daily alcohol intake (RR = 5.1).

Kästenbauer et al A Prospective Study of Predictors for Foot Ulceration in Type 2 Diabetes  
J Am Podiatr Med Assoc 91(7): 343-350, 2001

# Off-loading & Activity Monitoring Strategies

## Patient adherence to the treatment plan

Armstrong concluded that patients with neuropathic diabetic foot wounds do not wear their prescribed pressure-relieving modality for the vast majority of activity taken each day. Failure to adequately off-load the foot or modulate activity exposes the wound to repetitive stress during activity of the same magnitude that precipitated the wound in the first place

Armstrong et al Activity Patterns of Patients  
With Diabetic Foot Ulceration  
*Diabetes Care* 26:2595-2597, 2003

# Off-loading & Activity Monitoring Strategies

Patient adherence to the treatment plan

“vast majority of activity each day”

30% of study subjects wore their off-loading device more than half the time (about 60% of their daily steps).

70% of study subjects wore their off-loading device less than half the time.

# WHAT IS THE BEST WAY TO APPROACH THE HIGH RISK FOOT

A high-risk foot is ideally monitored by a multidisciplinary team which should address the following:

Static and functional foot assessment

Dermatologic and musculoskeletal inspection

Vascular/Neurological assessment and management

Metabolic management

Education of the patient and their family.

Risk Classification Based on the Foot Exam

Risk Category	Definition	Treatment Recommendations	Suggested Follow-up
0	No LOPS, No PAD No deformity	Patient education including advice on appropriate footwear	Annual by generalist or specialist
1	LOPS ± deformity	Consider prescriptive/ accommodative footwear. Consider prophylactic surgery if deformity can not be accommodated in shoes.	Every 3-6 months by generalist or specialist
2	PAD ± LOPS	Consider prescriptive/ accommodative footwear. Consider vascular consultation for combined follow-up	Every 2-3 months by specialist
3	History of ulcer or amputation	Same as category 1 Consider vascular consultation for combined follow-up if PAD present	Every 1-2 months by specialist

# Off-loading & Activity Monitoring Strategies

## ■ Other issues and co-morbid conditions

- ◆ Advancing age
- ◆ Poor vision
- ◆ Obesity
- ◆ Psychological or psychiatric issues
- ◆ Knowledge and/or intellectual deficits
- ◆ Social isolation
- ◆ Poverty
- ◆ Health care coverage and reimbursement

# Off-loading & Activity Monitoring Strategies

When the foot has developed skin breakdown, the goal is to heal the wound as rapidly as possible.



# Off-loading & Activity Monitoring Strategies

Once a foot ulcer develops getting the patient out of their therapeutic shoes will lead to earlier healing and some authorities feel it is below the standard of care to keep someone with a foot ulcer in the shoes that could have played a role in precipitating the ulcer.

# Off-loading & Activity Monitoring Strategies

Focal pressure that leads to ulceration can be

- Low continuous - posterior heel ulcers
- Moderate intermittent –plantar foot ulcers
- High single event- after stepping on a nail

# Off-loading & Activity Monitoring Strategies

## ■ Foot Wear Categories

- ◆ Street shoes (patient selected)
- ◆ Therapeutic shoes (professionally prescribed)
  - ◆ Extra depth shoes
  - ◆ Shoes with modifications
  - ◆ Custom Shoes
- ◆ Healing shoes and off-loading (professionally prescribed)



# Off-loading & Activity Monitoring Strategies

Debridement on a regular basis for the non-ischemic ulcer is essential.

Plantar foot ulcerations have a tendency to develop hyperkeratotic margins which can obscure the underlying ulcer base. Repetitive debridement reduces the wound bioburden, removes inhibitory proteases and restimulates the healing cascade.

# Off-loading & Activity Monitoring Strategies

**The following are the most commonly employed off-loading techniques for diabetic foot ulcers:**

- ◆ Total non-weightbearing: bedrest, wheel chair, motorized scooter, etc.
- ◆ Assistive devices: walker, cane, wheeled leg rest, crutches, iWalkfree, etc.
- ◆ Orthopedic frames employed to transfer weight around the foot.
- ◆ Internal off-loading from injected silicone.
- ◆ Below the knee casting
  - ◆ Total contact casting
  - ◆ Patellar tendon-bearing casting
- ◆ Below the knee braces and walkers
  - ◆ Removable walking braces with rocker bottom soles
  - ◆ Total contact custom walking braces CROW
- ◆ Foot/ankle casts or boots (AFO)
- ◆ Healing sandals / surgical shoe with molded plastizote insole
- ◆ Half shoes or wedge shoes
- ◆ Accommodative dressings: felt, foam, felted-foam, etc.
- ◆ Shoe cutouts (toe box, medial, lateral, or dorsal pressure points)

# Off-loading & Activity Monitoring Strategies

## Off-loading techniques for diabetic foot ulcers:

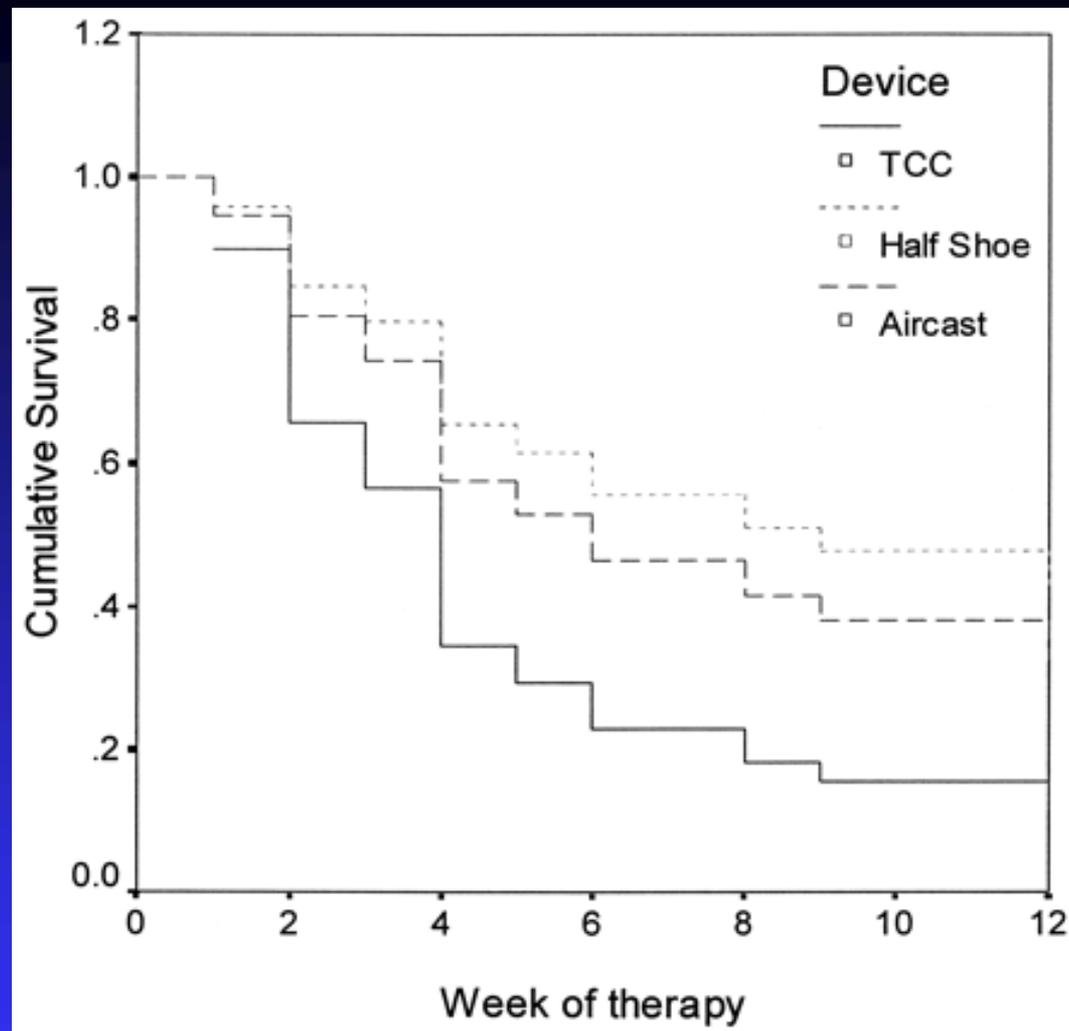
- ◆ Total non-weightbearing: bedrest, wheel chair, motorized scooter, etc.
- ◆ Assistive devices: walker, cane, wheeled leg rest, crutches, iWalkfree, etc.
- ◆ Worth mentioning:
  - ◆ Orthopedic frames employed to transfer weight around the foot.
  - ◆ Internal off-loading from injected silicone.

# Off-loading & Activity Monitoring Strategies

## Off-loading techniques for diabetic foot ulcers:

- ◆ Below the knee casting
  - ◆ Total contact casting
  - ◆ Patellar tendon-bearing casting/bracing



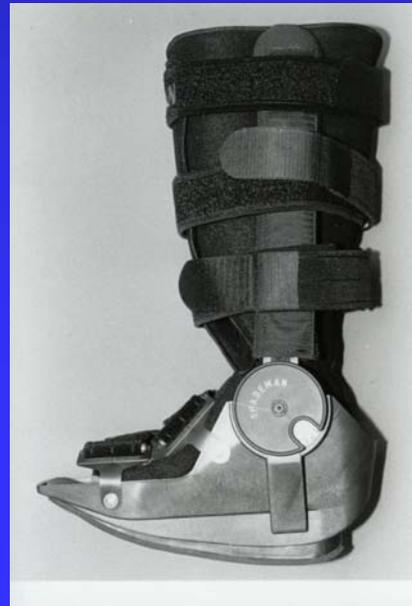


A significant difference in cumulative wound survival was noted at 12 weeks between patients treated with a TCC half-shoe and a Aircast.  $P = 0.012$  and  $0.033$ , respectively.  
 Armstrong et al *Diabetes Care* 24:1019-1022, 2001

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# Off-loading & Activity Monitoring Strategies

## **How does the practitioner choose which technique to employ?**

The underlying principal is to determine which method is best suited for the individual patient.

It is best to avoid those techniques that lead to deconditioning of the patient or their foot.

Non compliance can be countered with irremovable off-loading techniques.

Is limited joint mobility present?

Patients with co-morbid conditions require appraisal as to the impact of a particular off-loading method.

While total contact casting is considered the gold standard it has its drawbacks and is not suitable in all instances. Wu found in her study that TCC is not used over 90% of the time in patients where it has been shown to have benefits.

# Off-loading & Activity Monitoring Strategies

## Concluding Remarks

Off loading of foot ulcers is an important yet often neglected aspect of ulcer care by practitioners. Selection of methods will vary as to the patients needs and evidence of effectiveness of the method.

