

Shoe Therapy for the Healed Patient

5th Annual Multidisciplinary
Management of the High Risk Diabetic Foot Conference

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Stephen Albert, D.P.M., CPed., APWCA
DVA Medical Center – Denver
Eastern Colorado Health Care System

Shoe Therapy for the Healed Patient

■ Objectives

1. Describe the conditions that respond to shoe therapy
2. Discuss the materials and techniques common to shoe therapy
3. Describe the decision making process

Shoe Therapy Overview

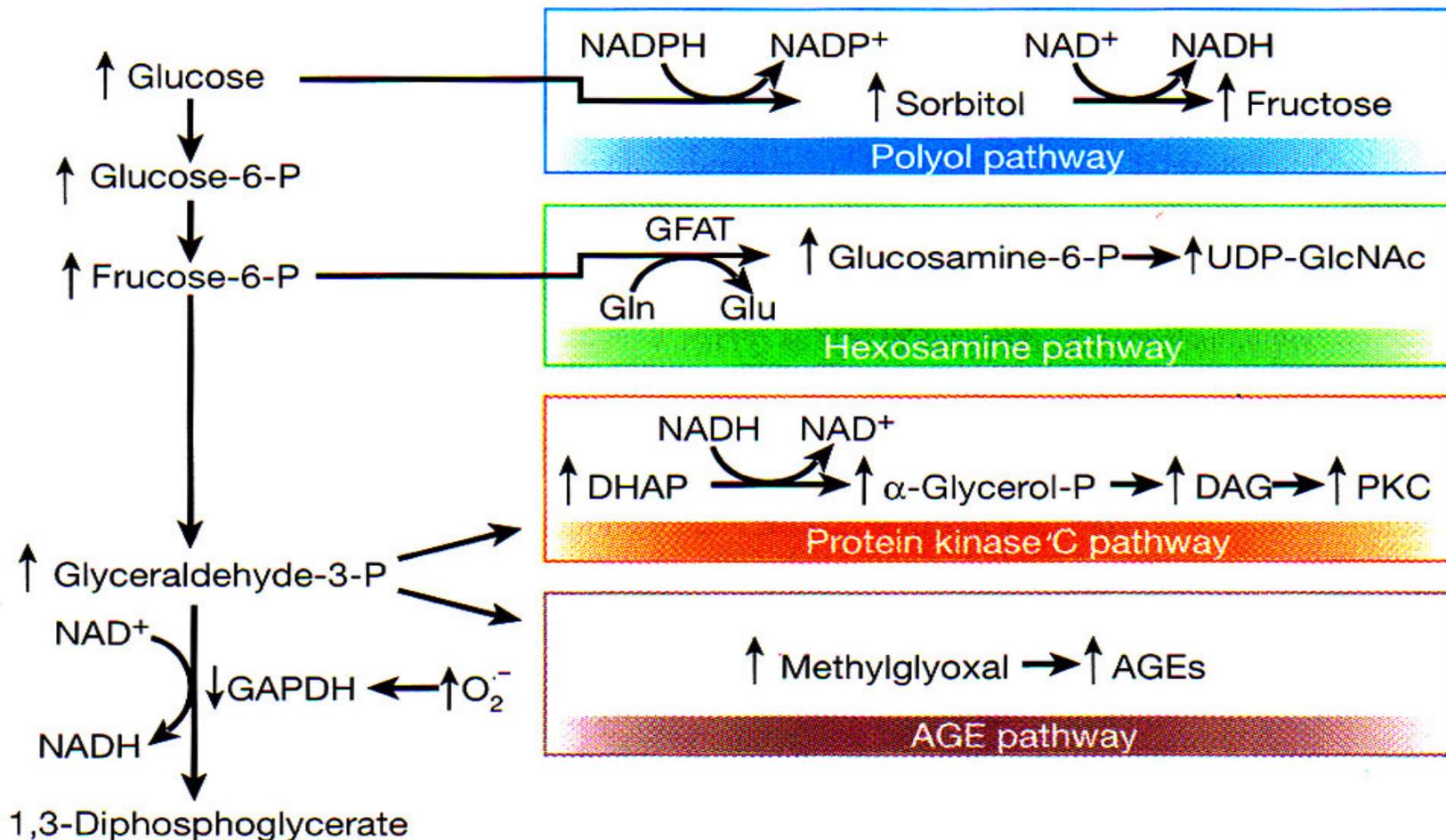
- Brief updated statistics for diabetes in the US
- Discussion of latest risk assessment and comprehensive foot exam recommendations
- Look at foot wear options for diabetics

Shoe Therapy

There are greater than 23.6 million 7.8% of the population people in the United States, who have diabetes. This is up from 20 million in 2005. Despite advances, a cure for the disease remains elusive and the number of affected individuals continues to climb.

Source American Diabetes Association 2008

Shoe Therapy for the Diabetic Foot– Unified theory as proposed by Brownlee



Shoe Therapy

Dr. Brownlee has discovered are two novel pharmacologic approaches, transketolase activation and poly(ADP-ribose) polymerase-1 inhibition, that prevent diabetic complications in animals. These approaches are not ready for human trials.

Despite much research and progress a cure remains elusive and it appears certain that health professionals will be dealing with the complications of diabetes for years to come.

Shoes for the Diabetic Foot

What end organs are affected by diabetes and what complications develop?

- Eyes
- Heart
- Kidneys
- **Nerve**
- **Peripheral blood vessels.**
- Retinopathy
- Cardiovascular disease
- Nephropathy
- **Neuropathy**
- **Vasculopathy**

Shoe Therapy

Type 2 diabetic subjects without diminished peripheral sensation walked significantly slower ($P < 0.05$) than control subjects and with a wider stance ($P < 0.01$), both for walking in a linear path (velocity of subjects with diabetes was 62.2% that of controls and stance was 134.9% wider than controls) and when making turns (velocity 50.6% of controls and stance 120.1% wider than that of controls). The study revealed increased flexion/extension and lateral movement of the major joints in subjects with diabetes during both walking in a linear path and turns compared to control subjects. These findings suggest that at least some of the increased joint movement during walking in people with diabetes is likely neurological in origin and not related to muscle weakness (motor neuropathy) or loss of sensation in the feet (sensory neuropathy).

Shoes for the Diabetic Foot

- ◆ Convergence of more than one diabetic complication results in increased risk for limb loss.
- ◆ 8 out of 10 non traumatic amputations are in diabetics.
- ◆ Limb amputation, a much feared and costly consequence, occurs 10-30 times more often in diabetic persons than in the general population.

Siitonen et al Lower-extremity amputations in diabetic and nondiabetic patients: a population-based study in eastern Finland. *Diabetes Care*. 1993;16:16-20.

Trautner et al Incidence of lower limb amputations and diabetes. *Diabetes Care*. 1996;19:1006-1009

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 [lower limb biomechanical exam]
- ◆ Dermatologic and musculoskeletal inspection
- ◆ Vascular/Neurologic assessment and management
- ◆ Metabolic management
- ◆ Education of the patient and their family.

TASK FORCE OF THE FOOT CARE INTEREST GROUP OF THE ADA & AACE

The group met to concisely summarize recent literature regarding comprehensive foot examination and risk assessment for individuals with diabetes.

Several aspects of foot disease in this group were addressed.

- ◆ The pathway for foot ulceration and risk factors for foot ulceration.
- ◆ Essential features of the patients history
- ◆ Components of the foot exam.
- ◆ A new risk classification system with recommendations for treatment and follow-up.

THE PATHWAY FOR FOOT ULCERATION

Primary risk factors for foot ulceration:

Neuropathy

Deformity

Trauma

OTHER RISK FACTORS FOR FOOT ULCERS

- Past history of a foot ulcer
- Previous amputation
- Peripheral neuropathy
- Peripheral vascular disease
- Visual impairment
- Diabetic nephropathy (particularly if needing dialysis)
- Poor glycemic control
- Cigarette smoking

THE PATHWAY FOR FOOT ULCERATION

1st Question:

In individuals with diabetes and at risk for foot ulceration, which conditions are likely to benefit by professionally prescribed shoes?

Deformity and Trauma

KEY COMPONENTS OF THE FOOT EXAM

Inspection

Dermatological

Skin status color, thickness, dryness, cracking

Sweating

Infection:bacterial/fungal, checking between toes

Callus/blistering;subepidermal hemorrhage

Ulceration

Musculoskeletal

Deformity:clawtoes, prominent metatarsals, Charcot changes

Muscle wasting (guttering between metatarsals)

KEY COMPONENTS OF THE FOOT EXAM

Assessment

Neurological

10-g monofilament + 1 of the following 4

- ◆ vibration using a 128-Hz tuning fork
- ◆ pinprick sensation
- ◆ ankle reflexes
- ◆ vibration perception threshold

Vascular

pedal pulses

ABI, if indicated.

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

Shoe Therapy

■ Categories

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

Risk Classification Based on Foot Exam and Shoe Recommendations

- **Category 0** No LOPS, No PAD, No deformity
 - ◆ Patient selected shoes, well fitted

Shoe Therapy

No one should be wearing ill-fitting shoes particularly newly diagnosed diabetics. Studies in differing populations, one looking at shoe fit in podiatric students¹ and another in veterans in the VA medical centers, have shown that approx 75% are wearing ill fitting shoes.

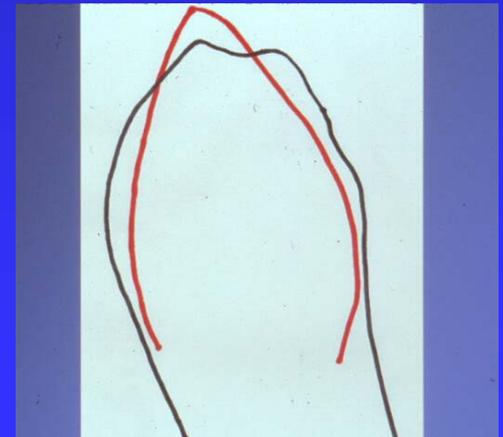
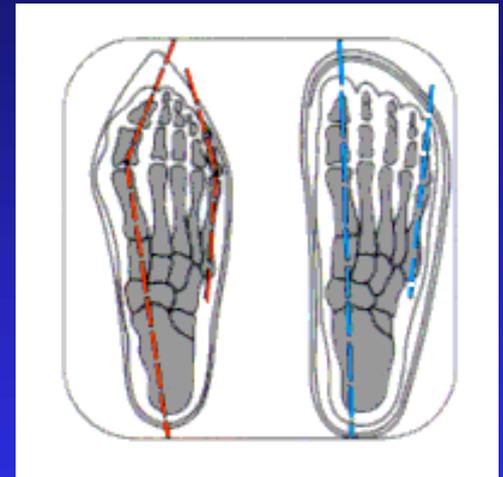
1 Riley et al Proper Shoe Size: Comparison of proper shoe size using the heel to ball measurements.. National Foot & Ankle Review 10:1 2004-2005

Shoe Therapy

Widest part of the foot = widest part of shoe

Length: check heel to 1st and 5th metatarsals

Does the design of the shoe allow for appropriate medial/lateral and dorsal/plantar toe room?



Shoe Therapy

■ Fitting shoes

- ◆ How to properly fit? start with a measurement, then look at foot shape.
- ◆ Measuring tools; Brannock device/Ritz stick



Some common sense guidelines for the patient selecting street shoes:

1. Sizes vary among shoe brands and styles. Don't select shoes by the size marked inside the shoe. Judge the shoe by how it fits on the foot.
2. Select a shoe that conforms as nearly as possible to the shape of the foot.
3. Have feet measured regularly. Foot size changes with time, typically larger.
4. Have BOTH feet measured. Most people have one foot larger than the other. Fit to the largest foot.
5. Fit at the end of the day when feet that tend to swell and are their largest.

Some common sense guidelines for the patient selecting street shoes:

6. Stand during the fitting process and check that there is adequate space ($3/8$ " to $1/2$ ") for the longest toe at the end of each shoe.
7. Make sure the ball of the foot fits comfortably into the widest part of the shoe.
8. Shoes should not be bought that feel too tight, expecting them to "stretch" to fit.
9. The heel should fit comfortably in the shoe with a minimum amount of slippage.
10. Always walk in the shoe to make sure it fits and feels right with movement. Neuropathy complicates this by altering the ability of the wearer to feel.

Risk Classification Based on Foot Exam and Shoe Recommendations

- **Category 1** LOPS with or without deformity
 - ◆ Professionally fitted extra depth shoes or modified extra depth shoes.



Shoe Therapy

What is an extra depth shoe?

Extra depth also allows extra room for any needed custom orthotics or shoe inserts. 1/4-inch is considered extra-depth and 1/2-inch of added depth is considered extra-extra depth or super depth.

Preferred Materials

High Quality Materials

Top grain leathers and breathable materials for increased comfort.

Wide Toe Box

Reduces pressure on sensitive areas of the foot and toes.

Non-Skid Sole

Provides better traction.

Seamless Interior

Prevents irritation and preserves skin integrity.

Extra Padding

Provides cushioning and reduces heel pressure.

Shoe Therapy

2nd Question:

In individuals with diabetes shoe upper should be breathable. Only natural leather materials are acceptable?

True or False

Shoe Therapy

2nd Question:

In individuals with diabetes shoe upper should be breathable. Only natural leather materials are acceptable?

False

Risk Classification Based on Foot Exam and Shoe Recommendations

- **Category 2** PAD with or without LOPS
 - ◆ **Professionally fitted extra depth shoes or modified extra depth**

Shoe Therapy

Goals for Shoe Modifications

Relieve areas of excessive pressure.

Any area where there is excessive pressure on the foot can lead to skin breakdown or ulcers. Footwear should help to relieve these high pressure areas, and therefore reduce the occurrence of related problems.

Excavation



Photo courtesy Apis Footwear Company



Shoe Therapy

Goals for Shoe Modifications

Reduce shock and shear.

A reduction in the overall amount of vertical pressure, or shock, on the plantar foot is desirable, as well as a reduction of horizontal movement of the foot within the shoe, or shear.

Wedged SACH heel



Photo courtesy Apis Footwear Company

Shoe Therapy

Goals for Shoe Modifications

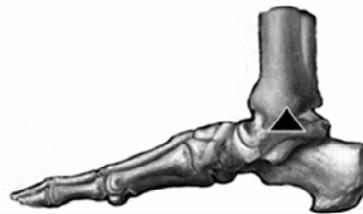
Accommodate, stabilize and address pathomechanics of deformities.

Deformities resulting from conditions such as Charcot osteoarthropathy, loss of plantar fat pad, non-reducible hammer toes and amputations must be accommodated. Some deformities need to be stabilized or their pathomechanics addressed and controlled as best as possible in an attempt to decrease progression of the deformity.



3

Toe Rocker



2

Ankle Rocker



1

Heel Rocker

Rocker sole



Photo courtesy Apis Footwear Company

Risk Classification Based on Foot Exam and Shoe Recommendations

■ **Category 3** History of ulcer or amputation

- ◆ **Professionally fitted extra depth, modified extra depth or custom made shoes**



Shoe Therapy

3rd Question:

In treating individuals with diabetes, what has just been presented that can categorize and help guide the shoe therapy decision making process?

Risk Classification Based on Foot Exam and Shoe Recommendations

- **Category 0** No LOPS, No PAD, No deformity
 - ◆ Patient selected shoes, well fitted
- **Category 1** LOPS with or without deformity
 - ◆ Professionally fitted extra depth shoes or modified extra depth
- **Category 2** PAD with or without LOPS
 - ◆ Professionally fitted extra depth shoes or modified extra depth
- **Category 3** History of ulcer or amputation
 - ◆ Professionally fitted extra depth, modified extra depth or custom made shoes

Contemporary Pedorthics



WAYNE DECKER, C.PED.
STEPHEN ALBERT, DPM, C.PED.