

Foot Care and the Diabetic Patient

Anthony Decuir, Jr., DPM



Prevention!!!





More amputation-related information

What is Peripheral Artery Disease?



Diabetes and Your Feet



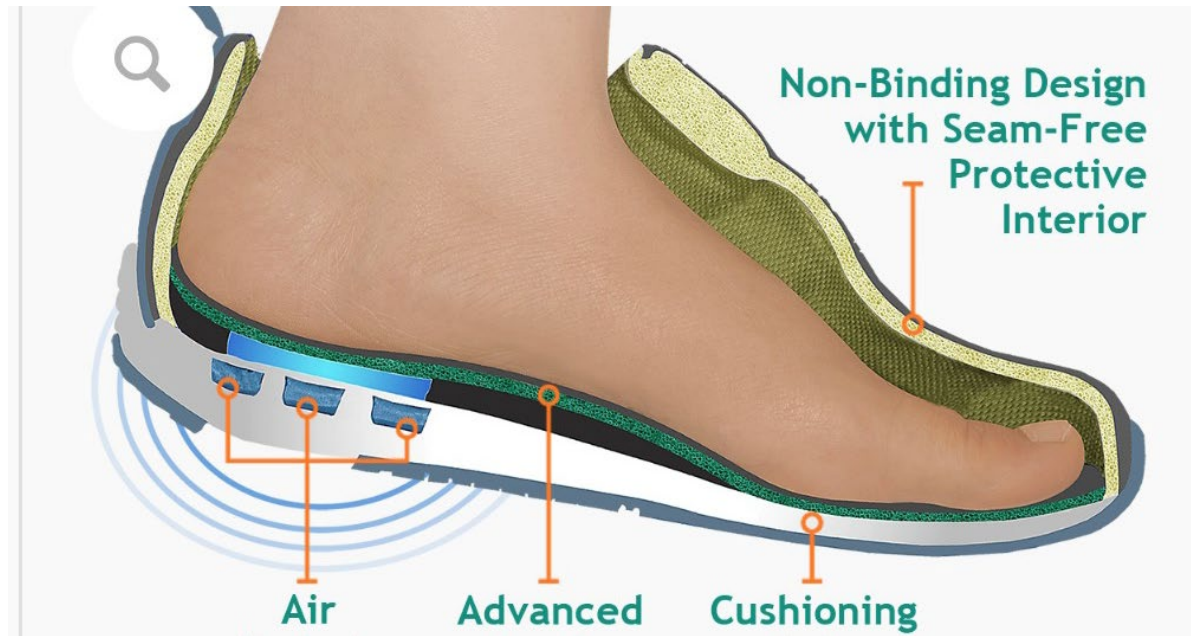
Foot Check Tips and Techniques



- Wash your feet thoroughly everyday
- Dry them thoroughly, and don't forget to dry between your toes
- Moisturize your feet, but avoid moisturizing between your toes
- Keep your toenails trim and use an emery board to file down sharp edges
- Check your feet for sores, cuts, blisters, corns, or redness daily. Let your doctor know if you find any of these.
- Wear moisture-wicking socks
- Before putting your shoes on, check for sharp objects (i.e., small rocks)
- Wear shoes that fit well and don't rub your feet
- While you're at it, avoid these:
 - Walking around barefoot
 - Soaking your feet
 - Smoking

Diabetic Foot Assessment

- Accommodative Shoe gear – depth-inlay shoe gear
- Orthotic Insoles – offloading pressure points
- Padding – pressure reduction
- Stretching – improve range of motion
- Surgical Intervention – to reduce digital deformities





Toe & Forefoot Amputations



Risk Assessment

Diabetes Foot Screen

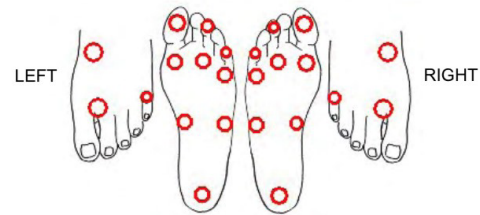
Name (Last, First, MI) _____ Date: ____/____/____

Fill in the following blanks with a "Y" or "N" to indicate findings in the right or left foot.




	R	L
Is there a history of a foot ulcer?	_____	_____
Is there a foot ulcer now?	_____	_____
Is there a claw toe deformity?	_____	_____
Is there swelling or an abnormal foot shape?	_____	_____
Is there elevated skin temperature?	_____	_____
Is there limited ankle dorsiflexion?	_____	_____
Are the toenails long, thick or ingrown?	_____	_____
Is there heavy callous build-up?	_____	_____
Is there foot or ankle muscle weakness?	_____	_____
Is there an absent pedal pulse?	_____	_____
Can the patient see the bottom of their feet?	_____	_____
Are the shoes appropriate in style and fit?	_____	_____

Note the level of sensation in the circles:

+ = Can feel the 5.07 filament — = Can't feel the 5.07 filament



Skin Conditions on the Foot or Between the Toes:

Draw in: Callous , Pre-ulcer , Ulcer  (note length and width in cm)
Label with: **R** - redness, **M** - maceration, **D** - dryness, **T** - Tinea

RISK CATEGORY:

- ___ 0 No loss of protective sensation.
- ___ 1 Loss of protective sensation
- ___ 2 Loss of protective sensation with either high pressure (callous/deformity), or poor circulation.
- ___ 3 History of plantar ulceration, neuropathic fracture (Charcot foot) or amputation.



Daniel Day / Getty Images

Hammertoe



Diana L. Lohrman



The Wagner Diabetic Foot Ulcer Grade Classification System

The Wagner diabetic foot ulcer classification system assesses ulcer depth and the presence of osteomyelitis or gangrene by using the following grades:

- Grade 0 – intact Skin
- Grade 1 – superficial ulcer of skin or subcutaneous tissue
- Grade 2 – ulcers extend into tendon, bone, or capsule
- Grade 3 – deep ulcer with osteomyelitis, or abscess
- Grade 4 – partial foot gangrene
- Grade 5 – whole foot gangrene

Note: While the wound shown in the above image may appear to be a grade 3 ulcer, upon assessment no abscess or osteomyelitis was found. Beneath the superficial necrotic tissue was exposed tendon.

The University of Texas Diabetic Foot Ulcer Classification System

The University of Texas system grades diabetic foot ulcers by depth and then stages them by the presence or absence of infection and ischemia:

- Grade 0 – pre-or postulcerative site that has healed
- Grade 1 – superficial wound not involving tendon, capsule, or bone
- Grade 2 – wound penetrating to tendon or capsule
- Grade 3 – wound penetrating bone or joint

Within each wound grade there are four stages:

- Stage A – clean wounds
- Stage B – non-ischemic infected wounds
- Stage C – ischemic noninfected wounds
- Stage D – ischemic infected wounds

A comparison of two diabetic foot ulcer classification systems: the Wagner and the University of Texas wound classification systems

S O Oyibo et al. Diabetes Care. 2001 Jan.

Show details



Full text links

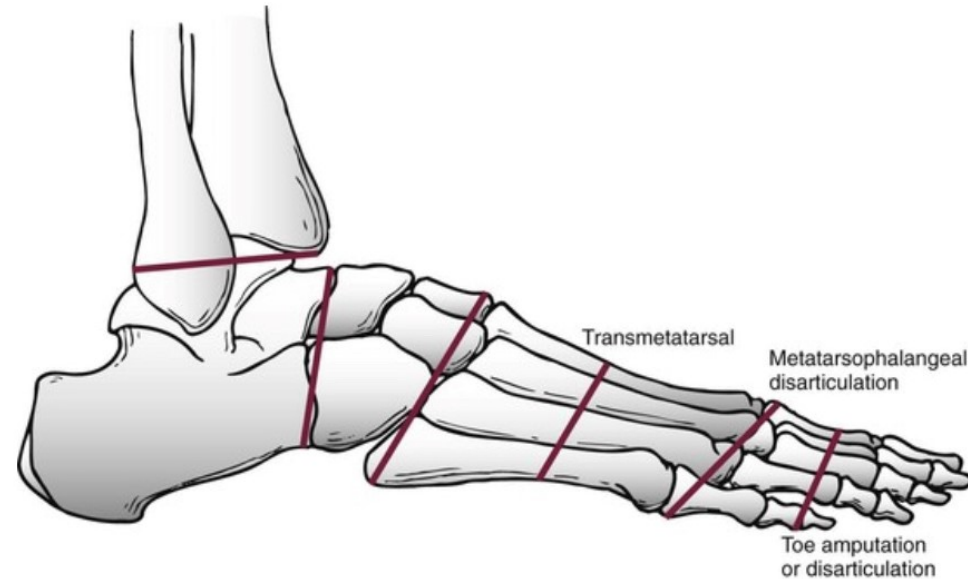
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Abstract

Objective: In this study the following two ulcer classification systems were applied to new foot ulcers to compare them as predictors of outcome: the Wagner (grade) and the University of Texas (LT) (grade and stage) wound classification systems.

Research design and methods: Ulcer size, appearance, clinical evidence of infection, ischemia, and neuropathy at presentation were recorded, and patients were followed up until healing or for 6 months.



Conclusions: Increasing stage, regardless of grade, is associated with increased risk of amputation and prolonged ulcer healing time. The UT systems's inclusion of stage makes it a better predictor of outcome.



🏠 Diabetes Home

Diabetes Basics +

Prevent Type 2 +

Living With Diabetes -

Education and Support

Eat Well +

Healthy Weight

Get Active!

Manage Blood Sugar +

Prevent Diabetes Complications -

Heart Disease

Chronic Kidney Disease (CKD)

Nerve Damage

Preventing Diabetes-Related Amputations

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Lower-limb amputations (LLA), which is surgery to remove a toe, foot, or leg, are increasing in the US, and 80% are a result of complications from diabetes. From 2009 to 2019, the number of diabetes-related hospitalizations due to amputation doubled.

But the good news is that most diabetes-related amputations can be prevented with lifestyle changes, blood sugar management, regular foot checks, and prompt wound care when needed.

How Diabetes Can Lead to an LLA

High blood sugar over time can cause diabetes complications that raise the chance of an LLA:

- **Peripheral arterial disease (PAD)** can narrow the blood vessels that carry blood to your legs and feet. Poor blood supply can make even a tiny cut heal slowly or not at all.
- **Peripheral nerve damage** can cause loss of sensation so you may not notice cuts, sores, or ulcers on your feet.

With these complications, even a small cut can become a serious infection. Depending on the condition, a doctor may



A small cut on the foot can become a serious infection that could require amputation if left untreated.

More amputation-related information

What is Peripheral Artery Disease?

Diabetes and Your Feet

Most amputations are preventable by checking your feet daily, going to regular visits with your doctor, and wearing proper footwear.

The connection between diabetes and your feet is important because diabetes can cause nerve damage and reduced circulation, ultimately leading to limb loss and other complications. The good news is, you can lower your chances of complications by managing your blood glucose (blood sugar) levels and taking care of your feet.

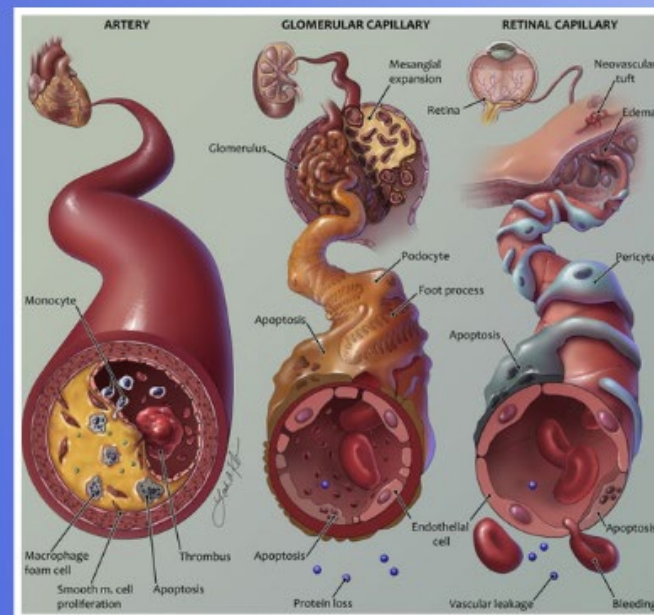
For these reasons, take good care of your feet and see your doctor right away if you see any signs of foot problems. Ask about prescription shoes that are covered by Medicare and other insurance. Always follow your doctor's advice when caring for ulcers or other foot problems.

What is Peripheral Artery Disease?

People with diabetes can develop many different foot problems. Even ordinary problems can get worse and lead to serious complications. People with diabetes are far more likely to have a foot or leg amputated than people without diabetes. Foot problems most often happen when there is nerve damage, also called neuropathy. This can cause tingling, pain (burning or stinging), or weakness in the foot. It can also cause loss of feeling in the foot, so you can injure it and not know it. Poor blood flow or changes in the shape of your feet or toes may also cause problems. Many people with diabetes have peripheral artery disease (PAD) (which reduces blood flow to the feet) and neuropathy. Together, these problems make it easy to get ulcers and infections that may lead to amputation.



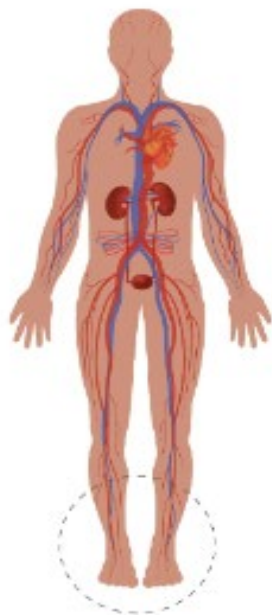
About **50% of patients with critical limb ischaemia (CLI)** the advanced stage of PAD associated with lower-extremity amputation and significant mortality, also have diabetes and they fare worse than non-diabetics.



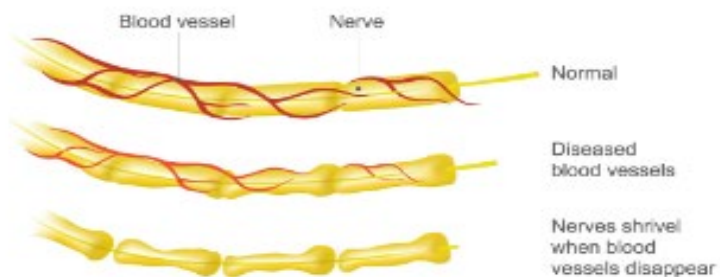
**DIABETES VASCULAR
COMPLICATIONS**

Diabetes Affects

(reduced blood flow and damaged nerve)



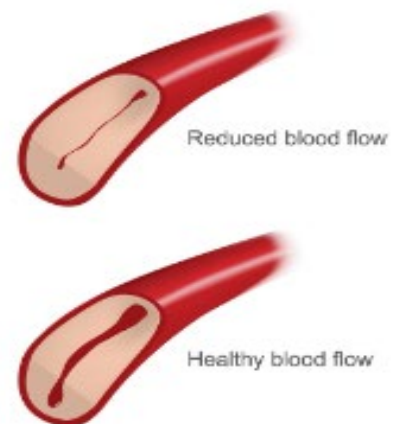
Diabetes Affects the Nerves



Diabetes Foot Ulcers



Diabetes Affects the Blood vessel



Treatment Options for Diabetic Neuropathy

- Pain medications.
- Anti-seizure medications.
- Antidepressants.
- **Topical creams.**
- **Transcutaneous electronic nerve stimulation (TENS) therapy.**
- **Hypnosis.**
- **Relaxation training.**
- **Biofeedback training.**
- **Acupuncture.**

Reversal of Neuropathic Pain in Diabetes by Targeting Glycosylation of Ca_v3.2 T-Type Calcium Channels

Peihan Orestes,^{1,3} Hari Prasad Osuru,¹ William E. McIntire,⁴ Megan O. Jacus,¹ Reza Salajegheh,¹ Miljen M. Jagodic,¹ WonJoo Choe,^{1,6} JeongHan Lee,^{1,7} Sang-Soo Lee,^{8,9} Kirstin E. Rose,¹ Nathan Piro,¹ Michael R. DiGrucio,^{1,3} Katireshan Krishnan,⁵ Douglas F. Covey,⁵ Jung-Ha Lee,^{8,9} Paula Q. Barrett,⁴ Vesna Jevtovic-Todorovic,^{1,2,3} and Slobodan M. Todorovic^{1,2,3}

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See "[Location](#), [Location](#), [Location](#)?" on page 3658.

Abstract

Go to: ►

It has been established that Ca_v3.2 T-type voltage-gated calcium channels (T-channels) play a key role in the sensitized (hyperexcitable) state of nociceptive sensory neurons (nociceptors) in response to hyperglycemia associated with diabetes, which in turn can be a basis for painful symptoms of peripheral diabetic neuropathy (PDN). Unfortunately, current treatment for painful PDN has been limited by nonspecific systemic drugs with significant side effects or potential for abuse. We studied in vitro and in vivo mechanisms of plasticity of Ca_v3.2 T-channel in a leptin-deficient (*ob/ob*) mouse model of PDN. We demonstrate that posttranslational glycosylation of specific extracellular asparagine residues in Ca_v3.2 channels accelerates current kinetics, increases current density, and augments channel membrane expression. Importantly, deglycosylation treatment with neuraminidase inhibits native T-currents in nociceptors and in so doing completely and selectively reverses hyperalgesia in diabetic *ob/ob* mice without altering baseline pain responses in healthy mice. Our study describes a new mechanism for the regulation of Ca_v3.2 activity and suggests that modulating the glycosylation state of T-channels in nociceptors may provide a way to suppress peripheral sensitization. Understanding the details of this regulatory pathway could facilitate the development of novel specific therapies for the treatment of painful PDN.

Endocannabinoid activation of CB₁ receptors contributes to long-lasting reversal of neuropathic pain by repetitive spinal cord stimulation

L. Sun, L. Tai, Q. Qiu, R. Mitchell, S. Fleetwood-Walker, E.A. Joosten, C.W. Cheung ✉

First published: 20 January 2017 | <https://doi.org/10.1002/ejp.983> | Citations: 30

Funding sources

The study was supported by research funding from the Department of Anaesthesiology, the Li Ka Shing Faculty of Medicine, The University of Hong Kong.

Conflicts of interest

None declared.

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Abstract

Background

Spinal cord stimulation (SCS) has been shown to be effective in the management of certain neuropathic pain conditions, however, the underlying mechanisms are incompletely understood. In this study, we investigated repetitive SCS in a rodent neuropathic pain model, revealing long-lasting and incremental attenuation of hyperalgesia and a mechanism of action involving endocannabinoids.

Method

Animals were implanted with monopolar electrodes at the time of partial sciatic nerve injury. Dorsal columns at spinal segments T12/13 were stimulated 3 days later (early SCS), and again at day 7 (late SCS) using low-frequency parameters. Hypersensitivity to cutaneous mechanical stimuli was assessed using von Frey filaments. Pharmacological agents, selected to identify endocannabinoid and opioid involvement, were administered intraperitoneally, 10 min before SCS.

Results

Early SCS caused partial reversal of mechanical hypersensitivity with corresponding changes in the biomarker of central sensitization, [phospho-Tyr¹⁴⁷²]-GluN2B. The partial reversal of hyperalgesia by early SCS was amplified by co-administration of LY 2183240, an inhibitor of endocannabinoid reuptake/breakdown. This amplification was inhibited by a CB₁R antagonist, AM251, but not by a CB₂R antagonist, AM630. Early SCS-induced

Expensive and Deadly: The Real Cost of Diabetes



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Diabetic foot complications cost more than the five most costly forms of cancer

WASHINGTON—For Americans, the cost of diabetes has never been greater. Not only does the disease cause detriment to the well-being of citizens, it also puts a tremendous financial burden on the country. More than 29.1 million people in the US suffer from diabetes, and diabetes costs us upwards of \$245 billion per year.

A major cost associated with diabetic medical care is lower-limb amputation. Diabetes can cause patients to lose sensation in their extremities, so an individual may not immediately notice injuries to his or her feet. This condition can cause diabetic ulcers—wounds on the feet that are slow to heal and prone to infection—which often require amputation. In 2013, about 73,000 Americans with diabetes needed amputations. The average cost for each amputation is over \$70,000.

“For those who have diabetes or are at risk for the disease, regular checkups by a podiatrist are one of the easiest ways to prevent most foot complications,” said American Podiatric Medical Association (APMA) President Frank Spinosa, DPM. “Including a podiatrist in your care can reduce amputation rates by as much as 85 percent.”

A study by APMA found that among patients with commercial insurance, each \$1 invested in care by a podiatrist results in \$27 to \$51 of savings for the health-care system. Among Medicare-eligible patients, each \$1 invested in care by a podiatrist results in \$9 to \$13 of savings.

“With proactive foot care, diabetes patients can reduce the risk of infection and amputation, improve function and quality of life and reduce health care costs,” Dr. Spinosa added.

To learn more, and to find a podiatrist in your area, visit www.apma.org.

View an [infographic](#) on the cost of diabetes nationwide.

The American Podiatric Medical Association (APMA) is the nation's leading professional organization for today's podiatrists. Doctors of Podiatric Medicine (DPMs) are qualified by their education, training, and experience to diagnose and treat conditions affecting the foot, ankle, and structures of the leg. APMA has 53 state component locations across the United States and its territories, with a membership of more than 12,000 podiatrists. All practicing APMA members are licensed by the state in which they practice podiatric medicine. For more information, visit www.apma.org.

THE REAL COST OF DIABETES

DIABETIC FOOT COMPLICATIONS ARE COMMON AND COSTLY

DIABETIC FOOT HEALTH



Up to **25%** of those with **DIABETES** will develop a **FOOT ULCER**



Estimated annual U.S. burden of diabetic foot ulcers is at least

\$15 BILLION

COST OF DIABETES IN THE US



\$176 BILLION

direct medical costs

\$69 BILLION

indirect medical costs
(disability, reduced productivity,
premature death)

INVESTMENT IN CARE

\$1 invested in care by a podiatrist results in **\$27** to **\$51** of savings for the health-care system, among patients with commercial insurance.



\$1 invested in care by a podiatrist results in **\$9** to **\$13** of savings, among Medicare eligible patients.

OUTSMART DIABETES

Podiatric medical care can reduce amputation rates up to **80%**



The inclusion of care provided by podiatrists for those with diabetes alone will save the health-care system **\$3.5 BILLION** per year.

APMA
American Podiatric Medical Association

YOU CAN OUTSMART DIABETES
WITH TODAY'S PODIATRIST

FOR MORE INFORMATION VISIT WWW.APMA.ORG



Commentary | [Open Access](#) | [Published: 24 March 2020](#)

Five year mortality and direct costs of care for people with diabetic foot complications are comparable to cancer

[David G. Armstrong](#) , [Mark A. Swerdlow](#), [Alexandria A. Armstrong](#), [Michael S. Conte](#), [William V. Padula](#) & [Sicco A. Bus](#)

[Journal of Foot and Ankle Research](#) **13**, Article number: 16 (2020) | [Cite this article](#)

22k Accesses | **236** Citations | **441** Altmetric | [Metrics](#)

Abstract

Background

In 2007, we reported a summary of data comparing diabetic foot complications to cancer. The purpose of this brief report was to refresh this with the best available data as they currently exist. Since that time, more reports have emerged both on cancer mortality and mortality associated with diabetic foot ulcer (DFU), Charcot arthropathy, and diabetes-associated lower extremity amputation.

The Risk of Subsequent Amputation Following An Initial Lower Extremity Amputation: A Systematic Review

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Advanced



Comparative Study

Fate of the contralateral limb after lower extremity amputation

Julia D Glaser et al. J Vasc Surg. 2013 Dec.

Free PMC article

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Full text links



Cite



Abstract

Objective: Lower extremity amputation is often performed in patients where both lower extremities are at risk due to peripheral arterial disease or diabetes, yet the proportion of patients who progress to amputation of their contralateral limb is not well defined. We sought to determine the rate of subsequent amputation on both the ipsilateral and contralateral lower extremities following initial amputation.

Risk of reamputation in diabetic patients stratified by limb and level of amputation: a 10-year observation.

Diabetes Care. 2006; 29(3):566-70 (ISSN: 0149-5992)

Izumi Y; Satterfield K; Lee S; Harkless LB

A black and white photograph showing a close-up of a person's foot, wearing a high-heeled shoe, stepping down onto a row of lit candles. The candles are arranged in a line, and their flames are visible. The image is framed by a red border.

gettyimages®
Nick Dolding



References

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2. Five year mortality and direct cost of care for people with diabetic foot complications are comparable to cancer. Journal of Foot and Ankle Research; 13, Article number 16 (2020). David Armstrong, Mark Swerdlow, Alexandria Armstrong, Michael Conte, William Padula, Sicco Bus
3. The Risk of Subsequent Amputation Following AN Initial Lower Extremity Amputation: A Systematic Review. International Journal of Diabetology & Vascular Disease Research; October 26, 2016. Wong CK, Stern JR, Rick F D'Andrea Jr, Loven SL, Panjaki S, See AS, Spinder SJ, Yerovinkina M. Nowygrod R
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5. Risk of reamputation in diabetic patients stratified by limb and level of amputation: a 10 year observation. Diabetes Care; 2006; 29(3):566-70. Izumi Y; Satterfield K; Lee S; Harkless LB
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Thank You!!!