HOW TO EFFECTIVELY TREAT

DIABETIC FOOT ULCERS



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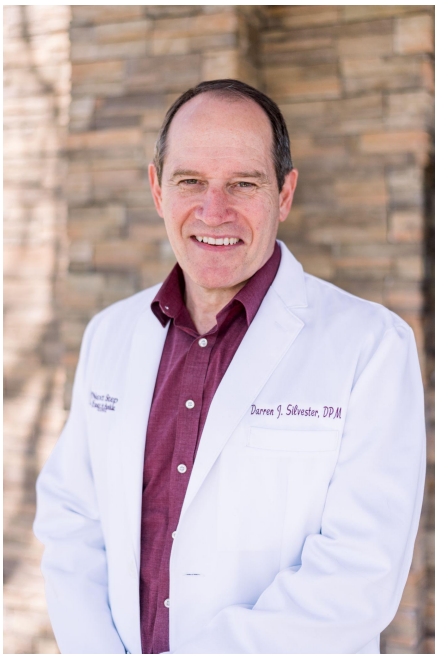
Next Step Foot & Ankle Clinic



HOW TO EFFECTIVELY TREAT DIABETIC FOOT ULCERS

By: Darren J. Silvester, DPM

About the Author



First, thank you for picking up this book. I hope this is informative and helpful for you. I have practiced podiatry for over 30 years. I have treated thousands of wounds during that time. I have read volumes of literature and clinical studies about diabetes, diabetic foot ulcers, and I have seen first-hand the devastating effects that these conditions have on the lives of patients. I I am not a research doctor but I am a nuts and bolts, day-to-day practitioner of medicine. For 6 years, I ran a limb salvage program at the Indian Health Service in Sisseton, South Dakota. The Tribe had nearly 10,000 patients with diabetes. Before I went there, they were averaging 6 major (above or below the knee) amputations per year. During the 6 years of my service there, they had 2 major amputations.

Appropriate wound management was critical to that success. Far more important was addressing the cause of the problem. At Next Step Foot and Ankle Clinic, we routinely have helped patients heal foot ulcers that have been present for years. We approach diabetic foot wounds in a unique way. We see the wound as a manifestation of the problem, not the primary problem. By approaching the wound this way, we can usually solve the cause of the wound and the wound takes care of itself, which significantly increases the chance for the wound to remain healed. When the clinic's or physician's focus is only on the wound, they are ignoring the bigger picture. They are treating only the skin. But I have news for you....the skin that is part of the foot that is ulcerated, was the same skin that is on the same foot that is NOT ulcerated. Simply addressing the *skin* won't work. *That is why up to 40-60% of foot ulcers recur within one year of being healed.* Most doctors don't know how to address the pressure problem so they leave the patient condemned to a lifetime of constantly watching out for the next foot ulcer, infection, or amputation.

Why This Book

My purpose in writing this book is to inform patients that there are ways to address foot ulcers that are much more successful in the longterm than just wound care. We have been able to get dramatic results with innovative techniques. I want to give patients who have had foot ulcers hope that they can be healed and dramatically lower the risk of the ulcer returning.

In my lifetime I have witnessed the birth of an industry: The Wound Care Clinic. When I first started practicing medicine there was no such thing. Wounds were just managed in the regular clinics by regular doctors. Now there is a whole specialty devoted to wound care. Wound care clinics have had a positive impact on how wounds are treated. Advancements like hyperbaric oxygen, Wound VAC, numerous wound care products, vascular interventions, debridement techniques, are all things that have become available to physicians in the past 20 years that have really raised the success rate of healing a wound. But a major problem with this is that the wounds in feet come back fairly quickly. The patient gets caught in a revolving door scenario.



SOMETHING IS MISSING IN ALL THIS. Wound Care Centers and traditional wound therapy all focus on the WOUND. I believe a NEW WAY OF THINKING needs to be adopted in the world of foot wound care in order to avoid the “revolving door”. I advocate treating the cause of the ulcer first. Keep reading and you will find out what I mean. First, let's go over some facts and statistics about a Diabetic Foot Ulcer (DFU). These statistics will explain why a new approach is necessary.

INTRODUCTION

<u>Overview of the Diabetic Foot Ulcer</u>

Diabetes has many possible complications. The good news is most of these complications are avoided if good blood sugar control is exercised. If not, most of the complications occur eventually. These complications include neuropathy, kidney damage, cardiovascular disease (stroke and heart attack), impotence, tooth and gum disease, and Alzheimer’s disease.

Those complications are bad enough. But many people consider a diabetic foot ulcer to be the most devastating and costly of all complications associated with diabetes. Not everyone with diabetes gets a diabetic foot ulcer. 15% - 30% of patients that have diabetes will have a foot ulcer sometime in their life. In 1998, the medical cost of healing a single diabetic foot ulcer was $17,500. Once an amputation gets involved the costs can soar up to 5 - 10 times that amount. This does not even take into account the secondary or indirect costs of a diabetic foot ulcer. Secondary causes include loss of work, cost for dressings, cost of a provider to stay with the patient if needed, depression, loss of self esteem and self worth, loss of quality of life, etc. The costs, in a nutshell, are staggering not only in money but socially as well.
https://bit.ly/3sD35u6

Who is At Risk for Getting a DFU?

First let me say that if you do an internet search on the causes of diabetic foot ulcers you get all kinds of far-fetched answers. They play some role but they certainly aren't the CAUSE. Here are some of the things that came up when I did an internet search:

Risk Factors for Diabetic Foot Ulcers

- poor hygiene (not washing regularly or thoroughly)
- improper trimming of toenails
- alcohol consumption
- eye disease from diabetes
- heart disease
- kidney disease
- Obesity
- High Blood Sugar Levels
- Poor Circulation
- Immune System Issues
- Infection
- Male gender
- Duration of diabetes
- Inappropriate self-care
- Hypertension
- Hyperlipidemia
- Insulin use
- Smoking

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Do not get me wrong. I am not trying to criticize people for trying to identify what causes a diabetic foot ulcer. But the list above simply does not reflect the real cause of a diabetic foot ulcer. Nothing on the list means you are going to get a foot ulcer.

I would consider these “secondary risk factors”. You might have a little higher risk of getting a foot ulcer if you have some of the things on this list, but YOU MUST HAVE TWO PRIMARY RISK FACTORS TO HAVE A TRUE DIABETIC FOOT ULCER.

WHY FOOT ULCERS OCCUR

There Are Two Primary Risk Factors

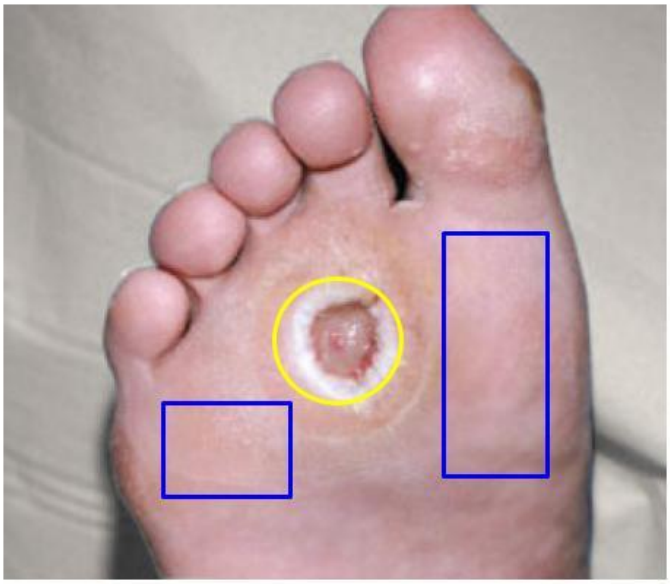
First: The foot has to become *insensitive or numb*. If the foot is fully sensate (feels things normally) then the chance of getting a foot ulcer is almost 0. If you can feel pressure on your feet then you can protect them. Many patients will tell me that they feel pain but they still get foot ulcers. Pain can come from neuropathy (see my book on that subject). It is a dichotomy. The patient cannot feel pressure to protect their feet but they still have pain.



Second: The foot has to have a *pressure point* where a bone or other tissue is prominent. This usually causes a callus then subsequent breakdown of the skin occurs under the callus.

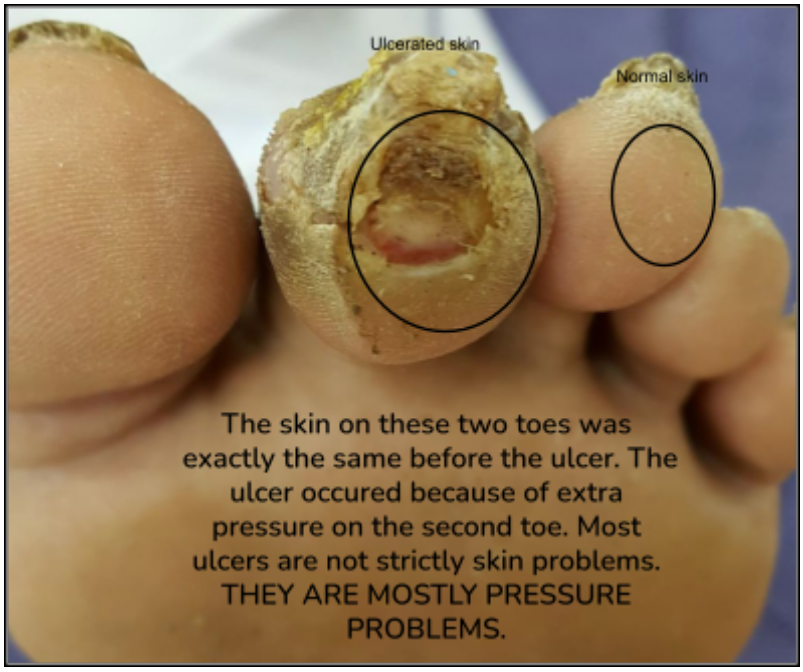
Sometimes there is a Third primary risk factor: Sometimes there is some *vascular compromise*. This is not always present in foot ulcers but it does occur sometimes. Vascular disease is not an “all or none” disease. It is a spectrum. Mild disease does not mean they cannot heal, it just may take longer. Severe disease is a serious problem and frequently leads to amputation or vascular surgery. If present, it needs to be addressed. Purely vascular ulcers only occur about 10% of the time. And I would place them in a different category than a DFU. They are vascular ulcers and need to be treated differently. https://bit.ly/3sD35u6

Note: There are foot ulcers that occur without these criteria. For example, an ulcer can occur from purely lack of circulation or from an injury. These are not true diabetic foot ulcers. These are ischemic or traumatic ulcers. These have a different treatment approach and are not considered true diabetic foot ulcers. However, patients with diabetes have them more often than patients without diabetes. For our purposes in this book, we are only discussing THE TRUE DIABETIC FOOT ULCER.



Using Logic

Look at this foot. Look in the blue squares. The skin is in great condition. Is the skin that used to be in the yellow circle any different from the skin that is in the blue boxes? No. There is nothing inherently wrong with the skin. Just treating the skin will almost always fail because there is nothing wrong with it in the first place. These ulcers are caused by abnormal pressure, not abnormal skin. So why not try treating the pressure along the skin?





These photos illustrate the progression of a callus caused by pressure. It evolves from a callus to an ulcer to a more severe, bleeding ulcer. Obviously, they are not all the same ulcer but they illustrate the typical progression.

Understanding Recurrence Risk

Overall, the annual risk of a patient with diabetes getting a foot ulcer is about 2%. If you have diabetes, the chance of you having a foot ulcer in your lifetime is around 15-30% (depending on the study you read). *Which means that out of 100 people with diabetes, 2% of those will get a foot ulcer every year and 15-30% will get an ulcer sometime in their life.* But if you have had a previous foot ulcer, your risk of getting another foot ulcer over the next 3 years increases to 60%. In one year, your risk of recurrence is 40%. So the history of a previous foot ulcer is a very strong risk factor for an additional foot ulcer. The most significant factors that contribute most to recurrence are: the presence of a foot ulcer on the bottom of the foot, the presence of a bone infection, hemoglobin A1c is greater than 7.5, and the C reactive protein is greater than 5 mg per L (this is a blood test generally used to evaluate the degree of inflammation). If you have an amputation you have a 50% chance of developing an ulcer on the contralateral limb within 18 months. At any one time there are about 2-3 million people with foot ulcers in the USA. https://bit.ly/3sZJTHh

IMPACT OF DIABETIC FOOT ULCERS

Economic Impact

The health care cost for a diabetic foot ulcer patient is about $33,000 per year. The patient is seen about 14 times per year and hospitalized 1.5 times per year. Beneficiaries with amputations cost about $52,000 total per year with 12 visits and 2 hospitalizations per year. Of course it is difficult to calculate the exact cost of the ulcer itself but patients with diabetes are thought to cost 2.3 times the patient without diabetes. These increased costs are likely related to other health issues associated with this patient group such as heart and kidney disease, which are more common in patients with diabetes.

“According to epidemiological studies, the number of patients with DM increased from about 30 million cases in 1985, 177 million in 2000, 285 million in 2010, and estimated if the situation continues, more than 360 million people by 2030 will have DM.” https://bit.ly/38yPpt7

Mortality Impact

A foot ulcer is a significant warning signal in the life of a patient. Can a foot ulcer kill you? Usually not...BUT the general health circumstances that cause a foot ulcer (poor glucose control, high blood pressure, obesity) also cause disease of the heart and kidneys and other organs. So the presence of the ulcer is a profound warning signal that things need to change. If you have a diabetic foot ulcer, the risk of death is 2x higher than those without one. The reason for this is multifactorial but ischemic heart disease and end stage renal disease are the most common. Higher mortality is noted after amputation:

Results from a review of 28 studies with 17,325 patients, discussing mortality after minor amputation: The meta-analytical results of the mortality rates were as follows: 3.5% at 1 month, 20% at 1 year, 28% at 3 years, 44.1% at 5 years, 51.3% at 6 to 7 years, and 58.5% at 8 to 9 years. From these studies of diabetic patients, age was the most consistent independent risk factor, followed by chronic kidney disease, PAD (peripheral arterial disease), and coronary artery disease. One study of patients with PAD had reported diabetes as an independent risk factor for mortality. The subgroup analysis of the four studies reporting the outcomes of patients with PAD showed greater 3- and 5-year mortality rates compared to the overall and “diabetic” results.

Conclusions:
Mortality after minor amputation for patients with diabetes and/or PAD was found to be very high. Compared with the reported cancer data, survival was worse than that for many cancers. Just as in the case of major amputations, minor amputations should be considered a pivotal event in the life of these patients.

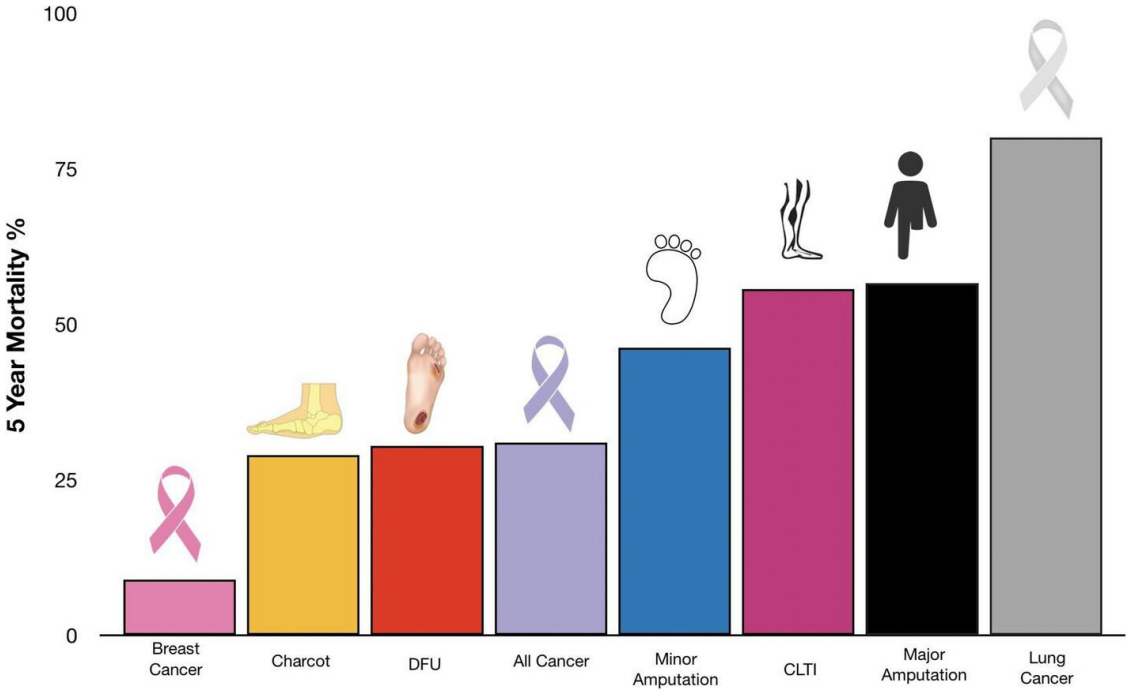
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Abstract

High mortality rates have been reported after major amputations of a lower limb, secondary to diabetes and peripheral vascular disease. However, the mortality rates have varied across studies. A systematic review of the 5-year mortality after non-traumatic major amputations of the lower extremity was conducted. A data search was performed of Medline using OVID, CINHAL, and Cochrane, 365 abstracts were screened, and 79 full text articles were assessed for eligibility. After review, 31 studies met the inclusion and exclusion criteria. *Overall, the 5-year mortality rate was very high among patients with any amputation (major and minor combined), ranging from 53% to 100%, and in patients with major amputations, ranging from 52% to 80%.* Mortality after below-the-knee amputation ranged from 40% to 82% and after above-the-knee amputation from 40% to 90%. The risk factors for increased mortality included age, renal disease, proximal amputation, and peripheral vascular disease. Although our previous systematic review of the 5-year mortality after ulceration had much lower rates of death, additional studies are warranted to determine whether amputation hastens death or is a marker for underlying disease severity.

https://bit.ly/3yK12s9

Even a small amputation carries a risk of mortality. This is not necessarily because of the amputation itself, but more of a reflection of the general health of the patient. Healing the ulcer quickly so the patient can get back on their feet to exercise, enjoy life, and simply go for a walk without worry is a worthy goal. https://bit.ly/3NkeZRB



Impact on Mental Health & Quality of Life

Probably one of the most significant factors of a diabetic foot ulcer is the impact it has on the quality of life for the patient and his/her family. This is not really talked about or considered, but it should be a primary consideration. If you or someone you love has a sore on their foot for a month or longer, what impact does that have on their life?

They have difficulty showering if they are supposed to keep it dry; shoe gear becomes a big problem with the dressing; dressing the foot is a pain and difficult for the elderly; costs of dressings become expensive; sometimes the wound bleeds or has an odor causing embarrassment; not being able to be active and participate in family activities is common. Diabetic foot ulcers and amputation can result in depression and loss of quality of life. Studies have shown that *50% of patients with a diabetic foot ulcer have depression*. Loss of income, inactivity, and stress all play a role in the psychological burden of a foot ulcer. All these have a negative affects on the personal image of the patient with a foot ulcer. https://bit.ly/38vsQWm

EVALUATION OF AN ULCER

What to Consider When Evaluating an Ulcer

Vascular: The circulation needs to be evaluated because without blood supply, the ulcer cannot heal. A simple exam of the pulses may be good enough. If the pulses are strong, great. If not, we use more sensitive and objective tests like ankle brachial index and pulse volume recordings. These use machines to measure the pressures and volume flows in the feet and legs. Most people we see with foot ulcers have enough blood flow to heal but it is important to check and fix first, if needed.

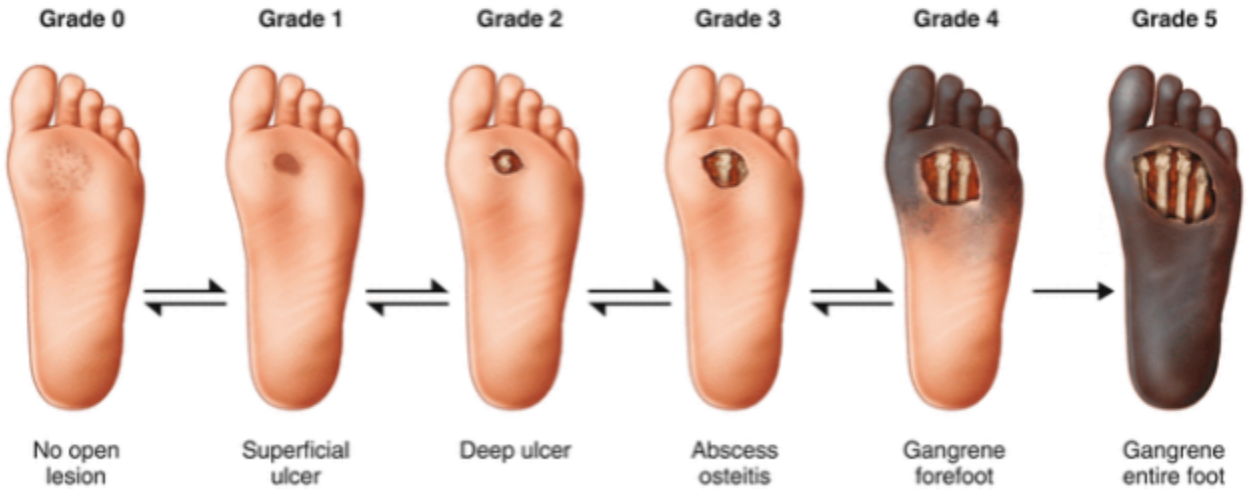
Neurological: Almost everyone with a true diabetic foot ulcer has a lot of neuropathy. If your feet are not numb it is very hard to get a foot ulcer on your foot. There is a test called “protective threshold” which is done with a 5.07 monofilament. If you can feel this, then you are not considered at risk for a foot ulcer. If you cannot, you have a loss of protective threshold and are considered at-risk. Other tests like hot/cold, vibration, and proprioception are also used to get an overview of the nerve function.

Wound size: Bigger wounds are worse and take longer to heal. Depth is also important to document. Wounds are graded based on depth and the deeper the wound, the worse it is.

Classification of an Ulcer

I. Waner's Foot Ulcer Classification System is one of the most common systems used to classify a diabetic foot ulcer:

WAGNER'S FOOT ULCER CLASSIFICATION SYSTEM



Wagner score	Description
Grade 0	No open ulceration, but with possible existence of bone deformation of hyperkeratosis
Grade 1	Superficial ulceration, but without penetration to deeper tissues
Grade 2	Deeper extension into tendons, bones, or joint capsule, which may be exposed
Grade 3	Presence of tendonitis, osteomyelitis, cellulitis, or deeper tissue abscess
Grade 4	Wet or dry gangrene of toe or dorsum of the foot, often with plantar infection
Grade 5	Extensive gangrene of the foot, with necrotic lesions and soft tissue infections indicating higher amputation

II. Contributing Deformity: ***This is the point of this book!*** Almost all TRUE diabetic foot ulcers have a contributing deformity such as a hammertoe, bunion, tailor's bunion, short Achilles tendon, or other contracture. If this deformity is allowed to stay, then the ulcer is always at risk of coming back. Removing a deformity surgically dramatically lowers the risk of a future ulcer and amputation. Your risk drops from 12.1 times more likely to get a foot ulcer to 1.7 times more likely to get a foot ulcer. That is a huge drop in risk. Below is a diabetic foot ulcer risk classification system that is very useful and revealing. Pay close attention to the highlighted areas.

III. Next Step Foot & Ankle Clinic Diabetic Foot Risk Classification:

Risk Category 0:
You have no neuropathy (numbness, tingling, burning) in your feet and your circulation is sufficient. You may or may not have a foot deformity and you have no history of foot ulcers.

Your recommended preventive measures are to wear good shoes and inspect your feet daily. Follow up with us in 6 – 12 months, or anytime you observe redness, swelling, or have pain in your feet. If you have deformities such as bunions, hammertoes or even ingrown toenails, consider correcting these now, while you can do so with very little risk.

Risk Category 1:
You have neuropathy with no deformity. Your circulation is adequate.

Your recommended preventive measures are to get soft shoes without seams, perhaps diabetic shoes. You should see your podiatrist every three or four months. Take the preventive measures in Risk Category 0 above, and be sure to inspect your feet daily for any problems. You may be a candidate for nerve surgery to restore your sensation and decrease/end nerve pain in your feet. *You are 1.7 times more likely to get a foot ulcer than people in Category 0.*

Risk Category 2:
You have neuropathy with deformities, and adequate circulation. You have no history of a foot ulcer.

Your recommended preventive measures are extra depth shoes with soft diabetic insoles and meeting with your podiatrist every 90 days. Continue with the steps outlined in Category 0 and Category 1, above. If you are a candidate for surgery, we STRONGLY RECOMMEND considering surgery to correct deformities at this time. Dealing with deformities such as hammertoes and bunions can lower your Risk Level to Category 1. *You are 12.1 times more likely to get a foot ulcer than someone in Category 0. You are now considered to be in a HIGH RISK GROUP.*

Risk Category 3:
You have neuropathy, foot deformity, and a history of a foot ulcer.
Your recommended preventive measures are to get diabetic extra depth shoes and insoles to take pressure off the prominent boney areas of your feet, and continue to take the preventive steps outlined in all categories above. We VERY STRONGLY RECOMMEND surgery to correct your deformities and relieve your pressure points if you are a candidate for surgery. This can lower your risk to Category 1. *You are 36 times more likely to develop a foot ulcer than someone in category 0. You are in a VERY HIGH RISK GROUP.*

Risk category 4: YOU HAVE A FOOT ULCER.

(Adapted from the University of Texas Diabetic Foot Risk Classification System)

By carefully reading the risk classification system, you can see that by getting rid of a pressure spot or deformity, you can dramatically lower the risk of future foot ulcers.

HOW TO PREVENT & TREAT FUTURE FOOT ULCERS

Surgery Options to Correct Deformities That Cause the Ulcer

Everybody gets very nervous when you mention surgery, especially on a patient with diabetes. When I was in medical school decades ago, we were taught we should be very cautious and almost never perform surgery on diabetic patients. I found it ironic that we would treat patients' wounds for months and then finally amputate the toe or part of the foot (which is a surgery) as opposed to trying a simple early surgical intervention to get the pressure off the wound. It did not make sense to me at all. It turns out I was right! Since getting out of school a lot of research has been done in this field.

Most studies that have been done on surgery to correct foot deformities to try and solve the problem of foot ulcers have revolved around doing surgeries on bone structures to surgically offload pressure points.These studies have proven beyond any reasonable doubt that *if the patient with a foot ulcer is a candidate for surgery, they should have the foot surgery*. In almost every published study and meta analysis, patients who undergo foot surgery to correct deformities do much better than patients who undergo only conservative care.

- *What makes the patient not a candidate for foot surgery?*

There are several conditions that can prevent the patient from having foot surgery. Most commonly these include uncontrolled blood sugars levels, peripheral vascular disease that has not been addressed, a noncompliant patient, or a patient without

the ability to stay off the foot for a few weeks after the surgery. The general health of the patient is also a concern. As with any elective surgery, patient safety is a top concern. However most of these surgeries can be performed under local anesthesia, so the risk is minimal.

- *What surgical approach do you take to a diabetic foot ulcer?*

Osseous (or surgery on the bones)

These operations involve working on the bones to realign them and take pressure off prominent areas. This can involve removal of bone or cutting the bone to decrease pressure in the prominent areas. Many studies have been done showing the effectiveness of this therapy but it does involve some risk. First, the time required to heal a bone can sometimes be somewhat problematic. Generally bones take 4-6 weeks and sometimes longer to heal. Sometimes these surgeries require the patient to be non-weight bearing during that time. This is an extended recovery and is sometimes difficult for patients that have already had trouble walking. Also, there is a risk of infection with any surgery. A bone infection can be devastating and frequently results in loss of body parts. The good news about bone surgery is that it works quite well when needed. Also, many of these surgeries can be done in a minimally invasive manner to lessen soft tissue damage and shorten recovery time.

Soft tissue surgery to correct deformities:

There are many soft tissue procedures that can dramatically decrease pressure in prominent areas. I personally prefer soft tissue procedures if possible to offload pressure points. These can include surgeries on toes, feet, ankles, and legs. These procedures are very powerful and can dramatically change the future for patients with a diabetic foot ulcer or area that's at risk. One of the great advantages of these surgeries over bone surgeries is that they carry a much shorter recovery time and have much lower risk profile. Infections are much less common, the recovery is shorter, frequently the patient is able to resume activities in a couple of days. And they have been shown to be very effective. Here are some of the studies you may want to check out (the online references are listed):

In a study from 2004 comparing conservative versus surgical approaches to a diabetic foot ulcer, the surgery group showed higher healing rates, shorter healing time, less complications (infections), and lower re-ulceration rates and higher patient satisfaction. https://bit.ly/3PgNdqK

An article (Surgical Offloading Techniques Should be Used More Often and Earlier in Treating Forefoot Diabetic Ulcers: An Evidence-Based Review) published in the International Journal of Lower Extremity Wounds in 2019 reviewed many articles involving hundreds of wounds concluded:

Surgery was found to generate better values than standard conservative care for all outcomes except for the transfer rate. In particular, surgical bony offloading procedures demonstrated significantly better outcomes than standard conservative non-surgical care in terms of higher healing rates, shorter healing durations, and lower recurrence rates. Moreover, 96% of DFUs healed in <1 month following surgical bony offloading, whereas 68% of ulcers healed within 3 months after standard care. The findings could challenge the classical guidelines of DFU management. This evidence-based review indicates that surgical offloading could be used more often and be proposed earlier during the course of ulcer management. The results imply that a period of 12 weeks could be considered a reasonable cutoff value to consider surgical treatment for patients with nonhealing DFUs. https://bit.ly/3wxgsgz

Another article (Diabetic foot off loading and ulcer remission: Exploring surgical off-loading) concludes:

“Surgery is important to mechanically stabilise and harmonise the foot for long term off-loading and foot-protection. Surgery should not be reserved for recalcitrant cases only, but extended to ulcer prevention and remission.” https://bit.ly/3wgbJRp

A meta-analysis (which is a review of many articles) involving 593 foot ulcers reviewed a particular surgery called a metatarsal head resection versus standard care. Patients who underwent the surgery had “significantly better rates of healing, time to heal, ulcer recurrence, and infection than SC (standard care or non surgical) group. Failure to heal, recurrence, and infection rates were 4 times higher in the SC (non surgical) group than in the MHR (metatarsal head resection) group, and than in the MHR group.” https://bit.ly/3yK2ieR

Another meta-analysis studying metatarsal osteotomies (a surgery that involves cutting a bone to make is shorter to offload the ulcer) involving 129 foot ulcers found “ the weighted pooled rates were as follows: 98.7% for ulcer healing (in a mean time to heal of 6.5 ± 1.2 weeks), 4.3% for ulcer recurrence, 10.3% for ulcer transfer, 3.7% for infection, and 3.4% for nonunion.

These findings were found to be noticeably better than those reported in the literature following standard care, whether associated or not to nonsurgical off-loading methods and that for all the studied outcomes. Knowing the dismal natural history of recalcitrant diabetic foot ulcers treated conservatively, the results of the metatarsal osteotomy techniques seems to offer a promising alternative in terms of ulcer healing and ulcer complications. In addition to complicated wounds, the indications for metatarsal osteotomies could include noncomplicated ulcers with healing delay. https://bit.ly/3leJuw1

- Is tendon balancing the solution for most foot ulcers?

One of the things that happens frequently to people with long standing diabetes is that they start putting more pressure on the front of the foot. The reason for this is two-fold. First, the calf muscle in the back of the leg gets tight as all of us become less flexible as we age. Also with high blood sugar there is some “glycosylation” of the Achilles tendon and it shortens theoretically. The muscle in the front of the leg also gets a bit weaker in some patients. This is caused by nerve compression of the common fibular nerve. It is not uncommon in diabetes and can get so bad that it results in stumbling or dragging the foot (drop foot).

This increased pressure results in foot ulcers under the metatarsal heads. Previously intact skin gets a callus, bleeds in the callus, breaks down under the callus and then ulcerates. So tendon balancing (lengthening the tight tendon and, in some cases, strengthening the weak tendons) can restore the foot to normal “non-ulcer causing” pressures.

One study that reviewed 11 other studies including 614 patients has found that those patients who underwent tendon balancing procedures had dramatically lower recurrence rates and foot ulcers than those who did not. The healing rates were the same provided that the care was equal. But once the wounds healed, if no tendon balancing was performed then the ulcers came back much more commonly in the group who did not undergo surgical intervention. https://bit.ly/3Nlc9vD

For example, ulcers that occur in the forefoot frequently occur because the Achilles Tendon (or in some cases other tendons as well) is over-powering the foot causing significantly increased pressure on the ball of the foot. This condition is quite common and although the foot is on the floor with the heel down, there is still a lot more pressure underneath the metatarsal heads than the other parts of the foot. This contributes to calluses and subsequent ulceration. Most diabetic foot ulcers occur in the forefoot underneath the metatarsal heads. This occurs because these areas are taking increased stress and pressure. This pressure can be substantially alleviated by addressing the tendons in the leg. Depending on where the ulcer is located, certain tendons can be lengthened and the pressure alleviated in the areas of ulceration. All of these ulcers can be addressed by tendon balancing.

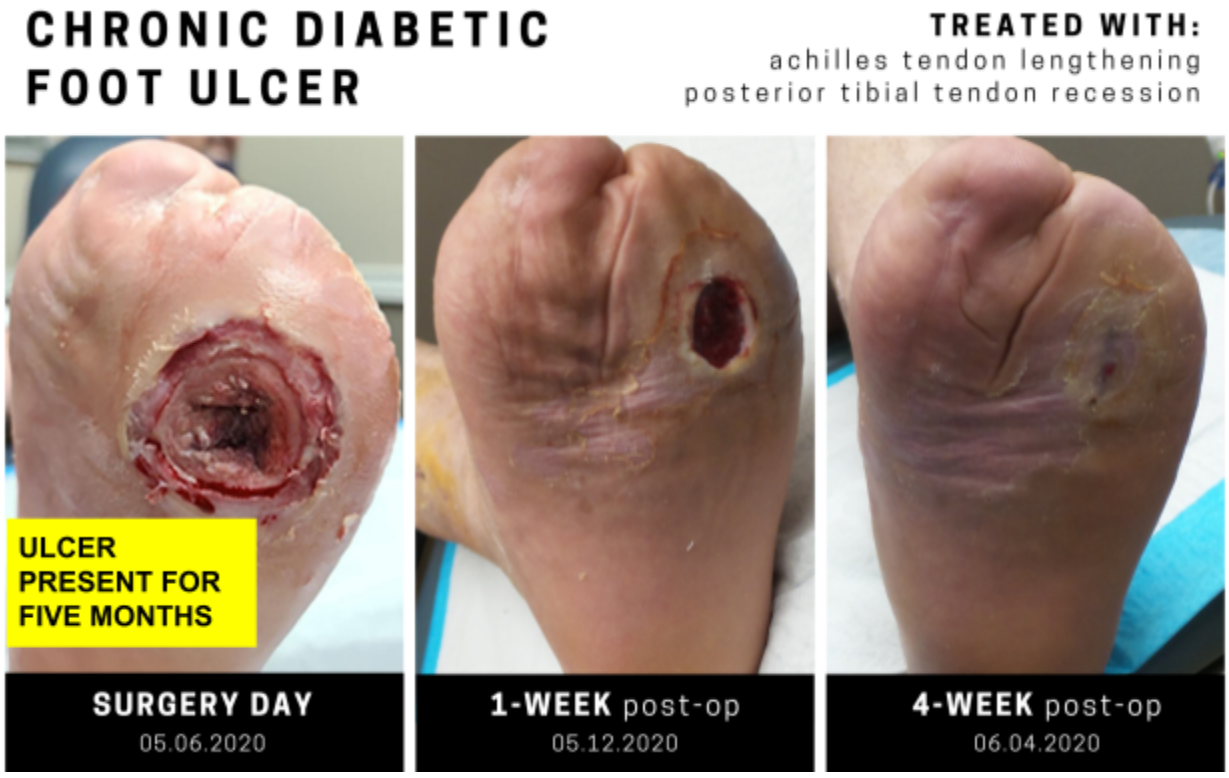


Another article published in 2003 studied 64 patients who were divided into 2 groups. The first group solely received standard care which included wound care and total contact casting. The second group received Achilles tendon lengthening and also wound care and total contact casting. They were followed for 2 years. 100% of the patients that had Achilles tendon lengthenings healed and only 88% of those that had just casting healed. After 2 years, 81% of the patients that got the cast had a recurrent ulcer and only 38% of the group with Achilles tendon lengthening got a recurrent ulcer.

The conclusion of the article is as follows:

"All ulcers healed in the Achilles tendon lengthening group, and the risk for ulcer recurrence was 75% less at seven months and 52% less at two years than that in the total-contact cast group. Achilles tendon lengthening should be considered an effective strategy to reduce recurrence of neuropathic ulceration of the plantar aspect of the forefoot in patients with diabetes mellitus and limited ankle dorsiflexion (≤5°)." https://bit.ly/3FOZXAP

Below is an example of a patient in our clinic who had undergone partial amputation (at another clinic) of his forefoot trying to heal chronic diabetic foot ulcers. Within a few months of the partial amputation, he developed another ulcer on the lateral aspect of his forefoot as seen in the first photo. There was no attempt to “balance” his foot. He was offered a leg amputation before he saw us. His previous physicians were ignoring the cause of the ulcer and only seeing the wound as the problem. His previous doctors just kept cutting things off and the next ulcer would show up. This is because the pressure that caused the ulcer in the first place was never addressed. He came to see us, desperate for help. WE IMMEDIATELY RECOMMENDED TENDON BALANCING. This was performed and literally the ulcer healed by itself. Nothing was done to the wound other than just applying a dressing and antibiotic ointment and a little patience. The foot healed rapidly and more importantly has stayed closed now for three years.



Another study in Plastic and Reconstructive Surgery published in 2013, studied 328 ulcers. 179 were treated with wound closure surgery alone and 145 were treated with Achilles tendon lengthening and wound closure. Ulcer recurrence occurred in 25% of the 1st group and 2% of the Achilles tendon group. They concluded that Achilles tendon lengthening significantly reduces the risk of recurrent diabetic foot ulcerations. https://bit.ly/3wwXAhw

TOE ULCERS: A SPECIAL CATEGORY



All these ulcers will likely come back if the toe is not straightened. Most toe deformities can be corrected with a minimally invasive procedure of only a needle stick (no incision) and a three-day recovery. Once the toe is straight, the ulcer heals very quickly because the pressure is off the wound.

Ulcers on the toe are quite common in patients with diabetes. These are particularly problematic and should be addressed aggressively early because there is very little soft tissue between this skin and the bone. As a result, these ulcers develop bone infections quite easily and frequently require amputations. Digital amputations are very common. Some estimates are over 180,000 each year in the United States. The great news is that correction of digital deformities that cause diabetic foot ulcers can be done easily with a short recovery. Traditionally straightening out a hammertoe required opening the toe, removing bone, putting a pin in the toe or other implant, and a prolonged recovery with a swollen toe. With innovations in post op care and minimally invasive techniques, that recovery can be as short as 3 days. Most of the time, we can correct a hammertoe deformity *without an incision* under local anesthesia. Frequently just use a needle to do a little soft tissue work and then we can place the toe in a straight position.

This gets pressure off the wound and most of the time the ulcer heals in a few days. These are my favorite because the solution is usually so simple the patients are amazed.

HOW TO HELP YOUR FOOT ULCER NOW

First get pressure off the foot. If you can do this you are going to make great progress towards healing your wound. If you have been seeing a doctor and they have not mentioned this then get a second opinion. There is an old saying about diabetic foot ulcers that is profoundly true:

"It does not matter what you put on the wound, it is what you take off it that counts."

There is a huge industry of wound care products that are quite effective and expensive. We have used most of them. They work and can speed up healing but if you don't get pressure off the wound they become a fancy bandage. Often we see patients who have been getting these dressings for months (at a staggering cost) and the wounds are just not changing. We get them offloaded and they immediately start to heal. This concept is called "OFFLOADING THE ULCER". There are many techniques to get pressure off the wound. Let's review a few of them.

OFFLOADING CAN BE USED WITH OR WITHOUT SURGERY! SO YOU CAN HAVE YOUR SURGERY TO GET RID OF THE PRESSURE POINT AND THEN OFFLOAD THE ULCER AND HEAL THE WOUND. THIS WAY YOU GET BOTH PROBLEMS SOLVED WITH ONLY ONE RECOVERY! IT IS A BRILLIANT WAY TO ADDRESS A FOOT ULCER AND THE PRESSURE THAT CAUSED IT.

Total Contact Cast



This is considered the "gold standard" of offloading. It has a lot of drawbacks however. The cast is heavy which makes it difficult to walk. The cast also takes a long time to put on and there is a risk of secondary ulcers that occur because the cast can rub on the leg. BUT THEY ARE EFFECTIVE. STAGGERINGLY ONLY 2% OF WOUND CARE CLINICS USE THESE DEVICES. https://bit.ly/3Pl8D69 If you have a chronic (greater than one month) foot ulcer that is not changing and you have not been placed in one of these it might be time to get a second opinion.

Knee Scooter

If you can use this, it works. You can get around and do things without putting pressure on the foot. Some people cannot use these because of fall risk but if you can use one, it can be a game changer. Bigger wheel models are more stable and baskets are nice to carry things.





Wheel Chair

These can be helpful for most patients don't want or can't use a knee scooter. If you can walk it can be hard to spend the effort to push yourself around with your arms, but keep in mind that it is only temporary. You are just trying to keep pressure off your foot ulcer until it heals.

Cam Walker

This can help a little but patient compliance is often an issue. These can be cumbersome and easy to remove so most patients just take them off. They also don't really get pressure off the wound completely but can be modified to help keep pressure off one spot.





Orthotics

These are great when they are made correctly and they are best if used once the ulcer is healed. Reulceration rates are in the neighborhood of 60% with no intervention and with appropriate orthotics they drop to 15%. https://bit.ly/3lbevky Amputation rates also drop dramatically with appropriate orthotics. We use a 3D scanner and a 3D printer to make ours custom orthotics. They are the most accurate orthotics available (to within a ½ mm). If you have had a foot ulcer or even a callus on your foot, then YOU SHOULD GET A GOOD ORTHOTIC. It can save your foot. Adversely, a poor orthotic can ruin your foot.

A WORD OF CAUTION: THERE ARE A LOT OF WHAT I CALL "ORTHOTIC BANDITS" AROUND. IF YOU BUY SOMETHING OFF THE SHELF FROM A RETAILER YOU SHOULD NOT SPEND MORE THAT $50 AND USUALLY A LOT LESS THAN THAT. I HAVE HAD PATIENTS COME IN WITH "ORTHOTICS" THEY PURCHASED AT A RETAIL STORE FOR MORE THAN A $1000 AND THEY DO NOT FIT THE PATIENT'S FOOT VERY WELL. THE RETAILER PULLED THEM OFF THE SHELF, STUCK THEM IN THE PATIENT'S SHOES AND GAVE THE PATIENT A "LIFETIME GUARANTEE". USUALLY A TWO MINUTE INTERNET SEARCH SHOWS THE SAME DEVICE FOR $20 AND IT'S STILL NOT CUSTOM MADE.

Post-Op Shoe

If you were given a post op shoe to offload or help your foot ulcer, count on have the ulcer for a long time. They are useless. They are nice because you can put a dressing on the foot but they DO NOT reduce the pressure that causes the wound.



What about insoles and diabetic shoes? Don't they prevent foot ulcers?

They can help but not very much. The studies on this are all over the map because many factors come into play–frequency of wearing the shoes, the presence of significant foot deformities, vascular and neurologic diseases, age, shoe quality–are all variables. The bottom line is there is not enough evidence to say they actually prevent recurrence. This is a line from an article that reviewed thousands of patients in many different studies about diabetic shoes: "However, two clinical trials found *no significant protective benefit of therapeutic footwear,* while analytic and descriptive studies *reported significant protective findings."* Don't bet your leg on a diabetic shoe. They are OK to use but likely are not the whole answer. Again, a diabetic shoe is great with a good orthotic. https://bit.ly/3IdeZXr

CONCLUSION

A diabetic foot ulcer can be devastating. They have a strong likelihood of recurrence if the forces that caused the ulcer are not addressed. The skin where the ulcer is was the same as the skin everywhere else on the foot. Treating only the skin is doomed to fail in most patients. Medical evidence for appropriate surgical offloading is overwhelmingly in favor of addressing the deformity that caused the ulcer and not just the ulcer itself.

Most wound care clinics are not equipped to address these deformities and just treat the wound costing the system and patient lots of money and time. 40% of foot ulcers will recur within a year and 60% will come back in three years IF THE DEFORMITY OR PRESSURE POINT IS NOT ADDRESSED. Not addressing a deformity surgically condemns the patient to a lifetime of waiting for the ulcer to come back.

Many of these surgeries can be done with minimally invasive techniques that require only a short recovery period. Most of the time the recovery is no different than if you were just treating the wound. In our clinic, we almost always combine the wound treatment and the surgery so that the amount of time off the foot is the same. The surgeries are not perfect, so a skilled surgeon who has done this before is needed. Careful planning and patient cooperation is also a necessity. Surgical results are vastly superior to non-surgical interventions in the long run. So if you or a loved one has a diabetic foot ulcer please give us a call at Next Step Foot and Ankle Clinic so we can help effectively treat and heal the ulcer.



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