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TREATING YOUR WOUND CARE PATIENTS

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WOUND Management

Limb Salvage: It's a Philosophy

Amputation prevention requires patience, planning, and persistence.

By Lee C. Rogers, DPM

The Mental Game

The World Health Organization and the International Diabetes Federation have stated that nearly 85% of diabetes-related amputations are preventable. While it requires a necessary technical skill set to perform complex interventions to save the diabetic foot from amputation, limb salvage is largely a "mental game." The mental game is understanding and intervening in the patho-physiology, how to improve the patho-mechanics, and a good dose of patience. The natural history of how a patient with diabetes requires an amputation is fairly well understood. We have described the concept "Stairway to an Amputation" which easily outlines this natural history (Figure 1).[1]

We first categorize a patient on one of the stair steps and decide what interventions can be done in order to prevent them from moving to a higher step, and ultimately what can be done to de-escalate the patient to a lower step. For example, in the case of someone on step 3 with an ulcer, if you can prevent that ulcer from becoming infected (step 5), or if you can treat the vascular disease (step 4), the amputation can be prevented. Moreover, if one can achieve ulcer healing, then the patient can de-escalate to step 2.

This concept fits nicely with the six-component program that we described in *JAPMA* in Mar/Apr 2010 in our article "Organized programs to prevent lower-extremity amputations."[2] We implemented this program which concentrated on 1) infection management, 2) vascular disease recognition and management, 3) off-loading plantar pressure, 4) debridement of wounds, 5) promotion of granulation tissue, and 6) wound closure. We were able to reduce major limb losses by 72% in one year and achieved a high-low amputation ratio of 0.05.

The high-low amputation ratio was described by Wrobel and Armstrong and is calculated by taking the number of high-level amputations (AKA and BKA) divided by the number of low-level amputations (partial foot or limb-sparing).[3]

> *The vast majority of amputations are a result of infection, gangrene, or a non-healing wound.*

In order to prevent diabetes-related amputations, one must first know what causes them. Pecoraro, et al. in 1990 published just that.[4] The vast majority of amputations are a result of ***infection***, ***gangrene***, or a ***non-healing wound***.

Infection

As illustrated in our Stairway model, infection is almost always the coup de grace that leads to the amputation. It needs to be dealt with swiftly to save both limb and life. Infections can be classified as limb-threatening or non-limb-threatening based on the extent, but a more exact classification of diabetic foot infections (DFI) was put forth by the Infectious Diseases Society of America (IDSA). The IDSA classifies DFI into uninfected, mild, moderate, or severe infections. Mild infections have less than 2 cm of surrounding cellulitis without deep spread to bone or tendon and no systemic signs. They are non-limb-threatening and can be treated as an outpatient. Moderate and severe infections have greater than 2 cm of surrounding cellulitis, can have deep spread to bone or tendon, and in the case of severe infections, systemic instability. Moderate and severe infections are generally treated as an inpatient and are limb-threatening.

Resistance in diabetic foot infections is common and needs to be considered. There are newer drugs for MRSA, and several more currently are undergoing trials. In limb—and life-threatening infections, anti-MRSA therapy should be started first, in a de-escalation fashion. After the culture and sensitivity is reported, the spectrum of coverage can be narrowed.

Many times DFI are surgical emergencies. Gas in the tissue or an abscess requires urgent surgical management. Open amputations should be limited to only infected or necrotic tissue and should leave any viable tissue, without regard to functionality. The function of the foot can be addressed in a second-stage surgery, and one might require all the soft tissue possible for closure.

Gangrene

While gangrene is an irreversible loss of tissue, revasculariza-

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tion can limit the amount of perigangrenous tissue lost. Critical limb ischemia is reversible with good vascular care. There are a multitude of vascular procedures ranging from endovascular to open bypass, but the fact remains that the diabetic foot requires maximum perfusion to heal. Care must be taken when interpreting noninvasive studies as some are influenced by calcification, inflammation, or infection. If the foot is clinically ischemic, it requires an intervention.

If the foot is infected, surgery is performed first to treat the infection. However, there is no good answer on the timing of foot reconstruction after revascularization. Some surgeons co-operate with vascular surgeons and perform the reconstruction in a single stage. Others wait a few days to weeks after revascularization.

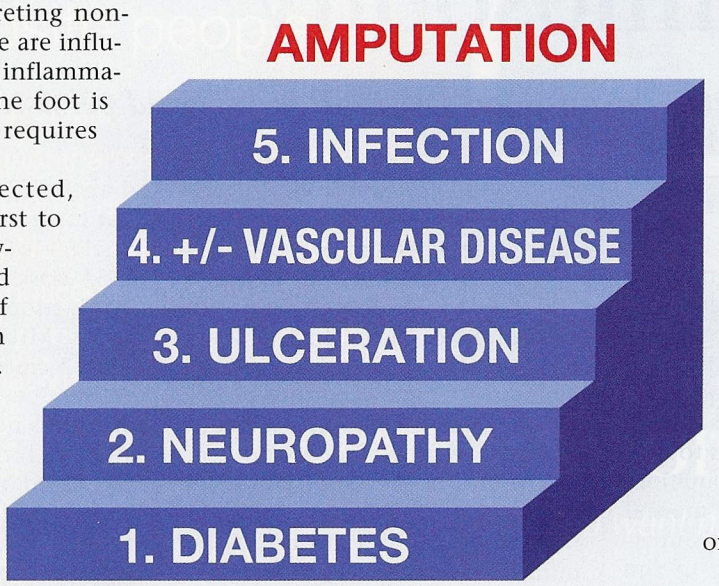

Figure 1: Stairway to an amputation

Non-healing Wound

The non-healing wound tends to be a "catch all" phrase for any wound that is failing any therapy. Most wounds will respond to some sort of therapy, so if a wound isn't healing, it should cause the clinician to alter the treatment strategy. If one's wound-healing "toolbox" is small, there will be more non-healing wounds than if a clinician is familiar with more treatments. We approach wounds from a surgical perspective. They respond well to wide surgical debridement, promotion of granulation tissue with Wound VAC®, and then closure with a variety of modalities such as Dermagraft® (Advanced Biohealing), split thickness skin graft, flaps, and DermaClose® (Wound Care Technologies).

Most diabetic foot wounds are caused by abnormal pressure. The pathomechanics of the foot need to be addressed. During wound healing, we often use removable cast walkers rendered irremovable, referred to as the instant total contact cast (iTCC). But one must not forget about intrinsic or surgical offloading. A good example is that of a Keller arthroplasty for a distal hallux ulcer. The hallux is the most common location for a diabetic foot ulcer, and many distal hallux ulcers are caused by hallux limitus in the face of neuropathy.

A Keller arthroplasty improves the dorsiflection of the first metatarsophalangeal joint, thus reducing the distal pressure. These can be performed to heal an ulcer, being categorized as a curative surgery. The rate of infection when foot surgery is performed with an open wound is 12-20%. But one forgets that the risk of infection with a diabetic foot ulcer alone is 25%. So, the benefit of foot surgery outweighs the risk of infection in most cases. We use post-operative prophylactic antibiotics for 10 days in these cases which may raise the eyebrows of some infectious disease experts, but given a high post-operative infection rate, we feel it is justified.

Also, it is important to realize that the action of saving a diabetic limb is not a quick one. Generally in medicine and surgery, we like to do things in a single stage, to avoid multiple trips to the OR and exposures to anesthesia. However, the only single-stage operation in the diabetic foot is an amputation, and we believe that is why many doctors give up so soon and amputate. One must accept that the diabetic foot can not be salvaged in a single stage. Our patients receive an average of 2.9 surgeries: usually an incision and drainage or debridement, followed by a bypass, followed by a reconstruction or graft. These are sometimes all performed in the same hospital stay, and other times in combination of inpatient and outpatient therapy.

In another article in this issue by Howard Michaelson, MPH, it is stated that the three necessary components of a successful limb salvage team are talent, tools, and teamwork. It is the talent that is hardest to come by, but many podiatrists are well-trained in foot and ankle surgery; it just takes a lesson in the philosophy of preventing amputations to change one into a master savior of limbs! ■

References:

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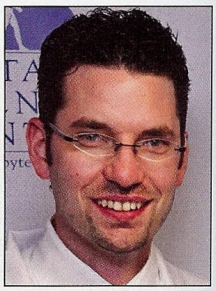

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