Developing Protocols for Wound Management

Consistently applied basic wound care strategies lead to better results.

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This article is written exclusively for Podiatry Management by the American College of Foot and Ankle Surgeons (ACFAS). Founded in 1942, The College promotes the art and science of foot, ankle and related lower extremity surgery, addresses the concerns of foot and ankle surgeons, as well as advances and improves the standards of education and surgical skill to ensure the highest level of patient care.

Wounds of the lower extremity can be extremely difficult to treat. Excessive weight-bearing, edema, malnutrition, infection, and co-morbidities such as diabetes, renal disease, peripheral arterial disease (PAD), venous insufficiency, and congestive heart failure (CHF) all can impair healing. Many patients have multiple comorbidities detrimental to resolution of their wound. In treating lower extremity ulcerations, it is important to work as a team with the both the patient and other medical specialties to provide the most effective wound management.[1]

In the initial evaluation of a patient with a lower extremity wound, a full history and physical should be performed. The patient's underlying health conditions which could delay or prevent healing must be identified and optimized using a multidisciplinary approach, to increase the likelihood of successful healing.[2,3]

We routinely work with the primary care team to manage diabetes or CHF, vascular surgeons for treatment of PAD or venous disorders, a dietitian to aid with improved nutritional status and diabetic control, and an infectious disease specialist for help with management of severe infections. Patients who smoke should be encouraged to quit, which may improve the arterial supply to their ulceration.[4,5]

Social History

The social history is of significant importance, and special attention should be paid to the patients' living situations (e.g., do they have stairs, do they live alone or with someone who could provide them assistance, what is their ambulatory status, what types of assistive devices do they have at home, what type of work do they do, etc.). This information will be helpful in determining how best to off-load a plantar ulcer, or what help the patient might require to comply with your activity restrictions. Identifying and alleviating barriers to compliance early on will result in more successful wound healing.

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Physical Exam

The physical exam should include evaluation of the ulcer itself including size, depth, presence of exposed tendon or bone, appearance of the wound bed (e.g., granular, fibrous, necrotic) with special attention to any signs of infection. The patient's vascular status must be assessed and, if pulses are not-palpable, non-invasive vascular studies should be obtained. A referral to vascular surgery for evaluation may be necessary dependent on study results. A sensory exam should be performed to identify the presence of neuropathy, as this could increase the risk of future ulceration.[6]

In addition, deformity that could be causing excessive pressure at the ulcer site must be identified. Surgical correction of this deformity in appropriate candidates, preferably after ulcer healing, may help in preventing ulcer recurrence. X-rays are routinely performed at the initial visit to evaluate foot deformity, rule out osteomyelitis, and for comparison if the ulcer worsens in the future.

Management of Lower Extremity Ulcerations

The management of lower extremity ulcerations must include an extensive discussion with patients about their role in the treatment process. Patients must follow their diabetic diet, increase protein intake, abide by weight-bearing restrictions at all times, elevate the affected extremity consistently, quit smoking,

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keep their bandage clean, dry, and intact, etc. They may benefit from both verbal and written instructions to improve compliance. These instructions must be reiterated at each follow-up visit, as compliance seems to wane as time to healing increases, and many wounds can take several months or more to heal.

It must be emphasized to patients that they are a very important member of the team in reaching successful and rapid wound healing; and that if they fail to do their part, they will likely extend their course of treatment and also increase their risk of amputation.[7] Even with these discussions, non-compliance is a real issue in wound care and might require the use of total contact casts, skilled nursing facility admissions, or other measures to help improve the likelihood of healing.

Figure 1: Jones Compression Dressing.

Once ulcer healing has been achieved, preventive strategies must be implemented to avoid recurrent ulceration.

Wound Healing Protocols

We have developed specific protocols for post-operative care to promote healing and likewise should develop standard protocols for wound management to improve outcomes. Our standard protocol includes weekly visits to perform cleansing of the extremity, debridement as indicated, and dressing changes which are left in place by the patient between each visit.[8] As long as the patient has adequate vascular status, we routinely use a Jones compression dressing (Figure 1) for immobilization and edema control whether treating a plantar foot ulcer or a venous leg ulcer. Edema control reduces drainage from the ulcer site, which will improve the rate of healing. It is imperative to utilize off-loading padding such as metatarsal pads, felt and/or foam cut-outs (Figure 2) under the dressing for plantar foot ulcers, especially in the forefoot.

Figure 2: Foam padding taped in place proximal to ulcer site for off-loading under dressing.

Patients are placed into surgical shoes, CAM walkers, or sometimes casts with a plantar post, depending on their ability to follow weight-bearing restrictions.[9] Patients are instructed to remain either partial weight-bearing on the heel or non-weight-bearing, depending on ulcer location and individual ability, using a cane, crutches, walker, wheelchair, or knee walker scooter.

Patients are instructed to limit ambulation to short distances about their home (e.g., bathroom and back) and to elevate their legs above their heart consistently, limiting dependency to 30 minutes at a time. Measurements of the wound diameter and depth are performed at each visit to track progress. These basic measures will result in healing of a majority of foot and leg ulcers without the use of expensive specialty wound care products.

Our wound care team commonly uses saline-based gels to keep a granular wound moist, enzymatic debriding agents for wound beds that are somewhat fibrotic, and collagen-containing dressings to promote granulation and healing.[10] If wound size has not improved significantly over a few weeks, add other specialty dressings such as skin equivalents, activated collagen, or in the case of excessive bio-burden, topical silver containing products or antimicrobial agents.[11,12]

Dealing with Infections

When there are signs of infection present, cultures need to be taken and empiric oral antibiotics prescribed until culture results become available. In severe infections, the patient should be hospitalized for IV antibiotics and surgical debridement as appropriate. If non-compliance with weight-bearing restrictions is an issue, switch from using a removable off-loading device, such as a surgical shoe or cam walker, to a cast.

Once ulcer healing has been achieved, preventive strategies must be put into place to avoid recurrent ulceration. A detailed list of foot care instructions is given to each patient in both verbal and written form. Appropriate off-loading orthotics, extra-depth shoes, Charcot Restraint Orthotic Walkers (CROW walkers), or patellar tendon-bearing braces are prescribed dependent on the previous ulcer location or deformity. Use of forefoot rocker modifications on extra-depth shoes in addition to orthotics with metatarsal padding and off-loading accommodations (Figures 3 and 4) can prevent recurrent forefoot ulcers.

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Hallux interphalangeal pre-ulcerative lesions can be off-loaded with a toe raise proximal to the previous ulcer site on the orthotic, accommodation under the lesion, a 3-degree rearfoot varus and possibly forefoot varus post, and a more distally placed rocker sole starting at the toe sulcus.

Pre-ulcerative lesions at the plantar heel are best off-loaded with a patellar tendon-bearing brace. A CROW walker is most commonly used for a Charcot foot deformity. High-risk patients need to be seen on a regular basis for foot evaluation, routine foot care, repeated foot care education, and shoe or brace evaluation and replacement, as indicated.[13,14] Walking for exercise is discouraged in patients with a history of foot ulcer due to the risk of re-ulceration, even with the use of prescribed footwear. I generally recommend seated weights, use of an exercise bike, or swimming rather than weight-bearing exercise in this patient population.

Figure 3: Forefoot rocker modification on an extra-depth shoe and custom orthotic with metatarsal pad for forefoot off-loading.

Patients must understand the importance of their role in the treatment process to expedite healing.

Patients with a history of venous leg ulcers, and others with edema, are prescribed appropriate compression stockings to be applied on first arising in the morning and removed at bedtime.[15] These patients must also elevate their legs periodically throughout the day for additional edema control. Weight loss may also be beneficial. Pneumatic compression devices may be prescribed in patients with severe edema for additional control. Primary care providers should be involved in the management of edema as diuretics also may be indicated.

Figure 4: Plantar surface of orthotic in Figure 3 demonstrating an off-loading accommodation under the 3rd metatarsal head.

Surgical Intervention

Certain patients may benefit from surgical correction of a deformity to reduce the risk of re-ulceration.[16] Historically, rates of compliance with wearing prescribed foot gear are low, so recurrence may occur even when the deformity can be effectively off-loaded by conservative means. Pre-ulcerative lesions at the distal and dorsal toes in patients with flexible hammertoe deformity may be effectively managed with percutaneous flexor and extensor tenotomy procedures.[17] These can be done under local anesthetic, quite safely, even in patients with multiple co-morbidities, reducing the need for padding and extra-depth footgear to prevent recurrent ulceration long-term.

Patients with plantar metatarsal head ulcers can benefit from shortening or elevating osteotomies, some of which can also be performed percutaneously.[18]

Standard bunion and hammertoe correction as well as midfoot or rearfoot fusion or realignment procedures, equinus correction, and Charcot reconstruction can also be performed in appropriate candidates.[19] Surgical procedures for wound closure such as skin-plasty or skin grafting may be utilized dependent on wound location and size, and sometimes in combination with procedures to correct deformity, when conservative treatment has not been entirely effective.[20]

It is important to match the type of procedure to the appropriate patient, based on overall health status and ability to comply with the post-operative instructions. The surgeon should have a good understanding of the patients' level of compliance after working with them on ulcer-healing over an extended period of time.

Conclusion

Wound management in the lower extremity requires a detailed evaluation of the patient, a multidisciplinary approach to patient care, and a standard wound-care protocol with extended follow-up after healing to have the best success at avoiding re-ulceration and amputation. The provider must have a good understanding of the barriers to patient compliance and try to mitigate these. Patients must understand the importance of their role in the treatment process for the most rapid healing. Consistently applied basic wound care strategies, in combination with a multidisciplinary approach to patient care, will effectively treat most lower-extremity ulcers. **PM**

References

[1] Weck M, Slesaczeck T, Paetzold H, Muench D, Nanning T, Gagern G, Brechow A, Dietrich U, Holfert M, Bornstein S, Barthel A, Thomas A, Hanefeld M, Koehler C. Structured health care for subjects with diabetic foot ulcers results in a major reduction of amputation rates. Cardiovasc Diabetol. 2013;12(1):45.

[2] Apelqvist J. Diagnostics and treatment of the diabetic foot. Endocrine. 2012;41(3):384-97. Schweinberger MH, Roukis TS. Wound Complications. Clin Podiatr Med Surg. 2009;26(1):1-10.

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[3] Zhang SS, Tang ZY, Fang P, Qian HJ, Xu L, Ning G. Nutritional status deteriorates as the severity of diabetic foot ulcers increases and independently associates with prognosis. Exp Ther Med. 2013;5(1):215-222.

[4] Silverstein P. Smoking and wound healing. Am J Med. 1992;93(1A):22S-24S.

[5] Thomas DR. Clinical management of diabetic ulcers. Clin Geriatr Med. 2013;29(2):433-41.

[6] Feinglass J, Shively VP, Martin GJ, Huang ME, Soriano RH, Rodriguez HE, Pearce WH, Gordon EJ. 2012;34(25):2158-65.

[7] Brem H, Jacobs T, Vileikyte L, Weinberger S, Gibber M, Gill K, Tarnovskaya A, Entero H, Boulton AJ. Wound-healing protocols for diabetic foot and pressure ulcers. Surg Technol Int. 2003;11:85-92.

[8] Morona JK, Buckley ES, Jones S, Reddin EA, Merlin TL. Comparison of the clinical effectiveness of different off-loading devices for the treatment of neuropathic foot ulcers in patients with diabetes: a systematic review and meta-analysis. Diabetes Metab Res Rev. 2013;29(13):183-93.

[9] Holmes C, Wrobel JS, Maceachern MP, Boles BR. Collagen-based wound dressings for the treatment of diabetes-related foot ulcers: a systematic review. Diabetes Metab Syndr Obes. 2013;6:17-29.

[10] Brem H, Balledux J, Bloom T, Kerstein MD, Hollier L. Healing of diabetic foot ulcers and pressure ulcers with human skin equivalent: a new paradigm in wound healing. Arch Surg. 2000;135(6):627-34.

[11] Sams HH, Chen J, King LE. Graftskin treatment of difficult to heal diabetic foot ulcers: one center's experience. Dermatol Surg. 2002;28(8):698-703.

[12] Vuorisalo S, Venermo M, Lepantalo M. Treatment of diabetic foot ulcers. J Cardiovasc Surg (Torino). 2009;50(3):275-91.

[13] O'Meara S, Cullum N, Majid M, Sheldon T. Systematic reviews of wound care management: (3) antimicrobial agents for chronic wounds; (4) diabetic foot ulceration. Health Technol Assess. 2000;4(21):1-237.

[14] Jones J, Nelson EA. Use of compression hosiery in venous leg ulceration. Nurs Stand. 2001; 16(6):57-60.

[15] Kim PJ, Attinger CE, Evans KK, Steinberg JS. Role of the podiatrist in diabetic limb salvage. J Vasc Surg. 2012;56(4):1168-72.

[16] Laborde JM. Neuropathic toe ulcers treated with toe flexor tenotomies. Foot Ankle Int. 2007;28(11):1160-4.

[17] Roukis TS, Schade VL. Minimum-incision metatarsal osteotomies. Clin Podiatr Med Surg. 2008;25(4):587-607.

[18] Greenhagen RM, Johnson AR, Bevilacqua NJ. Gastrocnemius recession or tendo-achilles lengthening for equinus deformity in the diabetic foot? Clin Podiatr Med Surg. 2012;29(3):413-24.

[19] Roukis TS, Schweinberger MH, Schade VL. V-Y fasciocutaneous advancement flap coverage of soft tissue defects of the foot in the patient at high risk. J Foot Ankle Surg. 2010;49(1):71-4.

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