Guidelines for the treatment of venous ulcers

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An advisory panel of academicians, private practice physicians, podiatrists, nurse clinicians, research nurses, industrial scientists, and an epidemiologist was chosen to develop guidelines for the treatment of venous ulcers of the lower extremity.

METHODS

Previous guidelines, meta-analyses, PubMed, MEDLINE, EMBASE, The Cochrane Database of Systematic Reviews, recent review articles of venous ulcer treatment, and the Medicare/CMS consensus of usual treatment of chronic wounds were all reviewed for evidence. Guidelines were formulated, the underlying principle(s) enumerated, and evidence references listed and coded. The code abbreviations for the evidence citations were as follows:

- **STAT**: Statistical analysis, meta analysis, consensus statement by commissioned panel of experts
- **RCT**: Randomized clinical trial
- **LIT REV**: Literature review
- **CLIN S**: Clinical case series
- **RETRO S**: Retrospective series review
- **EXP**: Experimental laboratory or animal study
- **TECH**: Technique or methodology description
- **PATH S**: Pathological series review

There were major differences between our approach to evidence citations and past approaches to evidence-based guidelines. Most past approaches relied only on publications regarding clinical human studies. Laboratory or animal studies were not cited. We have used well-controlled animal studies that present proof of principle, especially when a clinical series corroborated the laboratory results. It was also clear that principles that have been validated for other chronic wound types often are applicable to venous ulcers. Therefore, evidence was sometimes cited that was not specific for venous ulcers. Because of these variations, a different system was used to grade the evidence weight supporting a given guideline. The level strength of evidence supporting a guideline is listed as Level I, Level II, or Level III. The guideline levels are:

- **Level I**: Meta-analysis of multiple RCTs or at least two RCTs support the intervention of the guideline. Another route would be multiple laboratory or animal experiments with at least two clinical series supporting the laboratory results.
- **Level II**: Less than Level I, but at least one RCT and at least two significant clinical series or expert opinion papers with literature reviews supporting the intervention. Experimental evidence that is quite convincing, but not yet supported by adequate human experience is included.
- **Level III**: Suggestive data of proof of principle, but lacking sufficient data such as meta-analysis, RCT, or multiple clinical series.

**NB**: The suggestion in the guideline can be positive or negative at the proposed level (e.g., meta-analysis and two RCTs stating intervention is not of use in treating venous ulcers).

RESULTS

Guidelines have been formulated in eight categories for the treatment of venous ulcers of the lower extremities. The categories are:

- **Diagnosis**
- **Compression**
- **Infection Control**
- **Wound Bed Preparation**
- **Dressings**
- **Surgery**
- **Adjuvant Agents (Topical, Device, Systemic)**
- **Long-Term Maintenance**

Each of the separate guidelines underwent a Delphi consensus among the panel members to be critically evaluated. There was a consensus of at least ten panel members on each individual guideline. The majority of the guidelines had unanimous concurrence. The draft guidelines were presented at an open conference on October 3, 2005. Following the conference and audience discussion, a period of one month was allowed for written comments and submission of additional evidence literature. The draft guidelines were then modified, taking into consideration
all verbal and written comments. The resultant Guidelines for the Treatment of Venous Ulcers follows.

GUIDELINES FOR THE DIAGNOSIS OF LOWER EXTREMITY VENOUS ULcers

Preamble: Ulcers of the lower extremity may be caused by a variety of conditions. Elevation of ambulatory venous pressure (venous hypertension) is the most common. However, as treatment of the ulcer may vary depending on ulcer etiology, it is paramount that a correct diagnosis is made before treatment.

Guideline #1.1: Gross arterial disease should be ruled out by establishing that pedal pulses are present on physical examination and/or that the ankle : brachial index (ABI) is > 0.8. (Any ABI less than 1.0 suggests a degree of vascular disease and compression therapy is usually considered to be contraindicated with an ABI < 0.7.) In elderly patients, patients with diabetes mellitus, or patients with an ABI > 1.2, a toe : brachial index of > 0.6 or a trans-cutaneous oxygen partial pressure of > 30 mmHg in the region of the ulcer may help to suggest an adequate arterial flow (Level I).

Principle: Venous ulcers can exist in the presence of mixed arterial/venous pathology. However, treatment of only the elevated venous pressure will not succeed when significant arterial disease is present.

Evidence:

Guideline #1.2: Many definitions have been used to diagnose venous leg ulcers including clinical history and examination, invasive, and noninvasive testing. It is important to understand how the diagnosis was made and to understand the limitations of the method. Color duplex ultrasound scanning performed with proximal compression or a Valsalva maneuver is useful in providing anatomic and physiologic data helping to confirm a venous etiology for the leg ulcer (Level I).

Principle: Although clinical history and physical examination can be very suggestive of a venous etiology of the lower extremity ulcer after insufficient arterial inflow has been eliminated, a definitive diagnosis of the venous disease is desirable. This is not always possible. When using various tests to document venous disease, it is paramount that the information needed by the clinician be clearly communicated to the test performer.

Evidence:

Guideline #1.3: Patients presenting with an apparent venous ulcer and who are suspected of having sickle cell disease should have a sickle cell prep and a hemoglobin electrophoresis (Level II).

Principle: Patients with homozygous, heterozygous, or trait sickle cell hemoglobin can present with lower extremity ulcers resembling venous ulcers.

Evidence:

Guideline #1.4: Apparent venous ulcers that have been open continuously without signs of healing for 3 months
or that do not demonstrate any response to treatment after 6 weeks should be biopsied for histological diagnosis (Level III).

Principle: Malignancy, vasculitis, collagen-vascular diseases, and dermal manifestations of systemic diseases may present as ulcers on the lower extremity.

Evidence:

Guideline #1.5: Apparent venous ulcers, as well as all wounds, that are excessively painful and that progressively increase in size after debridement and/or treatment should be considered for other diagnoses such as pyoderma gangrenosum, IgA monoclonal gammopathy, Wegener’s granulomatosis, cutaneous chronic granulomatous disease, and mycobacterial or fungal etiologies. This suspicion should be especially high if the ulcer is darker in color, has blue/purple borders, or if the patient has a systemic disease such as Crohn’s disease, ulcerative colitis, rheumatoid arthritis, collagen vascular diseases, leukemia, or immunosuppression (Level II).

Principle: Leg ulcers that worsen in size and symptoms despite treatment, or do not show any improvement over 4 weeks of treatment, should raise suspicion that the ulcer etiology is not venous in origin or that the therapy needs to be re-evaluated. At this point, specific cultures for mycobacteria and/or fungi are useful, as biopsies for histology.

Evidence:

GUIDELINES FOR LOWER EXTREMITY COMPRESSION FOR TREATMENT OF VENOUS ULCERS

Preamble: Venous ulceration results from an elevated ambulatory venous pressure (venous hypertension). This frequently causes edema of the limb. External compression has been the mainstay to combat these problems.

Guideline #2.1: The use of a Class 3 (most supportive) high-compression system (three layer, four layer, short stretch, paste-containing bandages, e.g., Unna’s boot, Duke boot) is indicated in the treatment of venous ulcers. Although these modalities are similar in effectiveness, they can differ significantly in comfort and cost. The degree of compression must be modified when mixed venous/arterial disease is confirmed during the diagnostic work-up (Level I).

Principle: Venous ulcer healing is increased when adequate compression is applied to the lower extremity.

Evidence:

Guideline #2.2: Intermittent pneumatic pressure (IPC) can be used with or without compression dressings and can provide another option in patients who cannot or will not use an adequate compression dressing system (Level I).

Principle: Intermittent pressure stimulates venous return and can be utilized when constant compression is not tolerated.

Evidence:
3. Ennis WJ, Meneses P. Standard, appropriate, and advanced care and medical-legal considerations: part

Because venous hypertension is an ongoing condition, a degree of compression therapy should be continued constantly and forever. (see Long-Term Maintenance Guidelines.)

GUIDELINES FOR INFECTION CONTROL IN THE TREATMENT OF VENOUS ULCERS

Preamble: Infection results when the bacteria : host defense equilibrium is upset in favor of the bacteria. Infection plays various roles in the etiology, healing, operative repair, and complications of venous ulcers.

Guideline #3.1: Remove all necrotic or devitalized tissue by sharp, enzymatic, mechanical, biological, or autolytic debridement (Level I). (Detailed discussion of debridement is in Wound Preparation Guidelines.)

Principle: Necrotic tissue is laden with bacteria while devitalized tissue impairs the body’s ability to fight infection and serves as a pabulum for bacterial growth.

Evidence:


Guideline #3.2: If infection is suspected in a debrided ulcer, or if epithelialization from the margin is not progressing within 2 weeks of debridement and initiation of compression therapy, determine the type and level of infection in the debrided ulcer by tissue biopsy or by a validated quantitative swab technique (Level II).

Principle: High levels of bacteria $\geq 1 \times 10^6$ CFU/g of tissue or any tissue level of beta hemolytic streptococci impede the various wound-healing processes and have been demonstrated to impede spontaneous healing and surgical closure of venous ulcers. Cultures should be performed to isolate both aerobic and anaerobic bacteria.

Evidence:


Guideline #3.3: For ulcers with $\geq 1 \times 10^6$ CFU/g of tissue or any tissue level of beta hemolytic streptococci following adequate debridement, decrease the bacterial level with topical antimicrobial therapy. Once in bacterial balance, discontinue the use of the topical antimicrobial agent to minimize any possible cytotoxic effects due to the antimicrobial agent or emergence of bacterial resistance to the agent (Level I).

Principle: Systemically administered antibiotics do not effectively decrease bacterial levels in granulating wounds; however, topically applied antimicrobials can be effective.

Evidence:


**Guideline #3.4:** Cellulitis (inflammation and infection of the skin and subcutaneous tissue most commonly due to streptococci or staphylococci) surrounding the venous ulcer should be treated with systemic gram-positive bacterial antibiotics (Level II).

**Principle:** Edema fluid (plasma) neutralizes the fatty acids of sebum and inactivates the normal bactericidal properties of skin. This renders the skin and subcutaneous tissue susceptible to infection by streptococci and staphylococci.

**Evidence:**

**Guideline #3.5:** Minimize the tissue level of bacteria, preferably to $\leq 10^5$ CFU/g of tissue, with no beta hemolytic streptococci in the venous ulcer before attempting surgical closure by skin graft, skin equivalent, pedicled, or free flap (Level II).

**Principle:** “A wound containing contaminated foci with greater than $10^5$ organisms per gram of tissue cannot be readily closed, as the incidence of wound infection that follows is 50–100%” Tobin (1984).

**Evidence:**

**GUIDELINES FOR WOUND BED PREPARATION IN THE TREATMENT OF VENOUS ULCERS**

Aspects of wound bed preparation are deliberately left out of this section because they are covered elsewhere. (Detailed discussions of infection control, dressings, and tissue engineering/growth factors are in Infection Control Guidelines, Dressings Guidelines, and Adjuvant Agents [Topical, Device, and Systemic] Guidelines.)

**Preamble:** Wound bed preparation is defined as the management of the wound to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic measures. The aim of wound bed preparation is to convert the molecular and cellular environment of a chronic wound to that of an acute healing wound. The principles of wound bed preparation have been enumerated:


**Guideline #4.1:** Examination of the patient as a whole is important to evaluate and correct causes of tissue damage. This includes factors such as: (A) systemic diseases and medications, (B) nutrition, and (C) tissue perfusion and oxygenation (Level II).
Principle: (A) A general medical history and physical examination, including a medication record, will help in identifying and correcting systemic causes of impaired healing. The presence of a major illness or systemic disease and drug therapies such as immunosuppressive drugs and systemic steroids will interfere with wound healing by alterations in immune functioning, metabolism, inflammation, nutrition, and tissue perfusion. Autoimmune diseases such as rheumatoid arthritis, uncontrolled vasculitis, or pyoderma gangrenosum can all delay healing and may require systemic steroids or immunosuppressive agents before local wound healing can occur. Patients undergoing major surgery have a diminished wound-healing capacity as do chronic smokers. This information in addition to a detailed history of the wound itself is of benefit.

Evidence:
2. William DT, Harding K. Healing responses of skin and muscle in critical illness. Crit Care Med 2003; 31 (Suppl. 8); 547s–57s [LIT REV].

Principle: (B) Nutrition must be adequate to provide sufficient protein to support the growth of granulation tissue. Although most venous ulcer patients are ambulatory and not as nutritionally depleted as patients who require frequent or chronic hospitalization, nutritional support is required if an individual is undernourished.

Evidence:

Principle: (C) Wounds will heal in an environment that is adequately oxygenated. Oxygen delivery to a wound will be impaired if tissue perfusion is inadequate. Dehydration and factors that increase sympathetic tone such as cold, stress, or pain will all decrease tissue perfusion. Cigarette smoking decreases tissue oxygen by peripheral vasoconstriction. For optimal tissue perfusion, these factors must be eliminated or minimized.

Evidence:

Guideline #4.2: Initial debridement is required to remove the obvious necrotic tissue, excessive bacterial burden, and cellular burden of dead and senescent cells. Maintenance debridement is needed to maintain the appearance and readiness of the wound bed for healing. The health care provider can choose from a number of debridement methods including sharp, enzymatic, mechanical, biological, or autolytic. More than one debridement method may be appropriate (Level I).

Principle: Necrotic tissue, excessive bacterial burden, senescent cells, and cellular debris can all inhibit wound healing. Sharp debridement is often the most advantageous. However, the method of debridement chosen may depend on the status of the wound, the capability of the health provider, the overall condition of the patient, and professional licensing restrictions. Excessive debridement can result in a reinstatement of the inflammatory process with a consequent influx of inflammatory cytokines.

Evidence:

**Guideline #4.3:** Wounds should be cleansed initially and at each dressing change using a neutral, nonirritating, nontoxic solution. Routine wound cleansing should be accomplished with a minimum of chemical and/or mechanical trauma (Level III).

**Principle:** Irrigating and cleansing the wound removes loose impediments to wound healing. Sterile saline or water is usually recommended. Tap water should only be used if the water source is reliably clean. Experimental data suggest that a nontoxic surfactant may be useful as may fluid delivered by increased intermittent pressure.

**Evidence:**


**Guideline #4.4:** There should be an ongoing and consistent documentation of wound history, recurrence, and characteristics (location, size, base, exudates, condition of the surrounding skin, staging, and pain) to evaluate wound bed preparation. The rate of wound healing should be evaluated to determine whether treatment is optimal (Level I).

**Principle:** Ongoing evaluations of wound bed preparation are necessary because if the ulcer is not healing at the expected rate, interventions for wound bed preparation need to be reassessed. The longer the duration of the ulcer, the more difficult it is to heal. If an ulcer is recurrent, patient education or issues of prevention and long-term maintenance need to be reassessed.

**Evidence:**

GUIDELINES FOR DRESSINGS IN THE TREATMENT OF VENOUS ULCERS

Preamble: There is a plethora of choices for topical treatment of venous ulcers. Many dressings now combine wound bed preparation, i.e., debridement and/or antimicrobial activity, with moisture control. Guidelines are necessary to help the clinician make decisions regarding the value and best use of these advanced wound care products. Most dressings will be used in combination with compression systems (see Compression Guidelines).

Guideline # 5.1: Use a dressing that will maintain a moist wound-healing environment (Level I).

Principle: A moist wound environment physiologically favors cell migration and matrix formation while accelerating healing of wounds by promoting autolytic debridement. Moist wound healing also reduces pain. Dry dressings, except over intact skin, are considered injurious and can cause desiccation of the wound.

Evidence:

Guideline #5.2: Use clinical judgment to select a wound dressing that facilitates continued moisture (Level I).

Principle: Wet-to-dry dressings are not considered continuously moist. Continuously moist saline gauze dressings are as effective as other types of moist wound healing in terms of healing rate, although they may have other drawbacks such as maceration of the peri-ulcer skin, practicality of use, and cost effectiveness. It can also be very difficult, practically, to keep gauze dressings continuously moist.

Evidence:

Guideline # 5.3: Select a dressing that will manage the wound exudate and protect the peri-ulcer skin (Level I).

Principle: Peri-wound maceration and continuous contact with wound exudate can enlarge the wound and impede healing.

Evidence:


Guideline #5.4: Select a dressing that stays in place, minimizes shear and friction, and does not cause additional tissue damage (Level II).

**Principle:** Wound location, peri-wound skin quality, and patient activity can all affect the choice of dressing. The use of compression systems for venous ulcers alleviates the need for adhesive to keep the primary dressing in place. However, additional tissue damage may result if the dressing causes increased pressure on the wound or damages adjacent tissue. Venous ulcer patients are particularly susceptible to contact dermatitis related to topical therapies.

**Evidence:**


2. Dooms-Goosen A, Degreath E, Parijs M et al. A retrospective study of Patch test results from 163 patients with stasis dermatitis or leg ulcers: I. Discussion of the Patch test results and the sensitization indices and determination of the relevancy of positive reactions. *Dermatologica* 1979; 159: 93–100 [Retro S].


Guideline #5.5: Select a dressing that is cost effective and appropriate to the setting and the provider (Level I).

**Principle:** Because of their low unit cost, moist saline gauze dressings are often viewed as the least expensive and, therefore, most cost-effective dressing. However, as pointed out in Guideline #5.2, it is very difficult to keep a gauze dressing continuously moist. When determining cost effectiveness, it is important to take into consideration health care provider time, ease of use, and healing rate, as well as the unit cost of the dressing.

**Evidence:**


Guideline #5.6: Selectively use adjuvant agents (topical, device, and/or systemic) after evaluating individual patient/ulcer characteristics and when there is a lack of healing progress in response to more traditional therapies. (Detailed discussions of these alternatives are in Adjuvant Agents [Topical, Device, Systemic] Guidelines; Level I.)

**Principle:** Emerging therapies through recombinant technologies and cell-based devices may offer benefit and increase healing in selected patients or difficult wounds. These therapies are quite diverse and are discussed in detail in the Adjuvant Agents Guidelines.

**Evidence:** Evidence references are detailed in the Adjuvant Agents [Topical, Device, Systemic] Guidelines.

**GUIDELINES FOR SURGERY IN THE TREATMENT OF VENOUS ULCERS**

Preamble: The mainstays of moist wound dressings and a compression system are not successful in healing all venous ulcers. Also, they do not fully address the etiology of increased ambulatory venous pressure. Over the years, multiple surgical procedures have been attempted to treat venous ulcers with varying degrees of success. True randomized clinical trials comparing operative techniques are rare in the literature, but data are available supporting surgery in selected patients. These data include a cross-over study (DePalma RG, Kowallek DL. Venous ulceration: a cross-over study from nonoperative to operative treatment. *J Vasc Surg* 1996; 24: 788–92).

Guideline #6.1: Skin grafting of a venous ulcer, without attention to the underlying venous disease, is not a long-term solution and is prone to recurrent leg ulceration (Level I).

**Principle:** Closing the venous ulcer with an autologous skin graft (pinch graft, split-thickness graft, meshed graft, full-thickness graft) may provide a short-term goal of wound closure but does not address the increased ambulatory venous pressure (venous hypertension) that is the underlying cause of the ulcer.
Guidelines for the treatment of venous ulcers

Evidence:


Guideline #6.2: Subfascial endoscopic perforator surgery (SEPS) is the procedure of choice when it is desirable to address the underlying venous pathologic etiology of the ulcer by preventing backflow from the deep to the superficial venous system. To achieve the greatest effectiveness when using this procedure, care must be taken to divide all visible perforators. The procedure is not effective if the patient has severe deep venous disease with either deep reflux or obstruction. The SEPS procedure, with or without skin grafting or use of a bilayered artificial skin, has a lower complication rate, and compares favorably with the more formidable open procedure in terms of ulcer healing and recurrence (Level I).

**Principle:** Interruption of incompetent perforating vessels will aid in decreasing elevated ambulatory venous pressure in the leg.

Evidence:


Guideline #6.3: Less extensive surgery on the venous system such as superficial venous ablation, endovenous laser ablation, or valvuloplasty, especially when combined with compression therapy, can be useful in decreasing the recurrence of venous ulcers (Level I).

**Principle:** Procedures that are less extensive than deep ligation of multiple perforating veins can help to decrease venous hypertension when combined with an adequate compression system.

Evidence:


Guideline #6.4: Free flap transfer with microvascular anastomoses can benefit recalcitrant venous ulcers with severe lipodermatosclerosis by allowing wide excision of diseased tissue and providing uninjured venous valves in the transferred tissue (Level II).

**Principle:** Composite tissue from a nondiseased region of the body can bring abundant tissue with its own microvasculature to an area of injury.

Evidence:


**GUIDELINES FOR THE USE OF ADJUVANT AGENTS (TOPICAL, DEVICE, AND SYSTEMIC) IN THE TREATMENT OF VENOUS ULCERS**

_Preamble:_ Many agents have been suggested for use as adjuvants to moist wound-healing dressings and compression therapy in the treatment of venous ulcers. These adjuvant agents can be divided into topical agents to be applied to the ulcer, devices aimed at accelerating ulcer healing, and systemic drugs to treat the patient. Several of these agents have enough evidence to allow guidelines regarding their use to be developed.

**TOPICAL AGENTS**

_Guideline #7a.1:_ Cytokine growth factors have yet to be shown to demonstrate sufficient statistically significant results of effectiveness to recommend any of them for treatment of venous ulcers, although isolated reports suggest their potential usefulness (Level I).

_Principle:_ Cytokine growth factors are messengers/mediators of the wound-healing scheme. They have been shown to be deficient or trapped in chronic wounds, so theoretically they could be useful for treatment of venous ulcers, and several authors have reported positive results in small series.

_Evidence:_


_Guideline #7a.2:_ Topical application of oxygen-derived free radical scavengers have been reported to be beneficial for treatment of venous ulcers, as has a topical fibrinolytic agent. Neither of these modalities have sufficient data to recommend their use (Level I).

_Principle:_ Ischemia–reperfusion injury mediated by oxygen-derived free radicals has been suggested to play a role in the etiology of venous ulcers. Fibrin deposition is also an important pathogenic component of venous ulceration. Therefore, agents to decrease or abrogate these effects could theoretically be useful treatments.

_Evidence:_


**DEVICES**

_Guideline #7b.1:_ There is evidence that a bilayered artificial skin (biologically active dressing), used in conjunction with compression bandaging, increases the chance of healing a venous ulcer compared with compression and a simple dressing (Level I).
Principle: Various skin substitutes or biologically active dressings are emerging that provide temporary wound closure and serve as a source of stimuli (e.g., growth factors) for healing of venous ulcers.

Evidence:

Guideline #7b.2: Cultured epithelial autografts or allografts have not been demonstrated to improve stable healing of venous ulcers (Level I).

Principle: Although cultured epithelial autografts (CEA) have been useful in thermal burns, they do not appear to be durable enough to be sustained on venous leg ulcers.

Evidence:

Guideline #7b.5: Electrical stimulation may be useful in reducing the size of venous leg ulcers (Level I).

Principle: Various methods of electrical stimulation have been reported to improve wound healing in many settings. Not enough data exist to determine whether the electrical stimulus should be high voltage, low voltage, or pulsed and whether AC or DC current is superior.

Evidence:

Guideline #7b.4: Negative pressure wound therapy may be useful prior to a skin graft/flap by helping promote the development of granulation tissue in the wound base, or postoperatively by preventing shearing and removing exudates. However, its reported experience in venous ulcers is limited (Level II).

Principle: Negative pressure wound therapy applies negative pressure to help remove fluid, assist in granulation tissue formation, decrease wound size, and help promote skin graft take.

Evidence:

Guideline #7b.6: Laser therapy, phototherapy, and ultrasound therapy have not been shown statistically to improve venous ulcer healing (Level I).

Principle: There are theoretical reasons and preclinical studies suggesting that modalities such as laser therapy, phototherapy, and ultrasound therapy might be useful in the treatment of venous ulcers. Available evidence does not support their use.

Evidence:


Guideline #7b.6: Sclerotherapy may be useful as an adjunct to compression therapy in the treatment of venous ulcers (Level III).

Principle: Sclerosing superficial veins may be similar to surgical superficial vein ablation, which, when used with an adequate compression system, may improve ulcer treatment.

Evidence:

SYSTEMIC AGENTS

Guideline #7c.1: Pentoxifylline used in conjunction with compression therapy improves healing of venous ulcers (Level I).

Principle: Improvement to the microcirculation of the leg should theoretically aid the healing processes of venous ulcers.

Evidence:


Guideline #7c.2: The role of eicosanoids (prostaglandins) or prostaglandin antagonists in the treatment of venous ulcers lacks sufficient data to allow a recommendation (Level II).

Principle: Vasodilating and antiplatelet sticking effects of certain eicosanoids such as PGE or PG1 could theoretically improve venous insufficiency and minimize ulceration.

Evidence:


Guideline #7c.3: Oral treatment with micronized purified flavonoid fraction (MPFF) may be a useful adjunct to conventional compression therapy in the treatment of leg ulcers (Level I).

Principle: Agents that inhibit synthesis of prostaglandins and free oxygen radicals, decrease microvascular leakage, and inhibit leukocyte trapping and activation should theoretically aid in the healing of venous ulcers.

Evidence:


5. Ramelet AA. Clinical benefits of Daflon 500 mg in the most severe stages of chronic venous insufficiency. Angiology 2001; 52 (Suppl. 1): s49–56 [LIT R].

**Guideline #7c.4:** Fibrinolytic enhancement with an anabolic steroid such as stanozolol in conjunction with compression therapy may be useful in treating lipodermatosclerosis associated with venous ulcers. However, one must be aware of side effects (Level II).

**Principle:** A fibrinolytic agent capable of decreasing extravascular fibrin should be able to decrease induration and inflammation in cases of lipodermatosclerosis.

**Evidence:**

**Guideline #7c.5:** Oral zinc supplementation is not useful in the treatment of venous leg ulcers (Level I).

**Principle:** Adding zinc to patients without a deficient total body zinc reservoir will not improve healing of chronic wounds such as venous ulcers.

**Evidence:**

**GUIDELINES FOR LONG-TERM MAINTENANCE IN TREATMENT OF VENOUS ULCERS**

**Preamble:** Venous ulcers of the lower extremity are a chronic, long-term problem. Recurrence rates are as high as 70%. Therefore, long-term maintenance must be addressed even for healed ulcers.

**Guideline #8.1:** Patients with healed or surgically repaired venous ulcers should use compression stockings constantly and forever (Level I).

**Principle:** Most treatments do not eliminate the underlying increased ambulatory venous pressure (venous hypertension), so a degree of compression is necessary long term.

**Evidence:**

**Guideline #8.2:** Exercises to increase calf muscle pump function have been demonstrated to be helpful in long-term maintenance and venous ulcer prevention (Level III).

**Principle:** Calf muscle pump function has been shown to be improved with exercises.

**Evidence:**

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