
The local treatment and available dressings designed for chronic wounds

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The great diversity of wounds and the broad range of available dressings complicate the selection of proper chronic wound treatment. Choosing the right treatment is the essential step in the healing process. In this review, we focus on chronic nonhealing ulcers, which are a critical problem in clinical practice, and current knowledge about persistent wound care. Here, we present the objectives of local treatment with description of several types of dressings and their ingredients, features, indications, and contraindications. These include hydrocolloid, alginate, hydrogel, and dextranomer dressings; polyurethane foam and membrane dressings; semipermeable polyurethane membrane dressings; and TenderWet (Hartmann, Rock Hill, SC) and flax dressings. There is also a brief section on the use of other alternative wound-healing accelerators, such as platelet-rich plasma and light-emitting diode therapy. (J Am Acad Dermatol 2013;68:e117-26.)

Key words: chronic wounds; wound dressings; wound therapy.

Chronic wounds are wounds that take more than 8 weeks to heal despite optimal local and general treatment.^{1,2} They include venous ulcers, ischemic wounds (mostly of atherosclerotic origin), diabetic foot syndrome, and decubitus ulcers (trophic). Chronic wounds that rarely occur in clinical practice include burning (chemical, thermal, electric) and frost-bite wounds, wounds remaining after surgical intervention, wounds caused by cancer, immunologic and hematologic wounds, pyoderma gangrenosum, wounds accompanied by congenital vascular malformations, and iatrogenic wounds such as complications arising from treatment. Chronic nonhealing ulcers are a critical problem in clinical practice. Slow healing, difficulty in providing proper healing support or treatment methods, and patient suffering are great challenges for modern medicine.³

TREATMENT

The treatment of chronic wounds involves ensuring the balance of factors that determine wound healing. Such treatment should be complex, organized, and based on cooperation between the physician and the patient.

The complex treatment of ulcers consists of the following methods:

- Wound diagnostics.
- Causal treatment directed at the principal disease (eg, metabolic control of diabetes, prevention of chronic venous insufficiency, slowing the progression of *atherosclerosis*), with a discontinuation of medications that inhibit wound healing, if possible. This could include:
 - conservative treatment, eg, compression therapy, laser therapy, correction of risk factors, education;
 - pharmacotherapy, eg, anti-inflammatory therapy, analgesic treatment, anticoagulant therapy, antibiotic therapy; or
 - invasive treatment, eg, thromboendarterectomy, recanalization of thrombus, elimination of venous reflux.
- Exclusion of other factors that inhibit healing processes.
- Local treatment. This could be:
 - the mechanical removal of necrotic tissues through surgical procedures, ulceration hygiene, and enzymatic debridement;

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- in some cases of invasive infection, bacteriologic control and treatment consistent with bacteriologic culture and antibiogram;
- the application of biologically active dressings, and skin and skin-muscle grafts.
- General treatment, systemic treatment (anti-coagulant treatment, systemic antibiotic therapy, anti-inflammatory therapy, therapy inhibiting immunologic reactions, vasodilator treatment, rheology-improving drugs, and protein, vitamin, and microelement supplements).
- Systemic evaluations of healing progress.
- Patient education.

Local treatment—objects

- Cleaning stage

This stage involves the mechanical debridement of necrotic tissues, contaminations, foreign bodies, infectious ulcer tissues, and often wound edges to achieve improved perfusion. When abscesses appear, they must be opened and drained. After the wound cleaning, it is crucial to provide the optimal conditions for the biochemical processes and activity of the cells that take part in regeneration. These include moderate humidity of the wound bed environment, oxygen supplementation, normal gas exchange, and the optimal temperature and pH. Furthermore, it is essential to perform active diagnoses and aggressively treat infections.

- Proliferation stage

The crucial element of the local treatment of an ulcer is providing the newly formed tissue with the optimal humidity. Drying an ulcer causes cell death and inhibits healing. However, it is crucial to remove the excess exudates to prevent wound edge maceration. It is necessary to protect the sensitive granulation and epithelium against injury. During this stage of healing, it is also important to have the optimal level of oxygen access to the wound. Some authors emphasize the role of antioxidants (vitamin C) in wound healing.

- Wound closure and scar formation stage

Similarly to granulation tissue, the newly formed epithelium needs the optimal humidity, temperature, pH, and oxygen, which are all crucial for cell migration. The wound needs to be protected against harmful external factors.

The European Wound Management Association described a strategy called TIME, which refers to the methods of reinforcing the natural healing processes, and eliminating aggressive and proliferation-inhibiting activities.

- T (tissue management)—wound cleaning
- I (infection or inflammation)—decolonization and inhibition of infection
- M (moisture imbalance)—humidification
- E (edge of the wound, epithelium)—epithelialization support

These objectives can be reached by using the appropriate wound dressings and other alternative wound-healing accelerators that take an active part in the healing process. For example, an autologous platelet concentrate suspended in plasma, known as platelet-rich plasma, is a rich source of platelet-derived growth

factors, which accelerate healing via the activation of fibroblast, smooth muscle cell, and osteoblast proliferation. There are some commercially available devices used for the preparation of platelet-rich plasma, eg, AutoloGel (Cytomedix, Gaithersburg, MD) and SafeBlood (SafeBlood Technologies Little Rock, AR). These two methods can be prepared at the bedside for immediate application.⁴ Also of interest is the use of a light-emitting diode, which is a safer alternative to laser therapy and improves fibroblast proliferation by providing energy to the cells. The mitochondria of the damaged cells are provided with photon energy, which increases the respiratory metabolism of the cells thus enhancing the chance of survival and repair.⁵

For effective local treatment, it is crucial to choose an appropriate dressing with reference to the localization, character, depth and area of the injury, the level of exudates, any infection, the healing stage (Table I), and the skin type.⁶⁻⁸

Local treatment—an optimal dressing⁶

- guarantees the physical continuity of the wound;
- actively cleans the wound;
- absorbs excess exudates;
- protects against infection and external factors;
- provides the optimal pH, thermoregulation, gas exchange, and humidity;

CAPSULE SUMMARY

- Chronic nonhealing ulcers are a critical problem because of slow healing, difficulty in providing proper healing support/treatment methods, and patient suffering.
- We present the main objectives of local treatment in terms of healing pathophysiology.
- We focus on persistent wound care using local treatment with description of several types of dressings, their content, mechanism of action, advantages, and disadvantages.

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