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## Chapter 18

# CHRONIC WOUNDS

### KEY FIGURES:

Open wound

Wound covered with skin graft

Chronic wounds are open wounds that for some reason simply will not heal. They may be present for months or even years. Often, especially in rural settings, the wounds have not received adequate care. The most important component of the overall treatment plan must be to identify and treat the underlying cause that interferes with normal wound healing.

Begin by taking a thorough history to find out about the patient's medical status as well as information about the events that contributed to the development of the wound. Next, thoroughly examine the wound. From this information, the underlying cause for the nonhealing wound usually can be identified.

Once the cause is identified and properly treated, the basic principle of chronic wound treatment is essentially the same as those of secondary wound healing: regular dressing changes. For large wounds, a skin graft or flap may be required for final closure.

This chapter discusses the most common underlying causes (with treatments) for a nonhealing wound. In addition, a few specific, problematic chronic wounds are described.

## ***Common Causes and Treatments***

### *Neglected Wound/Poor Wound Care*

Especially in the rural setting, many chronic wounds do not heal simply because of inadequate wound care. Without proper care, the wound becomes covered with dead (necrotic) tissue. To achieve wound closure, all necrotic tissue must be removed (debrided), either with wet-to-dry dressings or with surgical debridement.

### *Surgical Debridement*

When a wound is covered with black, dead tissue or thick gray/green exudate, dressings alone may be inadequate. Surgical removal of a significant amount of necrotic tissue may allow successful wound closure with wet-to-dry dressings.

Using a forceps, pick up an edge of the dead tissue and cut it off the wound with a scalpel or scissors. This procedure usually is not painful because the tissue that you are cutting into is already dead. If it hurts, you are near healthy tissue.

Bleeding tissue is a good sign and indicates that you are in an area of healthy tissue. Dead tissue does not bleed.

This procedure can be repeated as often as necessary. You do not have to remove all necrotic tissue with one procedure.

Once the necrotic tissue has been removed, regular dressing changes should be started. Wet-to-dry dressings are the most appropriate choice. Dressings should be changed at least 2 times daily and optimally 3 or 4 times (in areas where dressing supplies are plentiful) until the wound heals. See chapter 9, "Taking Care of Wounds," for a detailed description of dressing options.

### *Foreign Material in the Depths of the Wound*

A foreign body in the depths of a wound may prevent healing. Foreign material such as glass, wood, or metal fragments can cause an inflammatory reaction in the tissues that will not resolve until the foreign material is removed.

The history often provides information that leads you to suspect that foreign materials may be the problem. An x-ray may be useful, but many foreign objects do not show up on x-rays.

Often foreign material is removed with overlying dead tissue during surgical debridement, allowing the wound to heal with dressing changes.

### *Infection*

If signs of surrounding soft tissue infection (redness, warmth, pain, swelling) are present, oral or intravenous antibiotics should be given. The presence of an open wound, in and of itself, does not necessitate oral or intravenous antibiotic administration.

Infection of the underlying bone (**chronic osteomyelitis**) may cause a chronic nonhealing wound. An x-ray may show irregularity in the periosteum (the thin layer of connective tissue around the bone), and signs of bone destruction may be seen.

Infection of the bone often requires at least 6 weeks of antibiotics. In addition, orthopedic and reconstructive surgical expertise is usually required for successful treatment because bone debridement and coverage with a muscle flap may be required for control and resolution of the infection—especially when an infection develops after an open fracture.

### *Tobacco*

Tobacco use interferes with wound healing through a combination of two mechanisms:

1. The vasoconstrictive effects of nicotine decrease local blood circulation to the skin. Thus, less blood and oxygen (and other factors that promote healing) reach the wound.
2. The carbon monoxide present in tobacco smoke further decreases oxygen delivery to the tissues because carbon monoxide decreases the ability of hemoglobin to release oxygen to the tissues.

All patients should be counseled not to smoke, especially patients with open wounds. When the patient stops smoking, the improvement in the wound may be dramatic.

### *Cancer*

In a long-standing wound that looks clean but still will not heal, the wound may be harboring an underlying cancer. Often such wounds look a little different from the usual chronic wound. The tissues around the wound edges may be raised and highly irregular, and irregular red patches may be seen in the surrounding skin.

The concern about an underlying cancer is especially applicable in chronic wounds in elderly patients and on sun-exposed areas of the body.

We tend to expect basal cell or squamous cell skin cancers to be relatively small (< 2–3 cm), but, if left untreated, they can grow to be quite large. Cancer of the breast and soft tissue sarcomas can erode through the skin to create a chronic open wound. Usually, these two types of cancer are associated with a large soft tissue mass underlying the wound.

For such wounds to heal, the entire lesion—i.e., the entire area involved with cancer—must be excised. If the wound is small (< 1–2 cm), immediate excision is indicated. In larger wounds, an incisional biopsy should be done to get a preliminary diagnosis, which helps to plan the definitive resection. See chapter 22, “Skin Cancer,” for details.

### *Malnutrition*

For a wound to heal, the patient's nutritional status must be sound. An adequate diet supplying the proper amount of calories and protein on a daily basis is very important. The importance of nutritional factors in wound healing is illustrated by the fact that elective surgery often is contraindicated in patients without adequate protein stores.

#### *How to Assess Nutritional Status*

The liver produces various proteins that have been found to correlate well with nutritional status. Examples include albumin, prealbumin, and transferrin. Although albumin does not correlate with nutritional status as well as the other two, measurement of serum albumin is helpful if the more expensive tests for prealbumin and transferrin are unavailable.

<b>Protein</b>	<b>Normal Value</b>
Albumin	3.5–5.0 gm/dl
Prealbumin	10–40 mg/dl
Transferrin	200–400 mg/dl

Vitamin C, vitamin A, iron, and zinc are also important nutrients for proper wound healing. In malnourished patients, vitamin/mineral supplements may be beneficial. In adequately nourished patients, however, extra doses of these nutrients are not necessarily useful.

As stated below in the discussion of radiation, vitamin E may be useful in a wound exposed to radiation. However, high doses of vitamin E interfere with normal wound healing in patients without a deficiency.

Although nutritional supplements may be required in severely malnourished patients, nutritional counseling may be all that is needed for most patients. Nutritional supplements, such as high protein/calorie drinks/puddings, are often quite expensive and unnecessary. See chapter 8, "Nutrition," for more detailed information.

### *Diabetes*

An elevated blood glucose level decreases the body's natural ability to heal wounds. For this reason, patients with diabetes must watch their diet and regularly check glucose levels. High glucose levels should be treated with the appropriate medications (insulin or an oral agent) to maintain the best possible blood glucose control.

## *Medications*

Ask all patients about use of prescription and over-the-counter medications. Several classes of medications interfere with wound healing:

### *Steroids*

Steroids significantly interfere with normal wound healing. Vitamin A may counteract the effects of steroids and promote healing. Try giving vitamin A orally (25,000 IU/day) or topically (200,000 IU/8 hours) for 1–2 weeks, and see if the wound begins to heal.

### *Nonsteroidal Anti-inflammatory Drugs (NSAIDs)*

NSAIDs (e.g., aspirin, ibuprofen) interfere with wound healing by decreasing collagen production. The precise mechanism is not fully understood. If the patient has a chronic wound and is taking NSAIDs, see if switching to another type of medication (e.g., acetaminophen) results in improved wound healing.

## *Radiation Injury*

The patient may give a history of previous radiation therapy to the area around the wound. Radiation damages the ability of the tissues to promote new blood vessel growth as well as interferes with cellular functions necessary for wound healing. These effects are not reversible once the radiation exposure has been completed and in fact may worsen with time. Because of these effects, a seemingly minor injury in an area that previously received radiation may result in a chronic, open wound.

Vitamin E has been shown to improve wound strength in areas exposed to radiation. It may be useful to try a short course (1–2 weeks) of oral vitamin E supplementation (100–400 IU/day) to see whether the status of the wound improves.

Often the entire wound may need to be excised to remove the damaged, radiated tissue. Especially if no reconstructive specialists are available, try local wound care for a few weeks after excision to see whether the wound begins to heal. If this treatment is unsuccessful, a split-thickness skin graft or, more likely, a flap may be required for wound closure.

## ***Specific Problematic Wounds***

### *Leg Ulcers*

Leg ulcers usually are caused by problems in either the arterial circulation or the venous circulation (or sometimes a combination of the two).

### *Arterial Insufficiency*

Leg ulcers due to blockages in the arterial circulation tend to develop over the medial aspect of the ankle. Compare the temperature of the patient's feet: is one foot cooler than the other? Coolness is a sign of inadequate arterial blood flow.

Check for the presence of palpable pulses in the foot and ankle. If you cannot feel the dorsalis pedis artery (on the top of the foot) or the posterior tibial artery (behind the medial malleolus), the patient probably has a problem in the arterial circulation. Even if you cannot feel a pulse in the foot vessels, blood flow to the foot may be sufficient to allow a properly treated wound to heal. Absence of a pulse, however, does indicate that the vessels are significantly diseased.

There are many high-tech ways to examine the patency of the blood vessels of the legs. Some are invasive (e.g., arteriogram, in which dye is injected into the vessels and x-rays are taken), and some are not (e.g., Doppler studies using sound waves to examine the vessels). A simple test to measure blood flow to the foot is as follows:

1. Measure the systolic blood pressure in the foot and divide this number by the systolic blood pressure in the arm (at the brachial artery, the usual place to check blood pressure).
2. The result is the **ankle/brachial index (ABI)**, which compares blood flow to the ankle with blood flow through the upper extremity. Because the upper extremity is rarely affected by vascular disease, the ABI allows you to determine the degree of diminution of blood flow to the foot.
3. An ABI  $> 0.5$  indicates that sufficient blood reaches the foot to allow wound healing.
4. An ABI  $< 0.4$  indicates poor blood flow to the foot. Healing probably will not occur unless a vascular bypass is done to bring more blood into the lower extremity.

### *Venous Insufficiency*

Ulcers due to problems with the venous circulation tend to be on the lateral side of the ankle or lower calf. Arterial pulses are usually normal. Such ulcers can become quite large (10–15-cm wounds are common).

The foot, ankle, or calf around the wound is often chronically swollen, and obvious skin changes are present. Skin changes include woody induration (the skin feels very hard) and brawny discoloration. Enlarged varicose veins are usually present.

### *Combination Arterial and Venous Insufficiency*

Unfortunately, many patients with leg ulcers do not have purely arterial or purely venous problems. Often the disease involves both arteries and veins.

#### *Treatment*

Leg ulcers are often quite difficult to treat. Although we try to avoid amputation, sometimes it is the only successful treatment option.

#### **If the cause is inadequate arterial circulation:**

1. If the ABI is  $> 0.5$ , the wound has a high likelihood of healing with proper local care (dressings) or a skin graft.
2. If the ABI is  $< 0.4$ , the chance of healing without vascular bypass to bring more blood to the area is low.
3. If no one with vascular surgical expertise is available, it is worth trying local wound care to see if the wound improves. If this attempt is unsuccessful, amputation may be the only way to obtain a closed wound.

#### **If the cause is venous insufficiency:**

An important component of treatment is to decrease the swelling in the foot or calf:

1. The patient should elevate the affected leg as much as possible. In bed the foot should be propped on a pillow. When the patient is seated, the foot should be propped on a stool so that it does not dangle dependently.
2. The patient also should wrap the leg with Ace wraps or wear support stockings to improve blood flow through the veins and out the lower leg. This strategy also helps to decrease leg swelling.
3. The Ace wraps should start at the toes and gradually go up to the calf. Be sure that the wrap is not too tight. It should be tighter at the toe than at the ankle and tighter at the ankle than at the calf. If the Ace wrap is not properly applied (i.e., if it is tighter at the ankle than the foot), it will cause constriction at the ankle and worsen the swelling in the foot.
4. In patients with arterial and venous problems, take care that the Ace wraps and support stockings do not impede arterial circulation.

Venous ulcers are notoriously difficult to treat. In some patients, especially those treated before the tissues of the leg become hard and woody, control of swelling and proper wound care allow venous ulcers to heal. For large venous ulcers, a split-thickness skin graft may be indicated, but there is a high chance that the graft will not work.

**If the problem is a combination of arterial and venous insufficiency:**

Each problem must be addressed separately. However, if the arterial inflow is poor, no matter how aggressively the venous problems are treated, wound healing will not occur.

*Pressure Sores*

A pressure sore is a chronic wound caused by prolonged application of pressure to an area of soft tissue. Usually these wounds develop over a bony prominence. (See chapter 17, “Pressure Sores,” for detailed information.)

***Overview of Treating Chronic Open Wounds***

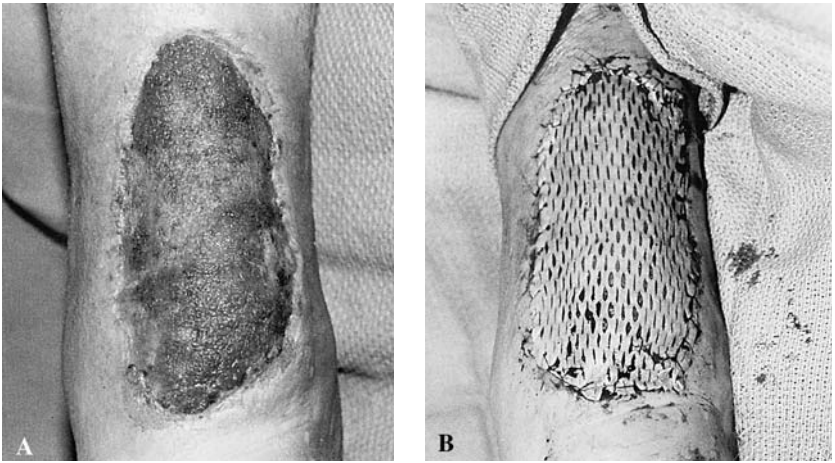
The key strategies to promote healing of a chronic open wound can be summarized as follows:

- Remove all dead tissues overlying the wound with either dressings or surgical debridement.
- Remove any foreign material from the wound.
- Treat with oral or intravenous antibiotics if signs of underlying or surrounding infection are present. The presence of an open wound in and of itself does not necessitate antibiotic administration.
- Identify other underlying causes that may prevent wound healing. Provide appropriate treatment.
- Because good nutrition is essential for wound healing, be sure that the patient gets enough calories and protein. A multivitamin may be helpful, but encourage the patient to eat a nutritious diet.
- Stop smoking.
- Adequate local wound care is essential. Dressings should be changed at least twice daily (3–4 times is optimal for a dirtier wound), and the wound should be cleansed with gentle soap and water or saline with each dressing change. Wet-to-dry dressings are often the method of choice. Wet-to-wet dressings or antibiotic ointment can be used once the wound is clean.

It may take weeks or even months for a wound to heal in this manner, but you should see gradual improvement. It is a good idea to measure the dimensions of the wound at each visit to document how the wound is progressing.

Large wounds (> 8–10 cm) may take many months to heal. Once the wound is clean and starting to heal, it may be useful to consider covering the wound with a split-thickness skin graft or a flap to hasten wound healing (see the appropriate chapters for more details).





*A*, Large (12 × 6 cm) chronic wound on the back of the calf. *B*, Wound covered with a split-thickness skin graft to promote closure.

### ***Bibliography***

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