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# Medical and surgical treatment of chronic venous ulcers



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## ARTICLE INFO

## ABSTRACT

Venous ulcer of the lower extremity is a common vascular condition and is associated with decreased quality of life, reduced mobility, and social isolation. Treatment of chronic venous ulcer (CVU) includes compression therapy, debridement of the ulcer when necessary, and wound care. Collagen and antimicrobial dressings can improve the proportion of ulcers healed compared with compression alone. Acellular skin equivalents are not superior to compression, but cellular human skin equivalents can promote more rapid healing, particularly in patients with longstanding ulcers. Current vascular surgical practice is to eliminate documented reflux or obstruction in patients with CVU that have failed a 3-month period of compression dressing, debridement, and local wound care. We found that surgical treatment of the superficial venous system can decrease the time to healing of CVUs compared with compression therapy alone, but does not increase the proportion of ulcers healed.

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## 1. Introduction

Venous ulcers are the most common ulcer of the lower extremity, with an incidence between 500,000 to 2 million people per year in the United States [1]. A 2006 study by Bergan and colleagues found that chronic venous disease accounts for up to 3% of total health care budgets in developed countries [2]. Venous leg ulcers are more likely to occur in people older than 60 year of age and in females [3]. The underlying causes of venous ulcers include elevated venous pressure, turbulent flow, and inadequate venous return [4]. Risk factors for chronic venous disease include underlying conditions associated with poor venous return (including congestive heart failure and obesity) and primary destruction of the venous system (including prior deep venous thrombosis, recreational injected drug use, phlebitis, and venous valvular dysfunction) [4].

Venous ulcers are generally diagnosed clinically based on anatomic location, morphology, and characteristic skin changes. The diagnosis can then be confirmed by assessing the functionality of the venous system using imaging. The gold standard for diagnosing venous disease is venography, but it is rarely used today due to expense, morbidity, and the availability of noninvasive tests. Instead, venous duplex ultrasound is most commonly used to diagnose venous abnormalities [2,5]. Chronic venous ulcers (CVUs) are defined as an ulcer that has been present for a minimum of 6 weeks with evidence of earlier stages of venous disease, including varicose veins, edema, and pigmentation [4]. Many CVUs are longstanding, with a mean duration of 9 months, and up to two-thirds are present for more than 5 years [3]. CVUs are associated with a decrease in quality of life due to pain, loss of function, reduced mobility, and social isolation [2]. The aim

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of this paper was to provide an evidence-based guideline for the best medical and surgical treatments for CVUs.

## 2. Medical therapy

The current standard therapy for CVUs includes compression of the lower limb with debridement of the ulcer, which heals 50% to 60% [2]. A 2009 Cochrane review of 39 randomized controlled trials (RCTs) comparing different wound dressings for venous ulcers concluded that compression dressings speed wound healing in venous ulcers. They also found that two layers of compression—with one layer being elastic and achieving 20 to 30 mm Hg of compression and effectively reducing venous hypertension—was necessary for effective ulcer healing [6]. However, no consensus exists about which second- and third-line therapies are the best. Additionally, the choice of dressings may change during the course of therapy, concomitant with the changing nature of the wound base and exudate, and the selection of particular dressings requires training and expertise in wound care [4].

In a previous study by our group, we performed a systematic review of the best treatments for CVUs. The review examined the use of advanced wound dressings, systemic antibiotics, and venous surgery during the use of adequate venous compression. The search included >10,000 publications from January 1980 to July 2012, and 62 publications were determined to be relevant [4]. The categories, classifications, and characteristics, of wound dressings with active chemical, enzymatic, biologic, or antimicrobial components are listed in Table 1.

### 2.1. Alternate wound dressings

A Cochrane review found no data to support the superiority of specific dressings [7]. In our 2014 systematic review, we found three RCTs, including a total of 361 patients, that compared ulcer healing using a hydrocolloid dressing versus at least two layers of compression. One study showed a shorter healing time with hydrocolloid dressings, but overall wound healing across the three studies was not different [4]. There were four studies with a total of 420 subjects comparing hydrocolloid dressings with other dressings, but the studies had high risk of bias and results were inconsistent [4]. There were no studies that compared compression therapy with foam dressings, which are often used to manage exudates. Additionally, studies that evaluated additives to dressings, including shale oil, tenuiflora bark, and human keratinocyte lysate, found no difference [4]. There was one RCT with 120 patients that compared collagen dressings with compression dressings and found a higher proportion of ulcers healed with the collagen, but no difference in wound recurrence rate [4,8]. Three studies evaluated acellular human skin equivalents, but had significant risk of bias with no consistent interventions and no improvement in wound healing [4,8,9]. Four studies evaluated cellular dressings, including cryopreserved human fibroblast–derived dermal substitutes, allogenic bilayered human skin equivalents, autologous keratinocytes in a fibrin sealant, and biodegradable mesh containing fibroblasts (Dermagraft®;

Organogenesis, Marston, WA) [10–13]. One of the studies demonstrated an improvement in ulcer healing as measured by total ulcer area, but another study with limited power showed no difference [4,10]. One study evaluating allogenic bilayered human skin equivalents reported improvement in wound healing, especially in patients with ulcers lasting more than 1 month that had previously failed treatment with compression dressings [12]. However, recurrence rates were not different between intervention and control groups. The fourth study reported a greater proportion of ulcers healed with the addition of autologous living keratinocytes than with compression alone [4,10–13].

### 2.2. Antibiotics

All chronic wounds become contaminated or colonized with bacteria, but infection only occurs when the bacteria start to invade the tissue. Signs of infection include pain, erythema, swelling, exudates, and odor. Antibiotic use is widely prevalent in the management of venous ulcers, but many patients receive them in the absence of clinical symptoms or signs of infection [14]. In our Agency for Healthcare Research and Quality review, three RCTs found significantly faster wound healing rates with antimicrobial dressings compared with other dressings [4,15,16]. However, silver dressings did not improve wound healing compared with nonsilver dressings [4]. Only one RCT examined the use of systemic antimicrobials in addition to compression therapy. The study of 36 patients compared ciprofloxacin and compression versus trimethoprim and compression versus compression alone and showed no improvement in wound healing with either systemic antibiotic compared with compression alone [4,17].

## 3. Surgical therapy

The current surgical practice is to eliminate documented reflux or obstruction in patients with chronic venous ulceration that have failed a 3-month period of compression dressing, debridement, and antibiotics [14,18]. Surgical therapies include treatments of the superficial, perforator, and deep venous system. The superficial venous system can be treated with ligation and division of the great saphenous vein at the saphenofemoral junction or the small saphenous vein at the saphenopopliteal junction, saphenous vein stripping, and stab phlebectomy of tributaries to the great or lesser saphenous vein. The perforator venous system can be treated with ultrasound-guided direct ligation and thermal or chemical ablation of the perforator vein. It can also be treated with the Hach procedure, which involves paratibial fasciotomy and dissection of the posterior perforator veins. Obstruction of the deep venous system can be treated with bypassing, stenting, or angioplasty of the stenotic vein segment. Reflux of the deep venous system can be treated with valvuloplasty or valve replacement with an autogenous vein valve from the upper extremity [19].

In a 2014 systematic review, our group found 8 studies comparing surgical intervention with compression and 3 studies comparing surgical treatments with no-concurrent-compression comparison groups [4]. Two studies, one RCT

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