Diagnosis and Management of Venous Ulcer Disease

Peter S. Liao, MD, PhD.

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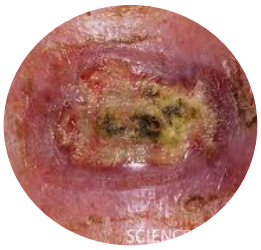
Lower Extremity Ulcer



An ulcer is a defect with loss of epidermis and at least part of the dermis

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WHY SHOULD WE CARE ABOUT VENOUS LEG ULCER PATIENTS

1 million people in the U.S. are affected by venous leg ulcers[1]	**21%** of all wounds seen in wound care clinics are characterized as venous ulcers[2]
50%-70% of lower extremity ulcers are venous[3,4]	**$14.9 billion** is spent annually to treat venous ulcers[3]

Due to pain, mobility limitations and other consequences, venous leg ulcers have been associated with increased rates of depression and substantial decreases in patient quality of life.[5,6,7]

[1]Internal Data,Dymedex Study
[2]The Outpatient Wound Clinic Market 2013 Report and Analytics, Net Health Analytics (2010-2012 claims data
[3]Rice J (2014). Burden of venous leg ulcers in the United States. Journal of Medical Economics. 17(5), 347-356
[4] O'Donnell TF, Passman MA, Marston WA, et al. Management of venous leg ulcers: Clinical Practice Guidelines of the Society for Vascular Surgery® and the American Venous Forum. J Vasc. Surg. 2014: 60, 3S-59S
5. Valencia IC, Falabella A, Kirsner RS, et al. Chronic venous insufficiency and venous leg ulceration. J Am Acad Dermatol 2001;44:401-21
6. Phillips T, Stanton B, Provan A, et al. A study of the impact of leg ulcers on quality of life: financial, social, and psychologic implications. J Am Acad Dermatol 1994;31:49-53
7. Green J, Jester R. Health-related quality of life and chronic venous leg ulceration: part 1. Wound Care 2009;December:S12-S17

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Venous Leg Ulcer Facts

- Active ulcers are seen in ≈1% of the adult population.
- ≈3 million people have CVI in the United States, and ≈33% develop venous ulcers.
- More than 50% of venous ulcers require prolonged therapy lasting >1 year.
- The socioeconomic impact of venous ulceration:
  - impaired ability to engage in social and occupational activities
  - reducing the quality of life
  - imposing financial constraints

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Venous Leg Ulcer Facts

- Disability related to venous ulcers
  - loss of productive work hours, estimated at 2 million workdays/year
  - 12.5% of workers with venous ulcers forced to retire early
- The financial burden of venous ulcer disease on the healthcare system!
  - Up to 2% of the total healthcare budget in USA

COLLINS L , SERAJ S. Diagnosis and Treatment of Venous Ulcers. ***Am Fam Physician.*** **2010;81(8):989-996, 1003**

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CAUSES OF LOWER LIMB ULCERATION

1. Venous insufficiency (50 -70%)
2. Diabetes (15 -25%)
3. Arterial insufficiency (10 -20%)
4. Vasculitis
5. Hematologic disease
6. Infections
7. Trauma
8. Drugs/therapy:-hydroxy urea
9. Skin Conditions:- pyoderma gangrenosum, necrobiosis lipoidica
10. Malignancies
11. Genetic :-prolidase deficiency, Klinefelter`s syndrome

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TABLE 1. Differential Diagnosis of Lower Extremity Ulcers

	Venous	Arterial	Diabetic
History	• rapid onset • edema • trauma • thrombophlebitis (20%)	• slowly progressive • arteriosclerosis • claudication • age usually > 45 years • significant smoking history • hypertension • hyperlipidemia	• diabetes • peripheral neuropathy
Pain	• some pain • increases with dependency • decreases with elevation	• moderate to severe • intermittent claudication • decreases with dependency • increases with elevation (at night) or leg exercises	• neuropathy (not painful) • anesthesia • paresthesia
Location	• medial malleolus • ankle • lower calf • stocking distribution	• lateral malleolus • anterior tibia • toes, heels, bony prominences	• pressure sites • plantar surface • heels, bony prominences • metatarsal head
Appearance	• irregular border • base with granulation tissue • exudative • weeping	• well demarcated, punched out • pale or white base	• thin, undetermined border • black, gray, or yellow base
Surrounding skin	• brown pigmentation • hyperkeratotic borders • edema • mottling • stasis dermatitis	• dry eschar • pale, cyanotic • cool • thin • shiny • dependent rubor • hairless	• pale • reticular vascular pattern • palpable purpura • hemorrhagic vessels • callus around wound • bullae formation

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Venous Stasis Ulcers

- A non-healing open wound
- With or without visible varicose veins
- Often at medial lower aspect of leg `gaiter region`

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Gaiter Region

Gaiters are garments worn over the shoe and lower pant leg. Used primarily as personal protective equipment. Commonly known today as "half-chaps", used in horseback riding

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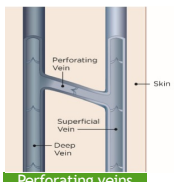
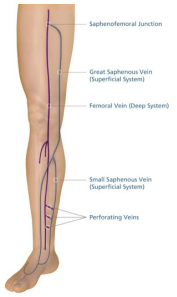
Anatomy of a Venous Ulcer



Perforating veins connect the deep system with the superficial system



Superficial Venous System
- Great Saphenous Vein
- Small Saphenous Vein
- Perforating Veins

Venous leg ulcers can be caused by reflux in any of the venous systems-whether superficial, perforator, or deep-when the valves of the veins have failed or the vein has become obstructed.[2]

[1]Kanth A, Khan S, Gasparis A, Labropoulos N, et al. The distribution and extent of reflux and ob-struction in patients with active venous ulceration. Phlebology 2015: 30(5): 350-6.
[2]Sufian S, Lakhanpal S, Marquez J, et al. Superficial vein ablation for the treatment of primary chronic venous ulcers. Phlebology 2011; 26: 301-6.

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From reflux to visible varicose veins

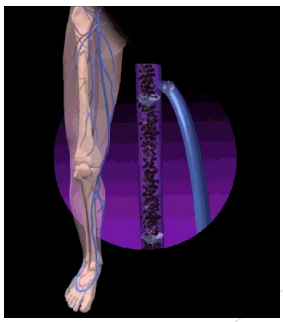

Illustration by Linda S. Nye

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Progressive Stages of Venous Ulceration

Clinical Appearance	
Signs/symptoms	Ankle flare Spider veins Early venous skin changes
Stage of disease	
Possible diagnosis	Venous disease Venous insufficiency

Usually preceded by **patchy erythema** or discoloration of an intense bluish red color (capillary congestion).

Ankle flare (Corona Phlebectatica) Ankle flare consists of a myriad of tiny vein branches that are so fine and so numerous that individual veins can be difficult to delineate.

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Progressive Stages of Venous Ulceration

Clinical Appearance	
Signs/symptoms	Venous dermatitis
Stage of disease	Established venous disease/lymphatic disease
Possible diagnosis	Venous disease Lymphovenous disease

Venous Dermatitis
Venous dermatitis is also known as varicose eczema and venous stasis dermatitis.

The reason this condition occurs is poorly understood, however underlying hypoxia due to the presence of pericapillary fibrin cuffs or arteriovenous shunts, leading to poor perfusion has been proposed (Romanelli and Romanelli, 2007).

Ischemia of the skin finally leads to **necrosis** (often following a minor episode of **trauma** such as from scratching)

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Progressive Stages of Venous Ulceration

Clinical Appearance	
Signs/symptoms	Lipodermatosclerosis Hyperkeratosis
Stage of disease	Advanced disease
Possible diagnosis	Lymphovenous disease due to dependency oedema

Lipodermatosclerosis (LDS) is a form of panniculitis that affects the legs.
It is characterized by inflammation of the layers of fat under the skin.

Signs and symptoms include: pain, hardening of the skin, change in skin color (redness), swelling, and characteristic "Champagne Bottle" tapering of the legs above the ankles.

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Progressive Stages of Venous Ulceration

Clinical Appearance	
Signs/symptoms	Open venous leg ulcer
Stage of disease	Established venous disease No obvious lymphatic involvement
Possible diagnosis	Venous disease with ulceration

Ulcer develops and is covered with **yellowish exudate** over granulation tissue.

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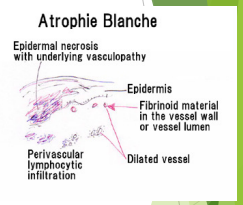
Progressive Stages of Venous Ulceration



Atrophie Blanche is a poorly understood condition manifested by avascular or poorly vascularized areas of skin often studded with dot-like capillaries. There is no clearly defined diagnosis, as atrophie blanche can be seen in many types of vascular conditions such as vasculitis, venous disease, and arterial disease.

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Progressive Stages of Venous Ulceration

- Non-healing ulcer resembles severe paronychia being boggy, undermined and congested from edema. **Base is white and fibrous**

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Progressive Stages of Venous Ulceration

- Healing ulcers have a **shallow sloping edge with healthy granulation tissue in their base and a pink lip of epithelium at the edge.** Ulcer is uniform and supplied by relatively uncongested capillaries .

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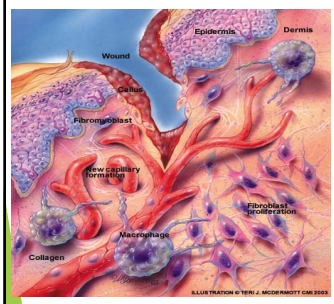
Pathophysiology of Venous Ulcer

BOTTOM LINE: Blood Flow is The Key To Wound Healing



Poor circulation decreases delivery of oxygen and nutrients, prevents removal of metabolic waste products such as carbon dioxide, and ultimately delays healing.

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Diagnosis of Venous Ulcer

Clinical Diagnosis:

- ✓ Gaiter area
- ✓ Signs of venous hypertension
- ✓ Past history of venous thrombosis
- ✓ Past history of treatment for varicose veins
- ✓ Family history of venous disease

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Diagnosis of Venous Ulcer

Radiologic Diagnosis:

Venous Duplex Scan

a) Assessment of deep venous system to detect DVT and Venous Insufficiency

b) Complete examination of superficial venous system including:

1) Great Saphenous and Small Saphenous veins
2) Accessory Saphenous veins
3) Perforating veins

Venogram

Standard Venogram

CT Venogram (CTV)

Magnetic Resonance Venogram (MRV)-for abdominal and pelvic veins

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Diagnosis of Venous Ulcer

Skin Biopsy:

Not indicated in uncomplicated venous ulcer.

Use only when skin malignancy or vasculitis suspected (**Marjolin's Ulcer**)

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Diagnosis of Venous Ulcer

Marjolin's Ulcer

- Malignant changes in scars/ chronic ulcers (burns, chronic venous wounds, etc…)
- They are often insidious and heralded by pain. There may also be a change in the nature of discharge which often becomes offensive and sometimes hemorrhagic.

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Diagnosis of Venous Ulcer

Marjolin's Ulcer

Treves and Pack describe two clinical types of Marjolin ulcers:

- The flat indurated, infiltrative, ulcerative form
  - Poor Prognosis
- The less frequent exophytic papillary form.

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Marjolin's Ulcer

The malignant change often begins at the edge which may show some warty change with elevation. Occasionally there is the appearance of a mass within the scar or ulcer. The majority of Marjolin's ulcers are found on the lower extremities.

Flat, indurated, ulcerated: Poor Prognosis

Warty, exophytic, papillary : Better Prognosis

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Severe Marjolin's ulcer from a burn.

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Management of Venous Ulcers

Exclude Arterial Disease!

Check pedal pulses BEFORE compression stocking

- Use Doppler to check ABI >0.8 (ankle/brachial index)
- If ABI is <0.5 NO compression

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Management of Venous Ulcers

Compression Bandaging

- Improves calf muscle pump function
- Reduces venous pressure
- Opposing gravitational venous reflux
- Improving lymph drainage
- Stimulates fibrinolytic activity
- Types:
  - I. Non-elastic wraps
    - I. Una Boot
  - II. Pneumatic Pump
    - I. Sequential Compression Pump
  - III. Compression Stockings

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Management of Venous Ulcers

Unna Boot

A paste bandage with zinc oxide, glycerin, etc.

Applied without tension distal to proximal ,below knee.

Primary dressing applied first.

Boot dries to a semi-rigid cast

Changed 1-2x q week, depending on drainage

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Management of Venous Ulcers

Pneumatic Compression Devices

Inflatable boot and pump rhythmically fills with air

Long-term use for patients who are not surgical candidates or have combined phlebolymphedema

For patients who have failed treatment with other compression devices

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Management of Venous Ulcers

Compression Therapy

Compression Strength	Indications
8-15mm	Leg fatigue, mild swelling, stylish
15-20mm	Mild aching, swelling, stylish
20-30mm	**Aching, pain, swelling, mild varicose veins**
30-40mm *	Aching, pain, swelling, varicose veins, post-ulcer
40-50, 50-60mm *	Recurrent ulceration, lymphedema

* Requires a prescription

2009 by American College of Phlebology 64

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Management of Venous Ulcers

I. SHARP DEBRIDEMENT: Using scalpel, scissors, curette is rapid and precise

II. AUTOLYTIC DEBRIDEMENT- The process by which the body attempts to shed devitalized tissue by manipulating moisture. Two categories:
1. Those that donate moisture to the dead tissue
2. Those that absorb excess moisture
   a. Second generation hydrogel sheet, e.g. Actiform Cool®, will absorb a certain amount of moisture while also donating some to provide good moisture balance.
   b. Alginates, cellulose dressings and foams are designed to absorb exudate.

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Management of Venous Ulcers

III. ENZYMATIC DEBRIEMENT - Enzymatic debridement involves application of collagenase ointment, which doesn't harm healthy tissue. Faster than Autolytic, but more conservative than sharp debriedment.
1. Collagenase (Santyl)
2. Papain-urea (Accuzyme)

IV. MAGGOTS - Aside from surgical debridement none of the many methods of debridement work as quickly (or as cost-effectively) as larval therapy (Thomas, 2006).
1. Monarch Laboratories- *Lucilia sericata* (Green bottle fly)

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Management of Venous Ulcers

- Maggots are currently one of the most effective means of treating ulcers with MRSA
- Specially bred fly larvae secrete enzymes to break down dead tissue into a liquid they will ingest
- The FDA approved this therapy in Jan, 2004.

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Management of Venous Ulcers

Dressings – Basic Principles

- Should keep ulcer moist not wet
- Simple low adherence
- Leave undisturbed as long as possible
  - 'strike through` of exudate to outside of the bandage is indication for intervention
- Knitted viscose primary dressings + superimposed absorbent pad (secondary dressing)
- Hydrocolloid dressing- dry sloughy wounds to reduce pain
- Absorptive dressing (alginate, foam, hydrofiber) – highly exuding wound
- Zinc paste bandage (Unna boot)

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Management of Venous Ulcers

Skin and Substitutes

1. Autologous;
   - Split skin grafts
   - Punch grafts
   - Cultured autologous keratinocytes
2. Donor:
   - Cadaver
   - Pig skin
3. Allogenic:
   - Bilayered skin substitutes; allogenic keratinocytes and fibroblasts in collagen gel (Apligraft); human amnion/chorin membrane (Epifix)

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Management of Venous Ulcers

Routine use of topical/oral antibiotics should be discouraged unless there is clinical evidence of infection (all wounds will be colonized with surface bacteria):

- Increased pain/Cellulitis
- Heavy or purulent exudate
- Rapid deterioration of ulcer
- Fever

❖Antibiotics are specifically indicated if group A β-hemolytic streptococcus is identified (can lead to necrotizing fasciitis)

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Management of Venous Ulcers

Pain Management

1. Compression and elevation
2. Opioids
3. Amitriptyline, gabapentin, block- autonomic nervous system mediated deep pain
4. Topical NSAIDS (ibuprofen foam)
5. Pentoxyphylline:- Trental 400 to 800 mg tid
   1. Fibrinolytic
   2. Reduction in leukocyte adhesion
6. Enteric coated aspirin:- 325mg

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Management of Venous Ulcers

	Compression alone	Compression + surgery
24-week healing rate	65%	65%
Ulcer healing at 3 years	89%	93%
12-month ulcer recurrence	28%	12%
Recurrence rate at 4 years	56%	31%
Ulcer-free time at 3 years	85 weeks	100 weeks

Eschar Study Barwell, JR, et al. Lancet 2004

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Venous ulcer healing predictor-The "4-week" Model Cochrane Database[1]

Change in wound area at 4 weeks is a strong indicator of healing at 12 weeks or 24 weeks.

The VLU treatment algorithm recommends > **40% wound closure after 4 weeks of conventional therapy** as a surrogate marker for the identification of patients who are likely to achieve complete wound closure with continued conservative treatment.

Week 1 | Week 2 | Week 3 | Week 4

A study has shown that patients with < **40% closure at 4 weeks** are unlikely to achieve complete wound healing and **may benefit from alternative or advanced interventions.**

[1] Howard M. Kimmel et al. An Evidence-Based Algorithm for Treating Venous Leg Ulcers Utilizing the Cochrane Database of Systematic Reviews. WOUNDS 2013;25(9):242-250

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Additional Venous Ulcer Healing Predictors[1]

Ulcer Depth

When comparing partial thickness venous ulcerations and full thickness ulcerations, **full thickness wounds take approximately twice as long to heal.**[1]

Ulcer Duration

According to a study, wounds that were < **5cm²** and those **ulcerations present for < 6 months** were more **likely to heal by week 24.** The multilayered compressive dressings healed 85% and 88% of these wounds, respectively.[1]

[1] Howard M. Kimmel et al. An Evidence-Based Algorithm for Treating Venous Leg Ulcers Utilizing the Cochrane Database of Systematic Reviews. WOUNDS 2013;25(9):242-250

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Management of Venous Ulcers

Thermal Ablation - 70-80 %
- Radiofrequency ablation (RFA)
- Laser ablation

Chemical Ablation 20-30 %
- Varithena (polidocanol 1%)
- Ultrasound guided Foam Sclerotherapy

Other ~10 %

Non-thermal, Non-tumescent
- Mechanochemical
- Sclerotherapy

Non-thermal, Non-tumescent, Non-sclerosant
- Medical adhesive

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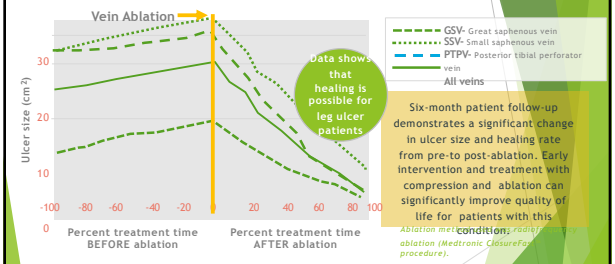
ABLATION: A PROVEN SOLUTION FOR PATIENTS WITH LOWER EXTREMITY ULCERS[1]



Six-month patient follow-up demonstrates a significant change in ulcer size and healing rate from pre-to post-ablation. Early intervention and treatment with compression and ablation can significantly improve quality of life for patients with this condition.

Ablation methods include radiofrequency ablation (Medtronic ClosureFast procedure).

In addition to standard compression therapy, 2014 SVS/AVF venous leg ulcer guidelines detail ablation of the incompetent veins to prevent recurrence and improve ulcer healing.

[1]Howard M. Kimmel et al. An Evidence-Based Algorithm for Treating Venous Leg Ulcers Utilizing the Cochrane Database of Systematic Reviews. WOUNDS 2013;25(9):242-250

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Guidelines for Earlier Patient Referrals

Background

UK NICE Clinical Guidelines CG 168 published in July 2013 recommended that venous leg ulcers be referred for specialist vascular assessment. The aim was to determine the impact of NICE CG 168 on referrals to leg ulcer clinic.

NICE National Institute for Health and Care Excellence

Method

A comparison of prospectively gathered data on patients referred to clinic before (January 2011 to June 2012) and after (January 2014 to June 2015) NICE guidelines

Results
- There was a twofold increase in referrals (181 patients, 220 legs vs. 385 patients, 453 legs)
- Significant increase in endothermal ablation (2 vs. 32 legs)
- No change in patients undergoing compression (62.8% vs. 63% legs)

[1] A. H. Davies et al. Impact of National Institute of Health and Care Excellent (NICE) Clinical Guidelines (CG 168) on the Referral and Management of Leg Ulcers. J Vasc Surg 2016; 4(1):144

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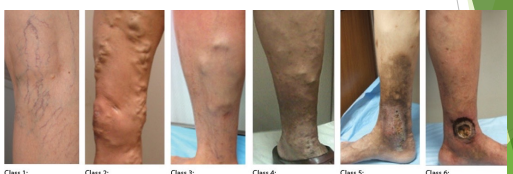
An ounce of prevention…

- Chronic Venous Disease
  - Progression: varicose veins, leg edema, skin discoloration, thickening, ulceration



Class 1: Telangiectasia. Class 2: Varicose vein. Class 3: Edema. Class 4: Pigmentation / Eczema. Class 5: Healed Ulcer. Class 6: Venous Ulcer.

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Management of Venous Ulcers

Ablation of Underlying Pathologic Vein

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Management of Venous Ulcers

Perforator Closure with RF and Laser

- 70 year old patient
- Ulcer for 17 years
- Performed perforator ablation with RF procedure
- Cleared ulcer within one month

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Management of Venous Ulcers

Perforator Closure with RF and Laser

Pre-Op Pictures Were Taken On 3/17/09

Post-Op Pictures Were Taken On 11/03/09

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Negative Prognostic Indicators for Venous Ulcers

- 1. Ulcer size ≥10cm
- 2. Ulcer duration ≥12 months
- 3. Presence of PAD
- 4. Greater than 50% of ulcer
- consisting of fibrous connective tissue

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Associated Skin Conditions

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CEAP 4: Venous Hyperpigmentation

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CEAP 4: Venous Hyperpigmentation

Not to be confused with: Drug Induced Hyperpigmentation- Coumadin

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CEAP 4: Venous Hyperpigmentation

Not to be confused with: Drug Induced Hyperpigmentation- Minocycline

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CEAP 4:
Venous Hyperpigmentation

Not to be confused with: Livedo Reticularis

Livedo reticularis is thought to be due to spasms of the blood vessels or an abnormality of the circulation near the skin surface. But it may be a symptom of a serious underlying condition, such as vascular disease, an endocrine disorder or a rheumatologic disease, such as lupus.

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CEAP 4:
Venous Dermatitis/Eczema

- Erythema, scaling, weeping, itching, non tender
- Chronic, ill defined, often bilateral, associated pigmented changes

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Treatment of Venous Dermatitis/Eczema

Contact allergies/irritants
Emollients , Steroids if inflamed

Cleansing and debridement:
Irrigation of ulcer with warm tap water, sterile saline
Venous wounds rarely need debridement. Only if infected necrotic tissue present.

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