



Chronic venous disease and leg ulcers

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Leg ulcers

- **prevalence** : 1% of adults
- **incidence**: in population over 50
 - 0,3 to 1000 inhabitants
- **chronic disease** : - 60 % of ulcers heal more than 6 months,
 - 33 % heal more than 1 year
- **impact on quality of life**
- **reccurences** – **2/3** of healed leg ulcers

Etiology of leg ulcers

- 75% venous
- 15% arterial
- 10% other



Venous leg ulcers

- 75% of all leg ulcers
- pathogenesis – valvular insufficiency
- 2 types:
 - 1) **ulcus cruris varicosum** – due to primary varicose veins
 - 2) **ulcus cruris posttromboticum** – due to deep vein thrombosis

Chronic venous disease

- CVD



CEAP classification

- Classification and grading of **chronic venous disease** on the basis of:
 - **C** – clinical manifestations
 - **E** – etiologic factors
 - **A** – anatomic distribution of involvement
 - **P** – pathophysiologic findings

CEAP classification

C 0 – no visible or palpable signs of CVD

C 1 – telangiectases and reticular veins

C 2 – varicose veins

C 3 - edema

C 4 – skin changes: pigmentation, eczema, lipodermatosclerosis, atrophia blanche

C 5 - skin changes + healed ulcer

C 6 – **skin changes + leg ulcer**

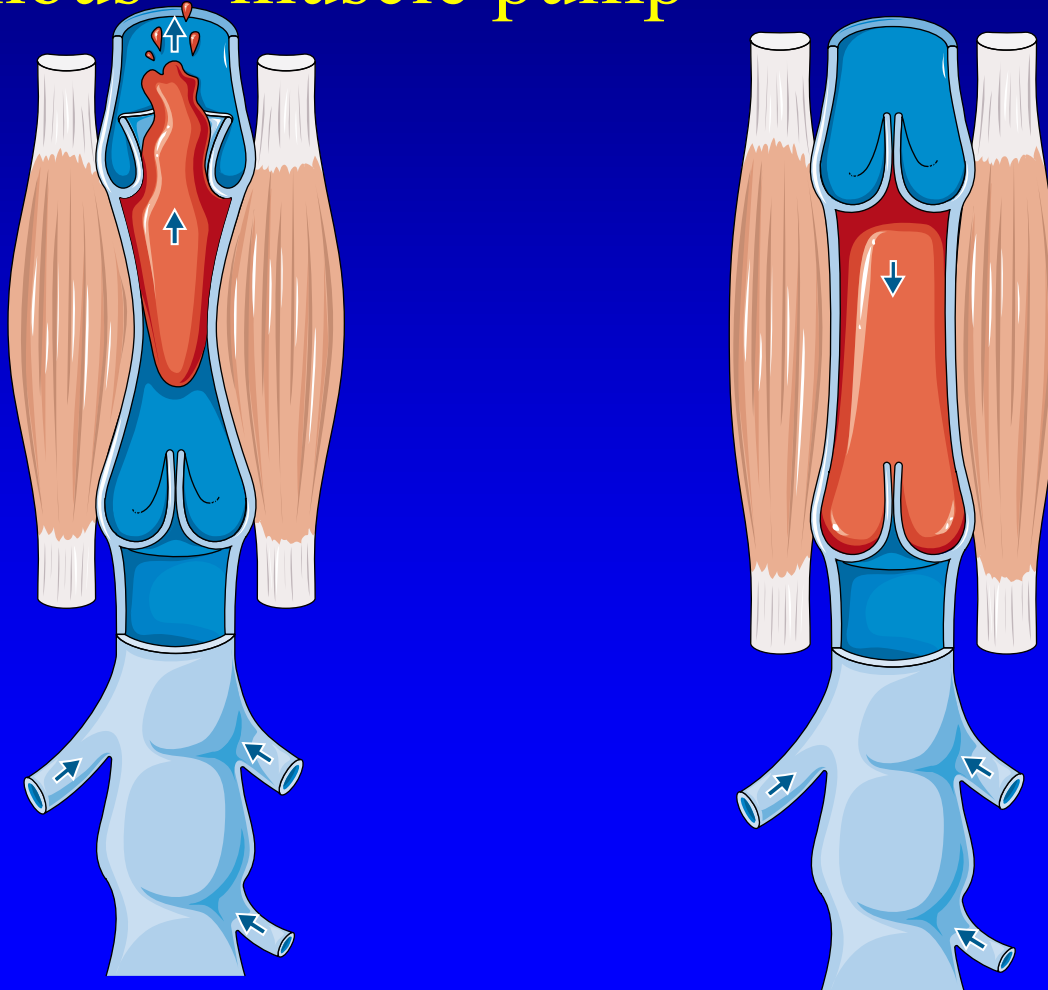


Chronic venous disease (CVD)

- **Vein Consult Program (2012)**
- epidemiologic study in Europe, Asia, Latin America, 90 000 persons
- CVD – **global problem**
- **prevalence:**
- **84%** - including stage C0s (symptomatic patients without clinical signs of the disease)
- **64%** - from stage C1

Venous return – physiological situation

- Venous – muscle pump



St. C4 - pigmentation



Atrophie blanche + leg ulcers



St. C6 – venous leg ulcers















Treatment of venous leg ulcers

- **invasive**
- **conservative:**
 - local treatment
 - pharmacological treatment
 - compression

Invasive treatment

- sclerotherapy (foam)
- surgical treatment
- thermal methods (endovenous laser, radiofrequency)
- non – thermal methods (glue)

Conservative treatment

- local treatment
- pharmacological treatment
- compression

Local treatment – wound healing - TIME

- **T** – tissue
- **I** – inflammation, infection
- **M** – moisture
- **E** – epithelization



Wound healing - TIME

- **A structured wound assessment tool in the form of acronym**
- **T** – tissue management
- **I** – inflammation, infection control
- **M** – moisture balance
- **E** – epithelization advancement

TIME – T - tissue

- debridement, wound bed preparation



Debridement

- treatment of wound bed and wound edges
- necessary for wound healing
- reduces odour, exudation
- improves quality of life

Debridement

- autolytic
- enzymatic
- biosurgical
- mechanical
- surgical
- hydrosurgical
- TNP (topical negative pressure)

Autolytic debridement

- **the most often used method**
- **semi-occlusive dressings** – film dressings
 - hydrocolloids
 - hydrogels
- create a moist wound-dressing interface which enhances the activity of endogenous proteolytic enzymes within the wound
- separation of necrotic tissue from healthy tissue

Autolytic debridement

- **advantage** : - selective
- painless
- **disadvantage** : - slow
- maceration
- odour

Enzymatic debridement

- **highly selective**
- **enzymatic agents** derived from proteolytic enzymes extracted from bovine plasma or pancreas, fruit and plants such as papain from papaya or bromelain from pineapple
- or bacterial collagenase derived from *Clostridium histolyticum*

Enzymatic debridement

- Iruxol mono - bacterial collagenase
derived from Clostridium histolyticum
(tzv. clostridiopeptidasis)
- cleaves triple helix of collagen
- selective debridement of necrotic tissue
- painless
- minimal risk of bleeding

Biosurgical debridement

- **larval therapy (Maggot)**
- fast and very effective method
- application of sterile fly larvae (**Lucilia sericata**) to the wound
- dressing change in 2-4 days

Biosurgical debridement

- **complex mechanism of action**
- mechanic movement of larvae
- production of proteolytic enzymes (collagenase, trypsin) and bactericid substances
- ingestion of bacteria
- decrease of pH of the wound – inhibitory effect on bacterial growth

Mechanical debridement

- mechanical removal of necrotic tissue
- disadvantage – pain, traumatization of healthy tissue
- advantage – quick method

- **sharp debridement**
- **debridement wet-to-dry** – gauze – painful

Hydrosurgical debridement

- **Versajet**
- pressurised water or saline
- the pressure is controlled via a handset
- the jet of fluid both cut and removes tissue while irrigating the wound
- **advantage:** quick
- **disadvantage:** - expensive
- painful

TIME – I - infection

- infection, inflammation control
- antiseptics



Antiseptics

- synthetic antimicrobial drugs
- they kill or inhibit microorganisms
- they are not toxic for keratinocytes
- **they act non selective**
- **broad antimicrobial spectrum**
- resistance – rare

Antiseptics

- silver
- iodine
- chlorhexidin
- honey
- polihexanid

Silver dressings

- **a broad antimicrobial spectrum:**
- Staphylococcus aureus, including MRSA, VRE (vancomycin-resistant enterococci), Streptococcus pyogenes, Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae
- viruses, yeasts

Silver dressings

- a variety of antimicrobial dressings containing silver
- a silver contact and physical and chemical properties vary greatly
- available in various formulations:
 - flat sheets
 - combined with hydrogels, alginates, hydrofibres
- resistance - rare





Silver

- International consensus - 2012
- **„Appropriate use of silver dressings in wounds**
- www.woundsinternational.com
- Effectivity, safety, cost-effectiveness

Iodine dressings

- **a broad antimicrobial spectrum:**
- G+, G- bacteria, viruses, fungi
- resistance – 0
- iodine is slowly released to the wound
- 2 forms: **cadexomer iodine**
povidone iodine

Iodine dressings

- **contraindication:**
 - known sensitivity to iodine
 - thyroid disease
- do not exceed 3 months continuous use – risk of systemic absorption
- available in **various forms:**
 - ointment
 - paste
 - flat sheets



Chlorhexidin dressings

- **a broad antimicrobial spectrum:**
- G+, G- bacteria, viruses, fungi
- resistance can occur



Honey dressings

- first used in ancient Egypt - 4000 years ago
- medical-grade honey dressings developed in the late 1990s
- a broad antimicrobial spectrum, including MRSA and VRE
- the ability of honey to **produce low levels of hydrogen peroxide** in the wound
- the provision of an **acidic wound environment (pH 3)**

Honey dressings

- reduce wound odour
- promote autolytic debridement
- available in various formulations:
- flat sheets
- paste
- ointment

Honey dressings

- **Contraindication:**
- patients with known allergy to bee stings
- highly exudating wound – risk of maceration
- may cause stinging sensation

Polihexanid

- **Polyhexamethylene biguanide (PHMB)**
- a broad antimicrobial spectrum, including MRSA
- used in healthcare and cosmetics for many years
- no reports of bacterial resistance to date
- no allergy

Polihexanid

- well tolerated
- contraindication:
 - pregnancy – first 4 months
 - dry wounds
- Prontosan – PHMB + betain

TIME – M - moisture

- moisture –
management of
exudate





Iniciály: H.T. Datum: 26.2.
2013



Moist wound healing

- **moist wound necessary for good healing**
- optimal hydration of the wound
- **copious exudate** – causes leakage, maceration, odour, infection
- **minimal exudate** delays autolytic debridement, inhibits epithelialisation and causes pain on dressing removal

Moist wound healing

- **dry wounds:** hydrogels
- **highly exudating wounds:**
 - alginates
 - hydrofibres
 - polyurethan foams

Hydrogels

- **amorphous gels**
- **flat sheets - gel compresses** (hydrogel + polyurethane layer)
- a high water content (30-90%)
- rehydrates dry tissue
- promote autolytic debridement
- have a cooling effect
- are easily removed
- are comfortable and flexible

Hydrogels

- may cause eczema or irritation
- they need secondary dressing
- may be combined with:
 - silver
 - hyaluronic acid



Hydrofibers

- nonadherent dressings
- ability to **absorb high levels of wound exudate**
- composed of sodium **carboxymethylcellulose**
- form non-adherent gel in exuding wounds
- create a moist wound-dressing interface

Hydrofibers

- promote autolytic debridement
- available in various formulations:
 - flat sheets
 - packing rope for cavities
 - combined with silver – antimicrobial activity
- contraindication: dry wounds

Polyurethane foam dressings

- **semipermeable**
- low adherent, soft, highly absorbent
- outer semipermeable membrane – allows fluid to pass into the insulating foam
- waterproof
- gas/water vapour permeable
- impermeable to bacteria
- **create a moist wound-dressing interface**

Polyurethane foam dressings

- available in various formulations:
- adhesive/non-adhesive
- shaped cavity devices for cavity wounds
- shaped sacral or heel dressings
- thin
- combined with silver or PHMB – antimicrobial activity
- combined with charcoal – reduce odour
- **contraindication:** dry wounds

Polyurethane foam dressings



Silicone dressings

- **silicone** – inert material
- atraumatic dressings
- painless dressing change

- **non-adherent sheets**
- **polyurethane foam dressings with silicone**

Alginate dressings

- **obtained from seaweed**
- **high absorbents**
- derived from calcium/sodium salts of alginic acid
- on contact with wound fluid, sodium salts in the exudate exchange with the calcium in the alginate dressing to form a soft gel which maintains a moist environment

Alginate dressings

- should be cut to the shape of the wound
- **hemostatic properties**
- may provide pain relief
- available in various forms:
 - flat sheets
 - packing rope for cavities
 - combined with silver or charcoal



Charcoal dressings

- active charcoal
- reduction of odour
- absorption of microorganisms and exudate



TIME – E - epithelization











Iniciály: *V. A.*

Datum: *7. 5. 13*

7 8 9 10 11 12 13 14 15



Bioactive dressings

- indication: **hard-to-heal ulcers**
- 20% of leg ulcers
- bad prognosis – leg ulcers larger than 10 cm² and lasting more than 6 months

Bioactive dressings

- protease modulating dressings
- hyaluronic acid dressings
- collagen dressings
- growth factors
- skin substitutes

Matrix metalloproteinases (MMPs)

- **group of zinc-dependent endopeptidases**
- produced by **granulocytes, keratinocytes and fibroblasts**

- **elevated protease activity in chronic wounds**
- **decreased levels of TIMPs** (tissue inhibitors of MMPs)

Protease modulating dressings

- composed of **collagen and ORC – oxidised regenerated cellulose**
- act by absorbing wound fluid and trapping proteases within their structure to render them inactive
- form a non-adherent gel which binds with growth factors protecting them from degradation by MMPs

Oxidized cellulose



Dressing change



Dressing change



Dressing change



Dressing change



Dressing change



Dressing change



Dressing change



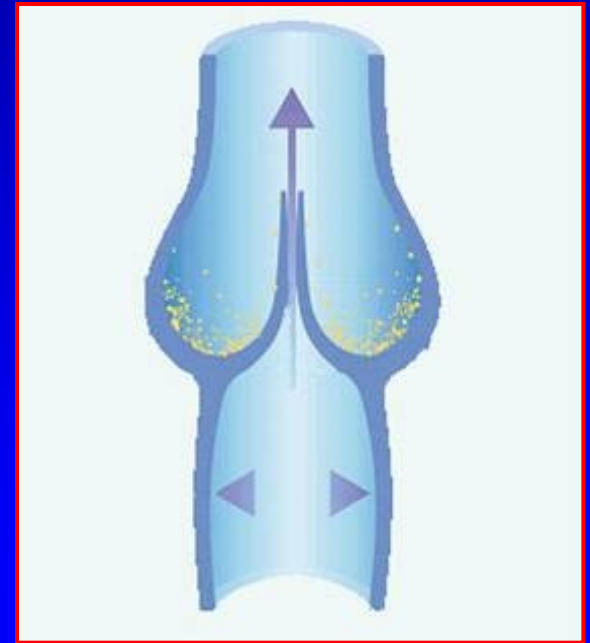
Compression

- Basic treatment of venous leg ulcers
- Compression leads to healing of 70% of venous leg ulcers smaller than 10 cm² in 3-6 months



Compression

- improvement of venous return
- reduction of venous dilatation
- ↓ venous reflux
- ↓ venous hypertension



Compression

- **1. short stretch compressive bandages:**
 - multilayer compression
- **2. compressive systems**
- **3. compressive devices**
- **4. compressive stockings for leg ulcers**

1. Compressive bandages

- short stretch compressive bandages:
- multilayer compression



Multilayer bandage



Multilayer bandage



Multilayer bandage



Multilayer bandage



Multilayer bandage - problems

- Wrong application in more than 50% patients













2. Compressive systems

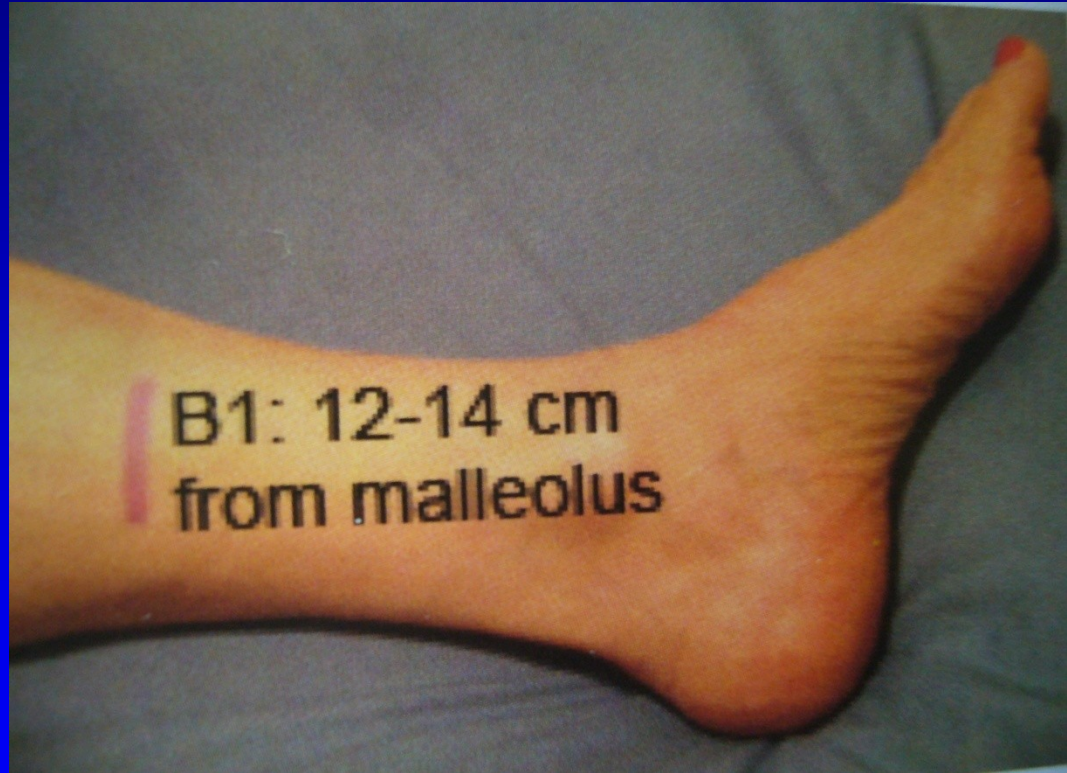


Compressive systems

- 4 basic properties: **P-LA-C-E**
- **P**ressure
- **L**Ayers
- **C**omponents
- **E**lastic properties

P - pressure

- Sub-bandage pressure
- 40 mm Hg in rest
- Pressure systems



Picopress



Compressive systems



*Management of chronic venous disorders of the lower limbs. Guidelines according to scientific evidence.
International Angiology 2018;37(3)*

Compressive systems



3. Compressive devices



Partsch H. reliable self-application of short stretch leg compression: Pressure measurements under self-applied, adjustable compression wraps. Phlebology 2019;34:208-213.

Circaid



Circaid



Circaid



Circaid



Circaid



Circaid



4. Compressive stockings for leg

- system of 2 stockings
- pressure - **40 mmHg**



Rabe E, Partsch H, Hafner J et al. Indications for compression therapy in lymphatic disorders: An evidence-based approach

Contraindication of compression

- PAOD – ABPI less than 0,5
- Acute erysipelas
- Acute eczema
- Heart failure

Pharmacological treatment

- micronized purified flavonoid fraction
- pentoxifylin
- sulodexid

