

Collection of Practical Guides of Wounds of the Servizo Galego de Saúde

Practical Guide for Ulcers of the Lower Limb. Guide No. 2



**COLLECTION OF PRACTICAL GUIDES OF
WOUNDS OF THE SERVIZO GALEGO DE SAÚDE**

**PRACTICAL GUIDE FOR ULCERS
OF THE LOWER LIMB**

Guide No. 2

Publisher: Xunta de Galicia
Consellería de Sanidade
Servizo Galego de Saúde
Dirección Xeral de Asistencia Sanitaria

Graphic design and layout: Versal Comunicación, S.L.

Year: 2016



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COLLECTION OF PRACTICAL GUIDES OF WOUNDS OF THE GALICIAN HEALTH SERVICE

- No. 1 Pressure Ulcers
- **No. 2 ULCERS OF THE LOWER LIMB**
- No. 3 Ulcers of the Diabetic Foot
- No. 4 Neoplastic Skin Lesions
- No. 5 Burn Injuries
- No. 6 Acute Surgical Wound
- No. 7 Skin Lesions Associated with Moisture
- No. 8 Traumatic Wounds



PRESENTATION

Everyone knows that the approach to ulcers and wounds implies a health problem of great magnitude due to the extra financial cost it means for sustainability of the health system, due to the loss of quality of life in patients, due to the impact that it has on their families and carers, and also by the workload and clinical variability that their care represents for healthcare professionals.

From the Servizo Galego de Saúde (Sergas), and more intensively from the General Sub-Directorate for Care Management and Organisational Innovation through the Health Care Integration Department, there is an awareness of the importance and impact of a proper management of the prevention and treatment of this type of lesions; so for several years we have been working to improve the structure, resources and conditions required, to try to normalise and systematise the care activity arising from this care process.

Through the **Úlceras Fóra Programme** the reference framework to develop and establish strategic lines in the approach of everything related to ulcers and wounds, one of the basic objectives proposed was to set common care criteria (to identify the risk, assess the lesions, establish preventive measures, establish treatments, use of products, monitoring, registration, etc.) which allow us to move towards the standardisation of criteria and a corresponding reduction in the clinical variability for this type of lesions.

That is why this **Collection of Practical Guides for Wounds from the Servizo Galego de Saúde**, describes the effort and enthusiasm of many professionals (doctors and nurses) to improve their clinical practice in the care and comprehensive approach to patients affected by ulcers and wounds, or at risk of suffering them, in order to incorporate the best available evidence to achieve an improvement in the patient's quality of care and safety.

Jorge Aboal Viñas
General Director of the Health Assistance Department
Servizo Galego de Saúde

PREFACE

This Practice Guide was developed with the participation of health professionals in primary care and hospital care of the Servizo Galego de Saúde (Sergas) and reviewed by expert professionals and scientific institutions at national level, under the coordination of the General Sub-Directorate for Care Management and Organisational Innovation and Direction of Sanitary Assistance of Sergas.

The recommendations for clinical practice based on evidence that are included in this guide are of a general nature and therefore do not define a single course of conduct to be followed in a procedure or treatment for the integral care that is intended to be carried out. Any amendment or variation of the recommendations set forth herein, shall be based on clinical judgement (internal evidence) of the health care professional who applies them and the best clinical practices of the time; as well as the specific needs and preferences of each patient in particular; the resources available at the time of the sanitary attention and in the regulations established by the institution or health centre where they are intended to be applied.

DISSEMINATION AND IMPLEMENTATION

The dissemination and implementation strategy of this practical guide; as well as, of the entire Collection of Practical Guides on Wounds of Sergas, shall be co-ordinated through the Technical Management of the Úlceras Fora Programme; that is to say, by the Health Care Integration Department, of the General Sub-Directorate General for Care Management and Organisational Innovation, of Sergas.

The diffusion process entails a ceremonial presentation at the Consellería de Sanidade of the Xunta de Galicia, the official presentation in all public institutions in the Sergas Healthcare Network, the dissemination of an official statement to the media, its disclosure in scientific events and dissemination on the Internet through the official website of Sergas.

VALIDITY AND UPDATE

The guide should be reviewed after 3 years from the date of its publication. Its updating can be performed before the end of this period if any of the recommendations of evidence modify its categorisation which may lead to a clinical risk of safety for the patient and / or affect the quality of care.

DECLARATION OF CONFLICTS OF INTEREST AND EDITORIAL INDEPENDENCE

The authors of this practical guide declare to have made an effort to ensure that the information contained herein is complete and up to date, and state that they have not been influenced by conflicts of interest that could change the results or contents during the preparation stage and its development. Likewise, the authors of the guide assume responsibility for the content expressed, which includes evidence and recommendations.

The editors of the Collection of Practical Guides for Wounds of the Servizo Galego de Saúde (Sergas) declare that there is editorial independence regarding the decisions taken by the Technical Management and the Coordinators of the Working Group.

ASSESSMENT AND CLASSIFICATION OF THE EVIDENCE

The scientific evidence and recommendations set forth in this Practical Guide were the result of the assessment and analysis of the sources of information consulted as bibliographic reference (clinical practice guides, guides based on the best evidence, other documents based on evidence, systematic reviews and original articles); the critical reading method and consensus by nominal group between authors and panel of experts was used to prepare it.

The classification of the level of evidence and grading of the recommendations has been maintained while respecting the original source consulted and the scale of evidence that has been used. The method that CENETEC (National Centre of Technological Excellence in Health) of Mexico in the development of their clinical practice guidelines (GPC) has been used for this:

- Classify with the symbol **[E]** that evidence which is published in any GPC, followed by its alphanumeric classification (quality of the study, if it is referenced) and bibliographic citation.
- Categorise with the symbol **[R]** those recommendations identified by any GPC, followed by their strength of recommendation (by A-B-C-D levels, in descending order according to clinical importance, or by their grading in high-moderate-low evidence).
- Identify with the symbol **[GP]** those actions and / or activities considered as good practices, which are not referenced or supported by any GPC, but that appear in other documents based on the evidence (guides to good clinical practice, clinical pathways, protocols based on evidence, etc.) and whose evidence has been obtained through systematic reviews, meta-analyses, clinical trials, etc.

The scales on the level of evidence and degree of recommendations that are described in the contents of this practical guide can be consulted through the bibliographic sources referenced in the summary table of recommendations / evidence.

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01 | RELATIONSHIP OF AUTHORS, COORDINATORS AND REVIEWERS

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HOW TO QUOTE THE DOCUMENT

García-Martínez M. B., Raña-Lama C. D. *Practical Guide for Ulcers of the Lower Limb*. [Practical Guide No. 2]. In: Rumbo-Prieto J. M., Raña-Lama C. D., Cimadevila-Álvarez M. B., Calvo-Pérez A. I., Fernández-Segade J., editors. Collection of Practical Guides for Wounds of the Servizo Galego de Saúde. Santiago de Compostela (A Coruña): Xunta de Galicia. Consellería de Sanidade. Servizo Galego de Saúde; 2016.

02 INTRODUCTION

2.1. JUSTIFICATION

The approach to chronic ulcers and wounds implies a health problem of great magnitude due to the extra financial cost it means for the health systems, due to the loss of quality of life in patients, due to the impact that it has on their families and carers (which in many cases have to take on the prevention and caring), and also by the workload that their care represents for healthcare professionals. Therefore, the decision-making regarding its approach requires taking into account several alternatives from a variety of information sources (clinical data, professional experience, preferences of the patient, scientific evidence, protocols, guides, etc.) which in turn causes a considerable variability of decisions based on the time, the information available and the person who decides. This gives rise to a great disparity in the performance of the professionals in techniques, tests, and diagnostic skills, clinical judgement and decision-making when facing the same problem or patient and even in a same professional in relation to patients with the same clinical and pathology.

This *Practical Guide to Ulcers of the Lower Limb* (Practical Guide No. 2) is integrated into the Collection of Practical Guides of Wounds of the Servizo Galego de Saúde (Sergas); in accordance with the strategies and lines of action promoted through the Úlceras Fora Programme coordinated by the General Sub-Directorate for Care Management and Organisational Innovation. In turn, such a Collection is aligned in line with strategy No. 10 (Improving Clinical Practice), of the Quality Plan for the National Health System 2010, as well as, with Sergas Strategy 2014: Public health at the service of patients.

This guide is therefore meant as a synthesis of the best interventions and preventive or therapeutic practices available for the care of adults with vascular ulcers of the leg (lower limb) or at risk of suffering from them; according to the clinical practice based on the most current evidence.

2.2. SCOPE AND OBJECTIVES

The scope of the guide is addressed to the people affected, informal carers and all health professionals with direct or indirect responsibility for the integral approach of ulcers of the lower limb, in any of the three health care levels in the Community of Galicia: Primary Health Care, Hospital Care and Socio-Health Care.

The aim of the Guide is to provide guidelines and / or standardised criteria to serve as a reference to identify risk factors, perform specific actions of prevention, detection, referral and treatment, which ulcers of the lower limb pose as a health problem. The aim is to contribute to the welfare of people, reduce the variability of treatments and professional uncertainty, reduce the prevalence and incidence of this health problem in society, as well as achieve greater optimisation in the management of human and economic resources available from the Galician health and socio-health care system based on the recommendations of practice based on evidence and; to attain a

few quality care indicators for the care and safety of patients that shall allow for greater efficiency of the process between the different care levels.

2.3. QUESTIONS TO BE ANSWERED BY THIS PRACTICAL GUIDE

- What are they and how are the ulcers of the lower limb defined (UEI)?
- What are their causes?
- What type are they and how are they classified?
- What are the most frequent locations?
- How do you assess the risk of UEI?
- What measures must be implemented to prevent UEI?
- What treatments and / or therapeutic measures are most appropriate?
- What complications can occur?
- What prevention recommendations are the most indicated?
- What treatment recommendations are the best?
- What therapeutic guidelines and health education should patients, informal carers and professionals follow to facilitate their healing?

03 | DEFINITION

The concept of an **ulcer of the lower limbs** refers to an injury to the lower limb that affects the skin and structures below it, either spontaneous or accidental, whose aetiology may refer to a pathological systemic or limb process and that does not heal in the time range expected (chronicity).¹

The term **vascular ulcers** is frequently used to refer to those arising from circulatory bed disease, although this concept makes no reference to their aetiology that is very varied (90 % are derived from venous insufficiency, 5 % from arterial diseases and 5 % of ulcers from other causes).²

04 | EPIDEMIOLOGY

Epidemiology is variable especially in relation to its aetiology and the populations concerned.

According to data from the document of the National Consensus Conference on Ulcers of the Lower Limb (CONUEI):¹

- Prevalence: 0.10 – 0.30 %.
- Incidence 3 to 5 new cases per thousand people per year.
- Both must be multiplied by 2 when we consider the segment of the population age > 65 years old.
- Prevalence increases with age. Approximately 1 % of the population may suffer from ulcers in their legs at some point in their life.³

05 | AETIOLOGICAL CLASSIFICATION

From the aetiological point of view (**table I**), the main aetiopathogenic causes that give rise to the different types of ulcers of the lower limb are:

VENOUS HYPERTENSION	Primary.
	Secondary.
	Arteriosclerosis.
ISCHEMIA	Arteriosclerosis.
	Thromboangiitis.
	Other ischemic causes.
NEUROPATHIC	Diabetes mellitus.
	Radiculopathy.
	Myelodysplasias.
	Toxic.
	Leprosy.
ARTERIAL HYPERTENSION	
ARTERITIS	Rheumatoid arthritis.
	Wegener syndrome.
	Churg-strauss syndrome.
HAEMATOLOGICAL DISEASE	Anaemia.
	Thalassemia
	Disglobulinemia (Waldenstrom's syndrome).
	Leukaemia.
	Cryoglobulinemia.
	Thrombocytopenia.
SEPTIC	Nodular hypodermatitis.
	Pyoderma.
	Mycosis.
	Bazin's erythema induratum.
	Leukocytoclastosis.
AVITAMINOSIS	Vitamin B-deficiency.
TOXIC	Hydroxyurea.
ASSOCIATED TO DISEASES	Werner's syndrome.
	Klinefelter's syndrome.
	Enfermidade de Crohn.
	Neoplasm (Kaposi, melanoma, carcinoma).
METABOLIC	Calciphylaxis.

So that we can distinguish the following large groups of ulcers of the lower limb based on their aetiology **(picture 1)**:⁴

- a) Venous ulcer.
- b) Ischemic ulcer.
- c) Neuropathic ulcer.
- d) Others (see aetiological classification table).



Picture 1. Ulcers due to congenital metabolic alteration: prolidase deficiency

06 MORPHOLOGY¹

The different variables of the morphology of the ulcer must be assessed both at descriptive level as well as to follow a correct clinical monitoring of its evolution. Therefore depending on the degree of tissue affectation we must differentiate.

Depth:

Depends on the level of affectation.

- **Level I:** Ulcer that affects the epidermis and the dermis.
- **Level II:** Ulcer that affects the subcutaneous cellular tissue or hypodermis.
- **Level III:** Ulcer that affects the fascia and the muscle.
- **Level IV:** Ulcer that affects the bone.

Tissue Structure:

Establishes the proportionality between the granulation tissue, the fibrin and the necrotic tissue.

- **Level I:** Base of the ulcer occupied in its entirety by granulation tissue and necrotic tissue and fibrin are non-existent.
- **Level II:** Base of the ulcer occupied in more than 50 % by granulation tissue and in a lesser proportion by fibrin, and necrotic tissue is non-existent.
- **Level III:** The base of the ulcer presents a granulation tissue of less than 50 %; fibrin, more than 50 % and necrotic tissue is non-existent.
- **Level IV:** The necrotic tissue occupies more than 50 % of the ulcer; fibrin, less than 50 % and granulation tissue is non-existent.

Extension Area:

The measurement of the ulcer's area has a predictive healing value.

Several methods can be useful but estero optical or photographic are the ones which accredit a greater correlation with the lesion area. A photograph is taken which is later computer processed in a very complex manner. For this reason we recommend other methods that are more easily applied such as the planimetric method, from a tracing on acetate, accepting a deviation from its results depending on the ulcer's area. Deviations of between 8 % and 11 % should be taken into account depending on the area that is lesser or greater than 10 cm² respectively. Acetate sheets are used for this which can be easily adapted to the ulcerative surface, whose contour is drawn with a pen. If the planimetric method cannot be used, at least the measurement of the maximum perpendicular axis of the lesion is recommended.¹

Volume:

The calculation of the ulcer's volume in a systematic way is not recommended.

07 | VENOUS ULCER

7.1. DEFINITION

Lesion located between the knee and ankle that does not heal during at least four weeks and that occurs in the presence of Chronic Venous Insufficiency.³

7.2. EPIDEMIOLOGY¹

They are the most common type of ulcers of the lower limb. Between 75 and 80 % of the ulcers of the lower limb are of venous aetiology. The incidence is between 2 and 5 new cases per thousand people and year. If we consider the data of other countries such as the United Kingdom, we can talk about 0.1 to 0.3 %, this increasing with age.^{5, 6, 11, 12}

7.3. ETIOPATHOGENESIS⁶

Chronic venous insufficiency (CVI) refers to a group of clinical syndromes whose common pathophysiological base is ambulatory venous and evolutionary hypertension in the lower limbs.

Venous hypertension (HTV) can originate from a primary or secondary form. In its primary form, the most common cause is hereditary or congenital abnormalities that affect the valvular functionality and distribution in certain venous segments, and the morphological alterations of the venous wall. Angiodysplasia are considered primary forms with more complex morphological alterations. In the secondary forms the thrombosis of the deep venous system is the most frequent cause.

Venous hypertension can affect the superficial venous system (internal or external saphenous vein systems) causing the development of varices or affect the deep venous system (iliofemoral or femoropopliteal sectors). The affectation of these systems may be simultaneous or unique.

Among the risk factors that contribute to the development of venous hypertension conditioning the emergence of clinical manifestations and the evolutionary course is obesity, structural alterations of the foot (flat foot), pregnancy, prolonged and usual standing, hormonal factors or the sedentary lifestyle. These factors contribute to the development of a lesion as well as maintaining its chronicity. Some others such as malnutrition, the use of drugs at parenteral level as well as certain comorbidities also contribute to chronicity in its evolution.³

Venous hypertension is the result of a dysfunction of the variable haemodynamics of the venous flow resulting in an increase in pressure on the distal segments (greater than 10-15 mmHg), this contributing in a lesser or greater extent to a dysfunction of the muscle pump mechanisms.³ Venous stasis produces haemorrhological alterations and leukocyte activation that derives in capillary thrombosis phenomena, with damage to the endothelial cell, migration of macrophages

into the interstitium tissue and release of free radicals, myocardial tissue. Therefore changes in micro-circulation are caused, which cause tissue ischemia and the development of the lesion.^{7, 8}

7.4. DIAGNOSIS^{3, 4, 9}

Medical record

The most important symptoms reported by a patient with venous ulcers are: heaviness and itching on the legs, which leads to lesions due to scratching; if the pain is moderate and is reduced when the legs are raised. The pain can be more intense in the cases in which there is infection. A history of deep venous thrombosis and / or the presence of varicose veins as precipitating causes should be taken into account in the medical record, as well as other predisposing factors that contribute to the chronicity of the process and determine its evolution.

Physical examination

a) Findings in relation with CVI (examination of the limb).

- **Varicose veins:** dilated veins, tortuous and insufficient arising from the superficial venous system. They are not a constant in the diagnosis of venous ulcer but for the most part they are seen when carrying out an examination standing up.
- **Venous dermatitis-eczema:** characterised by erythema, petechiae and pigmentation that can be confused with an infectious-cellulite process. Sometimes with a clinical appearance similar to contact dermatitis. The location and response to treatment provides very useful information.
- **Ochre hyperpigmentation:** relating to deposit of hemosiderin.
- **Lipodermato-sclerosis**
- **White atrophy**
- **Oedema:** different causes of unilateral and bilateral oedema must be ruled out.
- **Palpation of pulses:** should be performed in all cases. They must be present while their existence does not completely exclude the existence of peripheral arterial disease which is why a Doppler study must be performed to calculate the Ankle / Brachial Pressure Index.^{16, 10} The mobility of the limb should be examined, in relation to the ankle joint given the fundamental role that this plays in the muscular pump.³

b) Characteristics of the lesion.¹

The most probable diagnosis of the aetiology of venous ulcer should be considered in the case of those ulcers whose morphology is oval and round (usually with a longitudinal diameter greater than the sectional one), with dug in and well delimited edges and periulcerous tissue affected by chronic skin alterations (see clinical signs above) (**picture 2**).



Picture 2. Chronic venous insufficiency level 6 of CEAP. Venous ulcer

Complementary tests

- **Venous duplex ecodoppler:** Allows the haemodynamic examination of the limb giving a confirmatory diagnosis of the clinical suspicion. Allows the treatment strategies to be articulated once the anatomical sectors affecting superficial venous system (SVS) have been confirmed, deep venous system (SVP) or perforating veins.⁴
- **Doppler scan:** Allows the Ankle / Brachial Pressure Index (ABI) or Yao index to be calculated. Carrying out the ABI lets the presence or absence of peripheral arterial disease (PAD) to be confirmed. Its usefulness is limited in patients with severe calcification of the vessels such as diabetic patients or those with chronic renal failure of long evolution where other complementary tests may be needed. It should be performed on both legs at the initial visit.³

Calculation of the ABI index:

- It is calculated as the quotient between the systolic blood pressure at ankle level and brachial systolic pressure.
- Ankle pressure is obtained with a sphygmomanometer cuff placed above the ankle and a Doppler probe to record the flow in the route of the pedis artery and posterior tibia (on the back of the foot, external to the tendon of the extensor muscle of the first finger and at retro-malleolar level, respectively) and is divided by the brachial systolic pressure obtained at arm level with both devices.
- Requires proper training. In practice an ABI below 0.9 is considered pathological.¹¹
- Compression therapy, a fundamental pillar in the treatment of venous ulcers, can be applied without problems in patients with an ABI greater than 0.8.¹²
- We must be careful in the interpretation of ABI results in those patients with severe calcification of the vessels, such as those suffering from diabetes and chronic renal

- failure where they can be abnormally high because the vessels are not compressible.
- Values above 1.5 should be considered as not assessable and therefore should not be valued in the clinical decisions to be taken.³
- In summary, it is fundamental to demonstrate the existence of tibial pulses and / or pressure gradient in the foot > 60 mmHg and / or an Ankle / Brachial Index greater than 0.75 to establish the diagnosis of venous ulcer as a first diagnostic possibility.¹

- **Biopsy of the lesion:** A biopsy of the lesion should be considered if the appearance of the ulcer is atypical or if there is damage or disruption of improvement after 12 weeks of treatment,^{13, 14} ulcers of evolution over 6 months with hypertrophic or exophytic tissue granulation, recurrent ulcer with a history of neoplasm in the same location or presence of locoregional adenopathies in the absence of infection.¹ Systematic biopsy is not recommended.

7.5. CLASSIFICATION OF CHRONIC VENOUS INSUFFICIENCY (CVI)

The CEAP classification allows the clinical (C), Aetiological (E), Anatomical (A) and Physiopathological (P) data of the Clinical Venous Insufficiency to be integrated in the same nomenclature (**table II**).

In response to the clinic (class C) we find that the C-6 level associates skin changes with an active ulcer and that constitutes the functional class to which we refer to in this chapter.

LEVEL C-0	Absence of clinical signs of CVE.
LEVEL C-1	Reticular / telangiectasia varices.
LEVEL C-2	Truncal varices.
LEVEL C-3	Oedema.
LEVEL C-4	Skin changes (pre-ulcerous lesions).
LEVEL C-5	“C 4” level + history of healed ulcer.
LEVEL C-6	“C 4” level + active ulcer.

Táboa II. Graos do epígrafe C da clasificación da CEAP¹⁵

7.6. GENERAL GUIDELINES ON THE PREVENTION AND TREATMENT

We must assess not only the presence or absence of symptoms, and clinical examination, but also the patient comorbidities as well as their degree of autonomy at home. Thus elderly patients may present difficulties of therapeutic compliance in some aspects such as the use of compressive therapy.³

The aim is to detect and correct the triggers to avoid the appearance of ulcers as a complication of the CVI, treat them once they appear and prevent their recurrence.

7.6.1. GENERAL MEASURES

- **Control of triggering factors as well as of intercurrent diseases:** this consists of promoting measures to prevent chronic venous insufficiency (Annex 2) with an emphasis on the maintenance of a correct body mass index, raising the lower limbs above the level of the heart and in the execution of exercises involving the mobilisation of the ankle joint (flexion-extension, rotation) and the activation of the calf muscle pump. These measures are coadjuvant to the implementation of compressive therapy that is the mainstay treatment of these lesions. [R]^{5,23}

Health education has a great relevance. The work of the professional is not only to convey information but to give demonstrations and put into practice those skills the patient must use in their daily lives (appropriate exercises, care of the skin and its appendages, etc.).

- **Treatment of ulcers:** As general criteria, ulcers of the lower limb should be treated by strategies that are based on main variables such as the histologic level; the level of exudate; the clinically observed infection and the condition of the periulcerous tissue. The management of the wound follows the principles for the treatment of chronic wounds and those of healing in a wet environment, with the following features:¹⁶
 - Cleaning with potable water or saline solution with a pressure to allow waste to be removed without damaging the healthy tissue [R].³⁰
 - The use of antiseptics is not recommended as a general rule [R].³⁰
 - Debridement depending on the conditions of the bed and edges of the wound.
 - If there is a suspected bacterial overload or infection of the wound, dressings with bactericidal action shall be used. The use of dressings with silver or cadexomero iodine [R]^{5, 23} should be considered as the first choice to reduce the bacterial load, as they reduce the bacterial load, allowing the infection at local level to be controlled if it occurs, without important local and / or systemic hypersensitivity reactions and with no damage to healthy tissue (see annex 4).
 - Venous ulcers often show variable exudate. Vertical absorption dressings will be used depending on the amount so as not to macerate the periulceral skin. In any case, both polyurethane foams, such as hydrocolloid hydrofibre should be used and, if the exudate is very abundant, then calcium alginate dressings would be indicated [R].⁵
 - If indicated the periulceral skin would be protected with non-irritating barrier films or barrier creams [E].^{3, 23}
 - Hydration of the periwound skin with moisturising cream (unscented) or hyper-oxygenated fatty acids in emulsion.

- Treatment of the pain if there is any. The topical application of mepivacaine solution at 3.5 % can be useful especially when performing local cures.

The clinical practice guidelines support the levels of evidence and highest recommendation levels considered for specific treatment of uncomplicated varicose ulcers as follows:

- The treatment of first choice and that meets the maximum available scientific evidence, is multi-tier compressive therapy used routinely **[R]**.^{3, 5}
- The use of simple non-adhesive dressings for the handling of this type of ulcers **[R]**.^{3, 5}
- The prescription of pentoxifylline to improve healing of venous ulcers should be assessed **[R]**.^{3, 5, 23}
- The use of graduated compression stockings at least up to the knee to prevent recurrence of the venous ulcers in patients whose ulcers have healed is recommended **[R]**.^{3, 17} **(picture 3)**.



Picture 3. Reduction compression stocking in a patient with CVI

7.6.2. COMPRESSIVE THERAPY

This is the treatment of first choice in alterations of the venous system, whether therapeutically or preventively; however, compression that is not indicated or improperly conducted may be harmful to the patient.

The compression systems available to us are multilayer bandages (especially indicated in cases of an active ulcer), graduated compression stockings (useful for chronic patients and especially to prevent the recurrence of the lesion) and intermittent pneumatic compression systems.

The effects of compression therapy¹⁸

It works by decreasing the hyperpressure on the distal venous segments and improving valvular insufficiency:

- Increases the speed of blood flow, improves the function of the venous pump, favours the absorption of exudate in the interstitial space and improves or at least slows down the deterioration of trophic skin disorders (hyperpigmentation, etc.).
- It is very effective combined with exercise. It has been shown that 70 % of ulcers heal in a period of twelve weeks when the treatment consists of applying compressive therapy combined with physical exercise (walking).
- Reduces the time required for healing of the ulcers.
- Slows down the evolution of the underlying disease.
- It only has a beneficial effect if applied correctly.
 - It must be carried out depending on the ABI. Compression therapy of up to 40 mm Hg can be used in patients with ABI greater than 0.8. Below this figure, it is generally contraindicated or, if implemented, should be done with continuous monitoring and lesser degrees of compression. Compression therapy must be applied with great caution in diabetic patients and other diseases such as rheumatoid arthritis must be ruled out. This technique should not be applied if there is significant soft oedema [R].³
 - The procedure must begin with educating the patient, on the one hand to promote adherence to this therapy and on the other, to familiarise them with their indefinite use to prevent frequent recurrences.
 - The essential requirements for a correct compression are the education of the patient, the patient's consent, the proper compression material and correct technique.

Compressive bandaging and its application^{18, 19}

Simple bandaging is not recommended as it is less effective. This is often done with a crepe bandage, but it loses elasticity as the hours go by; it has great elastic fatigue, and must be changed every 24 hours.

The most efficient compression will be carried out with multi-layer bandages. The most widely used is that of two layers. Most are a combination of elastic bandage and inextensible bandage (or very low extensibility). A protection cushion (e.g.: an inextensible cotton bandage) is put in position first of all and, on top, at least another layer of elastic bandage. They are applied for a period of up to seven days. There are multi-layer bandages available that combine two low extensibility elastic bandages.

The extensible bandage is not effective at rest but it is in movement, it helps the calf muscle pump (Unna boot). The elastic bandage maintains pressure even at rest and adapts to the

shape of the leg. The combination of both types of bandage is an efficient way to promote the venous return and decrease venous hyperpressure.

The peripheral pulses must be palpated and the ABI determined before compressive bandaging is carried out. Processes that contraindicate it must be ruled out, apply the specific treatment of the wound and measure the perimeter of the ankle: below 18 cm is contraindicated, and in applying it, would need to be supplemented with a cotton bandage this perimeter has been safely exceeded. There are commercial presentations with instructions for correct placement of the bandages. The measurement of the ankle's perimeter also allows the size of either the multilayer bandage kits as well as the graduated compression stockings to be selected. The skin of the leg must be previously protected with moisturising cream, petroleum jelly, zinc oxide cream or hyper-oxygenated fatty acids in emulsion or milk, depending on availability and condition of the skin.

The multilayer compressive bandage as said will be carried out **(image 4)**:

- From the distal to proximal area.
- Starting at the base or root of the fingers.
- Foot at a bending angle of 90 degrees.
- Musculature of the leg relaxed (if possible in the Trendelenbourg position).
- Some authors recommend that is in pronation direction (from the fifth finger).
- In a spiral action, each round overlapping 50 % of the previous round.
- Multilayer (a greater number of layers with greater pressure; the current trend is to use bilayer bandaging).



Picture 4. Bilayer compression bandage

In combination with the multilayer bandage, in non-complicated venous ulcers a simple dressing is recommended as a primary dressing, as it is low-adhesion, cheap and acceptable to the patient [R]³. A Cochrane review concluded that the type of dressing applied under the compression has not been shown not to affect the healing of the ulcers.²⁰

7.6.3. GRADUATED COMPRESSION STOCKINGS

Compression stockings prevent the recurrence of the venous ulcers, deep venous thrombosis, reduce lymphoedema, and are also used for the treatment of venous ulcer with a low adherence dressing. It should not be forgotten that compression stockings greatly increase compression on the toes, so that the greater pressure by the stockings, the greater the chance of shortening the time of relapse and / or incidence of interdigital and digital helomas.

The pressure exerted on the ankle by the stockings allows them to be classified in:

- Light compression stockings (18-24 mmHg).
- Medium compression stockings (22-29 mmHg).
- Strong compression stockings (30-40 mmHg).

There are various types:

- Short (up to the knee), whole or open in the distal extremity.
- Long (cover the thigh).
- Up to the waist.

General measurements:

- The level of venous insufficiency determines what compression is appropriate for the patient.
- For the treatment of venous leg ulcers, patient compliance, ease of use and the economic implications to determine the length of the graduated compression stockings **[GP]**²¹ shall be taken into account, if we are to achieve being able to maintain the decreasing pressure especially in the infragenicular region.
- The selection of the stocking size requires the measurement of the ankle and calf in the early hours of the morning, which at the time of the measurement should be free of oedema. The shape of the leg must also be taken into account
- The best time to put them on is in the morning, after waking up or when the compression bandage is removed, if it the patient were to be wearing one. They are difficult to put on; there are devices on the market that facilitate their placement.
- They last approximately six months. There is a wide variety of sizes and types of stockings. Experts recommend the use of the stocking that it is best tolerated by the patient.
- Reduced compression and graduated light and normal compression stockings are useful alternatives for patients who cannot tolerate a multilayer bandage or the strong graduated compression stockings.
- If there is complete healing of the ulcer, due to the fact that these types of lesions have a very high recurrence rate, it is recommended to insist in both the elevation of the lower limbs (especially after a long time standing or after the walks), as well as in the antiestasis exercises and the use of graduated compression stockings up to the knee (the compression that the patient can tolerate)**[R]**.³
- If the size of the ulcer is not reduced in a month it is recommended that the entire process be reassessed from the beginning and, if indicated, refer the patient to his doctor and the vascular surgeon **[R]**.^{22, 23}

7.6.4. PHARMACOLOGICAL TREATMENT

- The administration of pentoxifylline at doses of 400 mg every 8 hours, in periods of at least 6 months must be taken into account **[R]**.^{5, 23}
- Systemic antibiotics should only be used if there is clinical evidence of infection and should be modified according to the culture and antibiogram **[R]**.²³
- In regard to the therapeutic management of complicated venous leg ulcers - bacterial colonisation, infection - the treatment guidelines are listed in annex 4.

7.6.5. SURGICAL TREATMENT

Patients with venous ulcers and reflux-incompetence of the superficial venous system (SVS) (classes 5 and 6 of the CEAP) are candidates for surgery to prevent recurrences **[R]**.³

We have different surgical techniques:

Techniques such as full or partial saphenectomies (internal or external systems) as well as phlebectomies, radio frequency ablation, sclerotherapy with foam or endolaser.

Other techniques to consider with haemodynamic bases and criteria are the CHIVA technique and the ASVAL (selective ablation of varicose veins with local anaesthesia).

If the venous sector affected is the deep venous system (SVP) although there are various techniques, some reconstructive (of the valvular level) and other derivative (bypasses), with high rates of ulcerous recurrence in the long-term and postoperative venous thrombosis they must therefore be regarded as technical resources for exceptional situations.

Skin grafts may be indicated for ulcers with adequate granulation tissue, not colonised that do not respond to treatment.

08 ISCHEMIC ULCERS

8.1. DEFINITION

Ischemic ulcers are lesions that appear as a result of a shortage of blood supply and chronic ischemic processes, with arteriosclerotic obstruction (peripheral artery disease in advanced stages that causes a critical ischemia of the lower limb) being the most significant cause of arterial obstructive processes of the lower limb.^{11, 24, 25}

8.2. EPIDEMIOLOGY

The incidence of arterial ulcers is closely linked with the epidemiology of peripheral artery disease (1-9 %), whose evolution to critical ischemia of the lower limb (CLI) in 5 years is around 5-10 %.²⁴

The incidence of critical ischemia is 220 new cases per million. Around 500 and 1.000 new cases per million of CLI in Europe and North America^{26, 27} are expected to be produced.

8.3. ETIOPATHOGENESIS^{23,24}

The main cause of the critical ischemia of the lower limb, and therefore of patients that can present ischemic ulcer, is arteriosclerosis. For this reason, the risk factors to consider are those of peripheral artery disease or peripheral arterial disease (PAD).

In summary: there is a decrease of the partial pressure of tissue oxygen, caused by a blocked artery either of degenerative aetiology (arterioesclerose) or inflammatory (arteritis). However, the pathophysiology is complex and very different in both cases so that unlike the ulcer with arterial hypertensive and arteritic aetiology, no morphological alterations are observed in the arteriole and capillary, but initially these are functional or adaptive type.¹

Risk factor of the PAD²⁴

- **Race:** higher prevalence in blacks.
- **Gender:** greater in men than in women especially in the younger age groups.
- **Age:** the prevalence and incidence increases with advancing age.
- **Smoking:** quitting smoking is associated with a reduction in the incidence of intermittent claudication as a clinical manifestation of the symptomatic PAD - see below.²⁸
- **Diabetes Mellitus.**
- **Arterial hypertension.**
- **Dyslipidemia.**
- **Inflammatory markers:** higher incidence in those who have a higher concentration of basal PCR.
- **Hyperviscosity and states of hypercoagulation:** the increase in plasma concentrations of fibrinogen has been associated with the PAD assuming both hyperviscosity as well as hypercoagulation to be a predictor of poor prognosis.

- **Hyperhomocysteinemia:** it has been described as high in over 30 % of patients with PAD.
- **Chronic renal insufficiency:** Could be of a causal nature.²⁹

The magnitude of the risk of the various risk factors on the development of critical ischemia in patients with PAD is variable and is depicted in the diagram below (figure 1).²⁴

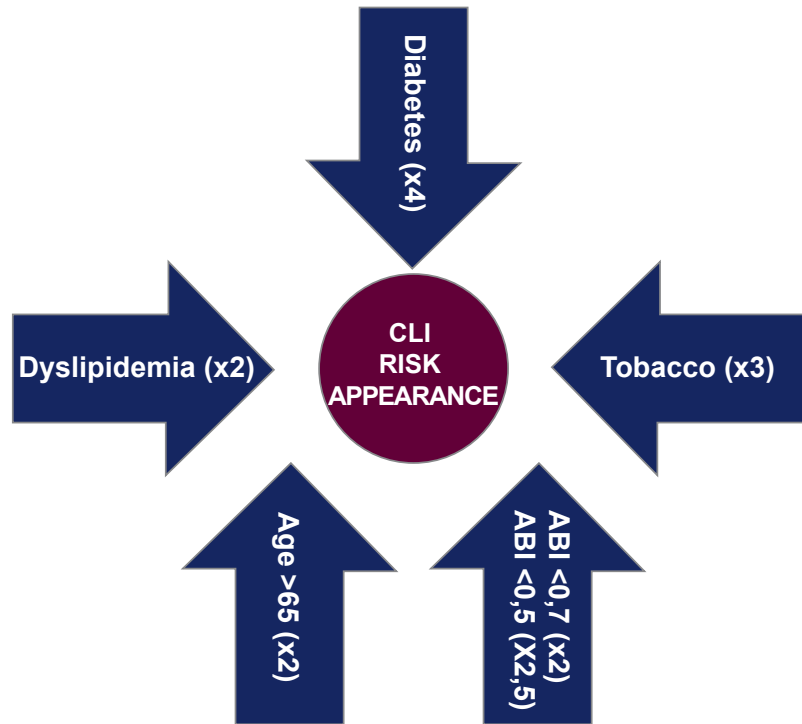


Figure 1. TASC II: pathogenesis

The pathophysiological alteration affects two levels: macrocirculation and distal microcirculation.^{30, 24, 31} In the macrocirculation involvement, arterial lesions are produced such as stenosis and / or blockage of the main vessels that finally exceed the compensating mechanisms (for example, the development of collateral arteries) and cause a decrease in pressure of the distal perfusion to the lesion which causes an inadequate supply of oxygen and necessary nutrients for tissue viability. A lesion of the microcirculation is then produced.

On one hand there is an alteration of the neurogenic microvascular control and haemorrhological alterations that cause an increase in capillary permeability and tissue oedema, as a result of disruption in the self-regulatory mechanisms.

The defence mechanisms are altered producing leukocyte activation; platelet and endothelial alterations that cause the release of oxygen free radicals, inflammation mediators and proteolytic enzymes that cause and perpetuate the capillary and tissue lesion.

8.4. DIAGNOSIS

A suggestive clinical history, in a patient with absence of any arterial pulse - absence of distal pulses to the coronary arterial lesion- together with the characteristics of the ulcers is the foundation of the suspected diagnosis. Confirmation will be carried out with haemodynamic scans.²⁵

Medical record

The typical symptom of PAD is intermittent claudication that consists of a muscle pain located in different parts of the leg, usually affecting distal sectors, which occurs repeatedly in relation to exercise and stops with rest in a variable term generally less than 10 minutes. It will affect the muscle groups distal to the obstructive lesions.

Sometimes the symptoms may not be present especially in patients with reduced ability to walk due to co-morbidities or because their physical activity is limited. This often happens in the advanced stages of the disease.

Critical Ischemia of the Limb (CLI)²⁴ is the clinical sign that occurs as a manifestation of peripheral chronic obstructive artery disease in advanced stages consisting of the presence of ischemic pain at rest that requires regular analgesia for a period longer than two weeks or the presence of the ischaemic lesions in the limb consisting of ulcers or gangrene and evidence which is usually a systolic pressure of perfusion in the ankle of less than 50 mm Hg. In diabetic patients, given the high prevalence of arterial calcification in their middle layer, a digital pressure of less than 30 mm Hg must be assessed.

Ischemic pain typically occurs at rest, increases with elevation of the limb and improves with the lowering of it and it also affects regions of the limb distal to the location of the obstructive lesion -usually fingers and foot-. This means an advanced degree of peripheral arterial disease (PAD).

Physical examination³²

Inspection:

- **Colour:** pale skin or cyanosis. The limb is raised to see if it goes pale and subsequently will be explored with the limb lowered (for example sitting) so that it adopts a bright red tone known as erythromelalgia in decline (by capillary vasodilation in these patients). This erythromelalgia may be reversible with elevation or be fixed ("Lobster foot") which occurs in most serious cases.
- **Temperature:** decreased.
- **Venocapillary fill:** slowed down. Pressing on the fingers so that the colour disappears and is recovered in a time interval which in normal individuals will be less than 3 seconds.
- **Skin appendages:** reduction of hair growth, even absence of this. Nail hypertrophy due to slow growth.

Palpation of pulses: Pulses should be palpated at all levels, carotids, upper limbs (MMSS) and lower limbs (MMII).

- **MMII:** palpation of the femoral pulse (in Scarpa triangle at groin level); popliteal (back side of the knee and with both hands); posterior tibial (on the inside of the internal lateral malleolus); pedal (on the back of the foot on the outside of the extender belonging to the first finger). They will be graded as normal (2), diminished (1), absent (0). Must be performed in both lower limbs and when the examination permits shall be made with both

hands and symmetrically. This allows the extent and characteristics of the pulse to be compared (possible delay between pulses of an limb compared to the contralateral).²⁴

Auscultation: of all of them.

- A murmur means a turbulence of the flow and could identify a stenosis whether significant or not.

Characteristics of the lesion:

- Consistent in ulcers of distal location (foot) or gangrene that generally affects distal regions (fingers). This location is typical in the case of spontaneous lesions. However, the appearance of lesions in atypical location secondary to a trauma is not uncommon, which are perpetuated in the time and with the characteristics of the ischemic ulcers.
- In the context of a patient without pulses, the ulcer is painful, with irregular margins, with absent or infrequent callouses with various sensitive signs, with pale background and often with necrotic tissue at its base or fibrin (**picture 5**).^{1, 30}



Picture 5. Critical ischemia of the lower limb. Ischemic ulcer

Complementary tests

- Measure of the malleolar pressure and Ankle / Brachial Index (ABI) or Yao index:^{32, 33} a pneumatic cuff of width at least 20 % greater than the diameter of the limb is required, a sphygmomanometer and a continuous Doppler transducer (probe from 8 to 10 MHZ). The ABI is calculated as the quotient between the systolic malleolar blood pressure (pedis artery and posterior tibial) and the figure of the greatest brachial systolic pressure obtained via Doppler in both arms (**annex 1**).
- Sometimes the pulse is absent in one of the two distal arteries due to congenital reasons in 10 - 15 per cent of the population. If the flow of the other is multiphase and the ABI greater than 0.9 it is considered normal.

- When no flow is found in any of these arteries or the arteries are not compressible due to calcification a photoplethysmograph placed on the first toe shall be used.
- In normal individuals the ABI is equal to or greater than 1, considering pathological values lower than 0.9.

Degrees of ischemia and their relationship with ABI.^{1, 33} The ABI is correlated with the degree of the PAD being particularly low in cases of critical ischemia, with rates typically lower than 0.5. Seriousness is greater at lower ABI. These values, however, are indicative and on many occasions overlap. In addition taking into account these and the associated clinical symptoms allows us to value the referral for treatment by an angiologist and vascular surgeon.³⁴

ARTERIAL CALCIFICATION	>1.3	Absence of arterial distensibility. Other measures are needed to assess perfusion (digital photoplethysmography).
NORMAL	≥ 1	Preventive strategies in the general population.
OCCLUSIVE ASYMPTOMATIC PAD	<0.9	Control risk factors.
INTERMITTENT CLAUDICATION	0.5 < ITB <0.9	Referral.
DYSESTHESIA-PARESTHESIAS - OCCASIONAL PAIN	0.3 <ITB <0.5	Referral.
PAIN AT REST MODERATE-SEVERE	≤ 0.30	Referral.
TROPHIC LESIONS	≤ 0.30	Referral.

Table III. The ABI correlation with the clinical symptoms^{1, 33, 34}

- **Plethysmography:** Available technique but less used given the availability, reproducibility and ease of interpretation of malleolar pressure with Doppler. This technique measures the volume changes of the limb in relation with the variations of the local blood flow. This could be of various types. Thus, the pneumoplethysmograph can be used to study the arteriopathies and air cuffs are used to this carry this out. The impedance plethysmography measures changes in electrical resistance that indicate changes in the fluid volume of the limb. This is used for the study of the venous pathology, the pneumoplethysmograph tool also being useful. Finally, for the study of skin microcirculation at digital level a photoplethysmography is used with an infrared emitting probe with a photoreceptor that receives the reflected light.
- **Digital pressure:** This is measured by the placement of proximal pneumatic cuff positioned on the first finger and a photoplethysmograph applied distally to the cuff. Also measurable in second and third fingers. It is especially useful in cases of lack of arterial compressibility (calcification).
- **Claudicometry** performed on a treadmill with an incline and a stable speed to assess clinical response (pain) and the variation of the ABI with exercise. It is not useful in critical ischemia symptoms of the limb given the functional limitation presented by these patients.

- **Image tests:** The echo-doppler exploration gives morphological information and haemodynamics on the atherosclerotic lesion. Other imaging tests such as magnetic resonance angiography (angioMRI) or angiography by computerised axial tomography (CAT) allow the characteristics and location of the arterial lesion to be known as well as how to plan the revascularisation strategy before surgical treatment. Arteriography remains the “gold standard” in the diagnosis of peripheral artery disease and atherosclerotic arterial lesions. However, the great development of the imaging studies with non-invasive techniques gives arteriography a crucial role not only for the confirmation diagnosis but allows the endovascular treatment of these lesions.

Differential diagnosis

A first approximation depending of the characteristics of the ulcer may guide the diagnosis.¹²

31, 35

	VENOUS ULCER	ISCHEMIC ULCER	NEUROPATHIC ULCER	HYPERTENSIVE ULCER	VASCULITIC ULCER
LOCATION	Lower third. Internal or external side of leg.	Variable. Frequent. Distal location.	Pressure zones, bony prominences.	External supra malleor side.	Variable, with multiple frequency.
MORPHOLOGY	“Rounded or oval”, superficial.	Small, deep, irregular.	Rounded Related to the bone surface on which it is located.	Extensive, superficial.	Small, oval.
EDGES	Well delimited.	Irregular.	Well delimited.	Irregular and hyperemic.	Well delimited.
BACKGROUND	Fibrinoid.	Necrotic.	Granulation tissue.	Fibrinoid.	Necrotic.
PERIULCERAL TISSUE	Pigmented. White atrophy.	Cyanotic.	Callous.	Hyperemic Old skin infarctions.	Hyperemic Old skin infarctions.
DISTAL PULSES	Generally positive (ABI > 0.75).	Negative.	Positive.	Positive.	Positive occasionally. absent*
PAIN	Mild, more if infected.	High.	Zero or low.	High.	High.
PANALYTICAL PARAMETERS	None.	None.	Hyperglycaemia.	None.	Variables.
ROLE OF THE RE-VASCULARISATION	None.	Important.	None.	None.	None.

*Sometimes in vasculitic ulcers there can be a PAD that while is not the cause that originates them, however, can contribute to a worse outcome of them.

Table IV. Differential diagnosis of ulcers

8.5. CLASSIFICATION OF PERIPHERAL ARTERIAL DISEASE

This chapter includes those ulcers related to chronic obstructive artery disease in its advanced stages (critical ischemia of the lower limb) according to the Rutherford classification (grades 4, 5 or 6) and the most used in our environment, the Fontaine classification (grades III and IV)^{17, 24} (picture 6).



Picture 6. Chronic ischemia La Fontaine grade IV

Various stages are established in relation to the clinic (from lowest to highest severity) and these correspond with characteristic exploratory findings in terms of perfusion pressures, measures in mm Hg at the level of the ankle and digitals.

In the stages of critical ischemia the perfusion pressure in ankle will be less than 50 mm and in the case of patients such as arterial calcification where the ABI is not assessable digital pressure should be taken into account whenever possible (table V).

STAGES OF FONTAINE	CLINIC	RUTHERFORD GRADE	RUTHERFORD STAGE	CLINIC	FINDINGS
I	Asymptomatic.	0	0	Asymptomatic.	Walking on normal treadmill or reactive hyperaemia.
IIa	Mild claudication or non-disabling.	I	1	Mild non-disabling claudication.	Complete the claudicometry; PT after exercise >50 mm Hg. Pressure drop of at least 20 mm Hg compared to rest.
IIb	Moderate to severe invalidating claudication.	I	2	Moderate claudication.	Between categories 1 and 3.
		I	3	Severe claudication.	Cannot complete the claudicometry; PT after exercise > 50 mm Hg.
III	Ischemic rest pain.	II	4	Ischemic rest pain.	Standstill PT < 40 mm Hg, PD < 30 mm Hg.
IV	Ulceration or gangrene.	III	5	Minor loss of tissue (ulcers or focal gangrene with diffuse ischemia of the foot)	PT < 60 mm Hg PD < 40 mm Hg.
		III	6	Greater loss of tissue (lesions that exceed the transmetatarsal level, or foot not viable in the long term).	Equal to category 5.

PT: perfusion pressure in the ankle PD: digital pressure.

Table V. Correspondence between Rutherford and La Fontaine classifications

8.6. GENERAL GUIDELINES ON PREVENTION AND TREATMENT

8.6.1. CRITICAL ISCHEMIA OF THE LIMB

Patients with critical ischemia of the lower limb (CLI) must be referred to the specialist in angiology and vascular surgery in all cases to start the process aimed at the revascularisation of the limb.¹

General measures

- Physical exercise is imperative, walking, the usefulness of exercise programmes aimed as a fundamental part of the treatment being shown to be essential **[R]**.^{5, 23} This is a determining factor in the cases of CLI to achieve a proper functional recovery.^{24,36-38}
- Smoking cessation with repeated recommendations, group sessions and nicotine replacement. Bupropion can be added, its association achieves high dropout rates.³⁰
- Diet, weight loss and exercise.
- Lipid control: reduction of total cholesterol and LDL <100 mg / dl or < 70 mg / dl in patients which have associated vascular injury in other locations (e.g. , coronary). The reduction of triglycerides and raising HDL concentrations is required.²⁹ Use of statins.⁵
- Prevention, diagnosis and treatment of diabetes: the aim of treatment is to achieve figures of glycosylated haemoglobin less than 7.0 %.
- Prevention, diagnosis and treatment of hypertension: the aim is to maintain blood pressure below 140 / 90 mm of Hg and in cases of Diabetes Mellitus (DM) or renal insufficiency <130 / 70 mm Hg.

Pharmacological treatment

- In secondary prevention, antiplatelets of a chronic form and use of statins shall be indicated **[GP]**.²⁴

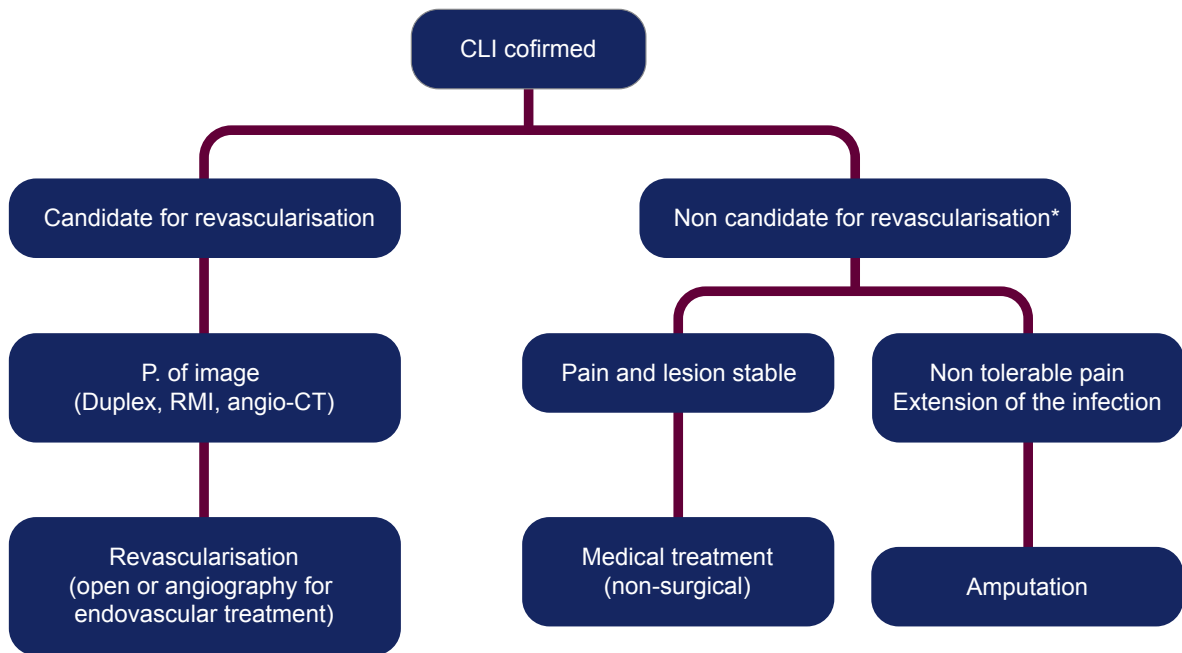
Other pharmacological treatments

- In non-revascularisable CLI, or when the revascularisation is not effective, the administration of prostaglandin E1 (PGE1) at doses of 40 mcg every 12 hours, intravenously for 21 days is recommended. If after this interval positive results are not shown in the disappearance of pain at rest or changes in the granulation tissue of the ulcer, treatment should be suspended **[GP]**.¹
- Action must be taken against pain with the analgesia required. It is often necessary to resort to opioid doses when similar analgesics at a lower level are insufficient.

Surgical treatment

- **Revascularisation:** The surgical revascularisation treatment of the limb is the treatment of choice in all cases of ulcers of ischemic aetiology. The strategy and surgical technique to follow should be depending on the morphology of the lesion, the extension of the affected sector, the general condition of the patient and the skills and experience of the surgical team **[GP]**.¹ We have several methods:
 - Multiple open surgery techniques: endarterectomy to repermeabilise, if it is achieved, the arterial stenotic / occluded segment; venous graft (autologous) or heterologous grafts whose objective is to carry out a bypass which overtakes the obstruction.
 - Endovascular surgery: treatment by percutaneous arteriography.
- **Amputation**
 - **Minor amputation.** Frequently it is necessary to associate this type of treatment to revascularisation procedures.

- **Major amputation.** In patients with CLI and ulcers where revascularisation is not viable, it is recommended that elective amputation be indicated. The decision to amputate, as well as the level of amputation, will take into consideration the potential for scarring, the possible rehabilitation and restoration of the quality of life of the patient and the family.
- In those cases in which the general condition of the patient as well as postoperative prognosis and life expectancy are valued as extremes then palliative treatment shall be considered (**figure 2**).



* Patient that is a non-candidate due to their basal condition, revascularisation is not technically possible or revascularisation not indicated due to generalised lesions.

Figure 2. Treatment algorithm for patient with CLI^(24 modified)

8.6.2. TREATMENT OF ISCHEMIC ULCERS OF THE LOWER LIMB

The management should be individualised and based on the patient assessment made, the limb and the signs of the wound (bed, exudate, smell, depth, necrotic tissue, edges, periulcer skin) and if it follows the principles for the treatment of chronic wounds and those of healing in wet environment, it has certain characteristics.

Before the revascularisation:

- Conservative treatment is recommended.³¹ It is worth noting that a dry cure may be indicated if the injury is not properly infused-vascularised. The aim is to keep the wound clean, avoiding bacterial colonisation if this has still not occurred. This helps to prevent the maceration and the risk of superinfection.
- In this situation topical antiseptics may have an important role. As a disadvantage they do not have selective activity as they eliminate all kinds of germs.

After the revascularisation:

- In general we do not recommend the use of antiseptics in ischemic wounds that are not infected or not colonised³⁰ (**annex 4**).
- The withdrawal of the dressings must be made by wetting with saline in order to relieve pain, prevent bleeding and damage in the periwound tissue, during the changes of dressings.³⁵ Washing with potable water or with saline with a pressure to allow the waste to be removed and the granulation tissue not be damaged (an option would be to use a 20 ml syringe with a needle or catheter of 0.9 mm) **[R]**.³⁰
- Once revascularised, the devitalised tissue could be removed by cutting, enzymatic or autolytic debridement followed by closure **[E]**.³⁰
- The presence of pain, odour, abundant exudate or undue delay in healing could indicate colonisation or signs that suggest infection associated with it, and would have to be handled with the appropriate bactericidal dressings.
- If an infection is suspected, it is advisable to perform a culture and antibiogram.³⁰
- The cure in wet environment is recommended **[R]**.³⁰ The choice of dressing will be depending on the type of tissue, exudate, location, perilesional skin and ease of placement and removal.
- Hydration of the periulcer skin, hyperoxygenated fatty acids in milk or emulsion.
- In plantar, interdigital ulcers and those related to rubbing it is recommended that unloading and protection devices be used.
- Non-compressive bandages.
- In the case of cellulitis, lymphangitis or osteomyelitis (i.e. in cases of active infection) the use of systemic antibiotics is recommended **[R]**.³⁰

The prevention of the occurrence or recurrence of arterial ischemic ulcers is carried out pursuant to the action on the vascular risk factors in all age ranges (no smoking, control of lipids, exercise, diet...) **[E]**.^{30, 38}

09 | NEUROPATHIC ULCER

The most common aetiology of neuropathic ulcers in Spain is Diabetes Mellitus. This practical guide to wounds develops a chapter in relation to this pathology (of the diabetic foot ulcer) so we will refer to it for consultation.

10 | OTHER ULCERS³⁹

There is a miscellany of ulcers whose last aetiology is tissue ischemia, however macroangiopathy is not associated. Many of them are associated with systemic diseases, which produce a primary lesion of arterioles, venules and capillaries.

They tend to be small in size, caused by multiple strokes with involvement from the surrounding skin with cellulitis, angiodermatitis or livedo reticularis. Pain is a permanent feature and revascularisation has no indication as part of their treatment.

Due to certain peculiarities, they require proper clinical evaluation and an appropriate differential diagnosis that allows us to articulate the most appropriate treatment strategies in relation to the aetiology of each one of them.

10.1. HYPERTENSIVE ULCER (MARTORELL ULCER)

10.1.1. DEFINITION

This is identified with the personal name of the Spanish author, Fernando Martorell, who in 1945 describes these wounds for the first time as “supramalleol ulcers due to arteriolitis in large hypertensives”. The clinical presentation is very characteristic: superficial necrotic ulcers, which tend to spread, are often bilateral, extremely painful, with irregular borders and hyperaemic. They are typically located in the anterolateral supramalleolar area of the leg or Achilles tendon. They are associated with high blood pressure (HT) which is poorly controlled persistent in patients with perceptible distal pulses; diabetes is present in about 60 % of the patients. They are often infradiagnosed.^{1, 40-43}

10.1.2. EPIDEMIOLOGY

Although it is a rare cause of ulcers in the lower limbs, they are not rare. They affect patients from 40 to 85 years of age, with poor control of their arterial hypertension of long evolution.⁴¹ Represent 3 to 4 per cent of the ulcers of the lower limb.⁴⁴ Its prevalence varies between 0.5 and 1 % of ulcers of the lower limb and its incidence of 4 to 6 new cases per 1.000 inhabitants and year. The prevalence and incidence increases in female sex especially in women with hypertension for more than 25 years of evolution. In this age group and pathology the prevalence is 15 to 18 % and the incidence of 20 to 25 new cases per 1.000 inhabitants and year.¹ There is also a higher prevalence in females aged over 65 years.³⁹

10.1.3. ETIOPATHOGENESIS

Arteriolar lesion is highlighted in this type of ulcer. The presence of a histopathological pattern consistent in uniform hypertrophy of the arterioles and obstruction due to accumulations of fibrin, with nuclear hypertrophy in the cells of the endothelium and basal hyperplasia (in accordance with the clinical signs and the presence of HT) should be considered as specific to the ulcer with arterial hypertensive etiology.¹ The reduction of the perfusion of the tissues leads to local ischemia and formation of the ulcer. The ulcer starts as a red spot that becomes cyanotic, forming a painful ulcer with bed of the ischemic wound.⁴²

10.1.4. DIAGNOSIS

Due to its low incidence and prevalence, it can easily be confused with other types of ulcers. The diagnosis is based on the typical location and in the clinical features: necrotic and painful ulcers that tend to deteriorate progressively, associated with arterial hypertension of long evolution and history of diabetes. High blood pressure (and often diabetes), the local signs and the subcutaneous arterioloesclerosis demonstrated histologically are compulsory to make the diagnosis.⁴⁵

The profile of the affected patient is a woman, with long-standing HT (greater than 10 years) and older than 55 years with very painful lesions, located in the distal third of external and supramalleolar part of the leg, flat edges, irregular and hyperemic, with background with fibrin and periwound skin unscathed or with skin infarcts. It is common that it be on areas of myocardial tissue. The pain does not improve with the lowering of the limb but worsens and is difficult to control.

Usually is not associated with peripheral artery disease and therefore presents distal pulses. In case they are not shown the Ankle / Brachial Index will be greater than 0.75 , threshold above arterial ischemic aetiology of such injury^{1, 39} are dismissed (see differential diagnosis table).

10.1.5. GENERAL GUIDELINES FOR PREVENTION AND TREATMENT^{1, 41, 42, 46}

Primary prevention would be a good control of arterial hypertension both through healthy lifestyles as of the risk factors for the HT (obesity, sedentary lifestyle, etc.). Tertiary prevention is founded in the control of blood pressure, weight, diabetes, physical exercise, treatment adherence, proper care of the wound.

The treatment of the Martorell ulcer is based on the control of hypertension (although an adequate control of blood pressure alone does not seem to reverse these lesions), the local care of the wound and pain control.

The therapy on the ulcer may not be different from that of the ischemic ulcers previously described. This treatment includes the debridement of the wound, the control of the bacterial load, the management of the exudate and the care of the edges and periwound skin following the principles of carrying out dressings in a wet environment. In cases of wounds of great extension a skin graft would be indicated. There is not enough evidence to recommend treatment with becaplermin gel (platelet-derived growth factor) compared to the usual care with hydrogel.

Lumbar sympathectomy has proved useful for the treatment of pain, but not for the healing of the ulcer. It could therefore be considered as a therapeutic option in those cases in which the medical treatment does not get adequate pain control. Revascularisation treatment is not indicated in the case of the hypertensive ulcer.

10.2. VASCULITIC ULCER

10.2.1. DEFINITION

Those ulcers that occur as part of the clinical manifestations associated with a heterogeneous group of diseases known as vasculitis are called this.

Vasculitis is characterised by a process of inflammation and necrosis of the blood vessels that lead to their occlusion causing a secondary ischemia of the tissues which depend on them. Can affect various organs or tissues and among others the skin.⁴⁷

10.2.2. EPIDEMIOLOGY

Ulcers are rare with prevalence lower than 0.5 %.¹

10.2.3. ETIOPATHOGENESIS

In vasculitis there is an altered immune response associated with quantitative and qualitative changes of the endothelial adhesion molecules and of the circulating leukocytes that mediate the immune response of the inflammatory processes.

The pathological findings common to all of them is necrotising vasculitis which is characterised by areas of cellular infiltration and disruption of the normal architecture of the vessels by neutrophils with fibrinoid necrosis that characterises the so-called leukocytoclastic vasculitis. These processes may occur in the presence or not of granulomatous inflammation.⁴⁷ The type of vessel affected lets you classify them into different categories.

10.2.4. CLASSIFICATION OF VASCULITIS

Vasculitis can be seen as a primary process- vasculitic syndrome or as a component of another underlying disease.⁴⁷

Therefore in terms of its aetiology we can differentiate: idiopathic vasculitis, primary or of unknown aetiology; vasculitis associated with other systemic diseases (such as rheumatoid arthritis or lupus); or vasculitis with a presumed aetiology (infectious hepatitis B virus or C , by immune complexes in relation to medicines or drugs, etc.).⁴⁷⁻⁴⁹

In regard to the severity of the involvement we can speak of cutaneous or systemic (of one or more organs).⁴⁸

In response to the size of the affected vessel^{48, 49} they are divided into:

- **Vasculitis of the large vessels** (the aorta and its branches). E.g. : Takayasu's arteritis.
- **Vasculitis of medium sized vessels** (arteries and veins of medium calibre). Among others such as panarteriitis nodosa (PAN). In the case of PAN the affectation of the medium vessel is predominant but not exclusive.
- **Small-vessel vasculitis** (arterioles and venules and capillaries). For example: Wegener syndrome (SW), Churg-strauss syndrome (SCS) or vasculitis cryoglobulinemic among others.

These latter ones and some case of vasculitis associated with other systemic diseases which can present ulcers as part of the clinical picture (see aetiological classification of ulcers).

10.2.5. DIAGNOSIS

The medical history must be geared towards knowing the form of presentation of the clinical picture (acute or chronic) and to identify the disease in order to adjust the treatment strategies. It is necessary to rule out disorders that may mimic a vasculitis.⁴⁸

Physical examination⁴⁸

The exploratory findings depend on the organ or organs affections being common in the skin affectation the emergence of palpable purpura, papules, vesicles, petechiae, splinter haemorrhages, pustules and urticaria. These manifestations are more common in the small-vessel vasculitis, as well as the presence of ulcers that may mimic other disorders. The finding of subcutaneous nodules, livedo reticularis, wheal-necrotic ulcers and digital infarcts indicate affectation of medium calibre vessels.

A Vasculitic ulcer is characterised by having a variable location and often being multiple, small in size and with oval morphology, with well-defined borders and background with necrotic areas (see table of differential diagnosis above, table IV).^{1,12,31,35} The periwound tissue is frequently hyperemic and regions of old infarction may be found.

Complementary tests

Laboratory studies will give us information on the gravity of the clinical picture and affectation of various organs, as well as the presence or not of immunocomplexes, antineutrophil cytoplasmic antibodies, etc., to better identify the disease.

A biopsy can provide information about the type of vessels affected and the presence or not of granulomatous inflammation (as in SW and SCS) or infiltrate rich in lymphocytes suggestive of a disease associated to the connective tissue.

Biopsy of the nodule using a deep punch or bloc resection allows diagnosis in up to 95 % of the cases, while the taking it in the ulceral edges or in the livedo reticular lesions allows the diagnosis in only 25 % of the cases.⁵⁰

10.2.6. GENERAL GUIDELINES ON THE PREVENTION AND TREATMENT⁴⁸

It will be that for the concurrent disease in the case of secondary diseases or associated with other diseases. For example in crioglobulinemica vasculitis given its frequent association with infection with the hepatitis C virus, interferon-alpha is the drug of choice.

In the case of the primary or idiopathic ones then multiple treatments are proposed. If we consider those that cause skin lesions as a cause of ulcers, we can consider, among others, corticosteroids as the sole treatment (as in the case of SCS) or these associated with cyclophosphamide (as in the case of the SW).

The treatment of the ulcer involves the control of the bacterial load, the management of the exudate and the care of the edges and periwound skin following the principles of dressing in wet environment with debridement when necessary. The management of the exudate, the care of the edges and periwound skin. It is also very important to achieve adequate pain control in these lesions. It is not possible to define a strategy aimed at preventing this type of lesion considering its pathogenesis.

11 SUMMARY OF EVIDENCE RECOMMENDATIONS

EVIDENCE [E] / RECOMMENDATION [R] / GOOD PRACTICE [GP]		LEVEL / GRADE
[GP]	The measurement of the ulcer's area has a predictive healing value. Several methods can be useful, digital planimetric is recommended.	Ia / A (CONUEI, 2009). ¹
[R]	The treatment of first choice and that meets the maximum available scientific evidence, is multi-layer compressive therapy used routinely.	A (SIGN, 2010). ³ (WOCN, 2011). ⁵
[R]	The use of simple non-adhesive dressings for the handling of this type of ulcers is recommended.	A (SIGN, 2010). ³
[R]	The use of graduated compression stockings at least up to the knee to prevent recurrence of the venous ulcers in patients whose ulcers have healed is recommended.	A (SIGN, 2010). ³
[R]	If the complete healing of the ulcer occurs, due to the fact that these types of lesions have a very high recurrence rate, it is recommended to insist in both the elevation of the lower limbs (especially after a long time standing or after the walks), as in the antiestasis exercises and the use of graduated compression stockings up to the knee (the compression that the patient can tolerate).	A (SIGN, 2010). ³
[R]	The administration of pentoxifylline should be considered (at a dose of 400 mg every 8 hours, for periods of at least 6 months), to improve healing in patients with venous ulcers of the leg, complementing compression therapy.	A (SIGN, 2010). ³ (WOCN, 2011). ⁵ B (AWMA-NZWCS, 2011). ²³
[R]	Consider the use of dressings with silver * or iodine cadexomero** as antimicrobial agents of first choice in the control treatment of the bacterial load, as well as an alternative to topical antibiotics.	*C (WOCN, 2011). ⁵ (AWMA- NZWCS, 2011). ²³ ** B (AWMA- NZWCS, 2011). ²³
[R]	As a general rule, the local application of systemic antibiotics is contraindicated. Systemic antibiotics should only be used if there is clinical evidence of infection.	B (AWMA-NZWCS, 2011). ²⁴

[GP]	Argentinc Sulfadiazine, mupirocin, fucidic acid and metronidazole antibiotics are recommended for topical use in the ulcer. They must be considered as second intention and subsequent to the use of antiseptics recommended (silver dressings and iodine cadexomero).	1+ / A (CONUEI, 2009). ¹
[GP]	Patients with venous ulcers and reflux-incompetence of the superficial venous system (SVS) (classes 5 and 6 of the CEAP) are candidates for surgery to prevent recurrences.	(CONUEI, 2009). ¹
[GP]	Patients with critical ischemia of the lower limb (CLI) must be referred to the specialist in angiology and vascular surgery in all cases to start the process aimed at the revascularisation of the limb.	1+ / A (CONUEI, 2009). ¹
[R]	Physical exercise is imperative, walking, the usefulness of exercise programmes aimed as a fundamental part of the treatment being shown to be essential. This is a determining factor in the cases of critical ischemia of the limb (CLI) in order to achieve a proper functional recovery.	C (AWMA-NZWCS, 2011). ²³
[R]	Encourage patients to carry out a physical activity programme to strengthen the calf muscles (twins) and increase the range of motion of the ankle to prevent the recurrence of the ulcer.	A (WOCN, 2011). ⁵
[R]	Educate patients that compression stockings or that pressure bandages must be worn daily for the prevention of venous oedema and recurrence of the venous ulcers.	A (WOCN, 2011). ⁵ B (AWMA-NZWCS, 2011). ²³
[R]	Consider the use of hydrocolloid dressings or foam to reduce the pain associated with leg ulcers with venous insufficiency.	B (WOCN, 2011). ⁵
[GP]	In non-revascularisable CLI, or when the revascularisation is not effective, the administration of prostaglandin E1 (PGE1) at doses of 40 mcg every 12 hours, intravenously for 21 days is recommended. If after this interval positive results are not shown in the disappearance of pain at rest or changes in the granulation tissue of the ulcer, treatment should be suspended.	2++ / B (CONUEI, 2009). ¹
[R]	In general we do not recommend the use of antiseptics in ischemic wounds that are not infected or not colonised; and in the presence of granulation tissue.	Moderate evidence (SAS, 2009) ³⁰
[R]	As a general rule, clean wounds with physiological saline, distilled water or tap drinking water.	High evidence (SAS, 2009) ³⁰

[R]	Clean the ulcer by applying a pressure washing (1-4 kg / cm ²) to ensure the detritus produced by the bacteria and traces of the dressings are removed without harming healthy tissue. (To do this, use a 20 to 35 cc syringe, and a needle or catheter of 0.9 mm in diameter).	Moderate evidence (SAS, 2009). ³⁰
[E]	Ischemic ulcer, once revascularised, the devitalised tissue could be removed by cutting, enzymatic or autolytic debridement.	(SAS, 2009). ³⁰
[R]	In the case of cellulitis, sepsis, lymphangitis or osteomyelitis (i.e. in cases of active infection) the use of systemic antibiotics are recommended.	High evidence (SAS, 2009). ³⁰
[E]	The prevention of the occurrence or recurrence of arterial ischemic ulcers is performed pursuant to the action on the vascular risk factors in all age ranges (no smoking, control of lipids, exercise, diet...)	(SAS, 2009). ³⁰
[R]	It is recommended that the medical dressing be done in wet for its greater clinical effectiveness and cost-effectiveness, in terms of scarring, than the traditional treatments with dry gauze.	High evidence (SAS, 2009). ³⁰
[E]	If an infection in an ulcer is suspected, it is advisable to perform a culture and antibiogram.	(SAS, 2009). ³⁰
[GP]	To obtain a microbial sample it is recommended to follow the puncture-aspiration technique.	1b / A (CONUEI, 2009) ¹
[GP]	The alginate, hydrofibre of hydrocolloid dressings and polyurethane foams are valid in the control of the exudation of the ulcer.	2++ / B (CONUEI, 2009). ¹
[E]	Consider the use of dressings or bandages impregnated with zinc oxide to provide comfort and promote the epithelisation and granulation of the superficial ulcers.	1++ (SIGN, 2010). ³ (AWMA-NZWCS, 2011). ²³

12 LITERATURE

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13 ANNEXES

ANNEX 1

PROCEDURE TO PERFORM THE ANKLE / BRACHIAL INDEX (ABI)

1. Patient at rest (supine) and relaxed at least 5 minutes before the start of the examination.
2. Explain the procedure.
3. Position the sphygmomanometer cuff on the arm; apply gel on the skin in the arterial route to encourage the transmission of the signal through the skin.
4. The arterial audible signal is obtained with the Doppler (throbbing, like a whip), the cuff is pumped up above the value of systolic blood pressure, 20 mmHg more after ceasing to hear it.
5. When the audible signal appears in the course of the slow deflation, the figure will be recorded. The highest pressure obtained is taken as a reference.
6. If there were difference in measurements in both arms the highest systolic pressure detected would be recorded (control arm).
7. For the pedial artery and the posterior tibial, the cuff would be positioned above the ankle, supramalleolar area. And the same process as in the arms would be followed.
8. To obtain a good signal it is recommended:
 - a) To support either the hand, wrist, or forearm to avoid inappropriate movements of the probe.
 - b) To maintain the probe at an angle of 45-60° with respect to the surface of the skin. To pick up the probe like a pencil, looking for support to stabilize the same.
 - c) The tip of the probe must always be covered with gel.
 - d) Apply moderate pressure on the skin, to avoid arterial collapse.
9. The intensity of the Doppler wave is not taken into account.
10. The calculation of the Ankle / Brachial Index is done by dividing the systolic pressure obtained in the ankle by the brachial systolic pressure.
11. A normal ankle / brachial index must be something greater than or equal to 1.
12. Values above 0.8 enable us to apply compressive therapy safely.
13. If it is greater than or equal to 1.25 or 1.3 this would indicate loss of flexibility of the arteries, calcification of the middle arterial layer.
14. Values less than 0.9 are considered pathological.
15. The lower the value the greater severity of arterial disease (see text).

ANNEX 2

GENERAL PREVENTIVE MEASURES IN CHRONIC VENOUS INSUFFICIENCY

ACTIVITY / EXERCISE	<ul style="list-style-type: none"> – Avoid long periods of standing or sitting. If you do stand for a long time, do regular exercises that promote movement such as standing on tiptoe from time to time. – Do physical exercise daily (walking 3-5 Km., gymnastics, cycling, swimming, dance, golf, yoga...). Avoid sports that involve sudden movements of the legs. – Exercise feet daily: <ul style="list-style-type: none"> • Walking on tip toes or on your heels. • Rotation movements (external and internal) of the ankles. • Flexion-extension of the feet simultaneously or alternately. • Supported on your back do the bike in the air or scissor movements with the legs. • If you are travelling by car make stops every 150 km to stretch your legs. • If you are travelling by plane, small movements of your legs and feet every half hour.
REST	<ul style="list-style-type: none"> – Rest with the legs raised above the level of your heart for 15-30 minutes three or four times a day. – Try to sleep with legs in a slightly elevated position: Use cushions, pillows on the feet or by placing blocks of about 15 cm in height at the foot of the bed. – Do not sit with your legs crossed. Avoid deep couches or those with hard edges.
SKIN CARE	<p>Daily hygiene of the skin with pH-neutral soap, soft thorough drying, do not rub.</p> <ul style="list-style-type: none"> – Finish your showers with cold water jets on your legs (10-20 seconds on each leg), from the feet to the knees or from the root of the thigh. – Moisturise the skin after the shower or bath using a rapid absorption cream (non-scented, lanolin-based or urea).
CLOTHES	<ul style="list-style-type: none"> – Use wide, comfortable and breathable footwear with heels between 3 and 5 cm. Avoid flat footwear and do not go barefoot. Buy new shoes in the afternoon (laced shoes, leather). – Avoid using tight-fitting clothing and that constricts.

MISCELLANEOUS	<ul style="list-style-type: none"> – If the healthcare staff recommend, use elastic containment (rest) or graduated compression stockings. – Avoid: <ul style="list-style-type: none"> • Overweight. • Alcohol, tobacco and constipation. • The direct application of heat in the lower limbs. Hot baths, saunas, hot waxing, etc. • knocks and scratches on the legs, and rubbing of footwear.
WHEN TO GO TO YOUR LOCAL HEALTH CENTRE?	<p>When there are wounds on the skin of legs, there is irritation or redness, swelling, or if the pain gets worse.</p>

ANNEX 3

CRITERIA FOR REFERRAL OF ULCERS TO SPECIALIST CARE³

- Suspicion of malignancy.
- Infection proven by clinical examination and positive culture of bacteria only sensitive to antibiotics that are parenterally or orally dispensed in a hospital.
- Ankle / Brachial index less than 0.5 and generally when PAD associated to ABI < 0.80 is suspected.
- When the ulcer does not heal in the expected time interval (4-6 weeks) or there is no reduction in size despite proper therapy.
- Pain that is difficult to treat in outpatients.
- Rheumatoid arthritis / Vasculitis.
- Atypical distribution of ulcers.
- Suspicion of contact dermatitis or dermatitis resistant to topical steroids.

ANNEX 4

GENERAL GUIDELINES FOR TREATMENT. ANTIBIOTHERAPY

Infection is the most frequent complication of ulcers. Both this and the density or bacterial load detected with swabs or tissue biopsies, contribute to the likelihood of leg ulcers not healing, thus hindering the process.^{51, 52}

The infection can be considered an evolutionary process when three concepts are handled:⁵³

- **Colonisation:** Presence of microorganisms on the surface which do not multiply.⁵⁴
- **Critical colonisation:** Bacteria are able to reproduce in non-viable tissue from the lesion. Suspect this if there is a delay of wound healing, change of the characteristics of the lesion (pale colouring, increase of the exudates, bad odour) without associating other perilesional signs and if there is no systemic impact.¹
- **Infection:** Changes in the appearance of the ulcer associating acute inflammatory signs such as erythema, flushing, or heat in the surrounding skin, change in the appearance of the exudate if it becomes cloudy, emergence of perilesional lymphangitis or lymphatic dissemination route, oedema. There may be signs of systemic impact such as fever and analytical changes (leucocytosis, left deviation) motivated by haematic dissemination and septicemia.⁵⁵

To obtain a microbial sample it is recommended (recommendation grade A) to follow the puncture-aspiration technique.

In general it is not recommended that ulcers be cleaned with antiseptic routinely because they can be cytotoxic, and the risk-benefit ratio must always be assessed. However, it can be useful in special situations^{5,30} (see section 6.6.2 . Treatment of ischemic ulcers of the lower limb). Some authors consider silver dressings and iodine cadexomero^{1, 53} as the treatment of first choice in the treatment of the bacterial load.

Argentic sulphadiazine, mupirocin, fucidic acid and metronidazole are antibiotics recommended (Grade A) for topical use in the ulcer.^{1, 53} Although they should be considered a second-choice because complications can occur and resistance be developed.

As a general rule the application of systemic antibiotics at the local level is contraindicated. Antibiotic treatment should be administered depending on the antibiogram, while, faced with the clinical evidence of infection the following could be recommended as empirical treatment:^{1, 58}

- **Mild infection:** Ulcers of depth I level. Stable clinical situation, absence of prior infection and antibiotic treatment in the previous 6 weeks: Amoxicillin / clavulanic acid (and chlorhexidine). Useful alternatives levofloxacin and moxifloxacin. Also useful clindamycin, cotrimoxazole, linezolid (all with activity against *Staphylococcus aureus* resistant to methicillin -MRSA - whose incidence has increased as primary infections acquired in the community).

- **Mild - serious infection:** Ulcers of depth II level. Stable clinical situation, absence of prior infection and antibiotic treatment in the previous 6 weeks: Use of parenteral antibiotics such as ertapenem. Also useful amoxicillin-clavulanic acid in monotherapy, or third-generation cephalosporins or fluorquinolones associating metronidazole in both cases. If MRSA is suspected associate daptomycin, linezolid or glycopeptide.
- **Very serious infection:** Ulcers of depth III and / or IV level; clinical situation unstable, absence of prior infection and antibiotic treatment in the previous 6 weeks: Piperacillin-tazobactam, imipenem or meropenem (all broad-spectrum, with antipseudomonal activity). Associate antibiotics active against MRSA if it is suspected.



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