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LOWER LIMB ULCERS IN PEOPLE EXPERIENCING HOMELESSNESS

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Abstract

The homelessness crisis in Poland poses a serious challenge for the State, with the number of homeless individuals exceeding 30,000 in 2019. This paper highlights one of the most common surgical problems of people experiencing homelessness, namely venous leg ulcers, and presents current treatment guidelines. Homeless individuals, particularly exposed to inadequate living conditions, poor hygiene and circulatory disorders, are at high risk of developing this condition. Venous ulcers are chronic wounds with prolonged and complex healing processes. They arise due to venous hypertension associated with chronic venous insufficiency and thrombosis. Specialised treatment is frequently necessary, which is a challenge in the case of the homeless due to difficulties in providing regular care. The treatment of venous leg ulcers is a multi-stage process.

The gold standard for managing venous leg ulcers is compression therapy, which reduces oedema and venous reflux. The TIME strategy outlines the

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approach to chronic wound management, emphasising the importance of initial wound cleansing (with surgery, enzymes, or larvae therapy), infection prevention, maintaining proper moisture levels and wound edge preparation. This requires the use of suitable antiseptics, dressings, and wound hygiene. People experiencing homelessness face specific problems that necessitate a holistic approach, which includes health education, nutrition, and rehabilitation.

Keywords: homelessness, chronic ulceration, chronic wound, infection

1. Introduction

The homelessness crisis in Poland is a serious challenge for the State. Based on data of a recent survey conducted by the Ministry of Family, Labour and Social Policy, 30,330 homeless people were identified in Poland in 2019³.

The figure shows a downward trend compared to 2017 data. However, the number of people in homelessness crisis is still significant. Providing treatment to people in homelessness crisis remains a daily routine in hospital emergency departments. These patients require multifaceted and long-term care. In this paper, we aim to highlight one of the most common surgical problems affecting people in homelessness crisis, i.e. lower limb ulcers, and we provide current guidelines for the treatment of this type of wound⁴. Venous diseases and their complications, despite their prevalence, still cause a decrease in patients' quality of life.

2. Characteristics of a person in a homelessness crisis

Based on the available data, the vast majority of respondents in crisis of homelessness (83.6%) are male, aged 41–60 years⁵. Addiction represents the second most common cause of homelessness, since as many as 77% of people with a long period of homelessness of more than five years were suspected to be substance-dependent, mainly addicted to alcohol, and 65% of the sample of

³ *Ogólnopolskie badanie liczby osób bezdomnych – Edycja 2019* zamieszczone na stronie internetowej Ministerstwa Rodziny, Pracy i Polityki Społecznej, <https://www.gov.pl/web/rodzina/wyniki-ogolnopolskiego-badania-liczby-osob-bezdomnych-edycja-2019>.

⁴ K. Wrenn, *Immersion foot. A problem of the homeless in the 1990s*, Arch Intern Med 1991, nr 151.

⁵ *Ogólnopolskie badanie liczby osób...*

homeless men have been officially diagnosed as addicted⁶. Additionally, the largest number of respondents have been in a homelessness crisis for a minimum of five to ten years, which demonstrates an extension of episodes of homelessness compared to the 2017 survey⁷.

3. What are ulcers?

Venous ulcers are among the most serious complications of chronic venous disease. As defined, they are chronic wounds involving the epidermis, dermis and subcutaneous tissue with impaired healing capacity, caused by impaired venous blood flow⁸.

Physical examination may reveal deep cavities, usually in the distal lower limbs. The lesions may be single or multiple. They are often accompanied by the telangiectasias and discolouration which are characteristic of chronic venous disease. Necrosis, pus, a fibrous or biofilm layer may be observed within the wound.

In spite of great advances in medical science, lower limb ulcers are still a considerable problem in modern medicine. Healing process of these wounds is extremely long, lasting from several months to more than ten years. Research⁹ in this area indicates that the treatment time is on average 9 months for half of all ulcers, and in 20% of cases it can be extended to as long as 2 years. In 8% of patients, the treatment process exceeds 5 years. Approximately 70% of patients face a risk of relapse¹⁰. For people experiencing a homelessness crisis, treating this type of ulceration, which requires regularity, constitutes a huge challenge.

⁶ A. Burak, A. Ferenc, *Defining and measuring of homelessness. Poland*, "Social Policy Issues" 2021, nr 52.

⁷ *Ogólnopolskie badanie liczby osób...*

⁸ A. Jawień, M.T. Szewczyk, A. Kaszuba, Z. Gaciong et al., *Guidelines for the management of chronic venous leg ulceration. Recommendations of a multidisciplinary expert group*, „Leczenie Ran” 2011, nr 8.

⁹ L. Lewandowska, Z. Adamski, *Opieka pielęgniarska nad chorym z chorobą owrzodzeniową podudzi*, Piel Pol 2008, nr 1; P. Mościcka, M.T. Szewczyk, J. Cwajda-Białasik, E. Hancke, A. Jawień, P., *Owrzodzenia o różnej etiologii. Opis gojenia trzech przypadków*, Piel Chir Ang. 2012, nr 3; M. Nieckula, G. Dębska, A. Szewczyk, *Udział pielęgniarki podstawowej opieki zdrowotnej świadczącej usługi zdrowotne w domu chorego mającego owrzodzenie żyłne kończyn dolnych*, Piel Zdr Publ. 2015, nr 5; R. Przybylska, *Rola zabiegów pielęgnacyjnych w leczeniu owrzodzeń podudzi*, Piel Pol. 2009, nr 3.

¹⁰ M. Nieckula, G. Dębska, A. Szewczyk, *Udział pielęgniarki...*

Chronic disease, if the conditions indicated above are not respected, leads to serious complications and causes pain and other symptoms for the patient. Moreover, lower limb ulcers constitute a complex problem from both a treatment and a care perspective, especially in the advanced stages of the disease¹¹.

4. Pathomechanism of venous ulcers

Venous lower limb ulcers are caused by prolonged venous hypertension – increased hydrostatic pressure in the lumen of the vessels. It can be caused by an impaired blood outflow from the distal sections of the venous vessels of the lower limbs opposite to the force of gravity. The main causes of this condition are chronic venous insufficiency and a history of superficial or deep venous thrombosis, in which dysfunctional deep venous valves are unable to transport blood efficiently. The calf muscle pump also plays an important role in the process of blood transport from the distal parts of the lower limbs. The effective work of the calf muscle groups during repeated muscle contractions acts as a driving force to increase the return of venous blood from the lower limb to the heart. Proper pump function depends on the full range of motion of the ankle joint and proper foot mobility, thus limited ankle mobility reduces pump performance leading to persistently high hydrostatic venous pressure, resulting in venous hypertension. The vast majority of patients with lower limb venous ulcers demonstrate a significant limitation in the range of motion of the ankle joint¹².

The insufficiency of the aforementioned processes results in superficial veins dilating and stretching to accommodate increased blood flow, retrograde blood flow, venous stasis and secondarily increased intravascular pressure.

Even though venous hypertension is associated with dysfunctions of the venous valves or the calf muscle pump, there are multiple theories to explain the causes of venous ulceration. There is a complex cascade of cellular events, with a number of cellular and humoral mechanisms linking ulceration to venous hypertension, however, a unified theory of pathophysiology remains speculative with a lack of understanding of the aetiology of venous ulceration¹³.

¹¹ P. Mościcka, J. Cwajda-Białasik, M.T. Szewczyk, A. Jawień, *Owrzodzenie żyłne – problem nie tylko osób starszych. Opis trzech przypadków klinicznych*. Piel Chir Ang. 2017, nr 11.

¹² A. Comerota, F. Lurie, 'Pathogenesis of venous ulcer', *Seminars in vascular surgery*, Elsevier 2015, nr 28; J.A.O'Brien, H.E. Edwards, K.J. Finlayson, G. Kerr, *Understanding the relationship between the calf muscle pump, ankle range of motion and healing for adults with venous leg ulcers: a review of literature*, "Wound Practice and Research" 2012, nr 20.

¹³ E.T. Chamanga, *Understanding venous leg ulcers*, "British Journal of Community Nursing" 2018, nr 23.

Approximately 10% of the European and North American population suffers from venous regurgitation, and venous ulceration develops in 0.2%¹⁴. Homeless people are extremely vulnerable to venous hypertension through prolonged standing and sitting, and the position often used for sleeping, results in venous stasis. Cold (frostbite) and dampness (immersion foot or trench foot) are also prevalent causes, resulting in primary damage and peripheral neuropathy, which is further exacerbated among the homeless people by alcohol dependency. The resulting loss of full limb range of motion and dysfunction of the calf muscle pump also accelerates venous hypertension and leg swelling, leading to ulceration. When combined with loss of pain sensation, it promotes more extensive lesions¹⁵. Among the homeless population, a high prevalence of hypertension, heavy smoking predisposes to arteriosclerosis, which in turn contributes to lower limb ischaemia. Lack of hygiene, such as prolonged wearing of unwashed socks for weeks or even months, and overgrown toenails also promote the development of foot lesions. The high dampness as mentioned above, together with secondary maceration of the foot skin, is another cause of ulcer formation. Homeless people commonly suffer from toe and nail fungus, and the coexistence of injuries, circulatory disorders and ischaemia of foot tissues promotes infection. The characteristic foot ulcers are usually infected by a variety of bacterial populations, including *Staphylococcus aureus*, *Streptococcus pyogenes*, anaerobic microorganisms and Enterobacteriaceae. These infections are a potential source of osteomyelitis, connective tissue inflammation and gangrene, which in turn can necessitate limb amputation¹⁶.

5. Treatment and diagnosis

The treatment of venous ulcers is a long-term process. Medical history and differential diagnosis are extremely important in the treatment process. Venous ulcers should be differentiated from ulcers associated with arterial ischaemia, skin diseases, infectious diseases, parasitic diseases, tumours and injuries. It defines further treatment. The recommended imaging study to confirm the venous aetiology of the ulceration is a duplex-Doppler (duplex ultrasound). It allows the evaluation of venous flows and the extent of reflux in the superficial and deep

¹⁴ *Ibidem*.

¹⁵ D. Raoult, C. Foucault, P. Brouqui, *Infections in the homeless*, "The Lancet Infectious Diseases" 2001, nr 1.

¹⁶ *Ibidem*.

venous system. In addition, it is recommended to measure the pulse rate on the dorsal and tibial arteries and to measure the ankle/arm ratio (norm: 0.9-1.3)¹⁷.

The gold standard for the treatment of venous ulcers is compression therapy, which aims to reduce swelling, pain and venous reflux. Studies show that multilayer compression therapy using elastic bandages has better results compared to single-layer compression therapy¹⁸. When applied correctly, it should reduce the features of venous hypertension, the main cause of venous ulcers. The recommended pressure generated by compression in the ankle region should be 40 mmHg and in the below-knee region 17-20 mmHg. The most common systems for using compression therapy are:

- two-layer compression (use of a backing and a low-stretch bandage);
- four-layer compression (cotton layer first, followed by a layer of crepe bandage, elastic bandage and finally an adherent layer).

An extremely important aspect of venous ulcer treatment is microbiological assessment. It has been proven that every chronic wound is colonised by bacteria¹⁹. However, this does not mean that an infection develops in every wound. The infection process is the result of consecutive events: contamination, colonisation, critical colonisation, local infection, and finally systemic infection. Contamination and colonisation states do not require antiseptic treatment, only observation. Chronic wounds can also be classified as uninfected, at risk of infection or infected²⁰. The W.A.R. scale may be used to assess the risk of infection (wounds at risk) and known risk factors for infection. Risk factors for the development of infection are divided into:

- endogenous – immune system diseases, diabetes and other chronic diseases, age: old age and early life (premature babies, infants, young children), obesity or malnutrition, critical limb ischaemia, burn wounds;

¹⁷ A. Jawień, M.T. Szewczyk, A. Kaszuba, Z. Gaciong et al., *Guidelines for the management of chronic venous leg ulceration. Recommendations of a multidisciplinary expert group*, „Leczenie Ran” 2011, nr 8.

¹⁸ T.F. O'Donnell, M.A. Passman, W.A. Marston et al., *Society for Vascular Surgery; American Venous Forum. Management of venous leg ulcers: clinical practice guidelines of the Society for Vascular Surgery® and the American Venous Forum*, J Vasc Surg. 2014, nr 60.

¹⁹ M. Sopata, A. Jawień, B. Mrozikiewicz-Rakowska et al., *Wytyczne postępowania miejscowego w ranach niezakażonych, zagrożonych infekcją oraz zakażonych – przegląd dostępnych substancji przeciwdrobnoustrojowych stosowanych w leczeniu ran. Zalecenia Polskiego Towarzystwa Leczenia Ran*, „Leczenie Ran” 2020, nr 1

²⁰ *Ibidem*.

- exogenous – heavily contaminated wounds (gunshot wounds, bite wounds, injuries), medications taken: glucocorticoids, insulin, cytostatic and immunosuppressive drugs, foreign bodies *in situ*, surgical wounds after procedures in non-aseptic conditions, specific pathogenicity and virulence of microorganisms, wound location, environmental factors (stimulants, poor diet, nursing home stay, hospitalisation, inadequate standards of care and wound treatment)²¹.

When analysing the above factors, in the context of people in crisis of homelessness, a high probability of wound infection can be assumed. These individuals are exposed to inadequate standards of care, have untreated chronic illnesses, frequent alcohol dependency problem and their diet is unbalanced. Clinical features of an infected wound include initial redness, followed by purulent exudate, pain, involvement of adjacent tissues and finally systemic infection²².

6. Treatment of chronic wounds

The topical treatment regimen for chronic wounds was introduced in 2004 by the European Wound Management Association. The TIME strategy is a system comprising four stages:

- T (*tissue debridement*) – wound debridement,
- I (*infection and inflammation control*) – infection and inflammation control,
- M (*moisture balance*) – maintaining adequate wound moisture, with the use of an appropriate dressing,
- E (*edges, epithelialisation stimulation*) – preparation of wound edges.

It should be emphasised that various elements of the TIME strategy need to be applied on a case-by-case basis, with a possible focus on the one that is most problematic at the time.

6.1. „T” for *tissue debridement*, i.e. the foundation of TIME

The first stage of the procedure is wound cleaning, or debridement. Regardless of the method chosen – surgical, enzymatic or biosurgical using maggots – debridement is fundamental to proper wound healing and reducing the risk of infection spreading. It is important to remember to carefully clean the wound of

²¹ M. Bartoszewicz, T. Banasiewicz, K. Bielecki et al., *Zasady postępowania miejscowego i ogólnego w ranach/owrzodzeniach przewlekłych objętych procesem infekcji*, „Forum Zakażeń” 2019, nr 10.

²² M. Sopata, A. Jawień, B. Mrozikiewicz-Rakowska et al., *Wytyczne postępowania miejscowego....*

biofilm, which is now considered one of the main risks for proper healing of a chronic wound. The gold standard in this case is surgical debridement, which, according to Biofilm-Based Wound Care, still has the highest efficacy in removing necrosis and biofilm. As an alternative to classical surgery, biosurgery uses maggots which, when placed under a dressing, secrete enzymes that cleanse the wound of dead tissue and destroy bacteria, viruses and fungi. This method is highly selective and would be ideal for outpatients, including patients in crisis of homelessness, if it was not for the common psychological resistance of patients and medical staff²³.

6.2. Lavaseptics and antiseptics

Lavaseptics, irrespective of containing antimicrobial substances, are used to clean and rinse the wound after initial mechanical debridement. Lavaseptics, such as saline, Ringer's fluid or sterile water, which do not have antiseptic properties, should only be used to rinse the wound preceding subsequent antiseptic action. These measures are ideal when we want to avoid potential reactions between subsequent preparations. Antiseptics should not be overlooked in the case of lower limb ulcers, especially among people in homelessness crisis with reduced levels of hygiene, when wounds are at risk of infection or infection is already ongoing. Only the use of an antiseptic enables local eradication of microorganisms, destruction of the biofilm and prevention of infection²⁴.

6.3. "M" for "moisture balance" or how to keep a wound moist

The choice of dressing should be based on the local wound characteristics and the current stage of wound healing. The dressing used must have the right degree of absorbency appropriate to the amount of exudate to protect the wound from harmful maceration. For people in homelessness crisis, whose lower limb ulcers are rarely wounds without features or risk of infection, the focus should be on dressings that exhibit antimicrobial properties in addition to exudate sequestration²⁵.

In infected dry wounds with low to moderate exudate, gel dressings containing octenidine or polyhexanidine are recommended. They absorb exudate when it

²³ M. Bartoszewicz, T. Banasiewicz, K. Bielecki et al., *Zasady postępowania miejscowego...*; M. Malone, T. Swanson, *Biofilm-based wound care: the importance of debridement in biofilm treatment strategies*, Br J Community Nurs 2017, nr 22.

²⁴ M. Bartoszewicz, T. Banasiewicz, K. Bielecki et al., *Zasady postępowania miejscowego...*

²⁵ *Ibidem*.

occurs, turning into a semi-liquid form, and when the wound is dry, they provide lubrication for optimal healing conditions. Wounds with moderate to heavy exudate should be treated with highly absorbent dressings such as hydro-fibre or foam dressings. The latter are additionally characterised by good thermal insulation properties and may also contain silver ions, i.e. have an antimicrobial effect. For wounds with low to moderate exudate and non-infected it is recommended to use hydrocolloid dressings, which, due to their active colloid layer, stimulate the processes of autolysis in the wound, stimulate angiogenesis and granulation. In the case of infected ischaemic wounds, dressings with iodopovidone²⁶ are recommended.

Recently, there has been an increase in the popularity of dressings based on modern technologies, such as lipid-colloid technology (TLC). These dressings are distinguished by their high absorbency and, due to their antimicrobial content, can be used as early as the debridement stage of an infected wound. Recently, dressings equipped with a healing TLC-NOSF matrix have also emerged, which transforms into a gel after interacting with wound secretions, thus shortening the healing process by reducing the damaging effects of extracellular matrix metalloproteinases²⁷.

6.4. Wound margin protection and epidermisation stimulation (E for *edges*, *epidermisation stimulation*)

Protecting and caring for the edges of a chronic wound, as well as maintaining adequate moisture in the wound and stimulating epidermisation promote wound healing. At this stage of treatment, it is recommended to use preparations containing substances such as paraffin, epidermal activators and substances with anti-inflammatory effects, for example bisabolol and plant extracts, including phytocollagen. Specialised hydrocolloid, polyurethane dressings absorb abundant exudate and protect the wound edges from harmful maceration and infection. The choice of appropriate protective and epidermal stimulants should be tailored to the specific phase of wound healing. It is also important to read the product description carefully to find out at which stage of wound healing its use is recommended²⁸.

²⁶ *Ibidem*.

²⁷ *Ibidem*.

²⁸ M. Sopata, A. Jawień, B. Mrozikiewicz-Rakowska et al. *Wytyczne postępowania miejscowego...*

7. Substances with antimicrobial activity

Octenidine dihydrochloride is used in both medical devices for wound irrigation and disinfectant drugs. The antiseptic action of the substance is based on binding with the fatty acids of the cell envelopes of bacteria and fungi, damaging them and ultimately leading to the death of the microorganisms. Its spectrum covers vegetative forms of bacteria, Gram-negative and Gram-positive bacteria, including also MRSA, ORSA, VRSA, VRE, as well as fungi, viruses and protozoa. The substance is further characterised by its ability to effectively penetrate biofilm structures. Octenidine, due to its good penetration, shows efficacy against the biofilm formed by pathogens often associated with wound infections, such as *Pseudomonas aeruginosa* and *Staphylococcus aureus* (including MRSA), *Acinetobacter baumannii*, including multidrug-resistant strains. In antiseptic products used for wound treatment, octenidine hydrochloride is found in combination with phenoxyethanol. Preparations containing octenidine dihydrochloride should only be used for small superficial wounds. There are contraindications for use on deep wounds and fistulas. The substance should also not be combined with silver-containing dressings²⁹.

Polyhexanidin (PHMB) acts analogously to peptides produced naturally by keratinocytes and neutrophils in the wound. The mixture of synthetic polymers binds to bacterial cell membranes, destroys the membrane and then selectively damages microbial DNA. Its broad spectrum covers both Gram-negative and Gram-positive bacteria, also in biofilm form, including resistant strains: MRSA and VRE, spore-forming bacteria, intracellular bacteria, fungi and human immunodeficiency virus (HIV). It is characterised by a prolonged action. Few anaphylactic reactions have been reported, but its efficacy and safety in wound treatment is scientifically proven³⁰.

Hypochlorites used in antiseptics are primarily a mixture of sodium hypochlorite and hypochlorous acid in low concentrations. They are recommended for hard-to-heal deep wounds, traumatic wounds and chronic wounds, including pressure sores or diabetic foot syndrome. Sterile, in low concentrations not exceeding 0.006%, they are also safe for use in the peritoneal cavity and on tendons and bones. At concentrations of 0.00025-0.5%, their

²⁹ M. Sopata, A. Jawień, B. Mrozikiewicz-Rakowska et al., *Wytyczne postępowania miejscowego w ranach niezakażonych, zagrożonych infekcją oraz zakażonych – przegląd dostępnych substancji przeciwdrobnoustrojowych stosowanych w leczeniu ran. Zalecenia Polskiego Towarzystwa Leczenia Ran, „Leczenie Ran” 2020, nr 1.*

³⁰ *Ibidem.*

antimicrobial activity is only partial. These compounds exhibit broad antimicrobial activity, covering Gram-positive and Gram-negative bacteria (including MRSA, ORSA, VRSA, VRE), viruses, fungi and bacterial spores³¹.

Chlorhexidine binds to the cytoplasmic membrane of the cell causing disruption of the membrane. At low concentrations (1 µg/ml), it has a bacteriostatic effect, while at higher concentrations (≥20 µg/ml) it exhibits a bactericidal effect. Its effectiveness also depends on the pH of the environment – it increases as the pH increases. The spectrum of antimicrobial activity of chlorhexidine includes Gram-positive bacteria, fungi, enveloped viruses and protozoa. Unfortunately, its efficacy against Gram-negative bacteria is poor. At a concentration of 0.001%, chlorhexidine inhibits tissue growth and can therefore slow down the wound healing process. Another limitation of this substance is the fact that resistance to this compound is increasing among bacteria isolated from wounds, which often coexists with antibiotic resistance. Due to the risk of selecting resistant strains, the high risk of anaphylactic reactions and the relatively high toxicity when juxtaposed with other agents, the validity of its use is currently being questioned³².

Iodine povidone exerts its antiseptic effect by irreversibly binding to bacterial proteins, lipids and nucleic acids, resulting in the formation of pores in the bacterial cell membrane, inactivation of enzymes and damage to the DNA structure. The spectrum of antimicrobial activity includes Gram-positive and Gram-negative bacteria, fungi, viruses and protozoa. It acts very rapidly, has an additional anti-inflammatory effect by inhibiting inflammatory mediators, and causes inactivation of enzymes that act destructively on host tissues³³. However, it is contraindicated in children under 6 months of age, as well as in patients with

³¹ M. Bartoszewicz, A. Junka, *Leczenie miejscowe rany przewlekłej objętej procesem infekcyjnym w świetle obowiązujących wytycznych*, „Leczenie Ran” 2012, nr 9; M. Sopata, A. Jawień, B. Mrozikiewicz-Rakowska et al., *Wytyczne postępowania miejscowego w ranach niezakażonych...*

³² M. Bartoszewicz, A. Junka, *Leczenie miejscowe rany przewlekłej objętej procesem infekcyjnym w świetle obowiązujących wytycznych*, „Leczenie Ran” 2012, nr 9; A. Kramer, J. Dissemond, S. Kim i wsp., *Consensus on wound antisepsis: update 2018*, „Skin Pharmacol Physiol” 2018, nr 31.

³³ M. Bartoszewicz, T. Banasiewicz, K. Bielecki et al., *Zasady postępowania miejscowego...*; A. Jawień, M. Bartoszewicz, A. Przondo-Mordarska i wsp., *Wytyczne postępowania miejscowego i ogólnego w ranach objętych procesem infekcji*, „Leczenie Ran” 2012, nr 9; A. Kramer, J. Dissemond, S. Kim i wsp., *Consensus on wound antiseptics: update 2018*, „Skin Pharmacol Physiol” 2018, nr 31.

hyperactive goiter, Hashimoto's disease and dermatitis herpetiformis. Use during pregnancy is not recommended. Unlike hypochlorites, it cannot be used inside the peritoneal cavity³⁴.

Silver as an antimicrobial agent is used to complement the treatment of chronic wounds. Regardless of the form in which it is present, its action is to damage the cell membrane, disrupt ion transport and inhibit cell division. Despite widespread use, silver resistance is still very low.

8. Antibiotic therapy

Chronic wound infections are caused by the formation of a biofilm by bacteria colonising wounds. It acts as a barrier to relatively large antibiotic particles, which are remarkably resistant to topically applied antibiotics. It is impossible to obtain a locally adequate therapeutic dose, which favours the selection of resistant strains. The latest guidelines do not recommend the topical use of antibiotics for chronic wounds. The only antibiotic approved for topical use is gentamicin embedded in the collagen matrix, in the form of a sponge³⁵.

Gentamicin in combination with collagen matrix, as indicated, is effective against the following pathogens: *Pseudomonas aeruginosa*, *Proteus spp.* (including indole-positive and indole-negative strains), *Escherichia coli*, bacteria of the *Klebsiella-Enterobacter-Serratia* group, *Streptococcus spp.*, *Salmonella spp.*, *Shigella spp.* High antibiotic concentrations at the site of application (300 to 9000 mg/l), much higher than the bactericidal concentration of gentamicin, are achieved within 1-2 hours and persist for up to 3-4 days³⁶.

The decision to use systemic targeted antibiotic therapy should be carefully considered. The antibiotic is chosen on the basis of microbiological tests and the ability to penetrate into the skin and subcutaneous tissue³⁷.

9. Behavioural problems of homeless people

One of the complementary methods to ulcer treatment and secondary prevention, and probably the hardest to implement in people experiencing a homelessness crisis, is to improve the general wellbeing of a homeless person in a broad sense.

³⁴ A. Kramer, J. Dissemond, S. Kim i wsp., *Consensus on wound...*

³⁵ M. Bartoszewicz, T. Banasiewicz, K. Bielecki et al., *Zasady postępowania miejscowego...*

³⁶ *Ibidem.*

³⁷ *Ibidem.*

More than half of the homeless people surveyed (56%) admit that they do not undertake any physical activity³⁸. For proper blood flow in the venous system of the lower limbs, the proper function of the calf muscle pump is crucial, so it is important to restore or increase mobility in the ankle joint and increase the strength of the lower limb muscles where possible.

In Poland, more than half of the homeless respondents (54%) admit that they eat their meals irregularly³⁹.

Proper nutrition and hydration are key in the management of chronic wounds. An adequate supply of glucose, amino acids and vitamins, especially C, A and E, is essential for tissue regeneration in the healing process. The patient should receive 30-35 kcal/kg b.w., no less than 1800 kcal, and maintain a protein supply of 1.5-2.5 g/kg b.w. Malnutrition, common among homeless people, increases the risk of wound infection, significantly slows wound healing and thus significantly worsens prognosis⁴⁰.

As many as 88% of homeless people surveyed admitted to smoking tobacco compulsively. Although smoking is not listed among the direct risk factors for venous ulceration, it is well known today that it significantly impairs wound healing. Smoking impairs the function of immune cells, vital for inflammatory and bacterio-fighting activity, and impairs oxygen transport to tissues. Hence, it has a deleterious effect that exacerbates the pathobiology of chronic wounds⁴¹.

10. Summary

People in homelessness crisis face specific problems that increase the risk of venous hypertension and, secondarily, venous ulceration of the lower limbs and lead to chronic wounds. It is important to emphasise that such individuals require holistic assessment and, in some cases, even multidisciplinary interventions. Noteworthy, these patients are at risk of developing very serious infections, including cellulitis and even sepsis. The gold standard treatment for venous lower limb ulcers is compression therapy. The TIME strategy outlines the approach to chronic wound management, emphasising the importance of initial wound cleansing (with surgery, enzymes, or larvae therapy), infection prevention,

³⁸ K. Pawlak-Sobczak, *Trudności i wyzwania działań z zakresu promocji zdrowia wśród osób bezdomnych*, „Acta Universitatis Lodziensis. Folia Sociologica” 2021, nr 79.

³⁹ *Ibidem*.

⁴⁰ M. Bartoszewicz, T. Banasiewicz, K. Bielecki et al., *Zasady postępowania miejscowego....*

⁴¹ J.C. McDaniel, K.K. Browning, *Smoking, chronic wound healing, and implications for evidence-based practice*, „J Wound Ostomy Continence Nurs” 2014, nr 41.

maintaining proper moisture levels and wound edge preparation. There is a wide range of products for chronic wound care. The choice of appropriate wound cleansers and dressings depends on the condition of the patient and the wound. Topical antibiotic therapy is not recommended and attention should be paid to microbiological tests and the penetration capacity of the substance when choosing systemic antibiotic therapy. Currently, the best antiseptics for use on chronic wounds are polyhexanide, octenidine with phenoxyethanol (for superficial wounds only) and povidone-iodine. People in homelessness crisis require comprehensive care, which does not just mean treatment of the ulcers themselves, but also removal of risk factors, protection against infection, education on healthy lifestyles and even provision of proper nutrition and rehabilitation.

References

Bartoszewicz M., Junka A., *Leczenie miejscowe rany przewlekłej objętej procesem infekcyjnym w świetle obowiązujących wytycznych*, „Leczenie Ran” 2012, nr 9.

Bartoszewicz M., Banasiewicz T., Bielecki K. et al., *Zasady postępowania miejscowego i ogólnego w ranach/owrzodzeniach przewlekłych objętych procesem infekcji*, „Forum Zakażeń” 2019, nr 10.

Burak A., Ferenc A., *Defining and measuring of homelessness. Poland*, „Social Policy Issues” 2021, nr 52.

Chamanga E.T., *Understanding venous leg ulcers*, „British Journal of Community Nursing” 2018, nr 23.

Comerota A., Lurie F., *‘Pathogenesis of venous ulcer’*, *Seminars in vascular surgery*, Elsevier 2015.

Jawień A., Bartoszewicz M., Przondo-Mordarska A. i wsp., *Wytyczne postępowania miejscowego i ogólnego w ranach objętych procesem infekcji*, „Leczenie Ran” 2012, nr 9.

Jawień A., Szewczyk M.T., Kaszuba A., Gaciong Z. et al., *Guidelines for the management of chronic venous leg ulceration. Recommendations of a multidisciplinary expert group*, „Leczenie Ran” 2011, nr 8.

Kramer A., Dissemmond J., Kim S. i wsp., *Consensus on wound an-tiseptis: update 2018*, „Skin Pharmacol Physiol” 2018, nr 31.

Lewandowska L., Adamski Z., *Opieka pielęgniarska nad chorym z chorobą owrzodzeniową podudzi*, *Piel Pol* 2008, nr 1.

Malone M., Swanson T., *Biofilm-based wound care: the importance of debridement in biofilm treatment strategies*, *Br J Community Nurs* 2017, nr 22.

McDaniel J.C., Browning K.K., *Smoking, chronic wound healing, and implications for evidence-based practice*, „J Wound Ostomy Continence Nurs” 2014, nr 41.

Mościcka P., Cwajda-Białasik J., Szewczyk M.T., Jawień A., *Owrzodzenie żyłne – problem nie tylko osób starszych. Opis trzech przypadków klinicznych*, Piel Chir Ang. 2017, nr 11.

Mościcka P., Szewczyk M.T., Cwajda-Białasik J., Hancke E., Jawień A., Brazis P., *Owrzodzenia o różnej etiologii. Opis gojenia trzech przypadków*, Piel Chir Ang. 2012, nr 3.

Mościck. P., Szewczyk M.T., Cwajda-Białasik J., Jawień A., *The role of compression therapy in the treatment of venous leg ulcers*, Adv Clin Exp Med. 2019, nr 28.

Nieckula M., Dębska G., Szewczyk A., *Udział pielęgniarki podstawowej opieki zdrowotnej świadczącej usługi zdrowotne w domu chorego mającego owrzodzenie żyłne kończyn dolnych*, Piel Zdr Publ. 2015, nr 5.

O'Donnell T.F., Passman M.A., Marston W.A., et al.; *Society for Vascular Surgery; American Venous Forum. Management of venous leg ulcers: clinical practice guidelines of the Society for Vascular Surgery® and the American Venous Forum*, J Vasc Surg. 2014, nr 60.

O'Brien J.A., Edwards H.E., Finlayson K.J., Kerr G., *Understanding the relationship between the calf muscle pump, ankle range of motion and healing for adults with venous leg ulcers: a review of literature*, „Wound Practice and Research” 2012, nr 20.

Ogólnopolskie badanie liczby osób bezdomnych – Edycja 2019 zamieszczone na stronie internetowej Ministerstwa Rodziny, Pracy i Polityki Społecznej, <https://www.gov.pl/web/rodzina/wyniki-ogolnopolskiego-badania-liczby-osob-bezdomnych-edycja-2019>.

Pawlak-Sobczak K., *Trudności i wyzwania działań z zakresu promocji zdrowia wśród osób bezdomnych*, „Acta Universitatis Lodzensis. Folia Sociologica” 2021, nr 79.

Przybylska R., *Rola zabiegów pielęgnacyjnych w leczeniu owrzodzeń podudzi*, Piel Pol. 2009, nr 3.

Raoult D., Foucault C., Brouqui P., *Infections in the homeless*, „The Lancet Infectious Diseases” 2001, nr 1.

Sopata M., Jawień A., Mroziakiewicz-Rakowska B. et al., *Wtyczne postępowania miejscowego w ranach niezakażonych, zagrożonych infekcją oraz zakażonych – przegląd dostępnych substancji przeciwdrobnoustrojowych stosowanych w leczeniu ran. Zalecenia Polskiego Towarzystwa Leczenia Ran*, „Leczenie Ran” 2020, nr 1.

Szewczyk M., Jawień A., Andruszkiewicz A. et al., *Zalecenia specjalistycznej opieki nad chorym z owrzodzeniem żylnym goleni*, Pielęg Chir Angiol. 2007, nr 3.

Thorn R.M.S., Lee S.W.H., Robinson G.M. i wsp., *Electrochemically activated solutions: evidence for antimicrobial efficacy and applications in healthcare environments*, „Eur J Clin Microbiol Infect Dis” 2012, nr 31.

Tsai J., Rosenheck R.A., *Obesity among chronically homeless adults: is it a problem?*, Public Health Rep. 2013, nr 128.

Willy C., Scheuermann-Poley C., Stichling M. i wsp., *Importance of wound irrigation solutions and fluids with antiseptic effects in therapy and prophylaxis: update 2017*, „Unfallchirurg” 2017, nr 120.

Wrenn K., *Immersion foot. A problem of the homeless in the 1990s.*, Arch Intern Med 1991, nr 151.