

Lower-limb oedema during pregnancy

Obrzęk kończyn dolnych u kobiet w ciąży

Katarzyna Ochałek^{1 (A-F)}, Aleksandra Frydrych-Szymonik^{2 (B,E,F)}, Zbigniew Szyguła^{3 (A,D,E)}

¹ Department of Clinical Rehabilitation, University of Physical Education in Krakow, Poland

² Doctoral studies (PhD) at the Department of Physical Education, University of Physical Education in Krakow, Poland

³ Department of Physical Education, University of Physical Education in Krakow, Poland

Key words

Pregnancy, oedema, chronic venous insufficiency

Abstract

Lower-limb oedemas can be the result of abnormalities in the structure and functioning of the lymphatic system, injuries or inflammation, or can be related to cancer and its treatment; however, they are more often one of the basic symptoms accompanying women in the third trimester of pregnancy due to venous insufficiency. The purpose of this overview is to discuss the current knowledge related to risk factors, prevention and treatment of lower-limb oedemas during pregnancy. The risk factors linked to gravidity-related oedema comprise of increased volume of circulating blood, the augmented uterus, increased body mass and changes to hormonal turnover. Vein insufficiency occurs as a result of venous hypertension caused by insufficiency of the muscle pump and valves regurgitation. Pregnancy, the application of Caesarean section and the postpartum period predispose to deep vein thrombosis (DVT). The basic and unquestionable method applied in the prophylaxis and treatment of abnormalities to the venous-lymphatic system and corresponding complications consists in compression therapy involving compressive bandaging and the use of compression garments. Compression can be applied either individually or in combination with other methods, such as manual lymph drainage, intermittent pneumatic compression and physical or breathing exercises. Based on the scientific research and experts' recommendations, compression is also considered to be an effective solution in the prevention and treatment of deep vein thrombosis and swelling in pregnant women, but further studies in accordance with the principles of evidence based medicine are needed.

Słowa kluczowe

Ciąża, obrzęk, niewydolność żylna

Streszczenie

Obrzęki kończyn dolnych mogą być wynikiem nieprawidłowości budowy i funkcji układu chłonnego, urazów, zapalenia, mogą się też wiązać z chorobą nowotworową lub jej leczeniem, jednak coraz częściej są jednym z podstawowych objawów towarzyszących kobietom w III trymestrze ciąży, głównie na skutek zaburzeń w układzie żylnym. Celem pracy jest przedstawienie obecnego stanu wiedzy na temat czynników ryzyka, profilaktyki i leczenia obrzęków kończyn dolnych u kobiet w ciąży. Wśród czynników ryzyka obrzęku związanego z ciążą wymienia się: wzrost objętości krwi krążącej, powiększenie macicy, wzrost masy ciała oraz zmiany w gospodarce hormonalnej. Zaburzenia żylna powstają w wyniku nadciśnienia żylnego na skutek niewydolności pompy mięśniowej oraz niewydolności zastawek żylnych. Ciąża, wykonanie cięcia cesarskiego, okres połogu sprzyjają wystąpieniu zakrzepicy żylniej. Podstawową i niekwestionowaną metodą stosowaną w profilaktyce i leczeniu zaburzeń układu żylnolimfatycznego oraz ich powikłań jest kompresjoterapia, wykorzystująca bandażowanie kompresyjne oraz stosowanie produktów uciskowych. Ucisk może być stosowany samodzielnie lub w połączeniu z innymi metodami, np. z manualnym drenażem limfatycznym, przerywaną kompresją pneumatyczną, z ćwiczeniami fizycznymi i oddechowymi. Na podstawie badań naukowych oraz w oparciu o rekomendacje ekspertów, ucisk wydaje się też skutecznym rozwiązaniem w profilaktyce i leczeniu zakrzepicy żylniej i obrzęku kończyn dolnych u kobiet w ciąży, jednak wymaga dalszych badań zgodnych z zasadami *evidence based medicine*.

The individual division of this paper is as follows: A – research work project; B – data collection; C – statistical analysis; D – data interpretation; E – manuscript compilation; F – publication search

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INTRODUCTION

Swelling of the lower limbs may be the result of genetically determined vascular malformation, which usually manifests itself in the period from early childhood up until the 2nd-3rd decade of life, however, in Europe, it is most frequently associated with cancer or chronic venous insufficiency^{1,2}. In Poland, about 10,000 people suffer from lymphoedema, which worsens the patients' quality of life³. More often, swelling of the lower limbs is related to the third trimester of pregnancy, mainly due to changes in the venous system^{4,5}. They arise as a result of venous hypertension caused by muscle pump failure, hepatic venous valves and vein thrombosis². They may initially be small, occurring in the ankle area and, depending on the duration and severity of the venous insufficiency, they gradually become larger. The severity of oedema increases in the evening, after a day of exercise, standing or sitting at work. The risk factors for oedema associated with pregnancy include: an increase in blood volume, enlarged uterus, weight gain, changes in hormone economy, changes in plasma hemostasis and water and sodium retention⁶. Slowing venous and lymphatic flow due to reduced muscle pump action, short intervals between pregnancies, genetics or caesarean section may predispose a person to thrombosis, which in pregnant women is 6 times more common than in non-pregnant women during the reproductive period. The greatest risk of thrombosis occurs in the third trimester of pregnancy, during childbirth and during the postpartum period⁷. Its most dangerous complication - pulmonary embolism (1/1,000-3,000 pregnancies) - is the most common cause of death among pregnant women⁸.

Pregnancy can also be a factor that causes lymphatic oedema (genetically determined, late onset) in women from the increased risk group, in which the reserves of the transport lymphatic system were reduced but there were no clinically observed signs of swelling, and in which, as a result of various factors

during pregnancy (weight gain, hormonal changes, venous stasis), these reserves were exhausted (lymphatic load exceeded the maximal transport volume). In turn, this leads to damage of the lymphatic system⁹. Being over-weight or obese, lack of physical activity and family history of venous insufficiency are among the additional risk factors.

A basic and unquestioned method used in prophylaxis and treatment of venous-lymphatic system disorders and their complications is Compression Therapy using compressive bandaging (CB) and compression garments (CG)¹⁰. Compression can be used alone or in combination with other methods, e.g. with Manual Lymph Drainage (MLD), Intermittent Pneumatic Compression (IPC), along with physical and breathing exercises. Compression is part of Complex Physical Therapy (CPT), also known as Complex Decongestive Therapy (CDT)¹¹. Procedures using compression should be considered in pregnant women, especially those with diagnosed venous flow impairment, even before pregnancy. Pharmacological treatment plays a supporting role in pain reduction and alleviating the symptoms associated with chronic venous insufficiency, but should not replace other treatments, especially Compression Therapy¹².

Although swelling of the lower limbs and its accompanying symptoms, such as pain, feeling of heaviness in the limbs, paraesthesia, burning, cramping at night apply to many, because about 80% of pregnant women^{6,13}, and venous insufficiency affects more than 40% of these women⁴, individual studies describe the beneficial effects of compression to improve venous outflow in women during the time of pregnancy¹⁴. There is also a gap in the literature associated with the use of comprehensive physiotherapy. Despite the guidelines on the treatment of venous thromboembolism in pregnant women^{10,15}, no studies have been conducted evaluating the effects of compression in both the prevention and treatment of oedema in women during pregnancy.

The aim of the study is to present the current state of knowledge

on risk factors, prevention and treatment of lower-limb oedema in women during pregnancy.

PATHOPHYSIOLOGY OF VENOUS OUTFLOW

Venous flow in physiological conditions depends on several factors, including proper action of the veins, an efficient valve system and functioning of the muscle pump. In a standing position, blood flows through the veins slowly, but when walking blood flow is accelerated by the contraction of the leg muscles, which in healthy subjects leads to a reduction of blood flow in the foot and reduces venous pressure. Abnormal functioning of the muscle pump, damage to the valves and limited movement of the joints leads to difficulties in outflow stasis, venous hypertension, and also triggers an entire chain of pathological changes in microcirculation, which cause significant clinical symptoms such as fluid retention in the tissues, oedema, trophic changes or shin ulcers^{2,6}.

THE VENOUS SYSTEM DURING PREGNANCY

Pregnancy promotes the formation of changes in the venous system. The negative factors acting on the veins during pregnancy include an increase in blood volume, enlarged uterus, weight gain, reduced physical activity and changes in hormone economy. Changes in the plasma have a significant effect on the venous system. There is an increase in plasma fibrinogen and coagulation factors VII, VIII, IX, and X, and the von Willenbrand factor due to the growth of oestrogen at the end of the first trimester of pregnancy. Increasing the blood stream by increasing the presence of water in the body and decreasing the concentration of albumin in the serum by approximately 25% are conducive to oedema of the lower limbs. A decrease in the concentration of antithrombin III can also be observed. Its deficiency is the cause of venous thrombosis. During

physiological pregnancy, there is a reduction in the level of the S protein, which can cause the development of thrombosis during the postpartum period. Compression of the growing uterus on the pelvic veins and venous plexuses of the pelvis, weight gain and reduced physical activity are conducive to venous insufficiency. Not without significance is the so-called Cockett syndrome, thus an increase in venous complications on the left side because of the crossing of the left common iliac vein with the right common iliac artery. Weakening of the venous wall tension, primarily due to increased oestrogen, causes abnormal flow in the superficial system. Endothelial damage and the release of inflammatory mediators are observed in microcirculation, which adversely affect not only the venous system but also the lymphatic system. Another factor promoting disturbances of the venous system is the reduction of physical activity. Reduction of the muscle pump favours venous stagnation, predisposes to venous thrombosis and, consequently, increases the risk of chronic venous insufficiency and its complications^{6,13}. Changes in the venous system may be assessed using the CEAP clinical classification¹³.

The clinical classification of venous insufficiency on the CEAP scale¹³:

- Class 0 – no symptoms of the disease during clinical examination;
- Class 1 – telangiectasies or reticular veins;
- Class 2 – varicose veins;
- Class 3 – oedema;
- Class 4 – skin changes associated with venous disease (discolourations);
- Class 5 – skin changes - healed venous ulcer;
- Class 6 – skin changes - active venous ulcer.

THE ROLE OF THE LYMPHATIC SYSTEM IN CHRONIC VENOUS INSUFFICIENCY

In developing chronic venous insufficiency, the initial changes concern the venous system – mainly due to valve damage – and are of dynamic failure in nature – i.e., high volume insuffi-

ciency. Oedema of venous etiology may also be accompanied by swelling of lymphatic origin^{2,16}. Already during the early stages of venous insufficiency development, the lymphatic system is a compensatory mechanism. As a result of the increase in hydrostatic pressure within the venous vessels, the excessive amount of compressed fluid cannot be transported back along with the lymphatic system, and over time, it can become damaged, reducing the transport reserves, which leads to the development of congestive lymphatic failure.

In the majority of women during pregnancy, the main place of fluid accumulation is the distal portion of the lower limbs, usually on both sides of the dorsal parts of the feet and/or ankles, however, in some women, this may regard the entire lower-leg, especially in those diagnosed with chronic venous insufficiency (veno-lymphatic oedema) (Picture 1). Initial late oedema is usually asymmetric and affects one limb. Deep vein thrombosis of the lower limbs may be accompanied by massive swelling of the limbs, combined with pain and bruising of the skin. In addition to difficulties with outflow of the blood, this swelling additionally causes difficulty in inflow, leading to ischemia. The chronic consequence of venous thrombosis may be venous insufficiency with permanent venous hypertension leading to thrombotic syndrome¹⁷.

There are several classifications of the stage of lymphoedema advance-

ment. One of them is the scale recommended by the International Society of Lymphology (ISL)¹¹. Stage 0 means no clinical symptoms in patients from the high-risk group (sub-clinical stage); stage 1 - means small swelling, usually resilient, receding after lifting the limbs; stage 2 – harder swelling, which is not relieved by elevating the limbs; stage 3 - so-called elephantiasis - means large swelling with the overgrowth of skin and fat, and a predisposition to infections: bacterial, viral and fungal.

THE CURRENT STATE OF KNOWLEDGE

Numerous reports positively assess the effectiveness of comprehensive physiotherapy (CPT, CDT) in the developed lymphoedema¹⁸⁻²⁰. Compression Therapy is an integral part of the treatment of oedema at any stage, regardless of its etiology. Compression, as a necessary element of CPT, in the form of multi-layer bandaging effectively reduces lymphatic swelling in the phase of intensive treatment¹⁹ (Pictures 2 and 3), and the compression products maintain the achieved effects after CPT during the chronic phase²⁰. Reports have shown that the application of compression at the initial stage of the disease could prevent the progression of oedema (the formation of fibrosis and the formation of fat tissue) and its complications²¹. Although Compression Ther-



Picture 1
Oedema of the lower leg



Picture 2

Bandaging of the lower leg



Picture 3

The effects after bandaging

apy has a long history, most of the reports to date are focused on procedures for treatment of the developed oedema, especially due to cancer, e.g., following breast cancer treatment. There are no studies evaluating the effect of compression in reducing the incidence of oedema in women during pregnancy, evaluating the effectiveness of compression for permanent oedema and finally, comparing the quality of life of women applying and not applying compression during pregnancy. A report evaluating the effect of compression in the form of compression stockings to reduce the risk of swelling of the lower limbs and enhance the quality of life in healthy women, showed improvement in the quality of life of these women²². Single studies have confirmed the beneficial effects of exer-

cise in water or massages in the area of the feet to reduce swelling, however, the methodology of the applied treatments is not accurately described^{23,24}. Some reports draw attention to the use of drugs from the phlebotropic group (flavonoids, benzopyrenes, coumarin derivatives)^{25,26}. These drugs are considered safe for women during pregnancy and recommended by the Polish Gynecological Society²⁷. They reduce permeability, have anti-inflammatory properties, improve microcirculation and reduce the symptoms associated with chronic venous insufficiency, however, there is no observed correlation between subjective improvement and clinical improvement²⁶. Pharmacological treatment of venous-lymphatic disorders is treated as complementary in relation to physical therapy²⁸.

Single studies also describe the use of kinesiotaping for the reduction of oedema in pregnant women²⁹, but previous randomized trials did not confirm the effectiveness of kinesiotaping in developed lymphoedema. Kinesiotaping may, however, be considered as an alternative method for people who do not tolerate compression³⁰.

Guidelines for the prevention and treatment of venous thromboembolism describe the principles of thromboprophylaxis in women at risk of the disease. In all of these women, apart from proper diagnosis, the authors suggest the use of properly selected stockings with graded compression during pregnancy and during childbirth as well as during the postpartum period. The use of graded compression stockings or intermittent pneumatic compression during hospitalization after childbirth is recommended for women following Caesarean section who are at increased risk of thrombosis^{10,15}. In women with a recent history of symptomatic thrombosis of the lower limbs, we recommend the immediate use of compression in the form of compression bandaging, and after the relief of swelling - the use of compression products with the pressure of 30-40 mmHg at the level of the ankle^{10,15}. For women in which compression was used in conjunction with early mobilization in the course of acute venous thrombosis, there was a greater reduction in swelling and reduction of pain compared with women who underwent passive recreation with compression³¹.

On the basis of the available literature and recommendations of experts in the field of lymphology and phlebology^{32,33}, it can be stated that in women with clinical symptoms of oedema, the use of compression stockings in the prevention of venous thrombosis, and in the prevention of lower-limb oedema in pregnant women, the use of pneumatic compression bandaging combined with physical activity seem to be effective solutions, but require further research in accordance with the principles of evidence-based medicine (EBM).

Conflict of Interest: None declared

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Address for correspondence

Katarzyna Ochalek PhD
Akademia Wychowania Fizycznego
Al. Jana Pawła II 78, 31-571 Kraków, Poland
mobile phone: +48 12 6831370
e-mail: k.ochalek@wp.pl