Effects of the decongestive physiotherapy in the healing of venous ulcers

EFEITOS DA TERAPIA FÍSICA DESCONGESTIVA NA CICATRIZAÇÃO DE ÚLCERAS VENOSAS

EFECTOS DE LA TERAPIA FÍSICA DESCONGESTIVA EN LA CICATRIZACIÓN DE ÚLCERAS VENOSAS

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ABSTRACT

The objective of this study was to verify the effects of the decongestive physiotherapy (DP) in the healing of venous ulcers. It is an interventionist, and almost experimental, study with the participation of 20 clients who were divided into 2 groups: the control group (n=10) and the intervention group (n=10). Clients from the first group were only treated with conventional dressing and those in the second group were treated with conventional dressing and decongestive physiotherapy (association of techniques: manual lymph drainage, compressive bandaging, elevation of the lower limbs, myolymphokinetic exercises and skin care). Both groups were treated during six months. The clients submitted to DP presented significant reduction of the edema and the pain, besides an improvement in the healing process. Results allowed to verify that the decongestive therapy stimulated the healing process of venous ulcers, improving the quality of life of the subjects.

KEY WORDS

Varicose ulcer.
Wound healing.
Physical therapy modalities.
Nursing care.

RESUMO

Objetivou-se neste estudo verificar os efeitos da terapia física descongestiva (TFD) na cicatrização de úlceras venosas. Trata-se de um estudo intervencionista, quase experimental, do qual participaram 20 clientes, divididos em 2 grupos: o grupo controle (n=10) e o grupo de intervenção (n=10). Os clientes do primeiro grupo foram tratados apenas com curativo convencional e os do segundo grupo, com curativo convencional e terapia física descongestiva (associação de técnicas: drenagem linfática manual, enfaixamento compressivo, elevação dos membros inferiores, exercícios miolinfocinéticos e cuidados com a pele). Ambos os grupos foram tratados durante seis meses. Os clientes submetidos à TFD apresentaram significante redução de edema e da dor, além de melhora no processo cicatricial. Os resultados permitiram verificar que a terapia descongestiva estimula o processo de cicatrização de úlceras venosas, melhorando a qualidade de vida dos indivíduos.

DESCRITORES

Úlcera varicosa.
Cicatrização de feridas.
Modalidades de fisioterapia.
Cuidados de enfermagem.

RESUMEN

En este estudio se objetivó verificar los efectos de la terapia física descongestiva (TFD) en la cicatrización de úlceras venosas. Se trató de un estudio intervencionista, casi experimental, del cual participaron veinte pacientes que constituyeron dos grupos: el grupo control (n=10) y el grupo de intervención (n=10). Los pacientes del primer grupo fueron tratados apenas con curaciones convencionales, mientras que los del segundo grupo recibieron curación convencional y terapia física descongestiva (asociación de técnicas: drenaje linfático manual, fajamiento compresivo, elevación de los miembros inferiores, ejercicios miolinfocinéticos y cuidados con la piel). Ambos grupos fueron tratados durante seis meses. Los pacientes sometidos a TFD presentaron significativa reducción de edema y dolor, y mejora en el proceso cicatricial. Los resultados permitieron verificar que la terapia descongestiva estimula el proceso de cicatrización de úlceras venosas, mejorando la calidad de vida de los individuos.

DESCRIPTORES

Úlcera varicosa.
Cicatrización de heridas.
Modalidades de terapia física.
Cuidados de enfermería.

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INTRODUCTION

Studies addressing the healing process of venous ulcers and quality of life have been viewed with importance[1-2]. A prevalence of 1% of venous ulcers in the adult population was identified in a European study and it has dramatically increased in individuals older than 80 years of age[2]. About 10% to 20% of the population in developed countries has varicose veins and the venous ulcer stands out as a prevalent complication, which affects 0.5% to 2% of the world population. Studies of this nature are scarce in Brazil. One study was carried out in Botucatu[3], SP, Brazil, which found a prevalence of approximately 1.5% of cases of active or healed venous ulcers.

The precise physiopathological mechanisms that lead to ulceration have not yet been clarified and are discussed in the scientific community, though chronic venous hypertension, generally resulting from venous reflux, is the most accepted factor in the majority of studies in the field[4-5].

In this context, considering that the underlying pathology of venous ulcers most accepted by the scientific community is venous reflux, we considered in this project the possibility of applying a specific technique to treat lymphedema, though directed to the treatment of ulcerations. This technique is called Complex Physical Therapy[6] (CFT), acknowledged and adopted by the Consensus Document of The International Society of Lymphology, The diagnosis and Treatment of Peripheral Lymphedema[7] (1995), the procedure of which consists of combining manual lymphatic drainage, elastic compression, myolymphoknetic exercise and skin care[8-9].

...exercise and manual lymphatic drainage are not usually prescribed to treat venous ulcers even though they are both techniques that stimulate venous and lymphatic return.

Manual Lymphatic Drainage (MLD) is intended to encourage circulation of the lymph and interstitial fluid in order to reallocate it into the blood system, reabsorbing edema and treating different pathologies, through gentle circular motion of hands on the area to be treated in a rhythmic and slow manner[10].

Elastic compression is applied after MLD to diminish the superficial venous system and diameter of the dilated vein, temporarily restoring vascular competence, impeding the venous reflux through inadequate perforating routes. Compression increases the contraction of the calf muscles, draining deep veins as long as the blood flow remains unchanged. The effects of compression on microcirculation include acceleration of the blood flow into the capillaries, reduced capillary filtration and increased re-absorption through increased tissue pressure, improving local lymphatic drainage and the effects of mediators involved in the local inflammatory response[11].

The systematic review carried out by Cullum and colleagues shows that the range of high compression in patients with stasis ulcers is at least twice as effective as treatment with low compression in completely healing venous ulcers. Multi-layered compression bandages seem superior to single-layered compression bandages, whereas the elastic multi-layered compression bandage is superior to the inelastic multi-layered compression bandage. Compression treatment, with bandaging or elastic stockings, is considered the first line of treatment when a venous ulcer occurs in the absence of a clinically important arterial disease[11].

Studies have shown that compressive therapy combined with rest and elevation of inferior limbs stimulates the healing of venous ulcers[11], however exercise[12] and manual lymphatic drainage[10] are not usually prescribed to treat venous ulcers even though they are both techniques that stimulate venous and lymphatic return. We also stress that medical-scientific literature is scarce in terms of studies addressing the role of myolymphokinetic exercises in preventing the venous affection of lower limbs[12]. Therefore, this study proposes the unification of these techniques, since they are isolated applied in clinical practice, so as to enable venous return and speed the healing of venous ulcers.

OBJECTIVE

To verify the effectiveness of Decongestive Physical Therapy (DPT) in healing venous ulcers.

METHOD

This quasi-experimental intervention was carried out in the Physical Therapy Outpatient School at the State University of Southeast of Bahia (UESB), Jequié, BA, Brazil, which developed the University extension project *Physical Therapy Care to Ulcerations in Lower Limbs*. This study is an excerpt of the Master's project *Effectiveness of decongestive physical therapy in healing venous ulcers* developed in the Graduate Program in Health Sciences at the Federal University of Rio Grande do Norte (UFRN), Brazil.

The study's population includes patients with venous ulcers cared for in the previously mentioned physical therapy outpatient clinic. A non-probabilistic sample composed of 20 patients who voluntarily visited the clinic between June 2007 and May 2008 was used.

These patients formed two groups: the Control Group (CG) and the Intervention Group (IG), with 10 patients each. The groups were matched according to the following variables: gender, age range, time and extension of lesion. Matching codes were generated for these variables. (Table 1).

Table 1 - Matching codes according to the variables: gender, age range, time and extension of lesion - Jequié, BA, Brazil - 2008

Gender	Age group	Time of lesion	Lesion extension	Matching code
Male	Up to 60 years	Up to 5 years	small/regular	1
Male	Up to 60 years	Up to 5 years	large/extensive	2
Male	Up to 60 years	> 5 years	small/regular	3
Male	Up to 60 years	> 5 years	large/extensive	4
Male	> 60 years	Up to 5 years	small/regular	5
Male	> 60 years	Up to 5 years	large/extensive	6
Male	> 60 years	> 5 years	small/regular	7
Male	> 60 years	> 5 years	large/extensive	8
Female	Up to 60 years	Up to 5 years	small/regular	9
Female	Up to 60 years	Up to 5 years	large/extensive	10
Female	Up to 60 years	> 5 years	small/regular	11
Female	Up to 60 years	> 5 years	large/extensive	12
Female	> 60 years	Up to 5 years	small/regular	13
Female	> 60 years	Up to 5 years	large/extensive	14
Female	> 60 years	>5 years	small/regular	15
Female	> 60 years	> 5 years	large/extensive	16

A balance between groups was attempted as the groups were being formed, that is, at each admission into one of the groups, another patient with the same code was allocated to the other group. The following inclusion criteria were used: patients with venous ulcer secondary to Chronic Venous Insufficiency (CVI) in one of the two lower limbs; being able to be undergo DPT in the healing process of venous ulcers according to the assessment of the angiologist member of the research team; being older than 18 years of age; attending the outpatient clinic to receive the DPT and dressings; being cognitively able to follow recommendations during the study's period; agreeing to voluntarily participate in the study, and sign a free and informed consent form.

The exclusion criteria were: diabetic patients with neuropathic or arterial ulcer or any other type of ulcer in the lower limbs not related to CVI; local and/or systemic infection; Deep Vein Thrombosis (DVT); those who missed the consultation three consecutive times or six alternated times and those who did not consent to participate.

All patients were referred to a nutritionist to control obesity and hypertension through hyposodic diet and to control other pathologies inherent to the condition of each patient.

This study was submitted to and approved by the Research Ethics Committee at the State University Southeast of Bahia according to Resolution 196/96 of the National Health Council that regulates research with human subjects (Protocol nº 59/2007).

The CG was submitted only to dressings performed by the nursing team (scholarship students and volunteers from the nursing undergraduate program at the UESB enrolled in their 6th or later semesters) complying with the scientific principles that guide nursing care provided for wounds. Dressings were composed of primary and secondary layers, using gauzes wet with saline solution, and bandages. It is important to stress that the dressing technique was applied daily and was identical for both groups.

In cases in which the wound developed fibrin and/or necrotic tissue in the ulcer bed, chemical debridement with papain cream at 10% was used in both groups whenever necessary up to the total removal of these undesirable tissues according to the percentage necessary for each patient. Papain was suspended after these tissues were removed. CG or IC patients underwent surgical debridement when needed. Chemical and surgical debridement was performed as many times as needed; chemical debridement was performed much more frequently (96%) than the surgical.

The IG had their dressings changed daily and the DPT was applied three times a week on alternating days by the same physical therapy team with a duration of 40 minutes for each session. During the weekends both the IC and CG were cared for at their homes. Therapy was applied in the following order: lower limbs were elevated to 30 degrees, manual lymphatic drainage, compression with elastic bandages up to the knee region, myolymphoknetic exercises, that is, flexo-extension of ankles, knees and hips three times with 30 repetitions performed with the limb under elastic compression. The elastic bandage was kept on a daily basis, removed only to sleep and replaced in the morning upon waking.

The manual lymphatic drainage on the lower limbs started with the evacuation of popliteal and malleolar inguinal lymph nodes followed by rhythmic, slow and gentle pressure, around 30 to 40mmhg, directing the lymph to a closer group of lymph nodes in the caudal-cranial direction.

Before initiating the treatment, the patients were evaluated according to the Brazilian Society for Vascular Surgery. The following variables were considered: socio-demographic variables (gender, age, schooling), alcoholism, smoking, associated diseases and leg ulcer extension, time of ulcer, site, and its degree of contraction. The level of pain was also assessed through a numerical scale from 0 to 10, and the edema of the affected limb.

To calculate the ulcer's area, the wound edge was circumvented with sterile transparent material in order to

determine: the largest horizontal and vertical lengths measured with a ruler graduated in centimeters. Afterward, the figure was input into the Autocad 2006[13], by the following steps 1) the scale was compared in relation to the ruler (cm^2); 2) two lines (blue and red) were drawn between the two measures (largest horizontal length and vertical length); these lines were measured and the average for the correct scale of the figure was computed; 3) the AutoCAD scale tool was used to put it in the Autocad scale; 4) the measures were checked and confirmed; 5) the Polyline command was used to draw the lesion area; 6) then the toolbar *inquiry* was used, and the option AREA was checked to measure the figures in cm^2.

Once the wound's area was determined, the degree of wound contraction was computed and expressed as a percentage using the formula[14]:

$$100 \times \frac{(Wo - Wi)}{Wo} = \% \text{ average of contraction}$$

Wo refers to the wound's initial area and Wi •refers to the wound's final area in the months 1, 2, 3, 4, 5 and 6.

To evaluate the intensity of pain, a numerical scale from 0 to 10 was applied: zero indicates absence of pain, one, two and three indicate mild pain (does not impede the performance of activities); four, five and six indicate moderate pain (hinders activities but does not impede them); seven, eight, and nine indicate strong or incapacitating pain (impedes any activity) and ten indicates extremely strong, unbearable or excruciating pain (in addition to impeding activity, it also leads to a lack of control)[15]. The scale was applied verbally and in writing and after the patients' response, the observer noted the score.

The pitting test was used; pressure was applied to the pretibial region with the thumb for about 10 minutes in order to observe whether an indentation was formed[16]. The edema was measured through a crosses scale, where one cross (+) = 0.25cm of indentation; two crosses (++) = 0.50cm of indentation; three crosses (+++) = 0.75cm of indentation, and four crosses (++++) = 1.0cm of indentation. For the purpose of comparison, one cross indicated minimum edema and four indicated maximum edema.

The collected data were input into a spreadsheet in the SPSS, version 15.0, which performed descriptive analysis and the Mann-Whitney and the *t* test to analyze the averages of wounds' contraction.

RESULTS

Ten out of the 20 studied patients composed the control group: seven were women (70%) and three were men (30%), with an average age of 61.9 (±11.66) years of age. The other ten patients composed the intervention group: three men (30%) and seven women (70%), with an average age of 65.5 (±10.28) years. The variables schooling, ulcer's site and duration, associated diseases, alcoholism and smoking are presented in Table 2.

Table 2 - Distribution of patients with venous ulcers by groups (IG and CG) according to variables: schooling, ulcer's site, duration and extension, associated diseases, alcoholism and smoking - Jequié, BA, Brazil - 2008

Variables	N		%	
	GI	GC	GI	GC
Schooling				
Illiterate	4	7	40%	70%
Complete primary school	3	2	30%	20%
Incomplete secondary school	1	-	10%	-
Complete secondary school	2	1	20%	10%
Site				
Right leg	3	4	30%	40%
Left leg	7	6	70%	60%
Medial Malleolus	6	8	60%	80%
Lateral Malleolus	4	2	40%	20%
Duration of lesion				
Up to 5 years	6	5	60%	50%
More than 5 years	4	5	40%	50%
Lesion extension				
small/regular	8	7	80%	70%
large/very large	2	3	20%	30%
Associated disease				
Hypertension	9	9	90%	90%
Alcoholism	-	-	-	-
Smoking	-	1	-	10%

The lesion extension was classified according to the COREN-MG-65/00 determination: small (less than $50cm^2$); regular (more than $50cm^2$ and less than $150cm^2$); large (more than $150cm^2$ and less than $250cm^2$), and extensive (more than $250cm^2$).

In relation to the intensity of pain over time, the average scores were significantly lower for the intervention group, as shown in Figure 1.

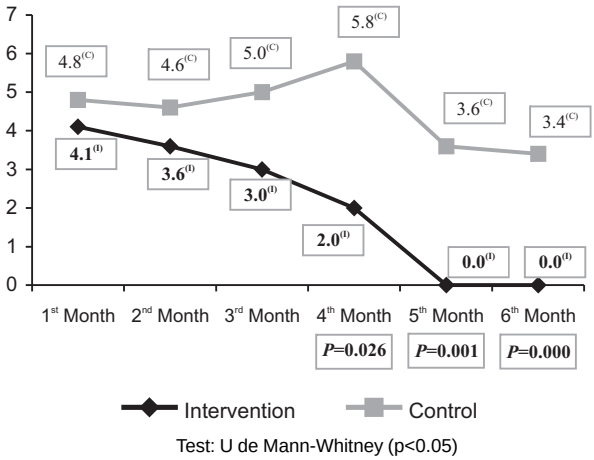
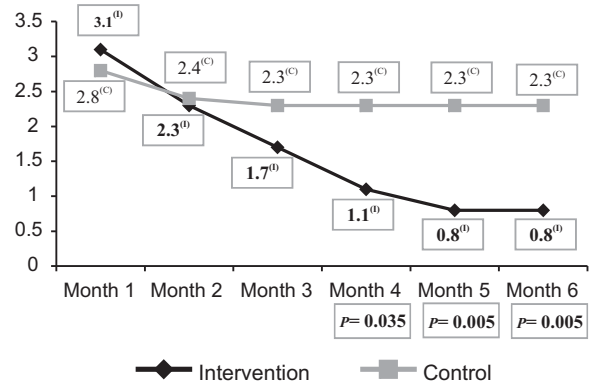


Figure 1 - Distribution of average scores attributed to the intensity of pain through a numerical scale from 0 to 10 in relation to the time of healing of venous ulcers in patients in the intervention and control groups - Jequié, BA, Brazil - 2008

Analysis of the graph reveal that the results related to pain, when submitted to the Mann-Whitney test, did not show any significant difference between months 1, 2 and 3, though a significant difference was found between the groups in the months 4, 5 and 6.

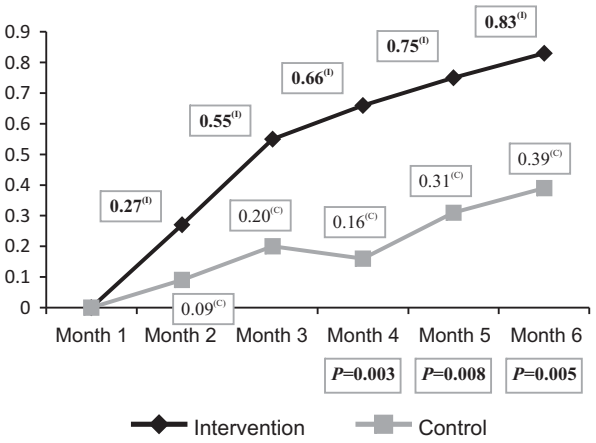
Regarding edema, its averages in relation to time of the intervention and control groups are presented in Figure 2.



Test: U de Mann-Whitney (p<0.05)

Figure 2 - Distribution of the average scores attributed to edema through the pitting test in relation to the time of healing of venous ulcers in patients in the intervention and control groups - Jequié, BA, Brazil - 2008

In addition to the general and clinical characterization of patients, another important variable to be measured is the level of wound contraction. The stronger the contraction of a wound, the more advanced is its healing process[17]. The averages of wound contraction of the intervention and control groups in relation to time are presented in Figure 3. It is important to note that the level of contraction in month 1 is zero because it is when patients were included in the study.



Test: U de Mann-Whitney (p<0.05)

Figure 3 - Distribution of average scores attributed to the contraction of wounds in relation to time of healing of venous ulcers of patients from the intervention and control groups - Jequié, BA, Brazil - 2008

Although the differences found in wound contraction are statistically significant only in months 4, 5 and 6, the intervention group consistently presented better results compared to the control group in all the remaining months.

It is noteworthy that at the end of the period (month 6), 100% of the intervention group sample presented contraction greater than 50% while the level of contraction in the control group was 40%. Of the control group samples, 30% presented very unsatisfactory contraction with values below 10%. Additionally, 30% of the intervention group wounds were completely healed while only 10% of the control group was in the same condition.

DISCUSSION

There was a prevalence of women among the 20 studied patients. Statistical data indicate that venous ulcers are more frequent among women, though up to the age of 40, they are somewhat equally distributed among genders. It is possible that this difference is due to women's longevity. The occurrence of venous ulcers has increased with the growth of the elderly population. International studies[18-19] have shown a prevalence between 0.06% to 3.6% in the adult population and 3.6% in individuals older than 65 years of age.

The average age of the study's participants (IG and CG) was 65.5 and 61.9 years old (± 10.28; ± 12.64) respectively; the 60 years old population predominated, which is in accordance with results found in the current literature[18]. However, there are others showing results below average[19], where 85% of the sample was older than 76 years of age (women) and 78 years of age (men). These differences might be explained by the socio-economic, cultural and geographic characteristics of each region. Most of the affected patients receive only one times the minimum wage, which confirms that low-income populations are more affected by the disease.

In relation to the ulcer's site, the IG showed a higher predominance in the instep (40%), at the level of the medial malleolus (60%) and lateral malleolus (40%), while ulcers were predominantly located on the calf (70%) at the level of the medial malleolus (80%) and lateral malleolus (20%) in the CG. The average duration of the lesions was 6.4 years (±3.5). In a study[3], carried out in Juiz de Fora, MG, Brazil, which evaluated 169 cases of leg ulcers, 152 were located in the legs distal region: 85 (50.3%) on the lateral side and 67 (39.6%) on the medial side. Hypertension is another disease that can interfere in the healing process because, in addition to its association with atherosclerosis, experimental studies in mice show that this disease also induces endothelial dysfunction, inhibition of collagen synthesis and decreased tissue oxygen due to vasoconstriction, hindering the healing process[20].

Both groups were balanced in terms of associated diseases, hypertension (90% in both groups) and CVI (100%

in both groups). Hence, no specific group had an advantage or disadvantage in relation to the healing response associated with these pathologies.

There are, in addition to hypertension, other extrinsic factors such as smoking that can negatively interfere in the healing process by diverse mechanisms. Carbon monoxide produced during combustion of tobacco displays affinity for hemoglobin two hundred times greater than oxygen, reducing the release of this element on peripheral tissues. Nicotine, a component of cigarette smoke, causes vasoconstriction, increases blood pressure and mobilizes free fatty acids, and also decreases the proliferation of erythrocytes, fibroblasts and macrophages, which are key cells in the healing process[21]. In this study however smoking was not prevalent in the studied patients; only one patient (10%) in the CG smoked.

Another complication possibly associated with wounds is pain, which in a chronic situation persists for too long a time for a lesion to heal or is associated with chronic pathological processes. It lasts more than three months and is either continuous or recurrent. In the case of ulcers, pain is caused by tissue injury, ischemia, hypoxia, inflammation, infection or adhesion of the covering to the wound bed. Pain causes adrenergic discharge causing vasoconstriction and, therefore, decreased tissue perfusion and alteration of inflammatory mediators, resulting in delayed healing[22].

A statistically significant difference was found in relation to pain between the groups in the last three months of treatment (*p=0.026; p=0.001; p=0.000*, respectively), which indicates the IG experienced lower levels of pain when compared to the control group. Another important finding was related to wounds contraction since a statistically significant difference was also verified in the last three months of treatment (*p=0.003, p=0.008 and p=0.005*, respectively). In this context, it is believed that the intervention process to which patients were submitted contributed to reducing pain and consequently to speeding up the healing process of venous ulcers.

Edema in the lower limbs is common[16-19] among patients with venous diseases and can present different degrees. It is generally found in the perimalleolar region or extends to the leg's lower third and is frequently associated with CVI (20% of cases). In early phases, the venous component prevails, which then becomes a mixed edema – venous and lymphatic – as it extends to stasis.

It is important to highlight two mechanisms capable of reducing CVI edema, which are increased tissue oncotic pressure and blockage of local lymph. A statistical difference was found in this study between the groups in the last three months of treatment *(p=0.035; p=0.005; p=0.005*, respectively).

These findings must be related to the association of the techniques used in the IG, especially MLD, specific manual technique, which mainly acts on the superficial lymphatic system and its entire anatomic and physiologic structure, due to its ability to unblock the lymph nodes and drain the excess fluid from the cells by stimulating protein re-absorption by the lymphatic system present in the interstitium and maintaining a fluid balance between the interstitial spaces[10], thereby creating an environment conducive to healing, especially when acting in a compromised bloodstream return.

In addition to MLD helping venous return, the use of the compression technique is also essential because it increases the healing rate of venous ulcers when compared to treatments without compression[11]. It acts on micro and macro circulation, diminishing pathological reflux during ambulation and increasing the volume of ejection during calf muscle activation, encouraging re-absorption of edema and improving lymphatic drainage.

More than 70% of the individuals with an active ulcer present impaired calf muscle function. Hence, muscle enhancement may stimulate muscle hemodynamics, reducing venous reflux and stimulating the healing process. In patients with varicose veins, capability of ejection is impaired to 60%, and in limbs with healed ulcer impairment achieves 76% while in limbs with an active ulcer this rate increases up to 90.5%[12].

Studies evaluating calf muscle[12] hemodynamics in supervised exercise in limbs with active venous ulcers revealed results with significant improvement of venous volume ejection, of the residual volume function and increased calf muscle resistance. This study used supervised exercise, ankle, knee and hip flexion-extension with a differential, that is, combined with exercise, the limb was under elastic compression and elevated to 30 degrees (myolymphokinetic exercises) to facilitate venous return.

Aiming to understand CVI clinical alterations the predominant pathological characteristic of which is insufficient venous return, we stress the importance of unifying techniques capable of stimulating venous return. But it is also important to stress the need for interaction between professionals, patients and families in order to ensure higher patient adherence to treatment, behavioral changes, and the health team's adapted and effective conduct.

CONCLUSION

Decongestive physical therapy accelerated the healing process, and reduced pain and edema in affected limbs. Hence, it is expected that the results of this study will contribute to the advancement of knowledge in the field, enlarging the use of decongestive physical therapy to reduce lymphedema and consequently heal venous ulcers.

The results indicate the importance of a multi-professional health team to provide care to patients with venous ulcers, encouraging the healing process and contributing to the quality of life of patients and their respective family members and caregivers.

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