

# Vascular physiotherapy for treatment of chronic venous disease: review article

## *Tratamento fisioterapêutico vascular para a doença venosa crônica: artigo de revisão*

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### Abstract

Physiotherapy has an important role to play in prevention of and recovery from the damage caused by chronic venous disease (CVD), employing techniques that are adapted to and focused on clinical disease status, in which form it is known as vascular physiotherapy. Early initiation of treatment with vascular physiotherapy can relieve symptoms of the disease, reduce the risk of venous ulcers and improve the quality of life of CVD patients. The objective of this literature review was to develop a protocol for treatment with vascular physiotherapy, compiling evidence of the benefits of each vascular physiotherapy technique and suggesting how they can be used for treatment of CVD. This is a review of literature investigating the subject that is listed on the LILACS and SciELO bibliographic databases and was published from 1990 to 2014. The resulting protocol is a proposal for treatment oriented towards the requirements of people with CVD, with the objective of achieving better quality of life.

**Keywords:** venous insufficiency; physiotherapy; exercise; therapy.

### Resumo

A fisioterapia tem papel importante no processo de prevenção e recuperação de danos causados pela doença venosa crônica (DVC), com técnicas adequadas e focadas no quadro clínico da doença, sendo então denominada de fisioterapia vascular. O tratamento fisioterapêutico vascular precoce pode aliviar os sintomas da doença, reduzir o risco de úlceras venosas e melhorar a qualidade de vida do portador de DVC. O objetivo desta revisão de literatura foi elaborar um protocolo de tratamento fisioterapêutico vascular, mostrando evidências e benefícios das técnicas da fisioterapia vascular e sugerindo como podem ser utilizadas no tratamento da DVC. Trata-se de um estudo de revisão de literatura através de referências sobre o tema, considerando os materiais disponíveis nas bases de dados bibliográficos LILACS e SciELO, publicados no período de 1990 a 2014. Esse protocolo constitui uma proposta de tratamento direcionada às necessidades dos indivíduos com DVC, a fim de proporcionar uma melhor qualidade de vida.

**Palavras-chave:** insuficiência venosa; fisioterapia; exercício; terapêutica.

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## ■ INTRODUCTION

The concept of a type of physiotherapy focused on circulatory disorders (vascular physiotherapy) such as chronic venous disease (CVD) is still recent and there are as yet few descriptions in the literature.<sup>1</sup> Despite the small number of studies investigating the effects of physiotherapy in this disease, those that have been published are illustrating its fundamental role in both prevention, thereby avoiding incapacity to perform simple tasks because of exacerbation of the pain involved, and in treatment to improve the quality of life (QoL) of the people affected.<sup>2-4</sup>

Authors writing on the subject highlight certain physiotherapy resources that could be used for this type of treatment, including vascular kinesiotherapy (with stretching, metabolic, strength, aerobic and proprioceptive exercises), breathing exercises, manual lymph drainage (DLM), pressure therapy, positioning to improve vascular function, and vascular education.<sup>5</sup>

Chronic venous disease is an abnormality of venous system function, caused by valve incompetence, that affects the superficial vein system, the deep vein system or both and which may be the result of a congenital or an acquired disorder.<sup>6-9</sup> It is one of the most common conditions that affect the lower limbs and is considered a functional problem and not merely an esthetic one. Chronic venous disease has become a public health problem because of its complications, such as venous stasis ulcers. This disease affects people's capacity for productive work, significantly reducing their quality of life and can provoke psychological disorders and social isolation.<sup>5,8,9</sup>

Currently, physical exercise is considered an effective measure for prevention and treatment of CVD, and walking as exercise has received the greatest attention in this respect. There is evidence that exercises to increase strength, such as training the muscles of the calf, is capable of reducing reflux of blood, by improving vein competence, provoking a reduction in the discomfort and harm caused by the disease.<sup>10</sup>

Physiotherapists have a significant role to play in the processes of prevention of and recuperation from the damage this disease causes. Early treatment designed to prevent venous hypertension, reflux and inflammation can alleviate the symptoms of CVD and reduce possible risks of ulcers, the disease's most severe complication.<sup>11,12</sup> In view of the above, this study was conducted with the objective of developing a protocol for treatment with vascular physiotherapy, compiling evidence of the benefits of each vascular physiotherapy technique and suggesting how they can be used for treatment of CVD.

## ■ METHODOLOGY

This study is a review of the literature available in publications indexed in the bibliographic databases LILACS and SciELO dated from 1990 to 2014. The search strategy used the following keywords: venous insufficiency; physiotherapy modalities; exercise; therapy. The inclusion criteria for articles were use of at least one of the keywords and publication date of 1990 or later.

A total of 26 publications were selected from the results of the database and library search that were directly related to venous insufficiency. The remaining results were related to endovascular procedures, tests of medications and platelet aggregation. Additional materials used for the study were located by means of non-systematic research in local libraries and searches of electronic journals.

## ■ RESULTS AND DISCUSSION

Vascular physiotherapy has been gaining more widespread acceptance as a noninvasive method for treatment of CVD based on therapeutic exercises. In view of this growing interest, it was decided to develop a protocol for treatment with vascular physiotherapy (Appendix 1) to be used as a foundation for provision of physiotherapy-based care for people with CVD.

Stretching is used to recover amplitude of movement, improve body function and as warm-up before an exercise program, with the objective of reducing the risk of injury.<sup>13</sup> The stretching technique chosen for the protocol was static, maintaining muscle stretching positions for 20 seconds with four repetitions, as described by Lima et al.<sup>6</sup> (Figures 1-4).

Meyer et al.<sup>14</sup> states that a combination of ankle exercise and subtalar movements for 5 minutes increases blood flow by stimulating the calf muscle pump (CMP) in combination with a position in which the lower limbs are raised in order to take advantage of the effect of gravity, facilitating greater blood mobility.<sup>1,6,15</sup>

Sochart and Hardinge<sup>16</sup> stress that a combination of vascular kinesiotherapy and a position in which the lower limbs are raised is capable of preventing onset of pain and of complications caused by CVD. Another benefit of active movement of these joints is an improvement in venous hemodynamics, which is maintained for up to 30 minutes after the end of exercise. In view of this, metabolic ankle exercises were included in the protocol (Figures 5-7).

Azoubel et al.<sup>17</sup> conducted a study that evaluated the muscle hemodynamics of the calf when subjected to supervised exercise, observing a significant

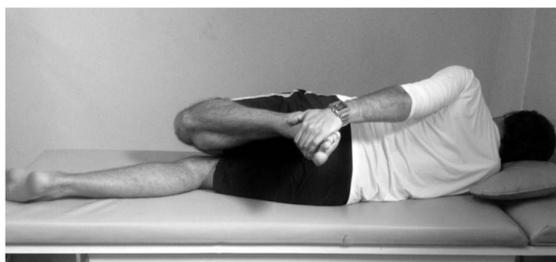


Figure 1. Stretching knee extensors.



Figure 2. Stretching knee flexors.

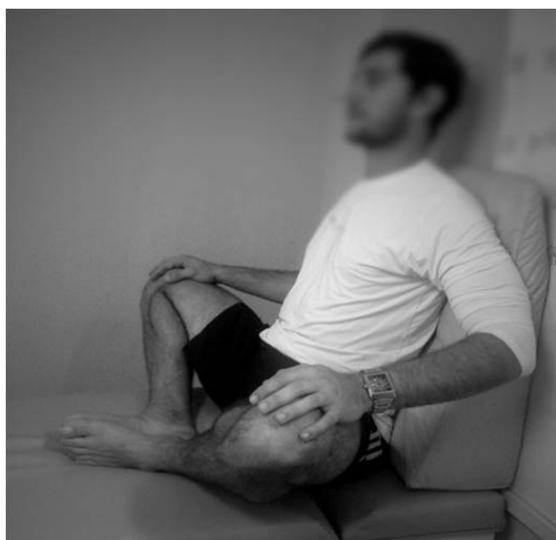


Figure 3. Stretching thigh adductors.



Figure 4. Stretching thigh abductors.

improvement in drainage of venous volume and in function of the residual volume and an increase in the calf's muscle resistance.

According to studies by Alberti et al.<sup>18</sup> physical exercise increases the muscle tone of the lower limbs and as a consequence can improve its effect on the venous system, resulting in a drop in pressure when walking and an increase in venous blood return. Resistance exercise (also known as strength exercise) is also therefore part of treatment for CVD and has been included in the treatment protocol developed (Figures 8-10).

With regard to aerobic exercises, it is clear that the objective of walking as therapy is, as stated by Lima et al.,<sup>6</sup> to achieve the greatest yield from the musculature of the calf, facilitating venous return and promoting better mobilization of the metatarsophalangeal joints, activating the CMP. Studies demonstrated that individuals who engaged in physical activity achieved a reduction in manifestations of the complications of CVD in comparison with those who did not practice any type of physical activity.<sup>14,15,18</sup>



Figure 5. Flexion and extension movements of the ankle.



Figure 6. Ankle rotation movements.



Figure 7. Flexion of hips combined with flexion and extension of the ankle.



Figure 8. Strengthening calf with latex band.



Figure 9. Strengthening calf in orthostatic position.



Figure 10. Strengthening calf in orthostatic position with ankle weight.

A study by Silva et al.<sup>10</sup> reports evidence that training the musculature of the calf is an activity that can reduce reflux of blood, improve vein competence and reduce the discomfort and harm caused by CVD. In view of this, walking was included in the protocol, performed for 10 minutes on a treadmill, varying length of stride and speed as training progresses (Figure 11).

According to Godoy et al.<sup>19</sup> the principles underlying myolymphokinetic exercises include muscle contractions and reducing the effect of gravity on vessels. When muscle contractions overcome a reduced gravitational pressure, venous and lymphatic return are improved because the lower limbs are positioned at the same height as the heart. This is why exercise on an exercise bicycle adapted for use in decubitus dorsal (or using a bed bicycle) has been included in the protocol (Figure 12).

According to Baldaço et al.,<sup>20</sup> proprioception is a bodily perception mechanism by which peripheral receptors send information to the central nervous system (CNS), in order to maintain control over the posture. Compromise of this system results in a joint stabilization deficit, which can contribute to postural destabilization.

In CVD, increased joint volume caused by edema provokes limitations to the amplitude of movement, reducing joint proprioception and impacting on the patient's functional capacity as a result. Some studies have shown that proprioceptive exercises can improve stability of joint equilibrium.<sup>18,21,22</sup> This justifies



Figure 11. Aerobic exercise - walking.



Figure 12. Aerobic exercise with bicycle in horizontal position.

including proprioceptive exercises in the vascular physiotherapy protocol (Figure 13).

Figueiredo<sup>23</sup> states that kinesiotherapy has proven effective for acquisition of tibio-tarsal equilibrium and mobility, improving walking performance. Tanaka & Revagnani<sup>24</sup> published an article in which they state that increased amplitude of ankle movement is related to activation of the CMP mechanism, facilitating venous return by contraction of local muscles (Figure 14).

Tanaka et al.<sup>12</sup> highlight that breathing exercises designed to encourage maximum inspiration are another relevant resource, since they promote alternation of different thoracic and abdominal pressure gradients, transmitting these pressures mechanically to the major vessels and potentiating blood flow at this level. This type of exercise is considered an activator of the thoracoabdominal (diaphragmatic) pump, improving blood return and helping with blood oxygenation.<sup>1,15,25</sup>



Figure 13. Flexion and extension movements on proprioceptive unstable surface.



Figure 14. Flexion and extension movements on balance board.



Figure 15. Relaxation position and diaphragm movements.

In view of their importance, breathing exercises were included in the treatment protocol (Figure 15).

Chaves et al.<sup>26</sup> point out that the potential of health education to promote self-care and encourage patients to take responsibility for decisions related to their health is well-recognized. Vascular education is considered to be the most important part of treatment and the guidance provided must be followed by patients, which is why vascular education has been included in the protocol.

Araújo<sup>27</sup> states that any type of physical activity provokes physiological responses during and after it is performed, such as changes to heart rate (HR) and arterial blood pressure (BP) in comparison with their levels at rest and that these changes can last for as long as 24 to 48 hours. Paula et al.<sup>28</sup> agree, stating that during strength exercises, both systolic and diastolic BP tend to increase, resulting in an increase in average BP, even if only for a short period of time.

According to Nóbrega,<sup>29</sup> HR increases during exercise in response to autonomic mechanisms, which become evident during intense exercise. In view of this, the protocol for treatment with vascular physiotherapy proposed here requires vital signs such as BP and HR to be measured before and after administration of the protocol.

## CONCLUSIONS

The protocol presented here is a proposal for treatment oriented towards the requirements of people with CVD. It is based on evidence showing the benefits

of vascular physiotherapy in terms of reductions in the signs, symptoms and possible complications of the disease and is intended to afford these patients a better quality of life.

It is hoped that this protocol will be used to direct therapeutic management of people with CVD and will be a first step towards opening new discussions on the measures to be adopted for prevention and treatment of this disease.

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Writing the article: FJL, TSS  
Critical revision of the article: FJL  
Final approval of the article\*: FJL, TSS  
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## Appendix 1. Vascular physiotherapy protocol for treatment of chronic venous disease

Measure arterial blood pressure and heart rate before and after each session.

### STRETCHING EXERCISES

Muscle stretching for **20 seconds (four repetitions)**.

**(Figure 1) Stretching 1:** in decubitus lateral, extend the hips, with knee bent and foot in plantar flexion, maintaining the position, to stretch the anterior chain of the leg.

**(Figure 2) Stretching 2:** in decubitus dorsal, raise the leg, flexing the hips, with knee extended and ankle in dorsiflexion, maintaining the position to stretch the posterior chain of the leg.

**(Figure 3) Stretching 3:** bring the soles of the feet together and perform and maintain a butterfly position, attempting to bring the knees as close as possible to the mat.

**(Figure 4) Stretching 4:** in decubitus dorsal, the patient holds one leg straight out, crossing the other leg over it and pulling it towards the body by the knee.

### METABOLIC ANKLE EXERCISES

Exercise combining ankle and subtalar movements, starting with **two series of 10 repetitions**, later progressing to three series of 10 repetitions.

Realized with the patient in decubitus dorsal on the bench with the legs elevated on a foam support with a height of 20 cm, allowing the ankle joint free movement.

**(Figure 5) Exercise 1:** perform dorsiflexion and plantar flexion movements, which can be alternate or simultaneous.

**(Figure 6) Exercise 2:** rotate the ankle, one series in a clockwise direction and another in the counter-clockwise direction.

**(Figure 7) Exercise 3:** one leg is at rest on the foam support and the other is raised by hip flexion to approximately 90°, with the knee extended, perform flexion and extension movements of the ankle three times and then bring the leg back down to rest.

### RESISTANCE EXERCISES

Exercises to strengthen the legs, starting with **two series of 10 repetitions**, later progressing to three series.

**(Figure 8) Exercise 1:** in decubitus dorsal, with legs on a foam support, one leg is raised by flexion of the hips to approximately 90°, with the knee extended, perform dorsiflexion and plantar flexion of the ankle against resistance provided by a latex band around the sole of the foot.

To increase the effect of this exercise, change the color of the latex band to increase the resistance against the movement.

**(Figure 9) Exercise 2:** standing upright on a step, with the ball of the foot on the edge of the step, the exercise starts with the gastrocnemius and soleus muscles in maximum extension, i.e. with the heel below the level of the step, and then the heel is raised as high as possible.

**(Figure 10)** To increase the effect of this exercise, perform it wearing ankle weights of varying mass.

### AEROBIC EXERCISES

Exercises each last **10 minutes** alternating between the two exercises at each treatment session.

**(Figure 11) Walking** – walk with a focus on ankle movement, paying attention to the elements of each stride.

To increase the effect of this exercise, vary the stride length and velocity.

**(Figure 12) Horizontal cycling** – the patient is in decubitus dorsal on a mat or mattress on the floor, with feet on the pedals of the bicycle, rather than sitting in the bicycle, in order to eliminate the effect of gravity.

To increase the effect of this exercise, the resistance setting of the bicycle can be increased or ankle weights can be worn.

## PROPRIOCEPTIVE EXERCISES

Exercises start with two series of 10 repetitions, later progressing to three series of 10 repetitions, alternating between the two exercises at each treatment session.

(Figure 13) *Mexican hat/balance disc* – bipedal equilibrium.

(Figure 14) *Balance board* – bipedal equilibrium.

To increase the effect of these exercises, start with the therapist providing help and then progress to the patient performing them unaided. It is also possible to start with a sitting position before progressing to a standing position. It is also possible to start with both feet and then progress to standing on one foot only.

## RELAXATION

(Figure 15) With the legs raised, perform standard breathing exercises with sustained maximum inspiration and a duration of 5 minutes.

## VASCULAR EDUCATION

Covering:

- 1- Information on physiological function and also on the abnormal venous system function that characterizes CVD;
- 2- How to live with the disease;
- 3- Importance of essential lifestyle changes and what should be avoided and what should be encouraged to achieve a better quality of life;
- 4- Exercises to perform at home to maintain the results achieved with treatment.

## ERRATUM

In the article entitled “Vascular physiotherapy for treatment of chronic venous disease: review article”, DOI: <http://dx.doi.org/10.1590/1677-5449.003215>, published in *Jornal Vascular Brasileiro*, v. 15, n. 1, p. 34-43, on page 34,

**where it reads:**

“Leila Manuela Santos Soares”

**it should be read:**

“Leila Manuela Soares dos Santos”