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Lymphomyokinetic exercises and activities for treatment of lower limb lymphedema: review

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SOUHRN

Dosud bylo publikováno málo studií věnovaných různým formám svalové aktivity v monoterapii zaměřené na zmenšení objemu otoku. Jedním z hlavních problémů je používání jediné metody umožňující hodnocení cviků jako monoterapie pro co nejrychlejší a dlouhodobé zmenšení rozsahu otoku. Byla nalezena jediná studie hodnotící stav bezprostředně po svalové aktivitě. Pasivní cvičení jako monoterapie může zmenšit objem otoku, ale lepších výsledků lze dosáhnout v kombinaci s mechanismy komprese. Zachování komprese po cvičení nebo aktivitách umožňuje dosáhnout lepších výsledků.

Keywords:
Activities
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Treatment

ABSTRACT

There is a scarcity of studies on active forms of muscle activity as monotherapy for the reduction in the volume of the edema. One of the major challenges is the use of an isolated method to enable the evaluation of exercises as monotherapy for an immediate and long-term reduction in edema. The only study encountered is an evaluation immediately after muscle activity. Passive exercise can reduce the edema as monotherapy, but better results are achieved when combined with compression mechanisms. The maintenance of compression after exercises or activities enables achieving better results.

Introduction

Lymphedema is a clinical condition resulting from the accumulation of macromolecules in the interstitial space, with the consequent accumulation of liquids. This condition may be primary or secondary. Patients with primary lymphedema are born with a deficient lymphatic system, whereas secondary lymphedema occurs due to a damage occurring to the lymphatic system some time in life.[1,2]

Lymphedema is classified in clinical stages. In Stage I, lymphedema worsens throughout the day but is reversed with rest. In Stage II, the condition is not reversed even with several days of rest. Stage III (elephantiasis) constitutes the most severe cases. The prevalence of chronic edema in the population is 1.33 per every 1000 individuals and this figure increases to 5.4 per every 1000 individuals older than 65 years of age. Regarding secondary lymphedema, the main causes are neoplasms, trauma, inflammatory processes, infectious processes and filariasis,[3–5] the latter of which is the most common cause, affecting approximately 120 million people throughout the world.[5]

Diagnosis

The diagnosis of lymphedema is based on a clinical history, physical examination and complementary exams, when necessary. The detailed, specific patient history and physical examination should investigate the evolution of signs and symptoms, episodes of infection, the presence of skin lesions, trauma, Stemmer sign in lymphedemas and edema other parts of the body reported by the patient.[1,5] The most

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widely used complementary exams are volumetry, circumference measurements, bioelectrical impedance analysis and lymphoscintigraphy. Other exams, such as ultrasonography, magnetic resonance, and computed tomography, detect the presence of edema, but are less specific.[6,7]

Lymphedema and treatment

There is no consensus on a single therapy for the treatment of lymphedema. A combination of therapies is suggested, generally including manual or mechanical lymphatic drainage, compression mechanisms, and exercises, the aim of which is to improve the quality of life of affected individuals.[8,9] In recent years, however, novel therapeutic options have been developed by Godoy & Godoy, such a cervical lymphatic therapy, mechanical lymphatic therapy with an electromechanical device that performs passive muscle activity, lymphomyokinetic exercises and handcrafted, laced stockings/sleeves in grosgrain (non-elastic) fabric for use on the lower and upper limbs.[2,9]

Lymphomyokinetic exercises and activities

There is a scarcity of studies on active forms of muscle activity as monotherapy for the reduction in the volume of the edema. One of the major challenges is the use of an isolated method to enable the evaluation of exercises as monotherapy for an immediate and long-term reduction in edema. The only study encountered is an evaluation immediately after muscle activity.[10] The study evaluated active exercises of plantar flexion and extension in the lying position, compared to rest and raising the limbs. All three alternatives led to a reduction in volume, but the reduction was greater when the individual was at rest compared to the active exercises and the greatest reduction occurred when the limb was raised. This study showed that active exercises reduce the volume of the edema less than rest and that the effect of gravitational pressure is a factor to consider in the prescription of exercises.[10]

Venolymphatic return depends on the integrity and trophism of the musculature. The calf muscles constitute a venolymphatic pump and are therefore one of the targets of active exercises to improve trophism. However, no articles are found in the literature that evaluate this approach. The aim is to maintain trophism without hypertrophy.

The type of exercise and how this muscle group is used is fundamental to the stimulation of venolymphatic return. A study evaluating venous return by puncturing the medial vein of the hallux and measuring systolic pressure every 0.5 seconds found a change that walking led to a variation in venous pressure ranging from 10 to more than 150 mmHg, whereas the range when using an exercise bike was only around 20 mmHg, demonstrating practically a lack of effective plantar flexion and extension stimulus with the latter modality, in which the calf muscle pump is not well utilized.[11]

Joint range of motion is normally compromised in individuals with lymphedema due to the increase in volume of the limb, which constitutes another limiting factor regarding the function of the calf muscle pump. Therefore, improving joint mobility is fundamental, which is achieved through the reduction of edema in venolymphatic disease.[9,12] The two studies cited report that gravitational pressure and the type of muscle activity exert an influence on the functioning of the muscle pump. Three basic aspects regarding exercises are expected: the immediate reduction in volume, long-term maintenance, and the maintenance of muscle trophism.

The type of exercise (passive or active) is another aspect to consider. Passive exercise normally reduces the edema, whereas active exercise improves muscle trophism. In a study evaluating passive plantar flexion and extension, the researchers punctured the medial vein of the hallux and measured dynamic pressure every 30 seconds. In the lying position, changes in pressure ranged from 8 to 77 mmHg, whereas this range was 10 to 150 mmHg in the standing position.[10,13] Therefore, the gravitational effect is the main aspect influencing the variation in pressure.

A study investigating the effect of one hour of therapy using an electromechanical device (RAGodoy®) that performs passive plantar flexion and extension found a significant reduction in the volume of the limb immediately after the session.[14] Another study (in publication phase) used the same device two hours per day for two weeks and found a reduction after each session; an increase in volume was found during a subsequent session in comparison to the end of the previous session, but the volume was lower than that at the beginning of the previous section. At the end of the two weeks, a statistically significant reduction was detected. Elastic stockings placed below the knee after the sessions and worn throughout the entire day led to better maintenance of the results at the end of the two weeks, with a greater reduction in comparison to patients who did not wear elastic stockings. Therefore, the use of a compression mechanism leads to a better result after the reduction in the volume of the limb achieved through passive exercises for mechanical lymphatic drainage (RAGodoy® device) or a session of manual lymphatic drainage.[15] Another study evaluated the adjustment of the elastic stocking during treatment with passive exercises (RAGodoy®) found a superior result.[16] Therefore, a set of small details is fundamental for achieving the best result.

With regards to the activity of walking as monotherapy for the treatment of lymphedema, a study found that an increase in the volume of the limb can occur, but a reduction occurs when walking is performed with compression stockings. Several studies in the literature have shown that this combination of therapies enables a reduction in volume in cases of lymphedema and venous disease.[17,18]

Regarding active exercises as monotherapy for the lower limbs, no studies have described a long-term reduction in the volume of the limb. However, such a reduction is possible with passive exercise as monotherapy.[15,16] When combined with a well-adjusted compression mechanism, a synergic effect occurs with passive and active (walking) exercises.[14–19] The type of exercise, muscle group, and gravitational pressure all exert an influence on the results.

A study evaluating intermittent changes in pressure at the stocking/skin interface measured every 30 seconds

for 12 consecutive hours found that an individual spends several hours per day without any calf muscle activity, but when it occurs, it generates an intermittent variation in pressure, thereby facilitating venolymphatic return.[20–22] The combination of muscle activity and a well-adjusted compression mechanism enables reducing the volume of the lymphedema. A hand-crafted laced compression stocking made from grosgrain (non-elastic) fabric allows the constant adjustment of the stocking to accompany the reduction in the edema, enabling the transformation of activities of daily living and walking into a form of treatment for lymphedema.[2,23,24] Thus, exercises and daily activities can serve a lymphomyokinetic purpose, leading to a reduction in the volume of the edema.[20]

Physical activity is defined as any body movement produced by skeletal muscles with an increased energy expenditure, such as household, labor, and leisure activities, exercise and sports.[20,25] Such activities can be strategically programmed to improve health and can be transformed into occupational exercises.[20,26] Exercises are structured muscle activities to improve physical fitness and health with no competitive purpose. In the treatment of lymphedema, muscle exercises and activities of daily living play a fundamental role in maintaining the functional aspects of the limb and reducing the edema.

Due to the physiology of venolymphatic return, every exercise and muscle activity requires a greater amount of blood, consequently leading to greater capillary filtration. Therefore, the limb may either increase or decrease in volume after such activities. Considering this response, Godoy & Godoy suggest the term therapeutic lymphomyokinetic exercise and activity when a reduction in volume of the lymphedema occurs after the execution of such activities.[20]

The main objectives of exercises and activities of daily living during treatment for lymphedema are the maintenance of muscle trophism, the enhancement of joint mobility, and a reduction in edema. Considering these three goals, there are different types of exercise with different energy expenditures. Thus, a good exercise for the reduction in edema may not be adequate for the maintenance of muscle trophism. Such an analysis is fundamental when choosing the best type of exercise.

When the goal is therapeutic (exercises used as a form of treatment for lymphedema), the aim is to identify and enhance the physiological mechanisms involved. When therapeutic exercises are prescribed for lymphedema, one must follow the principles that govern the dynamics of venolymphatic drainage and physiological responses to exercise to avoid complications, such as an increase in edema. Another important aspect to consider in the therapeutic approach is the use of compression mechanisms combined with exercises, with a specific analysis of the type of material and therapeutic response to determine whether a positive or negative synergic effect will be achieved.

Conclusion

Active exercises as monotherapy to reduce edema in cases of lower limb lymphedema are not described in the literature. However, such exercises may be useful when combined with compression mechanisms, provided such mechanisms are adjusted well to each patient. Passive exercise can reduce the edema as monotherapy, but better results are achieved when combined with compression mechanisms. The maintenance of compression after exercises or activities enables achieving better results. The maintenance of muscle trophism is suggested to improve the function of the calf muscle pump, but the reduction in volume is the initial priority.

References

1. Gasparis AP, Kim PS, Dean SM, et al. Diagnostic approach to lower limb edema. Phlebology 2020;35:650–655.
2. Pereira de Godoy AC, Pereira de Godoy JM, Guerreiro Godoy MF. Primary Congenital Lymphedema with More Than 10 Years of Treatment Using the Godoy Method Through to Adolescence. Pediatr Rep 2021;13:91–94.
3. Al-Kubati AS, Al-Samie AR, Al-Kubati S, Ramzy RMR. The story of Lymphatic Filariasis elimination as a public health problem from Yemen. Acta Trop 2020;212:105676.
4. Pereira de Godoy JM, Guerreiro Godoy MF, Barufi S, Pereira de Godoy HJ. Intensive Treatment of Lower-Limb Lymphedema and Variations in Volume Before and After: A Follow-Up. Cureus 2020;12:e10756.
5. Keo HH, Gretener SB, Staub D. Clinical and diagnostic aspects of lymphedema. Vasa 2017;46:255–261.
6. Mills M, van Zanten M, Borri M, et al. Systematic Review of Magnetic Resonance Lymphangiography From a Technical Perspective. J Magn Reson Imaging 2021;53:1766–1790.
7. Forte AJ, Boczar D, Huayllani MT, et al. Lymphoscintigraphy for Evaluation of Lymphedema Treatment: A Systematic Review. Cureus 2019;11:e6363.
8. Huggenberger K, Wagner S, Lehmann S, et al. Health and quality of life in patients with primary and secondary lymphedema of the lower extremity. Vasa 2015;44:129–137.
9. Pereira de Godoy JM, Pereira de Godoy LM, Pereira de Godoy AC, et al. Gain in joint mobility during intensive treatment of lymphedema using Godoy Method. Acta Phlebol 2019;20:27–29.
10. Godoy JMP, Godoy MFG, Valente FM. Interference of gravitational pressure during active exercising of patients with lymphedema of the lower limbs. Journal of Phlebology and Lymphology 2009;2:8–9.
11. Godoy JMP, Braile DM, Barufi S, Godoy MFG. Dynamic study of venous blood pressure in the lower extremities during walking and exercising using a stationary bicycle. Journal of Phlebology and Lymphology 2010;3:1–3.
12. Pereira de Godoy JM, Braile DM, de Fátima Guerreiro Godoy M. Lymph drainage in patients with joint immobility due to chronic ulcerated lesions. Phlebology 2008;23:32–34.
13. Pereira de Godoy JM, de Fátima Guerreiro Godoy M, Batigália F, Geraldi Xavier MI. Dynamic Evaluation of the Venous Pressure During Passive Plantar Flexion and Dorsiflexion Exercises with the RAGodoy® Apparatus. IJPMR 2008;19:6–7.
14. Amador Franco BP, Pereira de Godoy JM, Lopes Pinto R, et al. Redução do volume do linfedema de membro inferior com drenagem linfática mecânica com RAGodoy® avaliado pela bioimpedância. Angiol Cir Vasc 2013;9:154–157.
15. de Godoy JM, Lopes Pinto R, de Godoy AC, Godoy M de F. Synergistic effect of elastic stockings to maintain volume losses after mechanical lymphatic therapy. Dermatol Res Pract 2014;2014:430636.
16. Godoy M. Synergistic effect of adjustments of elastic stockings to maintain reduction in leg volume after mechanical lymph drainage. Int J Vasc Med 2014;2014:640189.
17. Fukushima T, Tsuji T, Sano Y, et al. Immediate effects of active exercise with compression therapy on lower-limb lymphedema. Support Care Cancer 2017;25:2603–2610.

18. Sierakowski K, Piller N. Pilot study of the impact of sporting compression garments on composition and volume of normal and lymphedema legs. Lymphology 2014;47:187–195.
19. Carvalho CA, Lopes Pinto R, Guerreiro Godoy M de F, Pereira de Godoy JM. Reduction of Pain and Edema of the Legs by Walking Wearing Elastic Stockings. Int J Vasc Med 2015;2015:648074.
20. Godoy JMP, Godoy LMP, Godoy MFG. Activities and Myolymphokinetic Exercises: therapeutic approach to lymphedema. TSH Editora, 2013:169.
21. Pereira de Godoy JM, de Fátima Guerreiro Godoy M, Valente FM. Interference of gravitational pressure during active exercising of patients with lymphedema of the lower limbs. Journal Phlebology and Lymphology 2009;2:8–9.
22. Pereira de Godoy JM, Pereira de Godoy LM, Barufi S, et al. Control of Lymphedema of the Lower Limbs Using Grosgrain Stockings as Monotherapy. International Journal of Scientific Research 2018;7:32–33.
23. Barufi S, Pereira de Godoy HJ, Pereira de Godoy JM, Guerreiro Godoy MF. Exercising and Compression Mechanism in the Treatment of Lymphedema. Cureus 2021;13:e16121.
24. De Godoy JMP, Lopes Pinto R, Godoy LMP, et al. Pilot Study on the Association of Different Compression Mechanisms to Maintain the Results of Lymphedema Treatment over One Year. Ann Med Health Sci Res 2017;7:365–367.
25. Geneen LJ, Moore RA, Clarke C, et al. Physical activity and exercise for chronic pain in adults: an overview of Cochrane Reviews. Cochrane Database Syst Rev 2017;4:CD011279.
26. World Health Organization. Physical activity. Fact sheet 385. Available from: www.who.int/mediacentre/factsheets/fs385/en/ [cited 2015-12-4]