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Volumetric alterations utilizing the RAGodoy® device to treat lymphedema of the lower extremities

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Abstract

Lymphedema is a specific type of edema due to failure of the lymphatic system associated with deficiency of proteolysis in the cell interstice resulting in an abnormal accumulation of proteins and macromolecules including hyaluronic acid. The aim of the current study was to evaluate the efficacy of a one-hour session using the RAGodoy® electromechanical device to reduce the volume of lymphedematous lower extremities.This study involved 10 case reports of female patients with ages ranging from 20 to 60 years old and with clinical diagnosis of lymphedema of lower limbs. The participants were submitted to a one-hour session of mechanical lymph drainage using the RAGodoy® device in order to evaluate the volumetric improvement of the limbs. There was a statistically significant volumetric reduction (p-value < 0.0002) comparing the size of the extremities before and after treatment. Mechanical lymphatic drainage using the RAGodoy® apparatus is efficacious in reducing the size of lymphedematous limbs.

Introduction

Lymphedema is a specific edema due to failure of the lymphatic system associated to deficiency of proteolysis in the cell interstice, resulting in the abnormal accumulation of proteins and macromolecules1 including hyaluronic acid2.

The psychological and social influences, the impediment to perform everyday activities because of joint mobility limitations, as well as the aesthetics of the affected limb have negative repercussions on the quality of life of patients with lymphedema3. Although a precise diagnosis is essential, treatment is initiated based on clinical symptoms. The signs of lymphedema together with the anamnesis of edema provide sufficient information to allow specialists to change or vary the physical treatment4.

The therapeutic options include conservative and surgical treatment; the latter should only be utilized in the most severe cases. When adequate conservative treatment is begun in time, the potential of complications is diminished 5. However in the treatment of lymphedema, there is no single specific therapy and an association of techniques is recommended6. The main indicated therapies include: manual and mechanical lymph drainage7,8, exercises and myolymphokinetic activities9-11, compression hosiery and bandaging12, hygienic care and precautions in everyday life13, psychological support14, and lymphokinetic medications15.

One of the cornerstones of treatment is lymph drainage, which is described as a technique of manual massage. The approach varies according to the author who describes the method16.

Mechanical lymph drainage has been explored little but may be performed using devices that utilize pneumatic compression17 or passive exercises18. The RAGodoy® apparatus performs dorsiflexion movements of the ankles thereby improving venous and lymphatic return as is evidenced by scintigraphy 19.

Techniques that provide an improvement of lymphedema over the short term are of particular relevance as this pathology is very prevalent and its negative repercussions often limit the day-to-day activities of sufferers.The objective of the current study was to evaluate the efficacy of a one-hour therapy session utilizing the RAGodoy® electromechanical apparatus to reduce the volume of lymphedematous lower extremities.

Methods

This case report-type study was carried out in the private clinic of the physiotherapist in Curitiba, Brazil in 2008.

The sample was composed of 10 female patients who were invited by order of arrival in the clinic to participate in the study. The purpose of the study was explained to all participants and they signed written consent forms. The ages of the patients varied from 20 to 60 years old and all were diagnosed clinically and by lymphoscintigraphy. Patients who had co-morbidities such as active neoplasms, infections of the affected limb or any other disease that may influence edema of the extremities were excluded. The participants were instructed to go to the treatment center without using any form of compression therapy including stockings.

The participants were submitted to two evaluations at distinct points in time: before and after a one-hour session of mechanical lymph drainage using the RAGodoy® device. The initial assessment involved a physiotherapeutic evaluation including anamnesis, physical examination and volumetry of the lower extremities. After the session, the volumetric examinations were again performed.

Volumetry was performed employing the water displacement method with the displaced water being weighed on accurate digital weighing scales (IBEM digital technology – model IBC-15). Descriptive analysis is expressed as the mean and standard deviation. The two-tailed t-test was utilized to compare the pre- and post-treatment measurements. Statistically significant differences were determined for p-values ≤ 0.05.

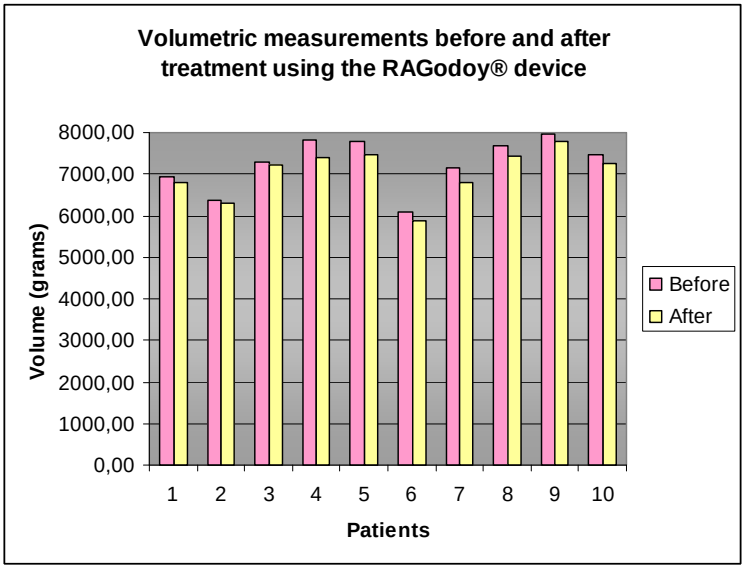
Results

There was a statistically significant volumetric reduction (mean = 223.79 grams; standard deviation ~ 593.46 grams; p-value = 0.0002) comparing the pre-treatment and post-treatment sizes of the limbs (Table 1; Figure 1).

Table 1. Volumetry before and after treatment using the RAGodoy® device

Before (grams)	After (grams)	Variation (grams)
6934.7	6791.4	143.3
6383.5	6284.2	99.3
7298.5	7232.4	66.1
7827.7	7397.8	429.9
7783.6	7475	308.6
6096.8	5876.3	220.5
7155.2	6802.4	352.8
7695.4	7441.9	253.5
7949	7794.7	154.3
7453	7243.4	209.6

Figure 1. Profile of the volumetric changes of patients submitted to a one-hour session utilizing the RAGodoy® device



Discussion

The current study shows that mechanical lymph drainage utilizing the RAGodoy device is efficacious to reduce edema of the lower extremities. This study confirms previously reported results8,18,19.

The RAGodoy® device reproduces the physiological movements of the ankle, activating the calf muscle which works as an 'impulsion pump' thereby directly stimulating lymphatic and venous return. Another factor that contributes to the good results is the horizontal position of the patient when using the RAGodoy® apparatus which reduces the deleterious effects of gravitational pressure, facilitating venolymphatic return. Any increase in the return pressure benefits the entire system.

Mechanical lymph drainage has been rarely reported in the literature with pressure therapy being the most frequently evaluated technique17,20. This novel option in mechanical lymph drainage contributes to the treatment of lymphedema. Another characteristic of the apparatus is that it can be used intensively for periods of 8 hours or more per day.

The association of therapies is recommended in the treatment of lymphedema with compression mechanisms being of fundamental importance both during treatment and for maintenance of the results. Thus compression stockings or bandaging should be utilized after mechanical lymph drainage.

Conclusion

Mechanical lymph drainage utilizing the RAGodoy® apparatus is efficacious to reduce the volume of lymphedematous lower

extremities and thus can be utilized in the treatment of lymphedema.

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