Manual Lymphatic Drainage in Blood Circulation of Upper Limb With Lymphedema After Breast Cancer Surgery

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Abstract

Objective: The purpose of this study was to assess blood flow after manual lymphatic drainage (MLD) in women who had received surgery for breast cancer and had post–axillary lymphadenectomy lymphedema.
Methods: Sixteen volunteers (mean age 64 ± 11.44 years) were divided into 2 groups. Those in group 1 received MLD without upper limb elevation, and those in group 2 received MLD with elevation of 30° of the upper limb. Blood flow velocity of the brachial vein and artery were measured using Doppler ultrasound before, immediately after, and 30 minutes after MLD, with and without 30° of upper limb elevation as defined by a random crossover design and an interval (washout) of 7 days. Comparison of data before and after MLD was evaluated by the Friedman test.
Results: There was a significant increase of blood flow velocity in the brachial vein after the therapeutic procedure with upper limb elevation. However, after 30 minutes the data returned to the pretreatment value.
Conclusion: This preliminary study indicated that MLD promoted increased brachial vein velocity flow in the short term. (J Manipulative Physiol Ther 2017;40:246-249)
Key Indexing Terms: *Ultrasonography Doppler; Blood Circulation; Massage; Physical Therapy*

Introduction

Circulatory blood impairment after surgery for treatment of breast cancer is reported to contribute to the development of lymphedema.[1,2] Arterial and venous hemodynamics can affect lymphatic circulation[3] in women undergoing axillary dissection or sentinel node biopsy[4] who have circulatory impairment[5,6] with a venous and lymphatic predominance.[7] Manual lymphatic drainage (MLD) is a widely used therapeutic procedure for prevention and treatment of circulatory disorders resulting from the treatment of breast cancer[8,9] that produces an increase of blood and lymph circulation and causes the reduction of excess interstitial fluid,[10] in addition to effects on the vegetative peripheral nervous system (sympatholytic effects).[11] The blood and lymph systems are strongly interconnected and therefore interdependent.[12] Manual lymphatic drainage is widely used as a conservative treatment because of its effect in increasing venous and lymphatic flow and ability to control lymphedema.[13]

Transcutaneous Doppler ultrasound determines blood flow velocity through ultrasonic waves reflected by the erythrocytes[6] and also is used to evaluate the effect of manual therapeutic techniques on blood circulation.[14] Lymphedema treatment with the named complex physical therapy, which involves MLD and compression bandaging, is controversial because interpretation of the results is limited by the different methodologies used, which does not allow the evaluation of the isolated contribution of MLD to circulatory flow and therefore to the control of edema.[15,16]

Given these concerns, we wished to test the hypothesis that MLD massage could increase blood circulation of lymphedema after treatment for breast cancer. Therefore, the purpose of this study was to assess blood flow after MLD in women who had received surgery for breast cancer and who had post–axillary lymphadenectomy lymphedema.

Methods

Participants in in this study were women receiving treatment for breast cancer who had axillary dissection

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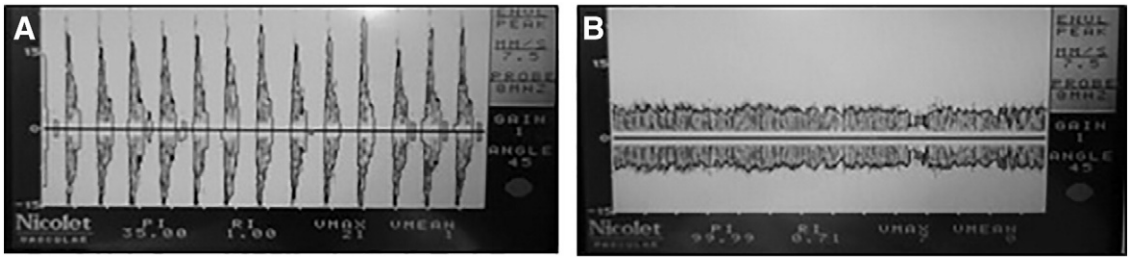

Fig 1. *Blood flow velocity. A, Brachial artery. B, Brachial vein.*

surgery. All volunteers were informed in advance about the procedure and signed an informed consent. This project was approved by the Ethics of the Hospital das Clínicas de Ribeirão Preto Committee under protocol number 13408/2013 and clinical trials under number NCT02475174.

Sixteen women diagnosed with lymphedema were evaluated after undergoing surgical treatment of breast cancer (voluntary axillary lymphadenectomy). The mean age of the group was 64 ± 11.44 years, and participants were further divided into 2 equal groups: group 1 members were treated with MLD without upper limb elevation, and group 2 members were treated with MLD with 30° of upper limb elevation. The exclusion criteria were muscle-tendon injury or joint damage in the limb being evaluated, skin disorders, circulatory diseases (diabetes or atherosclerosis), chemotherapy or radiation therapy, and history of bilateral axillary dissection.

The diagnosis of lymphedema was carried out by assessing the volume of the upper limbs, performed by perimetry with a tape attached to a spring and weight, in the supine position with the upper limb resting on a support and the shoulder at 90° of abduction, for a better positioning tape.[17] Seven distinct points were measured, starting from the elbow line, every 7 cm. The difference of the perimetry at each point provided the value for a target arm evaluation. The calculation of the upper limb volume, gold standard,[18] was made using the indirect method of the sum of the approximate volume of the 6 truncated cones formed by measurements of the circumferences of the 7 points of the arm and forearm,[17] with a difference greater than 200 cm^3 being considered lymphedema.[19]

To evaluate the blood flow through the brachial artery and vein (Fig 1), we used a portable continuous wave Doppler ultrasound, 8 MHz, with spectral analysis (SONARA/SONARA/Tek, Nicolet Versalab, San Carlos, CA). Analysis was performed after rest (5 minutes), in supine position in an air-conditioned room with the temperature set at 25°C.

The blood flow velocity in the brachial artery and vein was measured at the antecubital fossa with the upper limb relaxed and placed in a slight abduction and forearm supination.[20] The assessment was repeated 3 times with 1-minute intervals between collections. Assessments of blood flow velocity were taken before, immediately after, and 30 minutes after the therapeutic procedure, with and without elevation of the upper limb at 30° using a crossover design with an interval (washout) of 7 days. A simple lottery randomized the order of treatment protocols.

Manual Lymphatic Drainage

For the application of MLD procedure, we used the Leduc method,[21] applied in a supine position with the elevation of upper limb at 30° or no elevation. The MLD consisted of 10 movements in the contralateral axillary lymph nodes, 10 movements in the chest region (divided into 3 parts), and 10 movements in the arm with lymphedema (divided into 6 parts). Data were evaluated by continuous wave Doppler in the antecubital fossa (brachial vein and artery) before, immediately after, and 30 minutes after the therapeutic procedure. The interference of the limb positioning in blood circulation, already observed in isolation[22] in the effect attributed to MLD, was evaluated by applying the therapeutic resource with and without 30° elevation of the upper limb.

Statistics

The Shapiro-Wilk normality test was used to verify the distribution of variables; before a distribution that was not normal, we applied the Friedman test for comparison of preclinical data immediately after and 30 minutes after the intervention. In all calculations, the critical level was set to 5% ($P < .05$). Data processing was carried out through BioEstat software, version 5.0.

Results

There was no significant difference in the velocity of the arterial blood flow before and after intervention, with or without upper limb elevation. The data for median blood flow velocity of the brachial artery are listed in Table 1.

There was a significant difference between the data before and after the intervention in the upper limb elevation, with higher velocity of venous blood flow after therapeutic treatment; after 30 minutes, values returned to baseline