

The Influence of Manual Therapy on Biometric Parameters in Patients with Improper Body Weight

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Abstract: In recent years, there have been only a few studies showing an improvement of the lymphatic system function in patients with abnormal body weight after the use of manual lymphatic drainage (MLD). *The aim of the study* was to assess the effectiveness of using MLD of the abdominal cavity as one of the forms of therapy for lymphatic system dysfunction in people with abnormal body weight. *Material and methods:* The study presents the therapy of two women aged 30 to 59. They underwent 10 treatments of manual lymphatic drainage of the abdominal cavity (30 minutes x 3 times a week). Biochemical tests were performed before and after the MLD treatment. The degree of obesity was determined on the basis of the BMI (body mass index) and WHR (waist-to-hip ratio). The 7-point Likert scale was used to evaluate the patients' quality of life. *Results:* The overweight patient showed an improvement in biochemical parameters, including a decrease in the level of C-peptide and high-sensitivity C-reactive protein (hsCRP), and a better quality of life compared to the state before the therapy. This subject scored 3 points before vs. 5 points after the MLD treatment. The patient with class² obesity and coexisting diseases demonstrated the increase in the level of hsCRP and improvement was only visible in the level of C-peptide, however, after the therapy, there was also an improvement in quality of life. The patient with class² obesity scored 3 points before vs. 4 points after the MLD treatment. *Conclusions:* Initial research indicates potential benefits of the application of MLD to improve biochemical parameters, including a reduction in the inflammation in overweight patients and improvement in the quality of life in patients with abnormal bodyweight.

Keywords: obesity; inflammation; lymphatic system; manual lymph drainage

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1. Introduction

Overweight and obesity occur when excess fat accumulation (regionally, globally, or both) increases risk to health. Obesity is now recognized as a chronic or non-communicable disease [1-2]. In recent years, several studies have been carried out indicating that the obesity can cause pathologic changes in the lymphatic system, which can impair its function [3-5]. The research also proved that the dysfunctions of lymphatic system may influence the development of obesity, consequently restoring correct lymphatic functions can hinder the development of obesity [4-6]. In recent years, there has been a few research suggesting the possibility of restoring the correct efficiency

of the lymphatic system connected to obesity [7-9]. The improvement of the lymph flow can be partly influenced by physiotherapy. Manual lymphatic drainage (MLD), as a form of physiotherapy, aims at supporting the work of lymphatic system due to the increase of the lymph flow. MLD is one of the styles of manual therapy often used with patients after surgeries, radiotherapy or cancer [10, 11], as well as those with heart failure [12]. Until now, manual lymphatic drainage was particularly applied in the treatment of lymphedema and lipoedema [13, 14]. Manual therapy used in MLD cause stimulation of the lymph flow in two phases. The first phase in MDL, the moving phase, in which the stimulus is used to stretch the wall of lymphatic vessels to support its lymphangiomotrics, and the resting phase in which thanks to the suction action, the vessels are filled again. MLD indirectly causes the accelerated removal of the harmful metabolites from the tissues of the body, the increase in the dynamics of bodily fluids and the decrease of the sympathetic nervous system response [15, 16]. In addition, the circular movement used in MLD cause stretching of the lymph vessels from the outside, and in accordance with the law of Frank Starling, there is a temporary increase in the volume of lymph. As a result of stimulating the lymphatic system, the number of lymphocytes transported in the unit of time increases [17]. The lymphatic system is located within the whole body, it consists of lymphoid organs and vessels. Contrary to the cardiovascular system, it forms one-way transport system from the extracellular space to the vessels [18]. The absence of valves in capillaries makes the flow of lymph smooth, which is used to move the surplus of tissue fluid towards the lymph nodes, from which it is transported to the kidneys and removed from the organism. MLD uses the perforator vessels (transverse connections perforating fascia) located between superficial lymph vessels and visceral lymph vessels, deep lymph vessels. Due to the influence on the perforator vessels there is a possibility of relieving the deep lymph vessels [9, 17]. The purpose of this research is to evaluate the efficiency of MLD of abdominal cavity as one of the forms to treat the dysfunctions of the lymphatic system in patients with abnormal bodyweight.

2. Materials and Methods

The study presents the therapy MDL of two women: one was 59 years old and the other 30 years old. The patient number 1: A 59-year-old woman, professionally active (white-collar worker), overweight (body mass index [BMI]=27 kg/m²) having abdomen obesity (indicator WHR 0.84) and low level of physical activity. Patient number aged 30 years, professionally active (white-collar worker), with the obesity of class ^o2 (BMI=35 kg/m²) and abdomen obesity (indicator WHR 0.9), having average physical activity. Height measurements were made to the nearest 0.5 cm and body mass measurements were made to the nearest 0.1 kg. BMI was calculated according to the following formula: BMI = body mass (kg)/height (m)². Moreover, waist circumference was measured at standing position at mid-point between the lower costal margin and the upper hip bone and hip circumference was measured at the greater trochanter level with help of an inelastic measuring tape to the nearest 0.5 cm. Then a waist-to-hip ratio (WHR) was calculated for each patient as WHR = waist circumference (cm)/hip circumference (cm) [19].

After medical qualification, each patient underwent a biochemical test performed on the first visit. The concentration of high-sensitivity C-reactive protein (hsCRP) was assessed by immunoturbidimetry (Cobas 8000 analyzer, Roche, Switzerland) and the level of C-peptide was measured by the CMIA method. Then, during the first and subsequent physiotherapeutic visits, each subject underwent 10 MLD treatments according to Földi, which covered the abdominal cavity and the groin area [17]. The 7-point Likert scale was used to evaluate the patients' quality of life [20].

The study was approved by the Ethics Committee of the Medical University of Gdańsk (no NKBBN/692/2019-2020) and the investigation was carried out in accordance with the principles of the Declaration of Helsinki as revised in 1996.

3. Results

Patient No 1: Based on the anthropometric results, patient No 1 was diagnosed with overweight (BMI=27 kg/m²) and abdominal obesity (indicator WHR=0.84). The interview before the therapy revealed frequent constipation, flatulence, gastroesophageal reflux, esophageal erosion and headaches. After the MLD treatment, there was a noticeable improvement in intestinal motility and a decrease in frequency of flatulence. In addition, after the treatment, patient declared the improvement of sleep quality and vitality. In accordance with the Likert scale, the quality of life was scored 3 points before the therapy vs. 5 points after the therapy. Moreover, a reduction in the levels of C-peptide and hsCRP was found before and after MLD therapy. The values of biochemical parameters before and after the MLD therapy are presented in the Table 1.

Table 1. The values of biochemical parameters before and after the MLD therapy in overweight patient.

Parameter	Before therapy MDL	After therapy MDL
Age [years]	59	59
C-peptide [ng/mL]	2.95	2.23
hsCRP [mg/L]	3.6	3

Abbreviations: MDL (Manual lymphatic drainage), hsCRP (high-sensitivity C-reactive protein).

Patient No 2 in the age of 30 years old, professionally active (white-collar worker), with the obesity of class ^o2 (BMI=35 kg/m²) and abdomen obesity (indicator WHR=0.9), having average physical activity. The medical history included abnormal heart rhythm, diagnosed insulin resistance and polycystic ovary syndrome. Collected family’s medical history revealed hypertension burden, dyslipidemia and coronary heart disease. The patient did not take any medicines.

After the completion of MLD treatment, the improvement in intestinal peristalsis and a decrease of menstrual pain were detected. In accordance with the Likert scale, the quality of life was scored 3 points before the therapy vs. 4 points after the therapy. The patient with class^o2 obesity showed the reduction of the level of C-peptide and the increase in the C-reactive protein level. The values of biochemical parameters before and after the MLD therapy are presented in the Table 2.

Table 2. The values of biochemical parameters before and after the MLD therapy in a patient with class ^o2 obesity.

Parameter	Before therapy MDL	After therapy MDL
Age [years]	30	30
C-peptide [ng/mL]	2.4	1.9
hsCRP [mg/L]	1.3	1.9

Abbreviations: MDL (Manual lymphatic drainage); hsCRP (high-sensitivity C-reactive protein).

4. Discussion

In the conducted research, before the MLD therapy, patients No 1 and 2 demonstrated the level of C-peptide being in the reference standards. However, after the treatment, the patients demonstrated decrease in the level of C-peptide in blood serum. Before the therapy MDL, the level of C-peptide in patient No 1 was 2.95 ng/mL vs 2.23 ng/ mL (after the therapy MDL), while in patient with class^o2 obesity the level of C-peptide was 2.4 ng/mL vs 1.9 ng/mL (after the therapy MDL). It is suggested that the observable decrease in C-peptide may be a desired effect in the prevention of the development of insulin resistance and/ or diabetes of type 2 (T2DM) [21]. In addition, during previous research conducted by Shander et al. [22] and Bordoni et al. [23] it was indicated that there is a positive influence of lymphatic techniques on the migration of inflammatory cells. After therapy MLD in the overweight patient, the decrease of CRP level was observed which can be one of the benefits of restoring correct functions of lymphatic system, consequently it may influence a reduction in the low-level chronic inflammation [24].

Whereas, before the therapy the patient with class² obesity demonstrated the CRP level of 1.3 mg/mL vs 1.9 mL - directly after the treatment. The increase of CRP level may be caused by the fact that the patient had many coexisting diseases, which can be a restriction for the MLD therapy. However, there was a significant element of including the MLD therapy in both patients, which was better quality of life according to the Likert scale [20]. There was a vagatonic effect demonstrated- relaxation, improvement of intestinal motility and better sleep quality. In the patient No 1, the quality of life was scored 3 points vs 5 points after the treatment. However, the second patient's quality of life was evaluated with 3 points before the therapy and 4 points after the therapy. Our results are consistent with findings of Drouin et al. who demonstrated the influence of MLD of abdominal cavity on the intestinal motility and autonomic nervous system balance, moreover, it was also indicated that there is a positive impact on fear and stress of the subjects [25].

5. Conclusions

It is indisputable that there is a need of improving the medical care, as well as expanding the non-pharmacological methods of supporting the treatments of obesity. The understanding of basic mechanisms of civilization diseases greatly improved, but there is still a necessity for a further research. The application of manual lymphatic drainage in obesity may point new therapeutic purposes. Good results of MLD application in other diseases point the validity of introducing the treatment in patients with obesity.

Author Contributions: Conceptualization, K.A. and K.Z.; original draft preparation K.A.; R.H-K, and K.Z.; formal analysis K.A., R.H-K, project administration, K.A., D.W.; collection of literature, K.A., D.W.; review and editing, R.H-K, D. W. M.K.; and K. Z. All authors read and approved the final manuscript.

Funding: This work was supported by a grant from the Medical University of Gdańsk (02-0108/07/780)

Conflicts of Interest: The authors declare no potential competing interests with respect to the research, authorship and/or publication of this article.

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