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Study of the Effect of Massage Therapy on Serum Cortisol Concentration in a Patient with Chronic Stress

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Abstract: Stress is a condition that occurs when external or internal influences (stressors) are damaging or unusual in strength, which disrupt the homeostasis of the human organism. Cortisol is the glucocorticoid, which under the influence of stress factors increases its secretion more than 10 times. The aim of the study was to investigate the effect of massage therapy on serum cortisol concentration in patients with chronic stress. Material and methods: the study refers to a 3-month follow-up of a 32-year-old male patient with high serum cortisol levels. PSS – 10 (Perceived Stress scale) was used, serum cortisol was measured immunometrically with chemiluminescent labeling. Two courses of ten procedures were conducted with massage (classical or Chinese) therapy in the cervical-thoracic area. Results: Reduction of serum cortisol levels, reduction of pain symptoms, subjective and objective management of stressors. Conclusion: Massage therapy appears to be an effective method of managing stress and the pain symptoms associated with it.

Keywords: Stress, Massage therapy, Cortisol

Introduction

Daily responsibilities and lifestyle problems are the main cause of physical and psychological stress that deteriorates an individual's health. Prolonged exposure to stress activates the adrenocorticotropic hormone (ACTH) system and causes the release of cortisol hormones from the adrenal cortex. Many other biomarkers are affected by stress, but cortisol is considered the most important and potentially clinically useful biomarker for stress assessment and monitoring. Accurate and timely detection of elevated cortisol levels can improve the diagnosis, treatment, and prevention of stress-related diseases such as anxiety disorders, metabolic dysregulation, and cardiovascular disease. (Mahdizadeh et al., 2019)

The brain is the central organ of stress and adaptation to stress because it perceives and determines what constitutes a threat, as well as the behavioral and physiological responses to the stressor that promote adaptation ("allostasis") but also contribute to pathophysiology ("allostatic load"/ overload"). The adult, as well as the developing brain, possesses a remarkable capacity to exhibit structural and functional plasticity in response to stressful and other experiences, including neuronal replacement, dendritic remodeling, and synapse turnover. Stress can cause imbalances in the neural circuits underlying cognition, decision-making, anxiety, and mood, which can increase or decrease the expression of these behaviors and behavioral states. Furthermore, adverse early life experiences, interacting with alleles of certain genes, produce lasting effects on the brain and body through epigenetic mechanisms. Although prevention is key, brain plasticity offers hope for therapies that exploit brain-body interactions. (Iqbal et al., 2023)

Massage therapy is one of the socially preferred methods of alternative medicine. Although it is mostly applied to treat pain, recent studies recommend the application of this method to promote the development and growth

of premature newborns, suppress depression and anxiety, stimulate attention and concentration, and improve the function of the immune system. (Broom et al., 2012). There is an increase in the use of complementary therapies of integrative medicine due to the high prevalence of pain and the unsatisfactory results of conventional therapy. In addition to physical relaxation, proponents of massage therapy claim that it promotes mental relaxation and affects the psycho-emotional aspects of patients' health. (Field, 2010), (Furlan et al., 2012), (Sagar et al., 2007) The present study is part of a doctoral thesis on the topic "Effect of massage therapy on stress levels and pain symptoms in the neck-shoulder area".

Objective

The study aims to follow the effect of massage therapy on serum cortisol concentration, subjective perception of stress, coping with challenges in professional life, pain symptoms in the neck, shoulder region, upper limbs, as well as to evaluate the general well-being following the applied therapy.

Material and Methodology

The study concerns a patient with an apparent age of 32 years old, corresponding to the actual one, who is the manager of an accounting firm. Complaints date back to 2016, starting gradually with dull pain and discomfort in the cervical region. Treatment was carried out with non-steroidal anti-inflammatory drugs prescribed by the personal physician. At his first visit, the patient complained of tension and stress at work, as well as pain in the neck-shoulder region with manifest stiffness and a feeling of restriction of movement. The patient reports pain radiating to the elbow and ankle joints, reporting episodes of acute symptoms in the ankle joints, up to a complete restriction of movement in them. From the examination, we conclude that he has a correct physique with developed musculature, without distortions in the sagittal and frontal planes, as well as other anomalies in the musculoskeletal system. By calculating the body mass index, the result is overweight of the first degree. The patient is active, reporting regular physical activity such as walking, boxing training, and swimming during the summer months.

To track the above markers we used the Perceived Stress Scale (PSS-10 scale), a test to determine the level of emotional burnout, the Visual Analog Scale (VAS), the Neck Disability Index **(**NDI) and a laboratory testing of serum cortisol. All studies were conducted before the start of the massage therapy, after the tenth procedure and three months after the end of the therapy.

The study was conducted from 20.05.2024 to 17.06.2024 in the Day Center for Children and Adults with Disabilities, Burgas, under the supervision of a personal physician. The laboratory tests were done in a certified laboratory - Diagnostic and consultation center II Burgas. Before starting the course of therapy, the patient filled out an informed consent form. For the realization of the set goal, we formulated the following tasks:

- Short-term tasks - Improving the range of motion, influencing tissue nutrition in the painful area, eliminating pain, relaxing the underlying muscles.
- Long-term tasks - Permanent tissue relaxation, improved activity between agonist and antagonist muscles, building a motor habit in static and dynamic work, sparing the musculoskeletal system and self-regulation in stress management.

Considering the patient's symptoms, the idea of a combined use of techniques from European massage therapy and techniques from Chinese traditional massage arose. We believe that the concepts of the two types of massage, in combination, could solve both local problems through the classical healing massage, as well as the overall impact of the body through the Chinese massage. The methodology was applied two or three times a week, and one course of treatment consisted of 10 procedures for 25 minutes per session. The massage was performed using natural almond oil with the addition of lavender, which prevented trauma to the underlying tissue and ensured smooth execution of the techniques. The starting position of the patient is a prone position, the massage procedure is carried out in a secluded and quiet working environment.

With the application of therapeutic massage, we aim to improve tissue nutrition in the painful areas, relax the muscles in a reflex way and ensure the release of humoral substances that suppress pain symptoms and improve the general condition. The principles of impact of Chinese massage are related to the concept of the free flow of Qi energy along the channels and collaterals, the hormone between Yin and Yang, as well as the regulation of the blood substance Xue and the proper function of the internal organs Zan. The techniques used in the classic

healing massage are squeezing, rubbing and impact grips. In the massage therapy, we included the techniques of Chinese massage - tui, an, dien, mo, zhou na, gong and kouji. Some of the techniques have been modified for greater impact and effectiveness, taking into account the underlying tissues and areas of impact. The active points used in the methodology are the following: Baihui (GV 20), Fengchi (GB 20), Fengfu (GV 16), Dazhui (GV 14), Jianjing (GB 21), Jianliao (TE 14), Feishu (BL 13), Quchi (LI 11), Waiguan (TE 5), Hegu (LI 4), Houxi (SL 3).

Massage Technique

1. Straight sliding rub "tui"- The technique is applied with the pad of the thumb from the base of the skull, along the trapezius muscle. It is applied 4-5 times per line, covering the entire area of the area.
2. Brush rubbing - Performed with the hand clenched into a fist, with the dorsal surface of the middle phalanges and the base of the palm in contact with the skin. The technique is dynamic, leads to local hyperemia. Short, straight movements are performed in all directions.
3. Filing- The technique is applied to the upper part of the trapezius muscle. The therapist places both hands parallel with the thumb up, with the hands making cross-directional movements, entraining a skin fold.
4. Squeeze- From the base of the occiput, the thenar and hypothenar embrace the underlying tissue and continue in a straight line to the top of the clavicle.
5. "Zhou" technique - Circular rubbing with the pads of the four fingers on the paravertebral muscles - from the points Fengchi (GB 20) to Feishu (BL 13). The technique is performed until the underlying tissue is warmed.
6. "Na" Technique on Jianjing Point (GB 21) - The thumb is placed on the point area, the other fingers are bent and the underlying tissue is pulled in sync.
7. Processing pressure points with Dien Technique - Starts with Baihui point (GV 20), then Fengchi (GB 20), Fengfu (GV 16), Dazhui (GV 14), Feishu (BL 13) and Jianliao (TE 14).
8. Technique "soft cutting" - Percussion technique with spread fingers, performed with the ulnar edge of the fifth and fourth fingers. It is performed on the trapezius and the upper part of the deltoid muscle.
9. "An" Palm Technique - Palm pressure is performed, lateral to the Dazhui point (GV 14) to the end of the blade of scapula.
10. "Tui" technique on the upper limb - The movement is performed from the proximal to the distal direction, with the therapist covering the entire inner part of the arm along the patient's limb. The technique is repeated 3-4 times.
11. Technique "On us" - Pulling and holding the underlying tissue, performed on the entire upper extremity musculature. 3-4 repetitions starting proximal to distal.
12. "Pie" technique - slapping blows - 3-4 repetitions.
13. "Gun" technique - Fingers slightly flexed, the therapist performs prono-supinatory movements from the ankle joint and at the same time moves in the distal direction along the patient's limb.
14. "Diene" technique point processing - Quchi (LI 11), Waiguan (TE 5), Hegu (LI 4), Houxi (SL 3). Each of the points is processed until the corresponding reaction is obtained.
15. Rubbing the neck with folded fingers while thumbs are fixed on the Fengchi points (GB 20). The cupping is carried out until hyperemia appears and the skin warms up.
16. "Pie" technique - The impact grip is performed over the entire area of the trapezius muscle. Movements are made from left to right and vice versa.
17. “Gun” technique - performed from left to right, 4-5 repetitions. Sensation of dissipating tension.
18. “Zhou mo” technique - from the tip of the blade of one scapula to the blade of other scapula, passing through the Jianjing (GB 21) and Dazhui (GV 14) points.

Results and Analysis

Before the start of the massage procedures, the patient was asked to fill out questionnaires selected by us according to the symptoms, in order to correctly track the impact of the therapy on the specific complaints. The reviewed available literature, in which the somatic manifestation of stress is increasingly mentioned, prompted us to examine the relationship between pain symptomatology, stress perception and cortisol values, in this case study. Testing was performed before manipulation, immediately after and at a later stage of about three months after treatment. The initial results of the completed questionnaires gave high values in all tests. The pain sensation in the neck, shoulder area and upper limbs was described as "strong" by the patient. We determined

the quality of life using the Neck Disability Index (NDI). A total score of 34 points is defined as "severe disability" on this scale (25-34). On the Perceived Stress Scale (PSS-10), "moderate stress" was reported, with a score of 23 approaching the high stress limit (14-26). The occupational burnout questionnaire defined by us also reported high numerical values, which correspond to developing phase (37-60) and formed phase (61 and more points) , and the patient calculated 57 points in the "tension" section, 119 "Resistance" points and 71 "Exhaustion" points. Cortisol testing was performed in a laboratory by a medical professional, with the patient instructed to attend the same lab for all samples. The initial value of cortisol (552.50) was above the accepted reference values (171.00-536.00), which is 16.50 units more than the maximum normal value.

After the massage procedure, the patient again filled out all the questionnaires and, the day after the last procedure, gave a serum cortisol sample. The pain symptomatology settled to "no pain", the Neck Disability Index was scored with a total score of 2, the feeling of perceived stress on the survey decreased by 15 points and the score was 8. The re-completion of the occupational burnout syndrome questionnaire reported significantly reduction of the summed points in all sections (57, 63, 44), which concludes that only the "resistance" phase is in the developing stage and the absence of burnout signals and symptoms in the other two. An interesting result was obtained for serum cortisol, with a decrease of as much as 344.9 units, which we believe is the ideal value for the particular patient, who shared that the month was one of the busiest in the annual plan of his professional direction. We believe that above all, personal satisfaction and self-assessment of the ability to control stressful situations in everyday life is a major marker to consider in medical practice.

A dynamic lifestyle and limited financial and time resources put therapists in a situation of quick, effective and long-term solving of health problems. For this reason, we tracked how well results persisted over time. After 82 days, all surveys were distributed again, and a serum sample was given again. The Visual Analog Scale was marked with "slight pain", the Neck Disability Index was assessed as a total of 4 points, which was interpreted as no impairment, the Perceived Stress Scale gave a result of 11 points (low stress). Burnout syndrome based on the answers given, it was calculated that the "tension" phase has increased by 19 points, the "resistance" phase by 9 points and the "exhaustion" phase by 1 point since the last filling. The serum cortisol sample came out with a value of 414.70 units.

There was an almost two-fold increase from the date of examination immediately after the treatment, but despite this, the levels of cortisol in the body were within the limits of the reference values and 137.8 units less than the initial sample, before the massage course. It should be taken into account that the patient complained of a cold in the period of the third sample, which to a certain extent may affect the cortisol profile, since it is known that inflammatory processes in the body indicate an influence of its increased synthesis.

We performed a repeated course of treatment from 7.10.2024 to 29.10.2024 to track its impact on the specific patient. The massage procedures were performed in the same way as from the first ten-procedure course. Post-session scores on pain questionnaires, neck impairment index, stress scale, burnout, and serum cortisol were reported to be relatively stable and did not show a drastic decrease in values as after the first treatment.

We believe that the initial clinical results regarding cortisol are related to the impact of the new treatment method, which results in the body responding with a reduction in cortisol levels. Repeated massage procedures again lead to a reduction of the values, but a relatively stable condition is reported, without drastic changes in the data.

Table 1. Conducted research by dates. Horizontally - studies, vertically - dates

Date	VAS	NDI	PSS-10	Burnout	Cortisol
17.05.				-57	552.50
2024	6	34	23	-119	|171.00-
				-71	536.00|
19.06.				-0	207.6
2024	0	2	8	-56	|171. 00 -
				-27	536.00|
10.09.				-19	414.70
2024	2	4	11	-65	|171.00- 536|
				-28	
30.10.				-18	354.00
2024	0	2	9	-52	|171.00- 536|
				-28	

Discussion

The obtained results stimulated us to search the available literature for similar studies and to compare the obtained data with the findings of other authors. Most reviewed literature sources on the subject prove the effectiveness of massage in overcoming pain symptoms, improving the quality of life and feeling satisfied. Studies monitoring serum cortisol were limited. In the review, we encountered articles describing salivary cortisol before and after massage sessions, in which a decrease was observed immediately after the procedure, but without a tendency to maintain the result. To date, there is a lack of large-scale studies on the long-term effects of this type of therapy, and we have not found a specific methodology, dosage, and application techniques.

In a study by Marinova, D. (2019) is investigated the effectiveness of traditional Chinese massage on range of motion and pain intensity in the cervical spine. Thirty -eight patients with chronic neck pain were randomly assigned to an experimental and a control group. The patients in the experimental group were given ten Chinese therapeutic massages and therapeutic exercises twice a week. The control group performed only controlled therapeutic exercises. Tracking the dynamics of pain symptoms showed a reduction in pain in both groups of patients, with a tendency towards a significant reduction in the experimental group.

A study that was conducted in North Macedonia (2024) evaluated the effectiveness of therapeutic massage for neck pain in different professional groups - bank employees, accountants, secretaries, textile workers, people in the business sector and others over a period of three years (2019-2022). The study involved 127 volunteers reporting an average pain intensity level of 7 on a numerical rating scale of 1 to 10. Each of them received massage treatments once or twice a month. Consistent massage therapy was found to significantly reduce neck pain, but missing a procedure for more than 4 months resulted in an escalation of pain intensity. The author recommends regular massage therapy to relieve pain symptoms. (Arsovski, 2024)

Field, T., (2014) concluded in their review that moderate pressure massage resulted in increased vagal activity and decreased cortisol levels. He summarizes that functional magnetic resonance imaging data show changes in several areas of the brain, including the amygdala, hypothalamus and anterior cingulate cortex, all of which are involved in stress and emotion regulation. The author recommends further research to identify the underlying neurophysiological and biochemical mechanisms associated with moderate pressure massage.

An interesting and large-scale study by Iranian scientists (2016) is looking for the relationship between stress levels, neck pain and burnout syndrome in nurses. The total number of participants was 1400. At the end of the study, it was found that neck pain was more common in nurses with high levels of stress. The authors claim that the sample size of their study was large enough to conclude that work-related stress can cause neck/shoulder pain among workers. (Bahrami-Ahmadi et al., 2016)

Silva et al. (2019) conducted an experiment with elderly people aged about 63 years, with depressive and anxiety symptoms, and concluded that an exercise program in an aquatic environment improves functional autonomy and reduces oxidative stress in old people. We believe that water rehabilitation would have a similar effect on young people, as spa and wellness methods would have a place in the complex improvement of the body - functionally and mentally.

Conclusion

The combined methodology performed on a patient with elevated levels of serum cortisol, subjected to chronic professional stress, and with pain symptoms, gave significant results, both in the early stage of treatment and after about three months of the procedures. The procedures performed reported significant improvements in pain perception, quality of life, perceived stress, as well as a reduction in cortisol by 344.9 units. In the long term, we can summarize that the described massage procedure most clearly affects the feeling of pain, quality of life and perceived stress. The second course with massage therapy in the specific case confirmed the improvements in all the indicators of the performed studies. Although the initial results in serum cholesterol levels were not observed, the repeated reduction of its values from 60.70 units, leads us to conclude that the values of serum cholesterol in the first stage of treatment are not random and that massage therapy leads to its reduction. The data obtained from the experiment lead us to prepare recommendations for the application of the methodology in patients with similar symptoms. Based on the obtained results, we believe that the treatment courses should be conducted at an interval of three months in order to maintain a high health status, expressed in musculoskeletal and psycho-emotional condition.

Recommendations

In order to maintain an optimal state of health, in such cases we recommend physical activity, meditations, and breathing exercises in addition to the prepared methodology. We believe that conducting treatment courses every three or four months would positively affect the condition of patients with chronic stress or the application of massage once a week as a prevention of the escalation of symptoms. We also believe that a large-scale study with more patients would strengthen our result and prove statistically the significance of the applied methodology. Also, the addition of acupuncture for long-standing symptoms would lead to a more effective and rapid response.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS Journal belongs to the authors.

Notes

* Special thanks to the patient who always responded to our requests and actively followed our every recommendation. We are grateful for his participation in this study, in which he further engaged by visiting the laboratory on days determined by us.

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References

Arsovski, D. (2024). Effectiveness of medical massage in reducing neck pain among multiple occupational groups: A longitudinal study. *International Journal of Therapeutic Massage & Bodywork*, *17*(3), 23.

Bahrami-Ahmadi, A., Mortazavi, S. A., Soleimani, R., & Nassiri-Kashani, M. H. (2016). The effect of work-related stress on development of neck and shoulder complaints among nurses in one tertiary hospital in Iran. *Medical Journal of the Islamic Republic of Iran*, *30*, 471.

Broom, A. F., Kirby, E. R., Sibbritt, D. W., Adams, J., & Refshauge, K. M. (2012). Use of complementary and alternative medicine by mid-age women with back pain: A national cross-sectional survey. *BMC Complementary and Alternative Medicine*, *12*, 1-7.

Iqbal, T., Elahi, A., Wijns, W., & Shahzad, A. (2023). Cortisol detection methods for stress monitoring in connected health. *Health Sciences Review*, *6*, 100079.

Mahdizadeh, M., Jaberi, A. A., & Bonabi, T. N. (2019). Massage therapy in management of occupational stress in emergency medical services staffs: a randomized controlled trial. *International Journal of Therapeutic Massage & Bodywork*, *12*(1), 16.

Marinova, D. (2019, Nov). The effect of therapeutic massage in patients with chronic neck pain, Proceedings book, *International Scientific Congress "Applied Sports Sciences", Balkan Scientific Congress "Physical Education, Sport, Health"*, 15-16 November 2019, Sofia, Bulgaria, pp. 581-585, ISBN: 978-954-718-601-9 (Online); ISBN: 978-954-718-602-6 (Print).

McEwen, B. S. (2017). Neurobiological and systemic effects of chronic stress. *Chronic Stress*, *1*, 2470547017692328.

Field, T. (2014). Massage therapy research review. *Complementary Therapies in Clinical Practice*, *20*(4), 224-229.

Furlan, A. D., Yazdi, F., Tsertsvadze, A., Gross, A., Van Tulder, M., Santaguida, L., ... & Tsouros, S. (2012). A systematic review and meta-analysis of efficacy, cost-effectiveness, and safety of selected complementary and alternative medicine for neck and low-back pain. *Evidence-Based Complementary and Alternative Medicine*, *2012*(1), 953139.

Sagar, S. M., Dryden, T., & Wong, R. K. (2007). Massage therapy for cancer patients: A reciprocal relationship between body and mind. *Current Oncology*, *14*(2), 45.

Silva, L. A. D., Tortelli, L., Motta, J., Menguer, L., Mariano, S., Tasca, G., ... & Silveira, P. C. L. (2019). Effects of aquatic exercise on mental health, functional autonomy and oxidative stress in depressed elderly individuals: A randomized clinical trial. *Clinics*, *74*, e322.

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