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EVALUATION OF THE INFLUENCE OF SELECTED FASCIAL TECHNIQUES, BASED ON THE STECCO FASCIAL MANIPULATION, ON PAIN SENSATIONS AND REACTIVITY OF SOFT TISSUES

OCENA WPŁYWU WYBRANYCH TECHNIK POWIĘZIOWYCH, W OPARCIU O METODĘ MANIPULACJI POWIĘZI WG STECCO, NA POZIOM DOLEGLIWOŚCI BÓLOWYCH ORAZ REAKTYWNOŚĆ TKANEK MIĘKKICH

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A – przygotowanie projektu badania | study design, **B –** zbieranie danych | data collection, **C –** analiza statystyczna | statistical analysis, **D –** interpretacja danych | interpretation of data, **E –** przygotowanie maszynopisu | manuscript preparation, **F –** opracowanie piśmiennictwa | literature review, **G –** pozyskanie funduszy | sourcing of funding

SUMMARY

Background: Recent reports show that changes in fascia may be a source of many disturbances in human functioning. The concept of fascial manipulation (FM) postulates that removing the changes in ground substance of fascia reestablishes a proper tensional balance, reducing pain. Assessment of reactivity of soft tissues acts as an objective indicator, allowing for the confirmation of changes to pain levels.

Aim of the study: The purpose of this study was to evaluate the influence of therapy using the FM method on pain sensations and change in reactivity of soft tissues.

Material and methods: The research was carried out on 15 people (12 women and 3 men; aged between 18–30 years) who were randomly divided into three equal groups. Patients from the first group were treated using the standard protocol of Stecco's method, while in the second group the modified protocol was used. The last group was the control group. All patients undergo the diagnostic process specific for FM method and had their pain level (using the visual analog scale [VAS]) and reactivity of soft tissues (with the MyotonPro device) measured. Measurements of reactivity of soft tissues were taken from 10 points in pelvis (specific for Stecco's method). All measurements were taken three times; before and after the first treatment and after the third treatment. Outcomes were gathered and inputted to the STATISTICA 12 database and analyzed using ANOVA with repeated measures and Post-Hoc Tukey's test.

Results: Statistical analysis showed statistically significant change in some parameters related to the reactivity of soft tissues in the first group. Statistically significant changes ($p < 0.05$) of VAS were observed in every group but the first group had the biggest and the most dynamic decrease in pain levels.

Conclusions: Therapy using FM method causes significant changes in some reactivity of soft tissue parameters and in pain sensations. The biggest changes were observed in the first group, who were treated with Stecco's method.

KEYWORDS: Fascial Manipulation, Stecco, MyotonPro, pain

STRESZCZENIE

Wstęp: Doniesienia ostatnich lat pokazują, że zmiany w powięzi mogą być powodem wielu zaburzeń funkcji organizmu ludzkiego. Koncepcja Manipulacji Powięziowej zakłada, że usunięcie zmian w substancji podstawowej powięzi pozwala przywrócić odpowiedni balans napięciowy, redukując jednocześnie poziom bólu. Ocena reaktywności tkanek miękkich posłużyła za obiektywny wskaźnik, umożliwiający weryfikację zmian zachodzących w badaniu poziomu bólu.

Cel pracy: Celem pracy było zbadanie wpływu terapii metodą FM na poziom dolegliwości bólowych oraz reaktywność tkanek miękkich.

Materiał i metody: Badaniu poddano 15 osób w wieku 18–30 lat (12 kobiet i 3 mężczyzn), które losowo przydzielono do trzech równolicznych grup. Badanych z grupy pierwszej poddano terapii wg standardowego protokołu leczenia metodą Stecco, natomiast z grupy drugiej – zmodyfikowanego protokołu. Grupa trzecia była grupą kontrolną. Wszyscy badani byli diagnozowani zgodnie ze standardami metody FM, zmierzono ich poziomu bólu (VAS) oraz reaktywność tkanek (przy użyciu urządzenia MyotonPro). Pomiar reaktywności dokonywany był w 10 punktach w obrębie miednicy (specyficznych dla metody Stecco). Wszystkie pomiary przeprowadzano trzykrotnie; przed pierwszą terapią i po niej oraz po trzeciej terapii. Zebrane wyniki zostały zestawione w bazie danych programu STATISTICA 12 i poddane analizie wariancji z powtarzanymi pomiarami, a także wykonano test Post-Hoc Tuckey'a.

Wyniki: Analiza statystyczna wykazała istotne zmiany niektórych parametrów reaktywności tkanek w grupie pierwszej. Istotne statystycznie zmiany ($p < 0.05$) w skali VAS zaobserwowano w każdej z analizowanych grup, jednak grupa pierwsza odznaczała się największym i najbardziej dynamicznym spadkiem poziomu dolegliwości bólowych.

Wnioski: Terapia metodą FM powoduje istotne zmiany w parametrach związanych z reaktywnością tkanek oraz w dolegliwościach bólowych pacjenta. Największe zmiany zaobserwowano w grupie pierwszej.

SŁOWA KLUCZOWE: Manipulacja Powięzi, Stecco, MyotonPro, ból

Background

The infinite network, which has been a customary name for the fascia, is a structure formed by dense connective tissue, comprising specific cell types and the extracellular matrix [1]. Numerous studies have demonstrated that not only does the fascia permeate every part of the human body [2], it also provides receptor feedback [3,4] and transfers the musculo-fascial loads [5]. It is currently a common consensus that lesions of the fascia may be susceptible to pain and discomfort, reduced mobility, and other musculoskeletal disorders [6]. Many therapeutic methods have been developed in recent years to restore proper physiological fitness of the human fascia; however, there still is no conclusive, scientific evidence of their efficacy.

The Stecco fascial manipulation (FM) method has a high clinical efficacy and robust theoretical principles [7]. The theoretical principle of the Stecco FM process states that repeated motion patterns or traumas may contribute to the so-called densifications [8] (i.e. accumulation of hyaluronic acid, metabolites, etc.) which affect muscular fitness and become root causes of multiple systemic disorders. Densification may reduce the slip between individual fascia layers, and increase fascial stiffness. Lesions within the fascial tissue, which is a dense array of receptors [3,4] result in disorders of neuromuscular coordination, whereas mechanical fascial receptors begin to act as nociceptors. Research into the fascia [3] suggests that it is formed by a plastic tissue that is prone to mechanical, thermal and metabolic stresses; moreover, it is claimed that the fascia can be restored to its proper physiological fitness by exterior intervention [8]. The essence of the Stecco FM is to find the locations affected by densification and subject them to deep chafing, or massage [6], which results in a localized inflammation, and helps the fascial ground substance transform from a gel state to a solid state [9]. The selection of the right densification points is intended to restore the proper fascial tension balance, improve the transfer of musculo-fascial loads, and reduce the pain or discomfort experienced by the patient [8].

Aim of the study

The main objective of this study was to investigate the effect of a Stecco FM therapy on the Visual Analog Scale (VAS) pain level and the reactivity of soft tissues, as measured by a MyotonPro tester. Another aim of this study was to verify the variation of investigated fascial parameters between the standard Stecco FM protocol and a modified FM protocol.

Material and methods

The study was a randomized double-blind clinical trial. The test subjects included 15 people aged 21 to 29 years, with 12 females and 3 males. The test subject inclusion criteria were: age between 18 and 30 years, and motor organ pain discomfort present for a minimum of one week. The test subject exclusion criteria were: concomitance of a chronic or systemic disorder, pregnancy, administration of steroids, anti-inflam-

matory medications or blood coagulability modifying medications, other therapies in progress, and severe neurological disorders. Each test subject provided a written voluntary agreement to participate in the randomized double-blind clinical trial, and understood the therapeutic contraindications. The clinical trial period was preceded by six months of training. The research project was approved by the University Commission of Bioethics (1/2017).

Table 1. Basic anthropometric data of test subjects

Variable	N	Minimum	Maximum	Mean	Standard deviation
Age	15	21	29	22,93	2,01
Weight [kg]	15	48,5	77	60,37	9,63
Height [cm]	15	160	190	169,13	9,23

The test subjects were assigned to three groups. Group 1 underwent the therapy per the standard Stecco FM protocol (specific points on a single plane). Group 2 underwent the modified Stecco FM protocol (non-specific points on various planes). Group 3 constituted the controls which did not undergo any FM-based therapeutic activity. Each test subject was diagnosed according to the Stecco FM protocol and by a certified Stecco FM therapist. Based on this diagnosis, the points termed ‚coordination centres' (CC) were selected for further diagnostics and therapy. Each test subject completed their trial questionnaires three times (before and after the first therapeutic session and after the third therapeutic session) to specify: the locations of pain disorders on their body and their VAS levels; the same sequence was applied to complete the soft tissue reactivity tests with the MyotonPro.

To summarize, the research project specified three sessions with each test subject every 7 to 10 days. The first and third therapeutic session included diagnostics and the therapy, as applicable to each of the groups; the second session was therapeutic only. During the first therapeutic session, group 3 (the controls) had a 45-minute break between each soft tissue reactivity test and completing their trial questionnaires; group 3 was not asked to appear for the second therapeutic session, and during the third therapeutic session, group 3 was only diagnosed with the MyotonPro and asked to complete their trial questionnaire.

The MyotonPro is intended for an impartial, non-invasive and painless measurement of biomechanical and viscoelastic properties of tissues. The MyotonPro applies a mechanical pulse at 0.58 N of force for 15 ms, which propels the tested tissue, and measures the following parameters from the measurement of oscillation damping by the tissue:

- F – natural oscillation frequency, which characterizes the tone [Hz]
- D – logarithmic decrement of natural oscillation, which characterizes the flexibility, a measure inversely proportional to the decrement of oscillation
- S – dynamic stiffness [N/m]
- C – creep, which is the relaxation to deformation time
- R – mechanical stress relaxation time [ms]

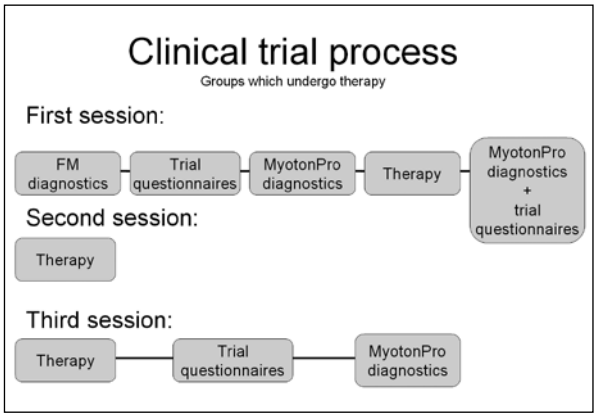

Figure 1. Clinical trial process flow for groups 1 and 2 (therapeutic)

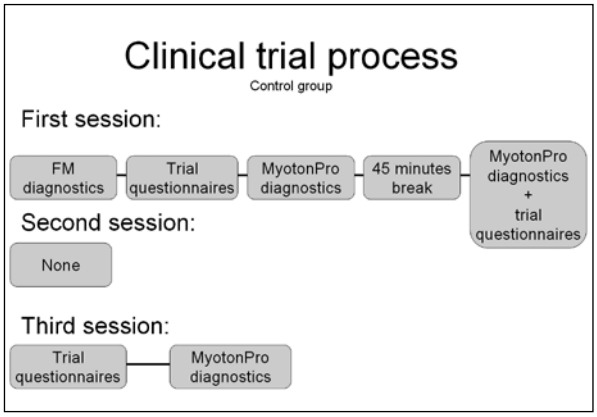

Figure 2. Clinical trial process flow for group 3 (controls)

The MyotonPro tests were done on 20 CCs specific to the Stecco FM: 10 CCs within the pelvis, 6 CCs within the scapulae, and at 4 CCs where the FM therapy was applied. Prior to the MyotonPro test, each test object was instructed about its form and process. During each MyotonPro test, each test object was prone or sitting (depending on the CC tested) as relaxed as possible. A triple scan mode of the MyotonPro was used to improve the reliability of test results. If the difference between any two tests exceeded 3%, the test was repeated.

The FM therapy was applied to 6 CCs qualified according to the diagnostic results from the first therapeutic session. In group 1, the CCs qualified exhibited the highest densification; however, a balance was retained between antagonistic sequences. In group 2, the CCs were qualified at random. Each CC was therapeutically processed twice, for 3 minutes long per iteration.

All the outcomes were gathered and inputted to the STATISTICA 12 database and analyzed using ANOVA with repeated measures and Post-Hoc Tukey's test. The assumed statistical significance level was $p < 0.05$.

RESULTS

For the sake of clarity, the clinical trial and specific test results obtained are shown on figures. The following figures show the mean VAS levels (Fig. 3) and the soft tissue reactivity (Fig. 4 to 10) measured before and after the first therapeutic session and after the third therapeutic session:

- Group 1 (TW);
- Group 2 (MIX);
- Group 3 (K).

Fig. 3 shows the mean VAS levels experienced by the test subjects before and after the first therapeutic session and after the third therapeutic session. In each group, a statistically significant change of VAS pain levels was found ($p = 0.007$). However, the most pronounced and dynamic reduction in the experienced pain discomfort was found in group 1 (TW), processed with the standard Stecco FM protocol ($p < 0.001$).

Fig. 4 shows the values of the Logarithmic Decrement measured at LA PV on the left-hand side of the body. Statistically significant variations of this parameter were found only in Group 1. Post-Hoc Tukey's test showed $p = 0.014$.

Fig. 5 shows the mean values of the Logarithmic Decrement measured at LA PV on the right-hand side of the body. Statistically significant variations of this parameter were, yet again, found only in Group 1 (Post-Hoc Tukey's test showed $p = 0.05$).

Fig. 6 shows the mean values of the Creep (deformation) measured at LA PV on the left-hand side of the body. Group 1 revealed a statistically significant reduction of this parameter Post-Hoc Tukey's test showed $p = 0.037$).

Fig. 7 shows the mean values of the Relaxation parameter measured at LA PV on the left-hand side of the body. The changes of this parameters showed statistical significance in Group 1 (Post-Hoc Tukey's test showed $p < 0.001$).

Fig. 8 shows the variations of the mean values of the Frequency parameter measured at RE PV on the left-hand side of the body. Group 1 revealed a statistically significant change of this parameter (Post-Hoc Tukey's test showed $p = 0.045$).

Fig. 9 shows the mean values of the Stiffness parameter measured at RE PV on the left-hand side of the body. The value changed with statistical significance in group 1 (Post-Hoc Tukey's test showed $p = 0.05$).

Fig. 10 shows the mean values of the Frequency parameter measured at IR PV on the left-hand side of the body. Only group 1 revealed statistically significant differences (Post-Hoc Tukey's test showed $p = 0.05$).

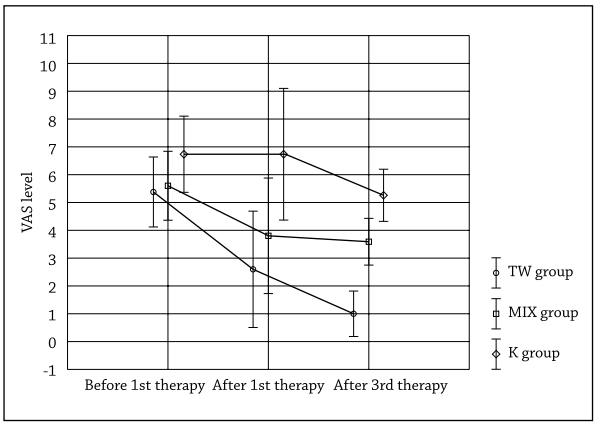

Figure 3. Variation of the VAS levels in the test subjects, $F(4,22) = 18.8509$; $p < 0.001$

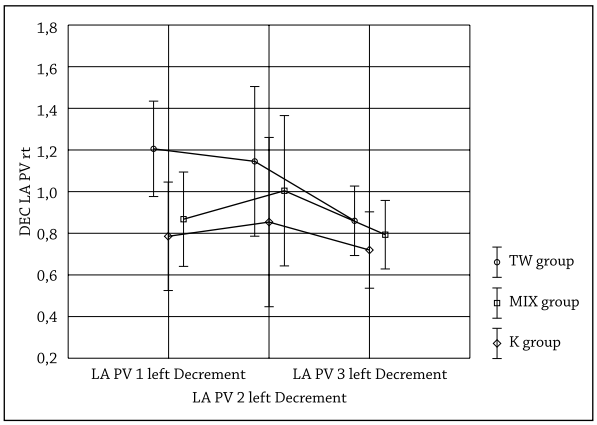

Figure 5. Variation of the Logarithmic Decrement at LA PV, right-hand side of the body, $F(4,22) = 1.1132$; $p < 0.05$

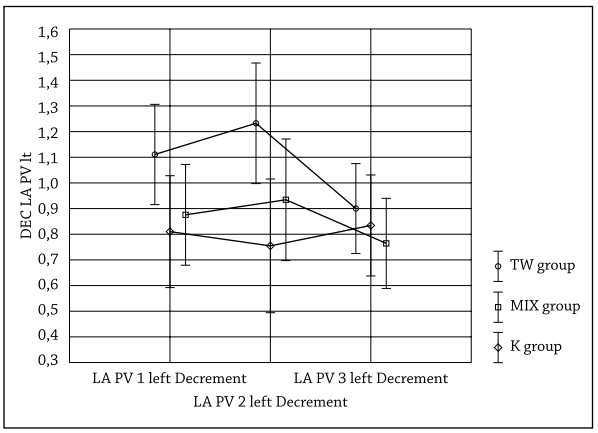

Figure 4. Variation of the Logarithmic Decrement at LA PV, left-hand side of the body, $F(4,22) = 2.8262$; $p < 0.05$

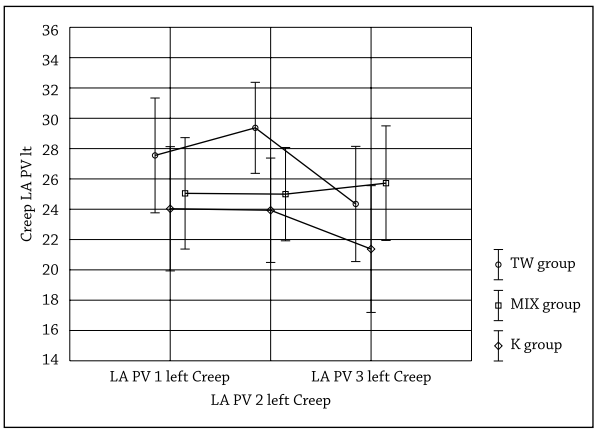

Figure 6. Variation of the Creep at LA PV, left-hand side of the body, $p < 0.05$; $F(4,22) = 2.3141$

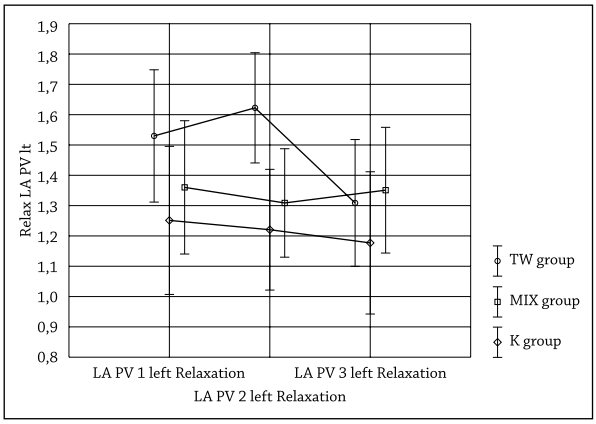

Figure 7. Variation of the Relaxation parameter at LA PV, left-hand side of the body, F(4,22) = 5.2975; p < 0.004

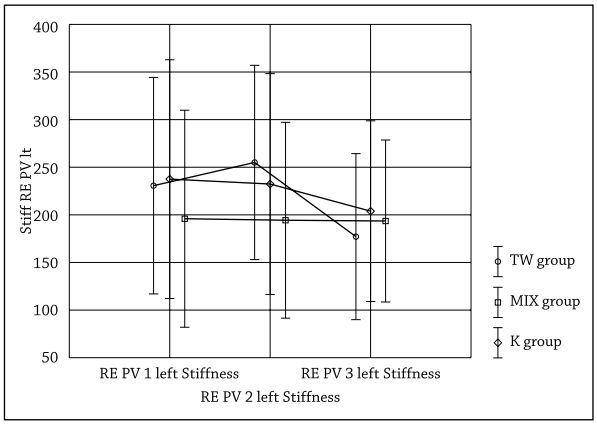

Figure 9. Variation of the Stiffness parameter at RE PV, left-hand side of the body, F(4,22) = 3.667; p = 0.042

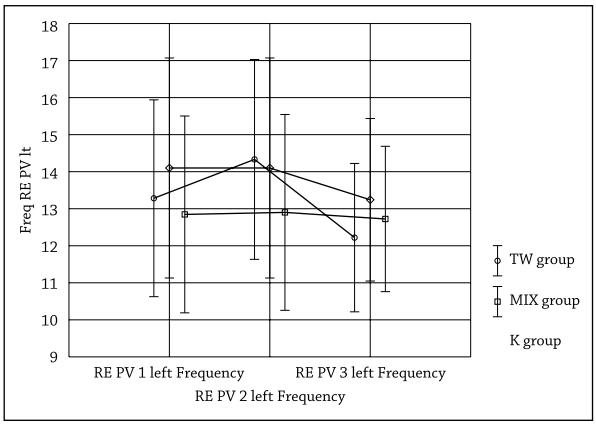

Figure 8. Variation of the Frequency parameter at RE PV, left-hand side of the body, F(4,22) = 4.2722; p = 0.027

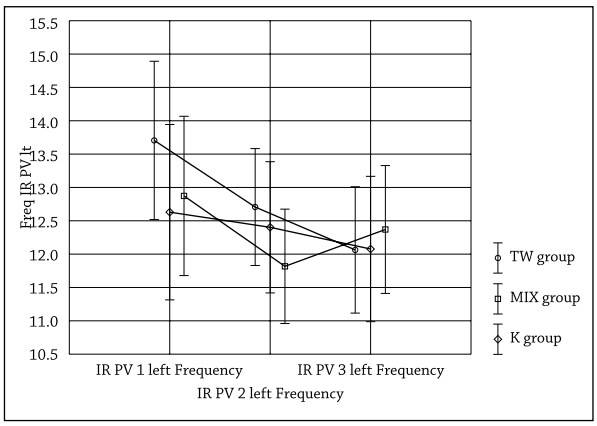

Figure 10. Variation of the Frequency parameter at IR PV, left-hand side of the body, F(4,22) = 5.151; p < 0.014

The soft tissue reactive tests revealed statistically significant variations of the test values in group 1 only (subject to the standard Stecco FM protocol). Pronounced variations were found in each of the parameters tested, with the highest variation of the Logarithmic Decrement. In five of out of the seven parameters described above there was a noticeable trend of initial increase in mean values, followed by their reduction after the third therapeutic session in group 1. The predominant part of these results applied to the left-hand side of the test subjects' bodies. Moreover, most of variations occurred in the frontal plane.

Discussion

The results obtained during the randomized double-blind clinical trial signify a reduction of the tone and dynamic stiffness in the tested tissues with improved flexibility and reduction in relaxation time after administration of the standard Stecco FM protocol therapy.

This is one of the first research projects to apply measurement of tissue tone and biomechanical and viscoelastic properties of tissues as an impartial, objective determinant of therapeutic efficacy of the Stecco FM. The research project is also the only one known to the authors to compare the standard therapeutic protocol of the Stecco FM to its modified version.

Research completed in the recent years demonstrates that application of the MyotonPro to evaluate different tissue reactivity parameters provides highly reliable results [10] with a high repeatability coefficient [11]. The reference literature findings revealed that the main parameters evaluated in similar research projects include tissue tone, tissue dynamic stiffness, and tissue elasticity. Park et. al [12] objectively noted that dysfunctional soft tissues were characterized by increased dynamic stiffness and tone. Wang [13] showed that muscle fatigue also increased muscular dynamic stiffness and tone, whereas administration of a properly designed therapeutic regime reversed this condition and reduced the values of these parameters, as measured with the MyotonPro. The charts featured above show similar relations. The largest reduction of the Natural Frequency Oscillation (as related to tissue tone) and Dynamic Stiffness (as related to muscular stiffness) between the initial and final states of the whole clinical trials were displayed in group 1 (TW). Groups 2 and 3 did not reveal significant changes in the same parameters. It was also noted that the values of Logarithmic Decrement (D), which are inversely propor-

tional to tissue elasticity. The reduction in (D) shall be then interpreted as an improvement in soft tissue elasticity, a phenomenon found in group 1 only.

Naturally, certain changes in VAS levels of pain discomfort and soft tissue reactivity was also found in groups 2 and 3. The reason for these findings in group 3 (the controls) would primarily be the systemic ability to compensate for disorders and partial self-recovery. There seems to be several reasons for changes of the parameters in group 2. The therapeutic effects, as they were, stimulated the body with an inflammatory condition, which was a prerequisite for tissue reconstruction and changes in the tone of the musculofascial system. The bodies of group 2 test subjects could employ another compensation strategy; hence the noticeable differences in test results before and after the therapeutic sessions. Psychological factors could be yet another reason for the variations found in group 2. The test subjects would undergo three therapeutic sessions, 45 minutes each, during which therapeutic effects were administered following a thorough diagnosis and concerned specific points of the human body. The reference literature relates to the effect of the therapist and patient relation on the pain levels experienced by the patient [14].

The most dynamic pain reduction and the only statistically significant variations in soft tissue reactivity were found in group 1, where the standard Stecco FM therapeutic protocol was administered. The results discussed herein suggest that the standard protocol of the Stecco FM is preferable, if one desires maximum efficacy. This research project, however, is a pilot project. Final conclusions will require continued clinical trial experiments and testing a larger number of test subjects (patients with pain), including a detailed follow-up.

Conclusions

A therapy administered following the standard protocol of the Stecco FM reduced pain discomfort. There was also a variation in the objective measurement of soft tissue reactivity, which can be viewed as a proof of the results provided by VAS pain level testing.

References

1. Liptan LG. Fascia: a missing link in our understanding of the pathology of fibromyalgia. J Bodyw Mov Ther 2010; 14: 3–12.
2. Langevin HM. Connective tissue: a body-wide signaling network? Med Hypotheses 2006; 66: 1074–1077.
3. Schleip R. Fascial plasticity – a new neurobiological explanation: Part 1. J Bodyw Mov Ther 2003; 7: 11–19.
4. Stecco C, Gagey O, Belloni A, Pozzuoli A, Porzionato A, Macchi V, et al. Anatomy of the deep fascia of the upper limb. Second part: study of innervation. Morphologie 2007; 91: 38–43.
5. Smeulders MJ, Kreulen M, Hage JJ, Huijing PA, van der Horst CM. Spastic muscle properties are affected by length changes of adjacent structures. Muscle Nerve 2005; 32(2): 208–215.
6. Busato M, Quagliati C, Magri L, Filippi A, Sanna A, Branchini M et al. Fascial manipulation associated with standard care compared to only standard postsurgical are for total hip arthoplasty: a randomized controlled trial. PM R 2016; 8: 1142–1150.
7. Borgini E, Stecco A, Day AJ. How much time is required to modify a fascial fibrosis? J Bodyw Mov Ther 2010; 14: 318–325.
8. Pedrelli A, Stecco C, Day JA. Treating patellar tendinopathy with fascial manupilation. J Bodyw Mov Ther 2009; 13: 73–80.
9. Matteini P, Dei L, Carretti E, Volpi N, Goti A, Pini R. Structural behavior of highly concentrated hyaluronan. Biomacromolecules 2009; 10(6): 1516–1522.
10. Pruyn EC, Watsford ML, Murphy AJ. Validity and reliability of three methods of stiffness assessment. J Sport Health Sci 2016; 5: 476–483.
11. Bailey L, Samuel D, Warner M, Stokes M. Parameters representing muscle tone, elasticity and stiffness of biceps brachii in healthy older males: symmetry and within-session reliability using the Myoton PRO. J Neurol Disord 2013; 1(1): 100–116.
12. Park SK, Yang DJ, Kim JH, Heo JW, Uhm YH, Yoon JH. Analysis of mechanical properties of cervical muscles in patients with cervicogenic headache. J Phys Ther Sci 2017; 29: 332–335.
13. Wang JS. Therapeutic effects of massage and electrotherapy on muscle tone, stiffness and muscle contraction following gastrocnemius muscle fatigue. J Phys Ther Sci 2017; 29: 144–147.
14. Bialosky JE, Bishop MD, George SZ, Robinson ME. Placebo response to manual therapy: something out of nothing? J Man Manip Ther 2011; 19(1): 11–19.

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