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Original Article

Effects of the Ergon® instrument-assisted soft tissue mobilization technique (IASTM), foam rolling, and static stretching application to different parts of the myofascial lateral line on hip joint flexibility

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Abstract. [Purpose] This study was aimed to compare the effects of three soft tissue treatments in different parts of the myofascial lateral line (LL) on the hip adduction range of motion (ROM). [Participants and Methods] Thirty university students received Ergon® instrument-assisted soft tissue mobilization (IASTM) treatment, foam rolling, and static stretching on the upper or lower part of the LL on the side of their non-dominant lower limb, while the other body side served as control. The participants received one treatment per week for six weeks with a simultaneous pre-and post-therapy assessment of their hip adduction ROM. [Results] The hip adduction ROM was improved on the intervention side in all experimental groups. The gains were more significant in groups that received the Ergon treatment. All Ergon interventions, as well as foam rolling on the upper part of the LL, led to the greatest hip adduction ROM improvement compared to the control side. No differences were observed between the Ergon groups. [Conclusion] The findings suggest that the implementation of Ergon IASTM, foam rolling, and stretching can produce positive effects on the hip ROM. The Ergon Technique is more effective compared to foam rolling and stretching, irrespective of the application site.

Key words: Instrument-assisted soft tissue mobilization (IASTM), Foam rolling, Stretching

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INTRODUCTION

For decades, the scientific community has supported the traditional view of a functional independence of the skeletal muscles, with the fascia functioning separately from the kinetic system[1)]. Recent data have cast doubt on these "classical" hypotheses, supporting the view that the fascia connects muscle groups to create functional myofascial chains[2)].

Indeed, Myers has strongly supported the synergistic effect along the myofascial pathways, which appear to respond in a coordinated fashion as a unit—that is, each fascia is related to the distribution of stresses (laterally) in the adjacent myofascial structures with stored elastic energy[3)]. In particular, he described the fascia as functionally integrated body sequences that form traceable "meridians," or myofascial pathways.

One of the most important myofascial lines of the human body is the myofascial lateral line (LL), which supports and controls each side of the body. Pathological manifestations associated with dysfunctions and decreased lateral line mobility

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include lateral rib cage shift in relation to the pelvis, varus or valgus knee, hip adduction restrictions, and shoulder ROM limitations[3].

Despite the importance of myofascial lines, only three studies have been conducted to date to evaluate the effects of different therapeutic techniques on the function of the myofascial meridians, all of which focused exclusively on the superficial back line (SBL). More specifically, Wilke et al.[4, 5] evaluated the effect of static stretching on distant portions of the SBL in other remote segments of the line. Their findings showed that a single session of static stretching could provide considerable flexibility to distant joints, thus demonstrating the existence of a strain transfer along the SBL. In the same direction, Fousekis et al. showed that the application of the Ergon® IASTM technique on either the upper or the lower part of the SBL might lead to a significant increase in hamstring flexibility irrespective of the application site[6].

Paradoxically, even though the pathological biomechanical adaptations of the lateral line have been linked with significant pathologies of high epidemiological incidence, there is no research assessing the impact of novel soft tissue techniques such as instrument-assisted soft tissue mobilization (IASTM) and foam rolling, or even classical interventions such as static stretching, on the functional capacities of the LL. Therefore, the purpose of this study was to evaluate the effects of Ergon IASTM, foam rolling, and static stretching in the upper and lower parts of the LL on the passive hip adduction range of motion (ROM).

PARTICIPANTS AND METHODS

Thirty healthy university students (17 males and 13 females; age: 20.6 ± 0.7 years; height: 170 ± 7.31 cm; weight: 72.2 ± 5 kg), from the Physiotherapy Department of the University of Patras, Greece volunteered for this study. Participants were excluded from the study if they had an injury in the upper or lower part of the body for at least one year before the survey and if they participated in sports involving extreme hip movements (e.g., martial arts). The ethical committee of the School of Health Rehabilitation Sciences of the University of Patras approved this study (12313-18/09/2018), and all participants signed informed consent forms.

The participants were randomly assigned to six different therapeutic interventions in the upper (trunk) or lower (lower extremity) part of the dominant-side lateral line, or in both sections simultaneously (i.e., the entire lateral line). Therapeutic interventions included a 10-minute myofascial treatment of the following: (a) the upper (Upper LL) and (b) lower part (Lower LL) of the LL with the Ergon IASTM technique, (c) the entire LL (Total LL) with the Ergon IASTM technique, (d) the upper and (e) lower part of the LL with foam rolling, and (f) static stretching of the LL. The entire research took place in the Human Evaluation and Rehabilitation Lab of the University of Patras over twelve weeks, during which participants received one treatment per week (with one-week breaks between treatments) with a simultaneous pre- and post-therapy assessment of the passive hip adduction range of motion in both hips (treated and untreated) with a goniometer. To guarantee the measurements' validity, the goniometric evaluations were performed by two independent physical therapists with expertise in evaluating joint range of motion. The time during which the measurements were made was the same for all participants (afternoon hours, between 15:00 and 18:00) and in controlled conditions (indoors, thermoneutral zone).Three measurements were performed in all the tests, and their average (on each side) was used for later analysis.

The statistical analysis included a three-way ANOVA (6 methods [Ergon–Upper LL, Ergon–Lower LL, Ergon–Total LL, Foam rolling–Upper LL, Foam rolling–Lower LL, Stretching] ×2 conditions [treated and control side] ×2 times [before and after the treatment]), in order to investigate the effect of the different methods on the hip adduction ROM. In the case of a statistically significant interaction of the three factors, Tukey's post hoc test was used to compare their levels. The effect size was calculated using the statistical index η^2, which is categorized as small (0.01–0.059), medium (0.06–0.137), and large (>0.138).Statistical analysis was performed with Statistica version 8.0 (StatSoft, Inc., Tulsa, OK, USA). The limit of statistical significance was set at $p<0.05$.

RESULTS

A statistically significant interaction of the three factors was found (6 methods [Ergon–Upper LL, Ergon–Lower LL, Ergon–Total LL, Foam rolling–Upper LL, Foam rolling–Lower LL, Stretching]×2 conditions [treated and control side]×2 times [before and after treatment]) ($p<0.001$, $\eta^2=0.30$). The ANOVA meta-analysis multiple comparisons showed statistically significant improvement relative to the initial (pre-treatment) measurements for all experimental methods ($p<0.05$). The greatest improvement was observed after the application of Ergon–Upper LL, Ergon–Lower LL, and Ergon–Total LL, by 21.8 ± 12.0%, 25.6 ± 9.4%, and 18.2 ± 5.8%, respectively.

Further, a statistically significant difference was observed on the intervention side compared to the control inthe Ergon–Upper LL, Ergon–Lower LL, Ergon–Total LL, and Foam rolling–Upper LL interventions ($p<0.01$). All three Ergon IASTM interventions on the treated side led to a significantly greater improvement in the hip adduction ROM ($p<0.01$) compared to the other experimental conditions. The Ergon–Lower LL treatment, in particular, showed a significant improvement compared to Ergon–Total LL ($p<0.05$), Foam rolling–Upper LL, Foam rolling–Lower LL, and Stretching ($p<0.01$), but not compared to Ergon–Upper LL.

DISCUSSION

Soft tissue techniques constitute an innovative treatment option of the superficial anatomical structures of the human body (skin, muscles, ligaments, tendons, fascia), which require a targeted therapeutical approach. Such techniques applied either manually or with specific medical equipment potentially improve the functionality of the tissues and mainly their elasticity. Based on these adaptations that were observed by the utilization of such techniques, the purpose of the present study was to compare the effect of Ergon IASTM applications, foam rolling, and static stretching on the myofascial lateral line, on hip flexibility. The selection and comparison of the abovementioned techniques were made based on several studies that have shown that all of them, separately or in combination with other methods, can increase the joints' range of motion[6–9]. Further, this research aimed to examine whether there is a functional interface between the myofascial structures of the lateral line, which is likely to affect the functional capacity of anatomical structures that are remote from the treatment site.

The findings of the present study indicate that the application of the Ergon IASTM technique to the myofascial lateral line (in all experimental conditions) is more effective than foam rolling and stretching in improving the hip adduction range of motion. In particular, its application to the lower and upper parts of the lateral line, as well as to its entire length, resulted in a significant improvement of the hip adduction ROM. These findings support the results of other studies that evaluated these techniques in elderly people and athletes. Pathania and Muragod compared the effects of static stretching, foam rolling, and IASTM on hamstring tightness in elderly participants[10]. Their results showed that all therapeutic interventions led to significant hip flexibility improvements, but the comparison between groups revealed that Ergon IASTM was more effective than foam rolling. Similarly, Markovic showed that, although both foam rolling and IASTM significantly improved knee and hip ROM in soccer players, the magnitude of the IASTM effect was twice as great as that of foam rolling[11]. These flexibility adaptations following the application of myofascial techniques can be explained by an improvement in the fascial layer sliding, a decrease in collagen resistance, and an increase in local temperature. Further, Schleip suggested that myofascial techniques stimulate and activate intrafascial mechanoreceptors, leading to an altered proprioceptive input to the central nervous system, which results in a decrease in the muscle tone of the associated muscle groups[12]. The superiority of Ergon IASTM in comparison with foam rolling can be explained by the fact that techniques using narrow-surface equipment can be more targeted and penetrate deeper, and thus better mobilize the tissues than wider-surface equipment. Also, IASTM procedures can lead to a better rolling off the fascia because they apply a considerable pulling force in the longitudinal direction of the soft tissue, in contrast to foam rolling, where a relatively strong mechanical stress is applied perpendicular to the muscle and fascial orientation. Static stretching also provides a better hip adduction range of motion. However, a single application seems to be insufficient in producing significantly strong effects, comparable to those of more powerful and targeted myofascial techniques that can directly affect the function of the myofascial structures.

Another important finding of this study is that the application of the Ergon IASTM technique on either the lower or the upper part of the LL significantly increases the hip's flexibility irrespective of the application site. More specifically, its application either to the lateral part of the trunk or to the lateral part of the lower extremity led to considerably positive adaptations in passive hip adduction, with no significant difference between them. These findings are in line with previous research on the application of the technique on the superficial back myofascial line, which found that the Ergon IASTM treatment of either the upper or the lower part of the SBL led to a significant increase in hamstring flexibility after four sessions spread over four weeks, regardless of the application site[6]. Furthermore, this novel finding of myofascial energy transfer can be indirectly supported by a survey that evaluated a remote stretching application on the superficial back line, showing that lower limb stretching based on myofascial chains can produce considerable improvements in the cervical ROM, similar to those of local stretching[5]. These adaptations can be explained by a myofascial transmission of tension and relaxation and by a neurophysiological reduction in muscle tone. Supporting the hypothesis of myofascial transmission of energy, several in vivo studies have demonstrated myofascial force transmission between the latissimus dorsi and the gluteus maximus[13], between the gastrocnemius and soleus muscles[14], and between the flexor carpi ulnaris and other wrist flexors[15], thus providing evidence of strain transfer to neighboring skeletal muscles.

Another factor explaining non-local treatment reactions could be related with myofascial tone decrease processes. More specifically, manual therapy techniques such as IASTM can lead to local as well as general decrease in myofascial tone, which may explain our findings[12].

This study's findings should be evaluated taking its limitations into consideration. The most important limitation was that it evaluated the effect of several myofascial applications on healthy young people, which makes it difficult to generalize these conclusions to older people, whose fasciae have altered mechanical properties such as increased thickness and stiffness. In addition, the ROM evaluations were performed with a typical goniometer, which, though a valid and reliable method, always contains a standard measurement error compared to more valid ROM evaluation procedures or equipment (e.g., 3D movement analysis). Besides, the present study focused on evaluating short-term ROM adaptations, while an assessment of long-term effects could reveal the duration of increased hip flexibility adjustments to the different therapeutic interventions.

Despite its limitations, the study's clinical value is particularly important, as it provides evidence that Ergon IASTM, foam rolling, and stretching can produce significantly positive results in improving the hip ROM. Further, the Ergon technique seems to be more effective than the other two interventions in increasing the passive hip ROM. Impressively, its application to either the upper or the lower part of the lateral myofascial line did not differ in its effectiveness in increasing the hip adduction

ROM. These findings, if further confirmed by future studies, can result in a new therapeutic approach for musculoskeletal pathologies and injuries on the lateral surface of the body such as lateral rib cage shift in relation to the pelvis, varus or valgus knee, hip adduction restrictions, and pathological lateral bending of the trunk.

In conclusion, the implementation of Ergon IASTM, foam rolling, and stretching may lead to a significant increase in hip flexibility after only one treatment session. The Ergon IASTM treatment of the lateral line is more effective in increasing the hip adduction ROM compared to foam rolling and stretching, irrespective of the application site. Further, the application of IASTM techniques to remote parts of the lateral myofascial line may be as effective as a local application in terms of improving flexibility. These functional adaptations can be attributed to myofascial transmission of energy and relaxation observed after soft-tissue techniques application. However, further research is needed to support the efficacy of those treatment techniques in the treatment of musculoskeletal pathologies.

Conflict of Interest

None.

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