



Original Article

The influence of the vibration form roller exercise on the pains in the muscles around the hip joint and the joint performance

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Abstract. [Purpose] The purpose of this study is to examine the influence of the vibration form-roller exercise on the pain in the hip joint and the joint performances. [Subjects and Methods] 30 adult patients were randomly sampled and divided into form-roller group (15) and the vibration form-roller group (15). The two groups were exposed to an exercise regimen of 3 sessions per week, over 4 weeks. Each session was composed of warming-up (5M), main exercises (20M), and five minutes of cool-down (5M). [Results] The result of this study, in the intra-group comparison of the Performance, the PRE group increase in the flexion, extension, and abduction of the hip joint, the VPRE group increase in flexion, extension, external rotation and internal rotation. In the comparison between groups, the VPRE group increase in the flexion and internal rotation. Through the intra-group comparison the pressure pain, the PRE group and the VPRE group decreases in the all muscles. In the comparison between the groups, there was increase in the iliotibial tract of the VPRE group. [Conclusion] The result of this study the effect of the form-roller & vibration form-roller exercises. Therefore, various exercise methods would have to be developed in order to overcome the limitations in the existing form-roller exercises.

Key words: Form roller, Vibration form roller, Tenderness

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INTRODUCTION

The professions of the people of the modern society, unlike those in the past, involve only limited and repetitive motions. The abnormal motions and habits will undermine the central axis of the human body and its balances, while causing pain. The occurrence of pain result in further compromises in the postures, as it causes the body to compensate for it. And, as a result, it will be the source of the functional disorders, such as the reduced flexibility, limitations in motions, and other inability disorders.

The initial stage of the functional disorder occurs in the neck and shoulder. The unstable position of the neck and the pain affect the torso and the hip joint, which causes difficulties in maintaining the posture and walking, further causing pains in the low back and legs and other neurological issues. There have been many treatment methods and treatment devices developed in the existing studies. However, there involve difficulties for application in terms of the level of professional skills required to use them and the cost of the treatment devices, etc. Such difficulties have been being mitigated since 2000, due to the development of the form roller exercises and the exercise methods. In addition to the physical therapies, this method is being used for the relaxation of fascia and stretching in various occupation groups, while taking less time and cost compared to the existing therapies¹⁾.

The form roller exercises relax the fascia using the body weight and reduces the tension in the muscles. With this, it

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increases the effect of muscle massaging and the range of the movement of the joints²). The form roller exercises relieve the muscles of cramping as massaging does. And, it soothes the nerves and facilitates blood circulation, helping the body recover from fatigue. Mohr et al.³ showed in their study with 40 participants of whom the flexion range of the hip joint was less than 90 degrees over a six-month period where the static stretching exercises and the form roller exercises were compared that the form roller was effective in enhancing flexibility. Pearcey et al.⁴ reported that the form roller exercises increased the pressure pain threshold of the muscles and enhanced the functioning and performance of the muscles.

The efficacy of the form roller exercises make them popular in various medical and health domains. However, the method of application and the manufacturing technology for the form roller itself are now faced with their limitations. In order to enhance the efficacy of the form roller, it is intended to apply the vibration technique of the existing physical therapy to the form roller exercises. The purpose of this study is to compare the effects of such a new method with the existing form roller exercises, as a preliminary study to develop a new training method using the form roller exercises in the future.

SUBJECTS AND METHODS

To this study, 30 students of G university were enrolled. The selection criteria was that the individual were to give their informed consent after being brief on and presented with the informative material in compliance with the Declaration of Helsinki and should be free of the orthopedic, internal-medicinal, or neuro-surgical conditions that affected the muscles around the hip joint and the walking abilities over the past six-month period. Among those who gave their informed consents, those who had 5 or higher VAS points when pressurized at the point of pressure pain in the form roller, rectus femoris, hamstring, gluteus, and iliotibial tract, which affect the functional motions of the hip joint, were selected.

The point of pressure pain of the participants was determined according to positional release therapy and the manual of trigger point and myofascial therapy by Kerry et al.⁵ and Dimitrios⁶). The participants were grouped into the form roller group (15) and the vibration form roller group (15). The two groups were exposed to an exercise regimen of three sessions per week, over four weeks. Each session was composed of five minutes of warming-up, 20 minutes of main exercises, and five minutes of cool-down exercises.

The form roller exercises program used a form roller and a vibration foam roller (TRATAC Active Roll made of Expanded Polypropylene, Naum Care, South Korea). And, in this study, the 3700 RPM mode was used. Using the form roller, self-fascia-relaxation exercises were performed. The self-fascia-relaxation exercises of each muscle were performed after three sessions of instructions and posture training by a therapist. And, the participants were supervised while performing the exercises to ensure accurate motions during the exercises⁴). In order to examine the changes in the muscle performances, a goniometer (Baseline, USA) was used to measure the operational range of the joints. The measured ranges were the flexion, extension, internal rotation, and external rotation of the hip joint⁷). Commander AlgometerTM was used to examine the changes in the pressure pain. The measurements were taken three times in accordance with the method suggested by Manga (2008)⁸), and the average of these measurements was used.

For the statistical analysis of this study, SPSS 18.0 for Windows was used to analyze the joint performance of the hip joint and the pressure pain. In order to examine the changes between groups, independent t-tests were conducted, while paired t-tests were conducted to compare within the same group before/after the test. The significance level for the statistical analysis was set to 0.05.

RESULTS

Of the demographic characteristics of the participants, the age (FRE group 20.60 ± 0.83 , VFRE group 20.50 ± 1.09), height (FRE group 166.53 ± 7.81 , VFRE group 162.57 ± 7.37), or weight (FRE group 66.41 ± 16.45 , VFRE group 62.58 ± 8.50) did not differ significantly between the groups.

In the before/after comparison within the same group for the motion range of the joints, the flexion, extension, internal rotation and external rotations of the FRE group and the VFRE group were all significant. In the comparison between the groups, the flexion and internal rotation in the VFRE group increased significantly ($p > 0.05$) (Table 1).

In the before/after comparison in terms of the pressure pain, the two groups showed significant increases in rectus femoris, hamstring, iliotibial tract, and gluteus. In the comparison between the groups, too, the iliotibial tract in the VFRE group showed a significant increase ($p > 0.05$) (Table 1).

DISCUSSION

In this study, the pain in the hip joint and the limitations in the range of movement function as the causes of deterioration of the mental confidence and social life, due to the undermined daily-life functions, walking abilities, and body conditions. In this study, in order to solve such problems in the earlier stages, the researchers compared the effectiveness of the self-stretching therapy using the form roller exercises and the vibration foam roller exercise, in order to manage the muscles around the hip joint in a more effective manner, as they are related to the walking motions.

Normally, the minor pains appearing in the muscles gradually develop into muscular pains and contractions. And, when

Table 1. Comparison of the hip joint ROM, tenderness before and after the experiment

| | FRE group (n=15) | | VFRE group (n=15) | |
|-------------------------------------|------------------|--------------|-------------------|--------------|
| | Before | After | Before | After |
| External rotation (°) | 26.0 ± 5.4 | 27.4 ± 3.1 | 22.7 ± 4.1 | 26.5 ± 3.0* |
| Internal rotation (°) | 22.9 ± 5.6 | 29.7 ± 4.2* | 24.0 ± 3.6 | 34.8 ± 8.4*# |
| Extension (°) | 19.3 ± 4.1 | 26.0 ± 4.7* | 19.0 ± 2.7 | 27.3 ± 6.0* |
| Flexion (°) | 56.1 ± 13.1 | 70.8 ± 11.6* | 64.5 ± 12.8 | 81.3 ± 9.0*# |
| Rectus femoris tenderness (point) | 10.4 ± 2.9 | 12.0 ± 3.2* | 9.55 ± 1.8 | 11.3 ± 2.2* |
| Iliotibial tract tenderness (point) | 10.0 ± 3.7 | 10.7 ± 3.5* | 9.1 ± 2.4 | 11.1 ± 2.0*# |
| Hamstring tenderness (point) | 10.3 ± 2.9 | 12.0 ± 3.2* | 10.9 ± 2.3 | 12.1 ± 2.2* |
| Gluteus tenderness (point) | 11.8 ± 2.5 | 13.4 ± 2.5* | 11.4 ± 2.7 | 13.2 ± 3.0* |

Value are Mean ± SD. Paired t-test *, p<0.05, independence t-test #, p<0.05

the part with the pressure pain is stimulated, the related pains, pressure pains, motor-neural disorders, or autonomous nervous reactions can be triggered. In order to solve this problem, the pains have been under control through regular exercises, stretching, and vibration techniques.

In terms of the influence on the motion range of the joints, the normal form roller exercises group showed significant increases in flexion, extension, and internal rotation, and the vibration foam roller exercise group in flexion, extension, external rotation, and internal rotation. In the inter-group comparison, the vibration foam roller exercise group showed a significant increase in the flexion and internal rotation. According to De Bruyne et al.⁹⁾ the flexibility in the hamstring was increased, while Mohr et al.³⁾ reported that the form roller exercises were effective in the flexion of the hip joint. Based on such results, the self fascial relaxation exercises, using form rollers became popular in yoga, Pilates, and fitness centers since the 2000s¹⁰⁾. Also, massages such as the form roller exercises relieves the muscle of the cramps, stimulates the deeper part of the muscles, and, through such stimulations, calms down the nerves, relaxes the muscles, facilitates the blood circulation, and helps fatigue recovery¹¹⁾.

With regard to the influence on the pressure pain, the two groups showed statistically significant decreases in the rectus femoris, hamstring, and gluteus. And, in the comparison between the groups, there was an effective reduction in the iliotibial tract of the vibration foam roller exercise group. In support of the findings in this study was Cheathaam & Kolber¹²⁾, where the quadriceps and hamstring had their threshold values reduced effectively. Also, in similar studies regarding vibration, it was reported that vibration may control pain or enhance the exercise performances when used in combination with them¹³⁾. Also, it has been reported that the subtle vibration energy can not only build up the muscular tissues by facilitating the contraction and relaxation of the muscles but also be advantageous in the less amount of tissue damage risks, while having dynamic effects such as circulation facilitation, stretching of the soft tissues, prevention of adherence destruction, enhancement of flexibility in tissues, and reduction of pain¹⁴⁾. The vibratory stimuli applied to the muscle activate the muscle spindles. As a result, not only the muscles under the direct influence of the vibratory stimuli but also the muscles near them can be affected¹⁵⁾. Pollock et al.¹⁶⁾ reported that vibratory stimuli on quadriceps could enhance the sensitivity to the knee-tendon reflection. Yang et al.¹⁷⁾ reported effectiveness in activation of the sensory receptors. This is a method that is actively used in many treatments. And, the same result was obtained in this study, too.

The positive aspect of this study was that the participants participated in the exercises out of curiosity on the vibration foam rolls, and they found that, unlike the normal form roller exercises, the pain was diminished during the exercises. The limitations of this study were that the participants experienced form roller exercises for the first time, and they had much difficulties in learning the initial motions of the exercises and the influence of daily life on the hip joint was not controlled. The result of this study showed the effect of the vibration form roller exercises. Therefore, various exercise methods would have to be developed in order to overcome the limitations in the existing form roller exercises.

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