ANALYSIS OF ELECTROMYOGRAM OF ADDUCTOR LONGUS MUSCLE DURING PILLOW-SQUEEZEAND BRIDGE MOVEMENT OF PILATES

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Abstract - The objective of this research is to find out the Impact of Pillow Squeeze and Bridge movement of Pilates on the electromyogram of Adductor longus muscle. The method was conducted to analyze the electromyogram on adductor longus of 16 adult women and men who live in J city. For the analysis of the electromyogram of adductor longus, this research used Tringo Wireless EMG System of DELSYS corporation, and found out the maximum value of RMS using RMS method. This measured data was calculated to draw the maximum value of EMG of adductor longus of each movement using SPSS 1.2 statistics program and was analysed using One-Way ANOVA to figure out the differences between EMG maximum values. This research could conclude with these results conducting Pairwise Comparisons to verify the differences among 4 selected movements. First, There was no statistically relevant result on the maximum value of level of activation of adductor longus between movement 1 and movement 4. Second, There was no statistically relevant result on the maximum value of level of activation of adductor longus between movement 2 and movement 3. Third, The levels of activation of movement 1 and movement 4 were higher than those of movement 2 and movement 3. As a result of this experiment, Pillow Squeeze and Bridge movement of Pilates made a lot of role in activation of muscles of adductor longus, and Pillow Squeeze applied movement with posture of leg lifting was especially effective to activation of muscles. This can give us an insight that we would reach a better conclusion on effect to the body of Pilates movements if we experiment more muscles with these Pillow Squeese and Bridge movement in the next reseach.

Key Words - Pilates, Adductor longus, Adductor, Pillow squeeze, Bridge

I. INTRODUCTION

Many people are exercising for beautiful body and health these days, and the interest in exercising is increasing. Park, Soo-jin (2015) stated that wellness is a compound word of well-being, happiness, and fitness. Healthy mind and healthy body are considered to be closely related to happiness. In addition to physical health, mental health and social health were gradually promoted in a society.

Among the various exercises, the most popular exercise for women is the exercise that makes pretty lines like pilates and yoga. Pilates, which has become popular all over the world these days, was originally made for rehabilitation purpose, You can use the tools and instruments to get the right movements and exercises as much as you want. Pilates is composed of a wide variety of movements with either no tools or tools (reformers, cadillacs, barrels, balls, circle rings, elastic bands, foam rollers). Each movement is designed to improve a particular muscle.
However, which of the actions would be the most beneficial to a particular muscle or the most effective on that muscle. For example, among the variousforms of pilates exercises that benefit the abdominal muscles, it would not be certain the most stimulating exerciseon the abdominal muscles. Lower body muscles were considered to be important health indicator for women (Nakano James Shulchi, 2013). Studies on pilates, cores and abdomen have been relatively advanced, but there is a lack of experiments comparing the movements and experiments on the lower body muscles. In addition, there were many studies on diet, obesity, body fat and physical strength, but it was difficult to find a study to evaluate the degree of muscle activation.

The purpose of this study is to use electromyography to find out which of threetypes of Pillow Squeeze exercises ora Bridge exercise was the most effective in activating adductor muscles in lower body.

II. METHOD

2.1 Subject

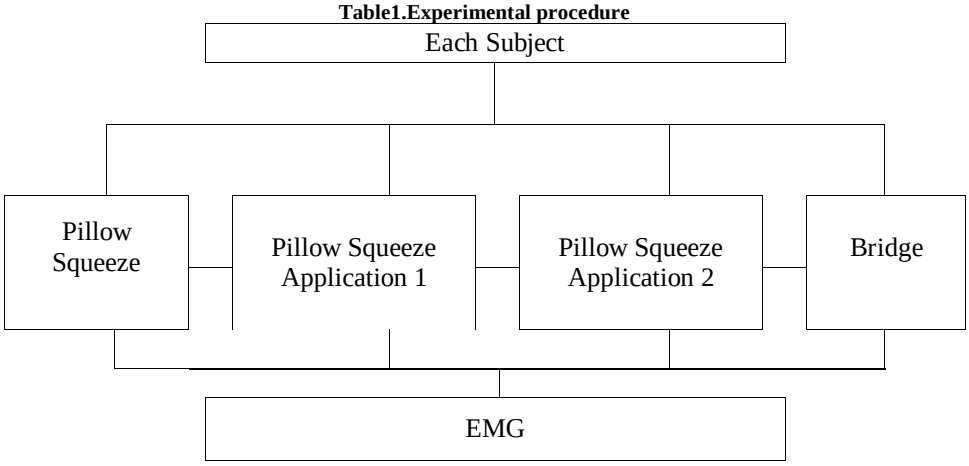
Sixteen healthy 20 year old boys and girls who had no Pilates exercise experience were selected for the present study. Subjects did not have any specific internal or external disease and did not consider the subject's athletic ability.Prior to participating in this experiment, all subjects were fully explained the objectives, methods, experimental contents and procedures, expected effects, and potential factors of the experiment.

2.2 Design

In this study, experiments were conducted to investigate which of the four movements of Pilates was most effective for activatingadductor longus muscle. Pilates breathing method was explained to the subjects. During Pillow Squeeze, Pillow Squeeze application 1, Pillow Squeeze application 2 and Bridge exercises, Wireless EMG(Trigno Wireless EMG system, Delsys, USA) on the adductorlongus muscle was measured. The experimental procedure in

the present study was as follows.

Table1.Experimental procedure



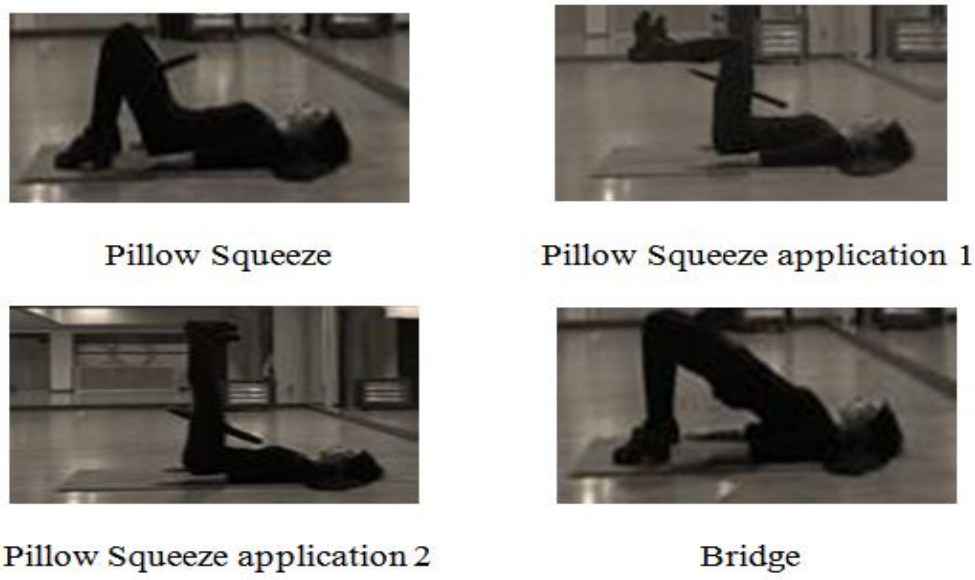


Figure 1. Motion of 4 types of Pilates

2.3 Analysis

EMG works analysis (Delsys, USA) was used to investigate the degree of muscle activation during eachmotion(figure 1). As shown in Fig. 2, three peaks of Y Max were selected for the most effective activation during 30 second interval.

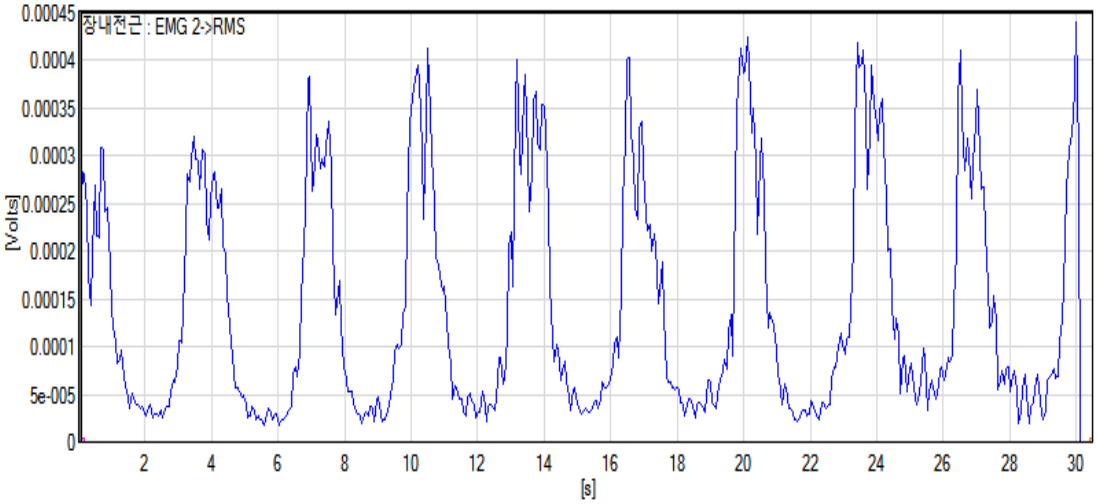


Figure 2.EMG peaks during a 30 second trial.

III. RESULTS

The M (average) of the Pillow Squeeze was 3.73 ± and the SD (standard deviation) is 2.45 ±. For Pillow Squeeze application 1, M is 4.48 ± SD is 2.64 ±. For Pillow Squeeze application 2, M was 4.73 ±, SD was 2.70 ±.For Bridge, M was 3.42 ± and SD was 2.29 ±. There was statistically significant difference between maximal EMG values ($p < 0.001$).

	N	M	SD	F	P
Pillow Squeeze	16	3.73	±2.45	7.58	P < 0.001
Pillow Squeeze Application 1	16	4.48	±2.64		
Pillow Squeeze Application 2	16	4,73	±2.70		
Bridge	16	3.42	±2.29		

Figure2. Statistics of EMG of Adductor longus mV=0.0001

DISCUSSION

This study was designed to help educate pilates about the most effective actions of intramuscular muscles during pilates operation. To determine the degree of muscle activation, EMG analysis was the most effective. The authors concluded that the Pillow Squeeze and Bridge which feet were attached to the ground were more stable. It would have been better to have a better grip on the floor to be more effective in stabilizing the whole body. The reason for this result may be that the maximum force could be generated when the muscle length was at the minimum unit of sarcomere muscle contraction. This could be because the resting length was the optimal resting length when the leg was bent or lifted. In addition, the actions of putting the soles on the floor were counteracted by the pressing force of the floor, that was, the ground reaction force (Gerry Carr 1997), and the forces were dispersed while being tightened inward by the law of inertia. In Choi, Eun-young (2010), the knee-gathering position induced internal rotation of the hip joint, and when this operation was continued or repeated, hypertrophy of the femoral root canal occurred. It was not related to strengthening the adductor longus muscle of the lower body muscles, but this phenomenon was thought to occur when exercising too much or repetitively.

ACKNOWLEDGEMENT

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