Effect of Kinesio Tape and Compression Garments on Lower limb Function and Balance

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키네시오 테이프와 압박의류가 하지기능과 균형에 미치는 영향

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Abstract

This study measures lower extremity function and balances to investigate the impact of Kinesio tape and compression garment on lower extremity function and balance ability. The sample of 18 peoples without any musculoskeletal disease who volunteered to be the subject of the study. We measured all subjects on the following metrics to evaluate the function and stability under the normal condition, with KT technique and CG: vertical jump height and reaching distance Anterior, Posteromedial, Posterolateral and NO, NC, PO, PC were evaluated. All measures were analyzed using paired t-test, independent t-test and verified using Shapiro-Wilk. We found the significant differences that groups using the KT technique in VJH have a p-value larger than .05($p<.05$) but, there was no much difference in the group that used CG. And, in the case of Dynamic balance, KT and CG group's significant p-value for reaching three directions (Anterior, Posteromedial, Posterolateral) was smaller than .05($p<.05$). In addition, in the case of static balance, the KT group's significant p-value was less than .05($p<.05$) in ST and WDI of PC position, and the CG group's significant p-value was less than .05($p<.05$) in ST, WDI of PO, PC position. As a result, applying KT technology helps lower extremity function, and wearing CG helps to improve balance ability. The study was limited since the subjects were a normal general and the gender of the subject consisted only of women.

1. Introduction

In response to increase in average life expectancy of the modern people, the health became a huge common interest for everyone. As a result, more people are interested in sports injuries [1,2,3]. According to Wunderlich, et al. (2021), Kinesio Taping (KT) was developed as Kenzo used an elastic therapeutic tape for the taping on the skin in 1970s. These days, Kinesio Taping is widely used in orthopedics and sports medicine to prevent injuries of athletes [4, 5]. Wang, et al. (2018) said taping is a natural therapy which controls pain by applying an adhesive tape without chemical treatment on the human muscle to use the mechanism of muscular homeostasis for normalization of muscle weakness, muscular spasm, and tension, improvement of blood, tissue fluid, and lymph, balancing of muscles that are not in harmony with surrounding matters, and relief of symptoms and pain [5,6]. According to Daniel, et al. (2017), use of Compression Garment(CG) which facilitates the circulation of vein blood flow is spreading to various fields. CG has been gaining popularity among athletes for enhancing performance, reducing fatigue, and reducing risk of injuries during exercise and sports matches [7,8,9]. Thus, it is necessary to identify how CG and KT easily usable by anyone with fewer side effects influence on the lower leg functions and balance of university students with increased muscle fatigue to contribute on relieving the symptoms related to lower leg functions of all people who stand for a long time during work or who often suffer from accumulative leg fatigue, preventing the health problems related to leg circular system, and improving the health of the people for enhancing the quality of life.

2. Method

2.1 Participant

This study targeted on 18 healthy adult women(Age: 23.44±1.23, Height: 164.36±5.91, Weight: 56.5±6.44) from S University

located in Asan-si, Chungnam, Korea. All subjects were given thorough explanations on purpose and method of the research before participation. For the research design, this study compared the two groups in pre-post test control group design (randomized). This study was approved by the IRB (Institutional Review Board) of Sunmoon University (SM-202005-034-2).

2.2 KT technique and Compression Garment

It used the Kinesio tapping technique (Nitto Denko Corporation, Osaka, Japan) of Osaka, Japan. KT applied the "I" shape strip to the tibia and the "Y" shape strip to the gastrocnemius. CG(VENEFLEX compression calf taper set, 4WIN Corporation, Seoul, Korea) is made of 35% spandex material and 65% nylon, and there is an adhesive streak of silicon on the inside lining, so It is designed to compress calves.

2.3 Measuring function of lower extremity (Vertical jump)

All participants performed a five-minute static stretching exercise before the experiment to prevent injury. After a one-minute break, record the position by extending the arm upwards, according to the researcher's signal, the subjects move downward and jump vertically as fast as possible to the maximum height to touch the wall with chalk on it. Measure the topmost part of the mark. The researchers allowed the knee to jump naturally without limiting the angle of the knee. The jump was measured three times for each condition.

2.4 Measuring stability of body

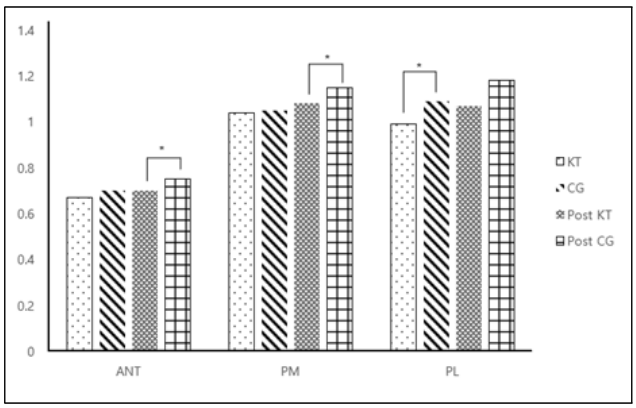
This study measured the dynamic balance based on the reach distance in the Y-Balance Test (Perform Better, U.S.A) When subjects couldn't maintain a posture in the platform (Example : Attempt was disposed and subjects tried again when the stretching leg touches the ground, when the subject falls from the stand platform, or when the subject fails to keep pushing the block with the stretching leg). This study measured the static balance by using TETRAX (Tetra-ataxiometric posturography, Israel). The subjects were measured with eyes open in stable platform (NO), eyes closed in stable platform (NC), eyes open in dynamic platform (PO), and eyes closed in dynamic platform (PC). Each measurement lasted for 32 seconds before and after the intervention. This study also used stability index (ST) and weight distribution index (WDI) for the evaluation. WDI expressed the weight bearing in percentage.

2.5 Data analysis

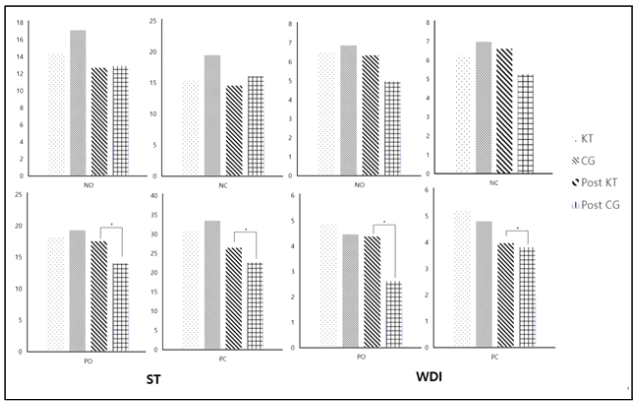
In this research, descriptive statistics were used to analyze the mean and SD(Standard Deviation) of each variable. For all statistical analyses, SPSS/PC ver.20.0 for windows program (SPSSINC, Chicago, IL) was used and the normality test was performed and satisfied. We analyzed using paired t-test to determine the difference between before and after the intervention, to find out the difference in the results between each group, we used an independent t-test to analyze them. The statistical significance level was set to $\alpha = .05$. Post-hoc analysis tests used Shapiro-Wilk.

3. Result

We found the significant differences that groups using the KT technique in VJH have a p-value larger than .05 ($p<.05$) but, there was no much difference in the group that used CG. And, in the case of Dynamic balance, KT and CG group's significant p-value for reaching three directions (Anterior, Posteromedial, Posterolateral) was smaller than .05 ($p<.05$) [Figure 1]. In addition, in the case of static balance, the KT group's significant p-value was less than .05 ($p<.05$) in ST and WDI of PC position, and the CG group's significant p-value was less than .05 ($p<.05$) in ST, WDI of PO, PC position[Figure 2]. As a result, applying KT technology helps lower extremity function, and wearing CG helps to improve balance ability.



[Fig. 1] Change of normalized score Y-balance test by each group according to intervention
(ANT, Anterior), (PM, Posteromedial), (PL, Posterolateral)



[Fig. 2] Change of stability index and Weight distribution index by each group according to intervention
ST: Stability Index, WDI: Weight Distribution Index, (NO, Normal eye open), (NC, Normal eye close), (PO, Pillow with eye open), (PC, Pillow with close eye)

4. Discussion

KT is applied in a one-dimensional plane, CG is the same asKTthat stimulates the skin's mechanical receptors, but overall pressure is added. In two dimensions, the overall pressure on the calfskin provides additional sensory signals incorporated by the central nervous system to reduce body sway in the event of a disturbance in CG's standing position, allowing quick adaptation of the skin's mechanical receptors [10].

Applying KT technology helps the lower extremity function, although there is no difference between KT technology and CG in terms of stable surface, it can be concluded that CG helps to improve balance ability than KT technology in terms of unstable surface.

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