

Effects of Kinesio Taping on Muscle Tone, Stiffness in Patients with Shoulder Pain

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| Abstract |

PURPOSE: The purpose of this study was to identify the effects of physical therapy plus Kinesio taping (KT) on muscle tone and stiffness in patients with shoulder pain.

METHODS: This study included 22 participants who were divided into the experimental group (n=11) who underwent a routine physical therapy with KT and the control group (n=11) who received the same physical therapy only. The physical therapy consisted of heat application and electrical stimulation. Heat was applied for 10 minutes and electrical stimulation was conducted for 20 minutes. Intervention was provided over a 1-week period, and frequency for muscle tone and stiffness was measured to determine changes in shoulder muscle status. The muscles were supraspinatus and deltoid. Measurements were taken before, after 1day, 3day and after 1 week to identify time-dependent effects of intervention.

RESULTS: The effects of the intervention were significant in both groups, and effects were greater in the experimental group. Changes in muscle tone and stiffness

were statistically significant in both groups and at varying time points ($p < .05$).

CONCLUSION: Based on the improved muscle performance found in this study, KT is considered an effective intervention strategy for patients with shoulder pain when it is combined with conventional physical therapy.

Key Words: Kinesio taping, Muscle tone, Shoulder pain, Stiffness

I. Introduction

The prevalence of shoulder pain is widespread, accounting for 7~ 38% of the total population (De Hoyos et al., 2004). Shoulder pain is commonly caused by impingement syndrome and rotator cuff problems (Johansson et al., 2005). These symptoms are usually treated through physical therapy under a primary option. Surgical treatment option is also available although it is not easily accessible and poses a possible risk of adverse events (Gerdesmeyer et al., 2003). Thus, conservative management should be prioritized and undertaken in an effective way to deal with the concerned condition (Green, 2003). In general, physical therapy is the mainstream of conservative management and focuses on pain management and range of motion (ROM) improvement (Ginn et al., 1997; Kim

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et al., 2014). However, physical therapy alone may not be enough to achieve desired outcomes, thereby requiring other techniques (Stiller, 2013).

Among them, taping is commonly used for the treatment and prevention of sports injuries, making tape applications widespread in sports and clinical settings (Birrner and Poole, 2004; Host, 1995). KT is designed to treat and prevent musculoskeletal injuries and has been reported to reduce pain and improve ROM (Refshauge, 2000). Tapes applied over joints and muscle areas are known to facilitate mobility and reduce the risk of further injury by increasing proprioception in a taped area (Cho and Choi, 2015; Kase et al., 2003). KT enhances the activity of the underlying muscles, depending on taping methods, and creates a space between the skin and muscle, when applied to skin, allowing for smooth blood and lymph flow (Shamus and Shamus, 1997). Kinesio tape is also easy to apply to any part of the body. These advantages make KT a common treatment approach in clinical contexts.

This study aimed to identify the effects of taping on shoulder pain when patients underwent conventional physical therapy with taping by measuring changes in frequency for muscle tone and stiffness.

II. Methods

1. Subjects

This study included 22 patients with shoulder pain who were treated at the S hospital in Daegu, Korea. The subjects were divided into the experimental group and control group, depending on whether or not taping was applied, although they all underwent physical therapy for the treatment of shoulder pain.

2. Procedures

For the experimental group, Kinesio tape was applied according to the original Kinesio taping method, developed

by Kenzo Kase (Kase et al., 2003). The physical therapy consisted of heat application and electrical stimulation. Heat was applied for 10 minutes and electrical stimulation was conducted for 20 minutes. One Y-strip of Kinesio tape was applied to the supraspinatus and deltoid muscles. The tape application over the shoulders was performed according to the Kase Kinesio Taping Methods (Kase et al., 2003). After the physical therapy, the tape was attached and the tape was removed prior to sleeping. To determine time-dependent muscle changes, frequency and stiffness was measured using MyotonPro (AS, Talinn, Estonia). The MyotonPRO was used to measure the tone (Hz) and stiffness (N/m) muscles. The measurement procedure involved pressing the device against the skin. The skin surface oscillation induced by the MyotonPRO was measured to verify the value of the mechanical variability (Bailey et al., 2013).

Measurements were performed at before intervention, after day 1, after day 3 and after week 1 during the 1-week intervention period. These measurements were compared to baseline values to determine time-dependent effects of taping. Participants were asked to remove the tape before each measurement to eliminate any effects of the tape on frequency and stiffness.

3. Statistical analysis

Data analysis was performed using SPSS to test the normality of data. Repeated measurements were performed to determine time-dependent changes in frequency and stiffness after the initiation of the intervention. A statistical significance level was set at .05.

III. Results

This study group were shown to be 53.13 ± 12.35 years, 168.46 ± 5.86 cm, and 76.64 ± 12.42 kg respectively. There were significant difference muscle tone (frequency) and

Table 1. Muscle tone, Stiffness on each group

Muscle	Group	Factor	Pre	After 1day	After 3day	After 1week
Supraspintus	CG	MT (Hz)	24.64±3.31	22.53±2.51 [†]	21.01±2.15 ^{†‡}	20.97±2.51 ^{†‡}
		S (N/m)	453.65±24.51	423.21±18.85 [†]	419.51±15.65 ^{†‡}	408.51±19.51 ^{†‡}
	EG	M (Hz)	21.85±3.81	17.51±3.61 [†]	15.51±2.51 ^{†‡}	14.51±2.51 ^{†‡▲}
		S (N/m)	472.81±27.51	435.52±28.51 [†]	420.52±19.51 ^{†‡}	404.51±12.84 ^{†‡▲}
Deltoid	CG	MT (Hz)	22.35±2.565	21.58±2.96 [†]	20.89±2.98 ^{†‡}	20.56±3.51 ^{†‡}
		S (N/m)	387.54±35.15	349.89±28.59 [†]	340.89±30.85 [†]	331.79±28.19 ^{†‡}
	EG	M (Hz)	23.26±2.35	22.98±2.51 [†]	21.55±1.51 ^{†‡}	20.88±1.98 ^{†‡}
		S (N/m)	398.84±19.54	368.46±23.55 [†]	346.28±20.84 ^{†‡}	323.89±18.55 ^{†‡▲}

CG: control group, EG: experimental group, MT: muscle tone, S: stiffness

[†] significant difference compared to pre

[‡] significant difference compared to after 1day

[▲] significant difference compared to after 3day

p<.05

stiffness following intervention time in two groups, between control group and experimental group (p<.05) (Table 1).

IV. Discussion

A variety of effects have been reported in previous studies applying KT (Murray, 2001). In the majority of these studies, KT was applied to various parts of the body and the resulting effects were discussed (Osterhues, 2004). In this study, physical therapy plus KT resulted in greater improvement in muscle performance than physical therapy alone. The positive effects of intervention on both experimental and control groups are partly attributed to pain relief and functional improvement resulting from physical therapy. In the comparison between the experimental and control groups, a reduction in muscle tension was more significant in the former, which is consistent with the findings of the previous studies that the effects of KT were greater during a short-term period. In previous studies, pain relief and ROM improvement were achieved immediately after KT applications (Frazier et al.,

2006). However, there were no differences in outcomes at day 3 and afterwards, when compared with the fake taping group (Thelen et al., 2008). This means that early improvement achieved after tape application was not maintained over time. In this study, reduced muscle tension was maintained after intervention, albeit with decreased magnitude, given that KT applications do not affect muscle alignment and frequency directly like ROM.

Shoulder range of motion is large given the high degrees of freedom (Neumann, 2013). As a result, the ratio of shoulder joint movements to total activities of daily living is high. Despite the need for a wide range of motion, the shoulder joint is potentially unstable in terms of bony structure (Neumann, 2013). However, the shoulder comprises many muscles and ligaments to enable joint stability (Blasier et al., 1992). Among the muscles that contribute to shoulder joint stability, the rotator cuff muscles play a key role during abduction along with the supraspinatus and deltoid muscles (Reinold et al., 2004). Abduction is one of important motions of the shoulders. That is why taping was applied to the supraspinatus and deltoid muscles and frequency and stiffness was measured in this study. As demonstrated in this study, physical therapy combined

with taping can facilitate shoulder pain management by allowing analysis of changes in muscle frequency and stiffness. If taping techniques for different shoulder muscles are further tested in future studies, more diverse taping interventions can be available for patients with shoulder pain.

V. Conclusion

This study underlines that physical therapy is more effective in improving muscle performance when it is combined with taping and that the combined approach can be used as an important intervention strategy for patients with shoulder pain

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