



Original Article

Effect of kinesio taping on the isokinetic muscle function in football athletes with a knee injury

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Abstract. [Purpose] The purpose of this study was to determine the difference in isokinetic muscle function in football athletes with a knee injury with and without kinesio taping. [Subjects] The subjects for this study were 10 football athletes (males) with a knee injury. [Methods] Measurements were performed by using Cybex dynamometer under uniform motion before and after the application of kinesio tape to the quadriceps and hamstring muscle. Maximal concentric knee extension and flexion at three angular velocities (60°/s, 120°/s, and 180°/s) were measured. [Results] A significant difference was found in peak torque and total work of the flexion at 120°/s and 180°/s, as well as in the average power of extension at 180°/s. [Conclusion] Though it is not the main therapy for muscle function in football athletes with injury, kinesio taping was an effective adjunct therapy.

Key words: Kinesio taping, Isokinetic function, Football athletes

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INTRODUCTION

Physical fitness is involved in complex functional activities, including muscle strength, muscular endurance, and thigh strength related with anaerobic power¹⁾. Physical fitness is essential for football athletes, for whom thigh strength is a highly critical factor of athletic performance²⁾. However, football athletes are easily exposed to the risk of injuries. In particular, injuries frequently occur in joint areas such as the knees and ankles³⁾. Injuries around the joint areas cause an abnormal functional injury in the proximal muscles and injuries in football athletes decrease the quadriceps muscle function and knee stability, thus affecting athletic performance. Thus, the quadriceps plays an important function in the recovery of injured area, physical fitness, and muscular function. Therefore, clinical therapists have aimed to strengthen the quadriceps muscle and stabilize the knee joints⁴⁾.

One of the proposed methods is taping therapy. In general, rehabilitation therapists use taping as an intermittent treatment method for pain relief and knee stability⁵⁾. The effects of taping are relief from pain in the affected parts, increase in the blood circulation, and improvement in function⁶⁾. Knee taping has been reported to correct the direction of the patella femoral joint, thereby relieving tissues of the stress from inflammation, and thus contributing to pain relief⁵⁾.

Previous studies on taping for the lower extremities reported that it results in increases in the isokinetic muscle function, grip of the upper extremities, and isometric power^{7–11)}. Few studies previously identified positive results from the muscle strength evaluations by using an isokinetic device after the taping. The isokinetic device has been used as a method for improving the muscle strength in athletes after the isokinetic exercise was introduced as a rehabilitation treatment method for patients with an orthopedic injury¹²⁾. Recently, exercise using an isokinetic device is considered highly effective for improving muscular function, and has an advantage of providing objective and reliable data¹³⁾.

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As mentioned earlier, taping therapy was suggested for use by clinical therapists for patients' recovering from an injury. However, previous studies were conducted only in athletes without general injuries who underwent kinesio taping to improve motor performance ability. Moreover, the number of studies on the isokinetic muscle function of football athletes who had injuries in the lower extremities is insufficient. Hence, the present study aimed to compare the differences in isokinetic muscle function of the thigh muscle in football athletes with knee injuries before and after kinesio taping.

SUBJECTS AND METHODS

The subjects in the present study were 10 football athletes who were admitted to Choi sports rehabilitation clinic for injuries in the knee area, and who voluntarily provided the consent for participation. The inclusion and exclusion criteria were as follows in the study: First, the onset of injury should be within 3 months prior to the start of the study. Second, the subjects should be males. Third, subjects with injuries in other parts of the body were excluded. Fourth, subjects younger than 18 years were excluded. Isokinetic muscle function of the thigh muscle was measured by using the Humac Norm Cybex extremity system (Computer Sports Medicine Inc., Stoughton, USA) before and after kinesio taping (MSSM Kino Soft Inc, Seoul, South Korea). All test protocols were approved by the institutional review board of the Physical Therapy Faculty of Kangwon National University.

The mean age, height, and weight of the subjects were 20.6 years, 177.1 cm, and 70.3 kg, respectively. Humac Norm Cybex extremity system was used to measure the isokinetic muscle function of the quadriceps and hamstring muscles, which belong to the thigh muscle group attached to the knee joints. During measurements with the isokinetic measurement device, the subjects were allowed to practice with 3 repetitions to adapt and fully exert their muscle strength. The axis of revolution of the dynamometer and the knee joint axis of revolution of the examinee were aligned during the measurement. The lever arm was tied to a spot higher than the length of the thumb from the outer lateral bone of the ankle joints to the knee joints to be measured. The thigh muscles attached to the knee joints to be measured were tightly fixed with a strap to prevent compensation, and the bodies were fixed to the measurement chair by tightening the seat belts to prevent movement of the torsos. In this way, the quadriceps and hamstring that are attached to the knee joints to be measured were independently evaluated.

Isokinetic muscle function was measured 10 times each at 60°/s, 120°/s, and 180°/s. The participants were given 1-min breaks between the tests and were allowed to see their results on a computer monitor during the measurement as a visual feedback in order to fully exert their muscle strength. The examiners motivated them as much as possible¹⁴.

Kinesio taping was applied to the thigh muscle group, which targeted the rectus femoris covering the area from the anterior inferior iliac spine, the origin, to the patellar tuberosity of the tibia bone, the insertion of the knee joint. For the application of kinesio taping, the examinees were postured with the muscles stretched from the anterior inferior iliac spine as the starting point. Then, the tape was attached without being extended along the muscle grain. Kinesio taping was applied on the hamstring muscle, starting from the ischial tuberosity, the origin, to the lateral part of the fibular head in the biceps femoris and to the insertion of the lateral condyle in the tibia.

The tape was overlapped starting from the ischial tuberosity to one-third of the region of the hamstring and then applied to the remaining two-thirds of the hamstring, the distal part, dividing it into the medial and lateral directions. Kinesio taping was applied on the hamstring, along the muscle grain, in a stretch posture¹⁵.

RESULTS

Changes in the isokinetic muscle function depending on differences between the injured side before and after taping are as follows (Table 1): Of the three variables, only one, namely, motion at each angular velocity in each variable showed a significant increase, and no significant increases were observed in the motions at other angular velocities ($p < 0.05$). Changes in the isokinetic muscle function depending on differences between the normal side before and after taping are as follows (Table 2): In the non-affected side, extension average power at three angular velocities (60°/s, 120°/s, and 180°/s) showed significant increases. An increase in the isokinetic muscle function was observed to be dependent on the angular velocity, except for some parts as in the affected side.

DISCUSSION

Despite being young, football athletes are exposed to injury risks in the lower extremities because of undergoing a substantial amount of trainings and games. Demands for physical therapy and rehabilitation treatment tend to increase owing to their injuries. Moreover, their thigh muscular function is markedly deteriorated, with increased fatigue, decline in muscle strength, and body imbalance¹⁶.

Rehabilitation therapists have paid much attention to the proximal areas of injured joints for the recovery of muscular function. One method is taping, which has been widely used to support and strengthen the components of body structure, including the joints, muscles, and tendons¹⁷. However, few previous studies have reported that taping had no effect^{18, 19}.

A previous study reported that compared the effect of kinesio taping before and after applications, no difference was observed in the peak torque value²⁰. In the present study, however, among the values measured at 180°/s of angular veloc-

Table 1. Thigh muscle isokinetic function with or without kinesio taping of the affected side

Variable	Degree (°/s)	Action	Before		After	
			Mean	SD	Mean	SD
Peak torque	60	Extension	195.8	31.6	201.3	29.4
		Flexion	110.9	22.9	115.1	19.3
	120	Extension	160.2	20.9	165.2	21.0
		Flexion	94.4	20.4	99.9	14.5
	180	Extension	139.7	16.9	142.2	15.4
		Flexion	81.1	18.5	85.9*	18.5
Total work	60	Extension	1,938.0	370.0	1,964.2	323.0
		Flexion	1,185.1	300.4	1,217.3	253.0
	120	Extension	1,702.5	238.1	1,744.4	231.2
		Flexion	1,012.9	254.1	1,104.4*	206.2
	180	Extension	1,466.0	240.4	1,488.2	181.7
		Flexion	863.3	250.4	930.8	226.7
Average power	60	Extension	133.5	19.4	136.8	19.6
		Flexion	85.9	15.3	89.1	13.6
	120	Extension	203.6	22.4	206.5	18.7
		Flexion	129.4	28.8	136.9	21.0
	180	Extension	231.9	26.9	241.4*	20.9
		Flexion	142.8	30.0	152.2	28.6

*p < 0.05

Table 2. Thigh muscle isokinetic function with or without kinesio taping of the non-affected side

Variable	Degree (°/s)	Action	Before		After	
			Mean	SD	Mean	SD
Peak torque	60	Extension	221.2	28.4	223.8	31.7
		Flexion	126.7	15.1	118.3*	16.1
	120	Extension	174.2	24.0	179.7*	18.7
		Flexion	104.0	16.2	109.0*	13.3
	180	Extension	149.7	15.4	151.8	13.7
		Flexion	92.9	14.5	94.1	13.5
Total work	60	Extension	2,183.2	337.4	2,230.4	389.1
		Flexion	1,413.2	281.1	1,328.0*	282.7
	120	Extension	1,815.2	276.7	1,864.7	282.2
		Flexion	1,165.9	234.0	1,211.8	176.6
	180	Extension	1,592.6	244.3	1,603.2	226.3
		Flexion	1,021.1	205.5	1,018.3	144.8
Average power	60	Extension	147.1	20.3	155.8*	19.7
		Flexion	101.4	14.9	95.9	15.1
	120	Extension	216.4	22.9	224.6*	21.8
		Flexion	146.1	25.2	151.7	15.7
	180	Extension	246.4	24.2	255.1*	21.3
		Flexion	166.9	24.8	170.3	23.5

*p < 0.05

ity, the peak torque at the injured side and flexion showed a significant increase. In addition, the flexion motion showed a significant increase among the total work values measured at 120°/s of angular velocity. Although other peak torque and total work values showed no significant increases, their values tended to increase according to the results of overall comparisons between the mean values before and after the therapy. Similarly, a previous study on knee joints showed a significant increase

only at 60°/s of angular velocity²¹). As these effects were from one-time application of kinesio taping, they may not be significant. Nevertheless, they may be significant in the psychological aspects of the athletes and knee stability. Furthermore, kinesio taping is considered useful for the recovery of functions of the knee flexor muscle of athletes in sports that involve a substantial amount of running and motion, such as football.

More results from comparisons between the peak torque values before and after taping showed significant differences for the normal side but not for the injured side. However, the flexion exceptionally showed a significant reduction at the angular velocity of 60°/s. This is considered to be caused by kinesio taping, whose effect on muscle fatigue might be greater than its desired outcomes during measurement of isokinetic muscular function in the examinees who might have complained of psychologically conscious discomfort in kinesio taping.

Therefore, among the 18 variables, peak torque, total work, and average power were significantly increased in the affected side, whereas the rest of the variables had no significant increase. Despite this, no overall significant increase in the isokinetic muscle function was observed in the present study; kinesio taping is believed to be useful as adjunct therapy for improving functional performance ability. In addition, it is expected to affect generation of action potential, increase in circulation, and stabilization effects of joints via physiological mechanisms. Thus, further studies on multilateral aspects, including muscle activity assessed by using electromyography, evaluation of proprioception, effects on the circulatory system, and kinematic analysis, are deemed necessary in order to investigate the effects of kinesio taping.

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