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ACL Repair

Effects of Kinesio Taping® on Muscle Strength after ACL-Repair

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Improvement in strength in the anterior and posterior thigh muscles following anterior cruciate ligament (ACL) reconstruction is a major focus for physical therapists, athletic trainers and other rehabilitation specialists. In general, there is a significant decrease in both extensor and hamstring muscle strength, with significant morbidity due to extensor lag. Efforts to increase quadriceps femoris and hamstring muscle strength may be hampered by the pre-surgical muscle atrophy commonly noted in ACL injured individuals, as well as post-surgical pain and swelling. Undesirable outcomes for soft tissue structures surrounding the knee after ACL-reconstruction can be correlated with restricted muscle contraction or limitation of knee motion.

Although the techniques of cutaneous stimulation to enhance muscle contraction are widely used in rehabilitation settings, the effect is not long-lasting, with most overflow continuing only about 15-30 minutes after cessation of treatment. No modalities or externally applied dressings have been described that prolong the treatment effects.

It may be that an elastic tape might cause proprioceptive stimulation while at the same time not limiting the enhancement of improved joint range of motion and thigh muscle function during rehabilitation. One such elastic tape is called Kinesio® Tape, long used for rehabilitation and during athletic competition in countries such as Japan, but not introduced into the United States until 1995. Kinesio® Tape is a relatively unique tape that is capable of stretching up to 130-140% of its resting state, may either be used as a compressive or non-compressive external adjunct to rehabilitation, is approximately the same weight and thickness of skin, and has no medicinal qualities. In addition, Kinesio® Tape is reported to be hypoallergenic and, due to its construction, allows the skin to breath.

Little is known of the proprioceptive effects of elastic tape, but it may be anticipated that there

will be a facilitatory effect of cutaneous mechanoreceptors as has been noted in the case of athletic tape. This mechanism may be an underlying component in the return of muscle function after injury. The purpose of this study is to compare the effects of Kinesio Taping® versus athletic tape on muscle strength in the quadriceps femoris, hamstring and anterior tibialis muscles of the lower extremity in individuals with recent ACL reconstruction.

Methods

In this study, 2 healthy adults, volunteered to perform an active knee extension as completely as possible. Each subject was positioned on a chair with an elevated seat such that their involved lower extremity did not touch the floor. Electromyographic (EMG) surface recording electrodes were placed on the skin over the muscles of the anterior and posterior thigh, and anterior leg compartment muscles. Each subject was asked to perform a single full knee extension with the involved side, and measurement of the active joint range of motion was made with a hand goniometer. EMG recordings were taken as the subjects then performed four full knee extensions. The goniometric and electromyographic measurements were made for the following conditions: no tape, athletic tape and Kinesio® Tape, with the latter applied to the method of Kase (1994).

Results

In both subjects, no difference was noted in extensor lag between the no tape and the athletic tape conditions. However, under the Kinesio® Tape condition, there was a significant improvement in the active joint range of motion. EMG measurements revealed similar results with little to no difference between the no tape and athletic tape conditions, whereas under the Kinesio® Tape condition there was an immediate increase of approximately 1½ times in amplitude compared to the prior conditions. In addition, each subject commented that they felt the muscle contraction was stronger when Kinesio® Tape was applied compared to either no tape or with athletic tape.

Conclusions

In this preliminary study, it was found that Kinesio® Tape applied to the anterior aspect of the thigh could significantly enhance the joint active range of motion and that this increase is correlated with an increase in surface EMG of the muscles of the anterior compartment of the thigh, the quadriceps femoris muscle. It is not known as this time if the effects demonstrated in this study are mediated by skin mechanoreceptors. Nor is it known if the enhanced muscular contraction noted shortly after application of Kinesio® Tape would be sustained after a prolonged period. These and other questions need to be addressed in further research efforts.

References

Kase K. 1994. Illustrated Kinesio Taping®, 3rd Ed., Ken'I Kai, Tokyo, pp.90-91.