

## EFFECT OF KINESIOTAPING ON PROPRIOCEPTION IN PATIENTS POST ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION SURGERY

Darshana Mendhekar <sup>1</sup>, Dinesh Chavhan <sup>\*2</sup>, Ashok Shyam <sup>3</sup>, Parag Sancheti <sup>4</sup>.

<sup>1</sup> BPTH, Sancheti Institute College of Physiotherapy, Pune, Maharashtra, India.

<sup>\*2</sup> MPTH in Neurophysiotherapy, Assistant professor, Department of Neurophysiotherapy, Sancheti Institute College of Physiotherapy, Pune, Maharashtra, India.

<sup>3</sup> MS Ortho, Research Officer, Sancheti Institute of Orthopaedics and Rehabilitation, Pune, Maharashtra, India.

<sup>4</sup> MS Ortho, Chairman, Sancheti Institute of Orthopedics and Rehabilitation, Pune, Maharashtra, India.

### ABSTRACT

**Background:** The Knee joint is the one of the most important joint in the pertaining to its functions of providing great stability, movement and weight bearing function. Among the contributors to knee joint stability, the anterior cruciate ligament (ACL) has long been considered the primary passive restraint to anterior translation of the tibia with respect to the femur. Deficient in neuromuscular control of the lower extremity is one of the main impairments following ACL injury. Therefore, improvement of the neuromuscular control of the knee following ACL injury or reconstruction makes possible better outcomes to return the functional activities and to reduce the rate of re-injury

**Aim:** To study the effects of kinesiotaping on proprioception in patients post ACL reconstruction.

**Purpose of study:** Loss of proprioception in patients post ACL Reconstruction surgeries is common and may lead to Kinesiophobia which is a fear of re-injury. This leads to fewer patients going back to their pre-injury level of activity. The purpose is to have a faster reduction in error of proprioception to enable the patients for a faster recovery

**Methodology:** It was a Cross sectional interventional study which included 20 subjects. Patients who had undergone an ACL Reconstruction without any fracture or neurovascular deficits were included who were undergoing physical therapy and were allowed full weight bearing. All the participants in the group were applied with a kinesiotape for mechanical correction of the knee and it was kept for two days. During these two days the subjects continued with their physical therapy. Pre and Post measurements of joint position sense was done by active reproduction of angle test.



**Results:** There was a significant reduction in the error of knee joint proprioception post two day intervention of kinesiotaping. Statistically p value was less than 0.005 hence it shows greater significance. The Coefficient of correlation = 0.8386.

**Conclusion:** There was significant reduction in the error of knee joint proprioception post Kinesiotaping.

**KEY WORDS:** Kinesiotaping, Proprioception, Anterior Cruciate Ligament, Stability.

**Address for correspondence:** Dr.Dinesh Chavhan, MPTH, Assistant professor, Department of Neurophysiotherapy, Sancheti Institute College of Physiotherapy, Pune, Maharashtra, India.

**E-Mail:** [drdineshchavhan@gmail.com](mailto:drdineshchavhan@gmail.com)

Access this Article online	Journal Information
<b>Quick Response code</b>  DOI: 10.16965/ijpr.2018.118	<b>International Journal of Physiotherapy and Research</b> ICV for 2016 86.93 ISSN (E) 2321-1822   ISSN (P) 2321-8975 <a href="https://www.ijmhr.org/ijpr.html">https://www.ijmhr.org/ijpr.html</a> DOI-Prefix: <a href="https://dx.doi.org/10.16965/ijpr">https://dx.doi.org/10.16965/ijpr</a> 
	Article Information
	Received: 21 Feb 2018 Peer Review: 21 Feb 2018 Revised: None
	Accepted: 16 Apr 2018 Published (O): 20 May 2018 Published (P): 11 June 2018

## INTRODUCTION

The Knee joint is the one of the most important joint in the pertaining to its functions of providing great stability, movement and weight bearing function. Dynamic knee stability is affected by both passive (ligamentous) and active (neuromuscular) joint restraints. Among the contributors to knee joint stability, the anterior cruciate ligament (ACL) has long been considered the primary passive restraint to anterior translation of the tibia with respect to the femur [1,2]. ACL also contributes to the rotational stability in frontal and transverse planes due to its orientation [3,4]. Surgical reconstruction is commonly used to manage ACL injuries, presumably because surgery restores mechanical knee stability, which, in turn, is thought to promote optimal knee function. Functional outcome after ACL reconstruction is not uniform though, and up to 60% of the population does not return to preinjury, high-demand activities. Reduced knee function postsurgery has been attributed to a variety of residual impairments, including knee symptoms (eg, swelling, pain or instability) , loss of knee motion, and thigh muscle weakness [5].

Deficient in neuromuscular control of the lower extremity is one of the main impairments following ACL injury. Therefore, there are several rehabilitation protocols after the injury for retraining of the knee neuromuscular control [6]. The re-establishment of neuromuscular control of the lower extremity has recently been recognized as one of the keys to restoring dynamic joint stability and functional movement patterns [6,7]. On the other hand, there are evidences that injury of the anterior cruciate ligament (ACL) and ACL surgical reconstruction may lead to Proprioceptive deficits [7,8]. Therefore, improvement of the neuromuscular control of the knee following ACL injury or reconstruction makes possible better outcomes to return the functional activities and to reduce the rate of re-injury [8].

The proposed mechanisms by which Kinesiotape works are different than those underlying traditional ankle taping. Rather than being structurally supportive, like white athletic tape, Kinesiotape is therapeutic in nature. According

to Kenzo Kase, the creator of Kinesiotape, these proposed mechanisms may include: (1) correcting muscle function by strengthening weakened muscles, (2) improving circulation of blood and lymph by eliminating tissue fluid or bleeding beneath the skin by moving the muscle, (3) decreasing pain through neurological suppression, and (4) repositioning subluxed joints by relieving abnormal muscle tension, helping to return the function of fascia and muscle [9]. A fifth mechanism has been suggested by [10], which describes Kinesiotape causing an increase in proprioception through increased stimulation to cutaneous mechanoreceptors. This proposed fifth mechanism has been examined using our current research method.

Little is known of a possible proprioceptive effect of Kinesiotape, however it has been anticipated that there will be a facilitatory effect of cutaneous mechanoreceptors as seen in studies examining the effects of linen-backed adhesive athletic tape [10]. Kinesio™ tape may have a similar effect on ankle proprioception due to its aforementioned characteristics. This concept underlies our hypotheses stating that proprioception will be enhanced through increased cutaneous feedback supplied from the Kinesiotape.

## MATERIALS AND METHODS

PCL reconstruction or menisci repair.

Type of study: Cross sectional Interventional study

Sample size: 20

Type of sampling: Convenient sampling

Study Setup: In various Physiotherapy clinics

Materials: Consent form, Goniometer, Kinesiotape.

**Inclusion criteria:** Age group 18-35, ACL reconstruction surgery done 4-8 weeks back, Full weight bearing status/ambulation, Willing to participate in the study, Already undergoing physiotherapy atleast 3 times per week, Knee joint proprioception should have an error of more than 2.5 degrees from the targeted angle of 45 degrees

**Exclusion criteria:** Any kind of fracture in the lower limb, Previous history of Knee injury or ankle sprain, Any kind of Neurodeficit.

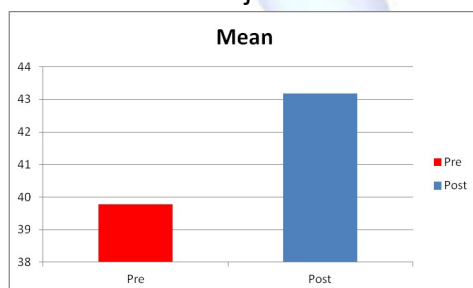
## Method

The athletes fulfilling all the inclusion criteria were selected by convenient sampling method and explained about project. A written consent was taken from them.

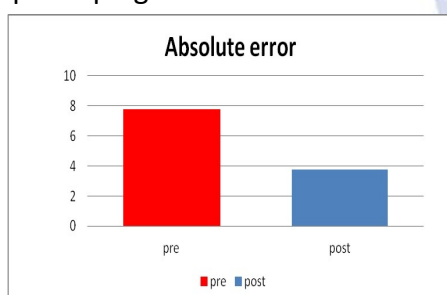
Proprioception of the affected extremity was tested using the active angle reproduction test. All the subjects were barefoot and blindfolded. The subjects were made to sit on a high raised seat with hip and knee flexion of 90degrees. They actively moved the affected lower limb to the target angle of 45degrees of knee flexion. The patient was instructed to hold this position for 10 seconds so the subject could memorize it and then was returned to 90degrees of knee flexion. After a pause of 5 seconds, the subject was asked to do the movement again. Subjects were not allowed to reposition the limb. The absolute error between the perceived angle and the target angle was calculated. The author then applied the Kinesiotape for mechanical correction of knee and the patient was instructed to continue with his rehabilitation for 2 days. After 2 days a reassessment was done for proprioception using the same test. The results of all subjects were then analyzed, compared and conclusion of the study was formed.

## RESULTS

Out of 17 subjects, 11 people improved in the predicted range (i.e. 42.5 to 47.5 degrees) which proves that 64.70% subjects benefitted.



The above graph shows an increase in the mean value of the post-taping values when compared to the pre-taping values.



The above graph shows a reduction in the mean of absolute error of the achieved values

Thus, this study proves that there is reduction in the absolute error of the knee joint proprioception after 2 day intervention of kinesiotaping for mechanical correction of the knee.

Paired t test was used for the statistical analysis of the data.

It was found out that the p value is less than 0.005 which is significant.  $t=3.475$  with 16 degrees of freedom. Mean difference= -3.412 95% confidence interval of difference. -5.493 to -1.331 Coefficient of correlation are =0.8386

## DISCUSSION

The ACL functions together with other anatomical structures surrounding the knee so as to maintain static and dynamic balance. It has an important role in proprioceptive monitoring of mechanical receptors such as Pacini corpuscles and Ruffini endings.

The ACL functions together with other anatomical structures surrounding the knee so as to maintain static and dynamic balance. It has an important role in proprioceptive monitoring of mechanical receptors such as Pacini corpuscles and Ruffini endings.

The anterior cruciate ligament (AGL) is an intra-articular element structure of paramount importance for normal knee movement since it secures simultaneously static and dynamic stability. Dynamic stability is supported by the presence of specific ligament mechanoreceptors which are proved to be an essential element for proprioception as it has been revealed by a few anatomical and histological studies. More detailed studies identified three types of mechanoreceptors by different morphologic characteristics: two types of Ruffini end organs, Paccinian corpuscles and a smaller number of free nerve endings. In this study was reported that neural elements comprise about 1% of the area of the ligament. The Anterior Cruciate Ligament is not only a primary restraint to anterior tibial translation but is also an important dynamic stabilizer of the knee joint as well [11].

Most authors refer to two types of proprioceptive sensation for clinical reasons. Static proprioception is defined as joint position sense that



is the direction of limbs in space and the perception of their interrelationship. Dynamic proprioception or else kinesthesia includes the sense of limb movement and speed changes, acceleration or deceleration [12].

Injury to joint structures such as ACL the menisci and following osteoarthritic changes are combined with mechanoreceptor damage. The following damage of afferent pathways and CNS transmission of information results in disturbing joint position sense and kinesthesia [13]. According to a study done by Barrack R. L, Skinner H. B, Buckley S. L , testing was done within the 30° to 40° range of knee flexion, and it was found that there was a defect in their knee joint proprioception which was attributed to the ACL injury rather than other variables. In the present study, the error in the proprioception of the intervention group was greatly reduced after applying the kinesiotape. The kinesiotape was applied for a duration of two days. Kinesiotaping can be effective in improving proprioception post ACL reconstruction. Kinesiotaping stimulates the mechanoreceptors in the skin and muscles. It provides input to the CNS about the limb position and enables postural control. The study proves that 65% of the total subjects showed an improvement in the knee joint proprioception post kinesiotaping according to the active angle reproduction test. The authors also found out that higher the absolute error in the proprioception, more was the reduction in the error post kinesiotaping. Thus, kinesiotaping can be used as an adjunct to proprioceptive training in helping the patient to recover more efficiently.

## CONCLUSION

This study proves that Kinesiotaping thus helps in reducing the absolute error in the knee joint proprioception in patients post ACL Reconstruction surgery.

## ACKNOWLEDGEMENTS

I take this opportunity to thank our principal Dr. Nilima Bedekar (PT) for her support. I would also like to thank Dr. Dhara Kapoor (PT), Dr. Ashok Shyam for their valuable expertise which helped me to conduct this study successfully. Lastly, I would like to extend my warm gratitude towards all the subjects who willingly co-operated and participated in the study.

## Conflicts of interest: None

## REFERENCES

- [1]. Butler DL, Noyes FR, Grood ES. Ligamentous restraints to anterior-posterior drawer in the human knee. *J Bone Joint Surg Am.* 1980 Mar;62(2):259-70.
- [2]. Kiapour AM, Wordeman SC, Paterno MV, Quatman CE, Levine JW, Goel VK, Demetropoulos CK, Hewett TE. Diagnostic value of knee arthrometry in the prediction of anterior cruciate ligament strain during landing. *The American journal of sports medicine.* 2014 Feb;42(2):312-9.
- [3]. Levine JW, Kiapour AM, Quatman CE, Wordeman SC, Goel VK, Hewett TE, Demetropoulos CK. Clinically relevant injury patterns after an anterior cruciate ligament injury provide insight into injury mechanisms. *The American journal of sports medicine.* 2013 Feb;41(2):385-95
- [4]. Quatman CE, Kiapour AM, Demetropoulos CK, Kiapour A, Wordeman SC, Levine JW, Goel VK, Hewett TE. Preferential loading of the ACL compared with the MCL during landing: a novel in sim approach yields the multiplanar mechanism of dynamic valgus during ACL injuries. *The American journal of sports medicine.* 2014 Jan;42(1):177-86.
- [5]. Chmielewski TL, Zeppieri Jr G, Lentz TA, Tillman SM, Moser MW, Indelicato PA, George SZ. Longitudinal changes in psychosocial factors and their association with knee pain and function after anterior cruciate ligament reconstruction. *Physical therapy.* 2011 Sep 1;91(9):1355-66.
- [6]. Risberg MA, Lewek M, Snyder-Mackler L. A systematic review of evidence for anterior cruciate ligament rehabilitation: how much and what type?. *Physical Therapy in Sport.* 2004 Aug 1;5(3):125-45.
- [7]. Barrack RL, Skinner HB, Buckley SL. Proprioception in the anterior cruciate deficient knee. *The American Journal of Sports Medicine.* 1989 Jan;17(1):1-6.
- [8]. Cooper RL, Taylor NF, Feller JA. A systematic review of the effect of proprioceptive and balance exercises on people with an injured or reconstructed anterior cruciate ligament. *Research in sports medicine.* 2005 Apr 1;13(2):163-78.
- [9]. Kinesio Taping Association, Kase K, Hashimoto T, Okane T. *Kinesio taping perfect manual: Amazing taping therapy to eliminate pain and muscle disorders.* Ken%ai-Kai Information; 1996.
- [10]. Murray H. Effect of kinesio taping on proprioception in the ankle. *J Orthop Sports Phys Ther.* 2001;31:A-37.
- [11]. Angoules AG, Αγγουλές ΑΓ, ΕΔΟΕΑΠ ΧΘ The contribution of the anterior cruciate ligament to the knee proprioception. *J Nov Physiother.* 2012;2(3).
- [12]. Hall JE. Guyton and Hall textbook of medical physiology e-Book. Elsevier Health Sciences; 2015 May 31.
- [13]. Lephart SM, Pincivero DM, Giraido JL, Fu FH. The role of proprioception in the management and rehabilitation of athletic injuries. *The American journal of sports medicine.* 1997 Jan;25(1):130-7.

**How to cite this article:** Darshana Mendhekar, Dinesh Chavhan, Ashok Shyam, Parag Sancheti. EFFECT OF KINESIOTAPING ON PROPRIOCEPTION IN PATIENTS POST ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION SURGERY. *Int J Physiother Res* 2018;6(3):2716-2719. **DOI:** 10.16965/ijpr.2018.118