A HYPOTHESIS OF ETIOLOGY OF ATRAUMATIC ACL INJURIES

Paladini Molgora Alessandro[1], Zampagni Maria Luisa[2], Casino Daniela[2], Corazza Ivan[3], Zaffagnini Stefano[2] and Marcacci Maurilio[2]

[1]Modulo di Ortopedia, Ospedale C.Ondoli di Angera, A.O. di Gallarate (VA)
[2]Biomechanics Laboratory - Rizzoli Orthopaedic Institute Bologna, Italy
[3]Istituto di Cardiologia-Università di Bologna

KEY WORDS: ACL, kinesiology, load cell.

INTRODUCTION: Atraumatic ACL injury has become more and more frequent especially in sport population. The causes which determine the ACL rupture, have not been identified and the possible relationship between proprioception and subjective function has not been adequately studied. Several authors (Schutte et al. 1987, Schultz et al. 1984) have found the mechanoreceptors in the cruciate ligament, and such receptors formed by muscle spindles, receptors in tendons and in skin determine a complex system for knee joint proprioception. Our starting hypothesis is that a possible cause of ACL lesion could be due to temporary inhibition of the muscular control following an alteration of the propioceptive joint control. The purpose of this study was to verify by a kinesiologic procedure if some stimulation of the subtalus joint could induce an inadequate recruitment of muscle fibers activation.

MATERIAL and METHODS: In this investigation we tested 15 adult patients that had ACL lesion without referring a true sports trauma. We asked each subject to realize a isometric contraction against resistance as request by Kendal and Kendal (1971) and Walther (1981) procedure test involving both hip and knee flexor and extensor muscles. The subjects were tested before and immediately after a manual percussion in the subtalus joint. The functional response of the subject to the force applied by the operator was measured by a load cell and the signal was analyzed by dedicated software (Light 5.0.1). This procedure was repeated two times for each subject in order to evaluate the reliability of the test. After the normal distribution of data was verified, significant differences were analyzed by the t- student test.

RESULTS: All subjects, before stimulation, were strong and maintained the force for various seconds (mean values 3.4±0.67 s) when asked to resist to the force applied by the operator. After the percussion of the subtalus joint, an evident decrease ($p<0.0001$) in the duration of the resistance was measured in all subjects (mean values 0.92±0.46).

DISCUSSION: The analysis of the results indicates that “wrong” proprioceptive stimuli coming from the subtalus joint or from other articulation of the middle foot could induce inhibitory reflexes to all connected muscular groups implied in the knee stability. This mean that, in the instants following a backing of the foot determining such stimulation, the knee could be in a situation of low muscular control leaving the loads tackled by the ligaments alone determining therefore the injury or rupture of the same ligaments.

CONCLUSION: We can conclude that in subjects that have a subtle alteration of the mio-tendinosus structures, a force even of modest intensity could determine a low muscular control in the lower limb with subsequent risk of knee ligaments injury. Therefore, a kinesiological evaluation of the upper and lower segmentarian muscular structures could be useful to prevent such injuries.

REFERENCES:

Kendall H.O., Kendall F.P., Wadsworth G.E. (1971) In: *Muscle –Testing and function, 2nd ed.*
Ed. Williams & Williams CO., Baltimore,.

Walther D.S. In *Applied Kinesiolgy*, Vol. 1: Basic Procedures and Muscle Testing. Ed. System DC, Pueblo, Colorado, 1981.

Schutte M J, Dabezies E J, Zimny M L, Happel L T. (1987)Neural anatomy of the human anterior cruciate ligament. *J Bone Joint Surg* (Am); 69 (2): 243-7.

Schultz R A, Miller D C, Kerr C S, Micheli L. (1984) Mechanoreceptors in human cruciate ligaments. A histological study. *J Bone Joint Surg* (Am); 66 (7): 1072-6.