

**BIOMECHANICS OF INJURY: IT'S ROLE IN PREVENTION,
REHABILITATION AND ORTHOPEDIC OUTCOMES****G. Cerulli*, M. Lamontagne** ***, A. Caraffa*, S. Bruè* , A. Liti*, and A. Raggi******Let People Move, Perugia, Italy******Laboratory for Research on Biomechanics, School of Human Kinetics and*******Department of Mechanical Engineering, University of Ottawa,
Ottawa, Ontario, Canada**

Biomechanical evaluations consist in measuring kinematics, kinetics and muscular activity of human movement. Kinematics analyses the movements of the body and its parts. Kinetics is the analysis of the forces that produce motion. The muscular activity provides information about the action of the muscles that produce the necessary strength to create motion. The integration of these three major components of the human movement is essential to identify functional alterations.

Thanks to research in the field of clinical biomechanics, our laboratory has developed innovative strategies with regards to evaluations and clinical treatments.

The functional evaluation and the morphological information, together with the biomechanical measurement of the locomotor's apparatus, allow a more accurate diagnosis of pathologies with advantages with regards to the decisions of the appropriate treatment, the best preparation for surgery, the organization and modulation of the rehabilitation program, and the decision on resuming sport and work.

Our experience highlights that biomechanical analysis is crucial even in prevention of sports injuries. In fact, the knowledge of the mechanics of the "sport-specific" movement allows a development of specific strategies to strengthen those structures that have a protective role.

All this is even more valid in the case of ACL lesion. In fact, the biomechanical functional evaluations provide the orthopaedist with a good contribution to the diagnostic and therapeutic management: confirmation of the clinical diagnosis, therapeutic decisions, and sometimes, the best type of surgery.

The "in itinere" evaluations during the rehabilitation program allow us to modulate it according to the functional conditions, the objectives to achieve, without damage.

"In-vivo" studies that we carried out on the elongation of the ACL during "sport-specific" movements underlined the protective role of the hamstrings and this result is very important in terms of prevention.

Of course, the reproducibility of the tests and the objectiveness of the data are useful for the longitudinal evaluation of the results.

The parameters to be measured are:

- Articular stability of the knee,
- Articularity
- Muscular situation
- Proprioceptive conditions
- Functional capability in executing sport specific gestures

To do this we need suitable instrumentation and a qualified staff that can interpret the data and correlate them to the locomotor apparatus and the sport gestures.