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The Rotational Movements of the Tibia and its Relation with the Injuries in the Knee Joint

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Short Communication

The knee joint can be described as a glinus or hinge joint, which is an overloaded joint, joining two long bones with poorly congruent joint surfaces. Thus, it is subject to numerous traumatic injuries, being one of the most injured joints of the body [1]. The knee has a screw house mechanism where the joint is locked by external tibial rotation during the extension process and is then unlocked during the bending process. Relatively, tibial rotation may occur during flexion and extension of the passive knee. During daily activities, many muscles are used in the inner tibial rotation, such as popliteal, semitendinosus, semimembranosus, sartorius and gracilis muscles, and in external rotation, such as the biceps femoris and vastus lateralis [2].

It is possible that the reduction of quadriceps muscle activity, associated with increased activity of the biceps femoris and semitendinosus, avoid anterior tibial displacement during walking, jumping and flexion-extension of the knee. However, the greater activity of the femoral biceps and vastus lateralis would avoid internal rotation of the tibia. Therefore, the modulation of the activity of these muscles would replace the action that would be exerted by the intact ACL (Anterior Cruciate Ligament) [3]. The passive and active structures contribute to guiding the tibio femoral kinematics as well as stabilizing the knee joint, while passive structures are known to touch a Paper key in restricting the extremes of movement.

As such, the reconstruction of the ligament should then provide a complete biological and mechanical recovery for the achievement of complete and stable function of the knee joint. Although the evaluation of the translational stability of the knee joint A-P is standard in clinical practice, objective measurements of rotational laxity are widely absent [4].The mechanisms through which ACL offers rotational stability are unclear, both in internal and external rotation. On the other hand, the rotational stability may be related to the ability of the ligament to pull the joints, so that the contact itself could provide rotational stability4.

The tibial rotation is a physiological torsion of the proximal joint axis of the tibia versus the distal in the transverse plane. The rotational deviation of the tibia is defined as an increase in torsion, both in the internal and external directions, greater than 10°, varying between 5° and 20°, as compared to the unaffected limb [5]. Overuse knee injuries, such as patella femoral pain syndrome (PFPS) and iliotibial band syndrome (ITBS), are among the most frequently reported injuries in runners. Actually, excessive tibial rotation is considered to be associated with the genesis of PFPS and ITBS, since it affects patellofemoral contact pressure and friction of the iliotibial band.

Part of the tibial rotation can be caused by rearfoot eversion, which is coupled via talus adduction to tibial internal rotation, and results from tight articulations of the ankle joint complex [6]. Relatively, Lee demonstrate that lateral tibial rotation is not affected by hamstrings during rest in a standing position [7].

Tibial rotation has been associated with a variety of patellofemoral dysfunctions, such as instability and compression syndrome. Mean while, internal and external tibial rotation results in increased pressures of the patellofemoral joint. In addition, the largest increases in knee pressure in almost complete extension, which is consistent with clinical evidence suggesting that the patellofemoral joint is more susceptible to instability-like lesions in this knee flexion interval [8].

In the context of the mentioned rotation, running seems to rely on the stability of the referred muscles. On fact, the three-dimensional complexity of the lower extremities with kinematics of young adult runners and elderly runners has demonstrated that elderly individuals may be more susceptible to execution-related injuries [9]. However, future studies need to prospectively address what are biomechanical injuries in rotational movements of the tibia.

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