BIOMECHANICS OF THE FOOTBALLER'S KNEE

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Abstract: The knee represents an amazing mechanism both by its architecture as well as by the finishing degree of bone surfaces. Those who don't know how complicated the knee movements are may simplify by saying that the knee is a "hinge". The knees and hips are the most important joints. It is true that the arms have movements of great finesse, although if we don't stand and we don't move, what does it matter that we can do highly accurate activities with the arms. The knee seems unstable but it has a high degree of stability.
The knee, by its complex anatomy, may develop ample movements. We are talking about flexion which means the bending of the knee. But we can also do extensions which mean the spreading legs from the knees.
Keywords: *knee, joint, biomechanics, football*

Introduction

Parents are scared their babies have bandy-legs, resembling parentheses. It is a normal thing at an early age. Then, in case of many babies, the legs are straightened. The legs pick up a "X" shape and this a normal position since, if the legs would not be in a "X" shape and a straight line will follow from up till down, the knees would not be able to execute the large range of movements.
There was a period when the meniscus suffered it was extracted by orthopedicians on a regular basis. There were even contests between surgeons who extract the meniscus faster.
Afterwards, it was found out that removing the meniscus is harmful, e.g. the wear called osteoarthritis occurred faster at the knee without a meniscus. A step forward was the introduction of arthroscopy, e.g. insertion of a video camera into the knee joints which allowed the visualization of the how severe the meniscus was ruptured and where the rupture was.
In the intervention with the arthroscopic there is also the chance, by a series of tubes other than the video camera one, for the surgeon to act with tucks, fine cutting instruments.
Thus, when the meniscus has a small rupture, with the help of arthroscopy, sewing can be achieved or only that compromised strip may be cut out, in this way the rest of the meniscus remains in the knee which fulfills important roles of shock absorption, distribution of forces in the knee and protection of the synovial fluid.
We mentioned that the knee cap is a bone acting as a pulley doubling the effort ability of the thigh muscle. The knee cap fracture is easily to treat if it is a simple fracture. But complications come from the extraordinary perfection of finishing the surfaces in the knee.
If the strains of the knee or the injuries are more ample, full ruptures of knee joints occur or the meniscus may break.
When the femur, the thigh bone, runs against the axis it is a luxation which represents a more complicated injury.
The knee cap and other surfaces of the bones, tibia and fibula, have perfect finishes at a finesse of 20.000 angstrom.[1] In order to see the amazing finesse in the knee a comparison should be made that, in the most modern and refined finishing technologies of the space rocket industry, the finish only achieves 2.000 angstrom, thus 10 times less than the finesse of the knee bones. In severe knee fractures, this is exactly the complication.
That is, after repairing the knee fracture, the finesse of the bone surface finishing can no longer be reconstructed.
After repairing the bone fracture, small irregularities appear leading to join degradation and to early osteoarthritis of the knees.[2]
The knee sprain occurs when we force this joint, when we engage it in an abnormal position. The strain of the knee determines a rupture; several fibers can break in the capsule covering the knee joint, as several fibers may break from its joints.
The knee swells and this simple sprain needs a treatment that is not that complicated. The sprained knee must be bandaged with ice, the individual must sit in rest and to take anti-inflammatory medication.
The shooting movement is complex and may be carried out from different positions. Usually, it consists from two phases: one of preparation, in which the shooting leg is brought backwards and one of execution, when the leg is projected with energy forwards in order to hit the ball, a precise and fast movement being transmitted to the ball.

During these phases, the body is supported by one leg and the trunk and the upper limbs execute various movements for providing balance which is unstable (the supporting base is small, reduced to the contour of the supporting leg).

In the preparation phase, the lower limb carries out an extension in the hip joint, a flexion of the knee and a plantar flexion of the foot.

From a biomechanical point of view, this movement has the role to tension the muscle chain that will carry out the shooting. It exercises a traction on these muscles which determines their elongation and, by it, the accumulation of a potential energy needed in the following phase.[3]

At the same time, the elongation of the muscles has the role to create the impossibility of a greater shortening which contributes to the increase of the carried out mechanical work. It is known that, from the resting position, a muscle may shorten no more than 1/3 of its length (in maximum contraction).

If it is elongated previously by stretching, it is shortened 1/3 plus the length on which it was stretched. As much a muscle can shorten the mechanical work is greater.

In the execution phase of shooting, the lower limb executes a vigorous motion forward and hits the ball. The movement consists in the flexion of the hip on the pelvis, extension of the knee and slight dorsal flexion in the ankle joint.

The muscle chain of the football shooting is formed, thus from the hip flexor, extensors of the knee and the dorsal flexors of the foot. In case the ball is hit with the outside or the inside of the shoe, slight movements of foot pronation or supination are also executed.[4]

The supporting leg is usually slightly flexed in all joints, this position being assured by the dynamic, relaxed contraction of the triple extension.

Quite frequently, together with the shooting, an extension of the supporting leg is also produced which is also assured by chain of the triple extension, however, by the overcoming contraction.

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