# LIGAMENTOUS INJURY OF THE KNEE JOINT

AN ESSAY

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C O N T E N T S



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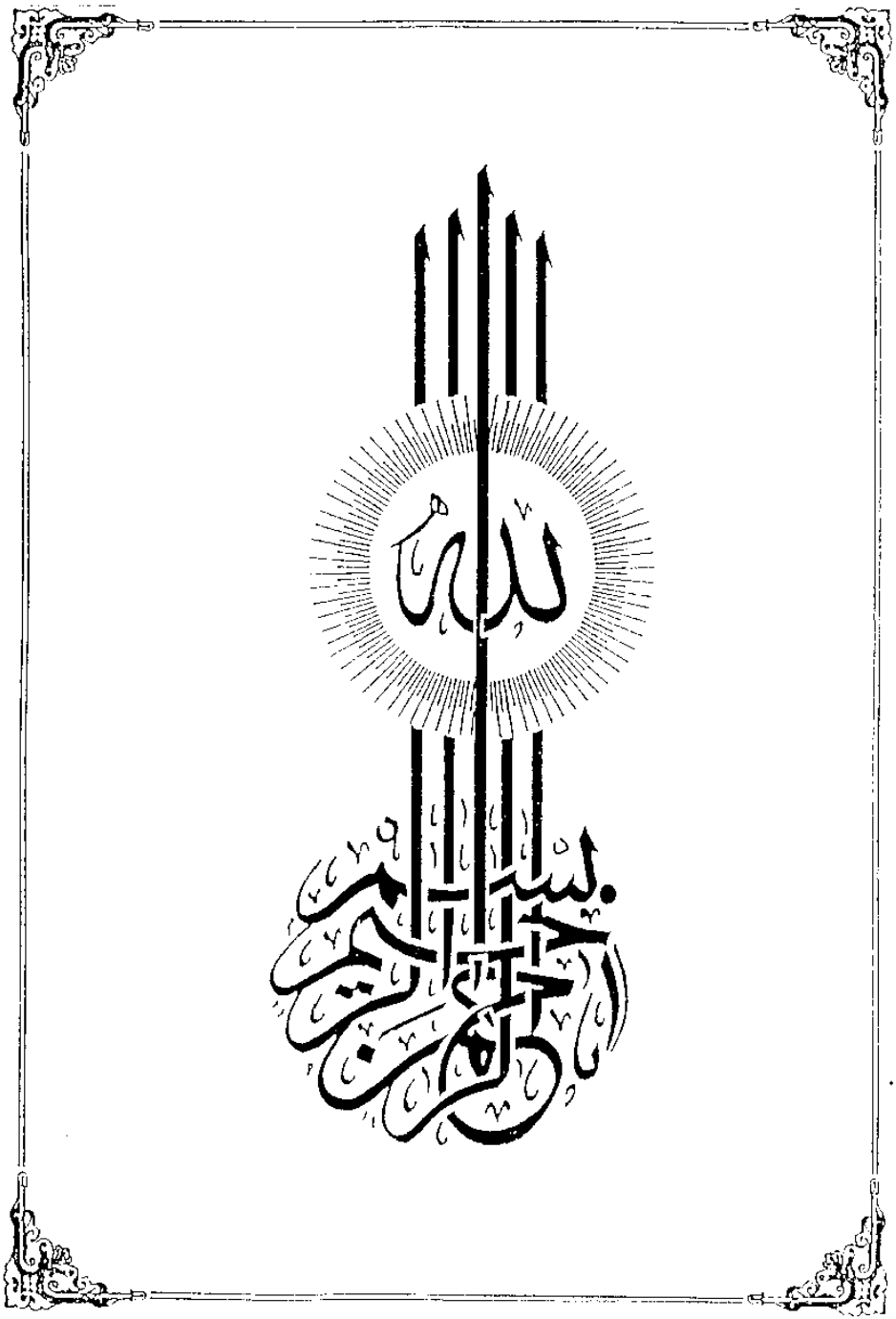

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# " INTRODUCTION "

# INTRODUCTION

Functionally, the knee has a more complex mechanism than has often been appreciated in the past. The major movements of the knee are flexion and extension, accompanied by internal and external rotation. Stability and function depends upon the contours, ligaments and the externally acting forces, in the form of musculotendinous units (Godfrey, 1973). Out of all this violence come injuries, especially to the knee. In 1966 more than 45,000 operations were performed on knees damaged in organised American football. Some injuries resulting from the more vicious blocks are terrible (Smillie, 1975). This draws attention to the importance and possible magnitude of the problem of the ligamentous injuries of the knee. Second only in importance to active muscular control is the passive control of the ligaments, which not only determine the direction in which muscle action is transmitted to the moving surfaces but achieve, through their sensory nerve fibres, the cooperation essential to protection (Smillie, 1973).

The functions of the medial, anterior cruciate, posterior cruciate and lateral ligaments, together with

the capsule, are so closely inter-related in maintaining the integrity and stability of the joint that it is difficult to ascribe a specific function or functions to any particular ligament. It is clear that in mechanical perfection all are important.

In practical approach to a subject which deals with imperfection there are degrees of importance. The medial ligament takes pride of place from the clinical viewpoint because of the implications of total ruptures and the frequency of minor injuries. The anterior and posterior cruciate are also of importance; the former because of inevitable involvement in total rupture of the medial structure and the frequency of solution of continuity associated with meniscus tears; the latter because of the frequency with which injuries are missed or misdiagnosed and the outcome in terms of disability (Smillie, 1975).

The knee joint is a diagnostic minefield. Every one who has to deal with knee problems has had diagnosis blown to pieces by the findings or absence of findings at subsequent surgery. Not even the most wary can escape all the pitfalls (Helal and Chen, 1976).

To effectively care for any injury one must have a substantial knowledge of the involved anatomy.

A good history of the mechanism of the inflicted trauma, if obtainable, and a thorough analytical examination will lead to a reasonably correct diagnosis. Successfull treatment then depends upon the capability of the surgeon, and the cooperation of the patient (Godfrey, 1973).

" SURGICAL ANATOMY "

## SURGICAL ANATOMY OF THE KNEE JOINT

The knee joint is a synovial joint of a hinge variety, although it is described as a hinge joint, but actually it is more complicated than a hinge joint because in addition to flexion and extension, it also has a rotatory component to its motion (Rockwood and Green, 1975). It is the largest and most complicated joint in the body. It consists of 3 articulations; two condyloid joint between the condyles of femur and condyles of tibia and a third between the patella and the femur. In all positions of the joint, the patella is in contact with the femur and the femur with the tibia. The bones do not interlock with one another, but the areas of contact are large, and the ligaments and the surrounding muscles are strong.

The femoral condyles are partly separated from the tibial condyles by two sharply curved pieces of fibro-cartilage called the semilunar cartilages. They lie on the marginal part of the tibial condyles and being wedge shaped in section, they slightly deepen the surfaces for articulation with the femoral condyles. In the interior of the joint there are also two very strong

bands which pass from the top of the tibia to the two femoral condyles. They cross each other and are called the cruciate ligaments of the knee. These ligaments take the chief part in holding the femur and tibia together.

The three bones of the joint are held also by:

1. An imperfect capsular ligament which envelops the joint incompletely.
2. Supplementary bands namely:
   a) Lateral and medial ligaments.
   b) Oblique posterior ligament.
   c) Ligamentum patellae which serves as an anterior ligament.

Stability of the knee joint:

Stability of the knee joint does not depend on the congruity and coaptation of the bony contours but mostly depends on the following factors:

1. The strong cruciate ligaments which provide antero-posterior stability during flex
2. Side stability depends on the collateral ligaments and the posterior oblique ligament.

3. Stability of the patella depends mostly on the lower part of the vastus medialis muscle as well as the medial vastal retinaculum. Damage to these fibres will lead to lateral displacement of the patella by the unopposed contraction of the main bulk of the quadriceps and the ilio-tibial tract.
4. The vastal retinaculum and the muscles around the joint contribute also to the stability of the joint.
5. Tensor fascia and the gluteus maximus contribute to the stability of the semiflexed knee by the ilio tibial tract.
6. Stability in extension depends mainly on body weight falling infront of the joint helped by tension of the ligaments (Last, 1973).

Bony contours:

The upper surface of the tibia possesses two separate plateaus.

The medial one is larger, slightly curved, C-shaped, and lies wholly on the upper surface of the tibia while

the lateral one is smaller, essentially circular, and it grooves over the posterior margin of the lateral tibial condyle, this allows withdrawal of the lateral meniscus by the popliteus muscle (Last, 1973).

In the centre are the anterior and posterior tibial spines. The anterior spine is sharper in its lateral view and is situated anteriorly and medially. The posterior spine is more rounded, domed in its lateral profile view, and is posterior and lateral in the middle zone of the plateau.

The menisci conform to the contours of the tibial plateaus and as they raise the periphery, they add to the cupping. The medial meniscus is more conventionally C-shaped and the lateral one is more circular. These cup like superior surfaces articulate with the unmatched femoral condyles. An end on view of the femoral condyles shows that the lateral condyle has an essentially vertical long axis. The medial condyle has a lazy- S configuration with its axis diverging posteriorly about 22 degrees "Fig. 1" (Godfrey, 1973). The difference in contours of the condyles and the plateaus account for the rotatory movement of the femur in relation to the tibia during

flexion and extension; a mechanism known as the "Screw-home mechanism".

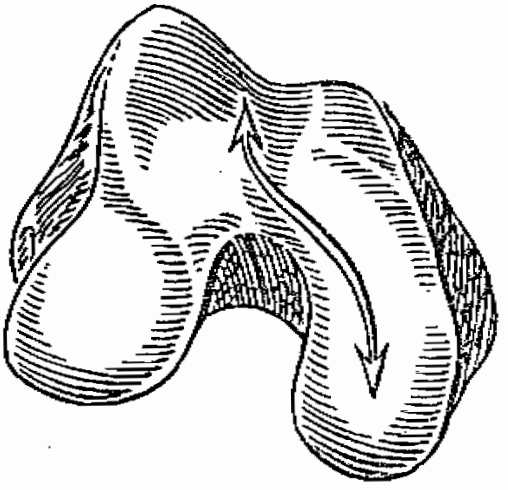

Fig. 1

The patella lies on the anterior aspect of the joint and it is called the knee cap. It has a protective function to the joint. Two-thirds of its posterior articular surface is lateral to a vertical ridge, and one third is medial to it (Last, 1973).

The capsule:

On the femur the capsule is attached below the epiphyseal line down to the articular margin except in two places:

1. At the back, it is attached to the intercondylar ridge at the lower limit of the popliteal surface.
2. On the lateral condyle, it encloses the pit for the popliteus tendon.

On the tibia the capsule is attached around the margins of the plateau except in two places which are:

1. Posterioly it is attached to the ridge between the two condyles at the lower end of the groove for the posterior cruciate ligament.
2. Laterally the capsule is not attached to the tibia but is prolonged down over the popliteus tendon to the styloid process on the head of the fibula.

The edges of this prolongation are the arcuate ligament posteriorly and the short external ligament anteriorly. The arcuate ligament is the edge of the capsule that arches down from the lateral meniscus to the styloid process of the fibula. The superficial fibres of the popliteus muscle are attached to it. The capsule has two main gaps in it, the one allowing popliteus tendon to enter, the other communicating with the suprapatellar bursa. Anteriorly the capsule is interrupted by a circular gap whose