MR IMAGING OF TRAUMATIC DISORDERS OF THE KNEE

THESIS

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By

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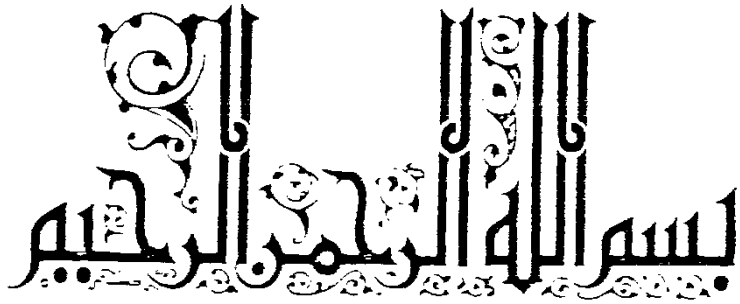

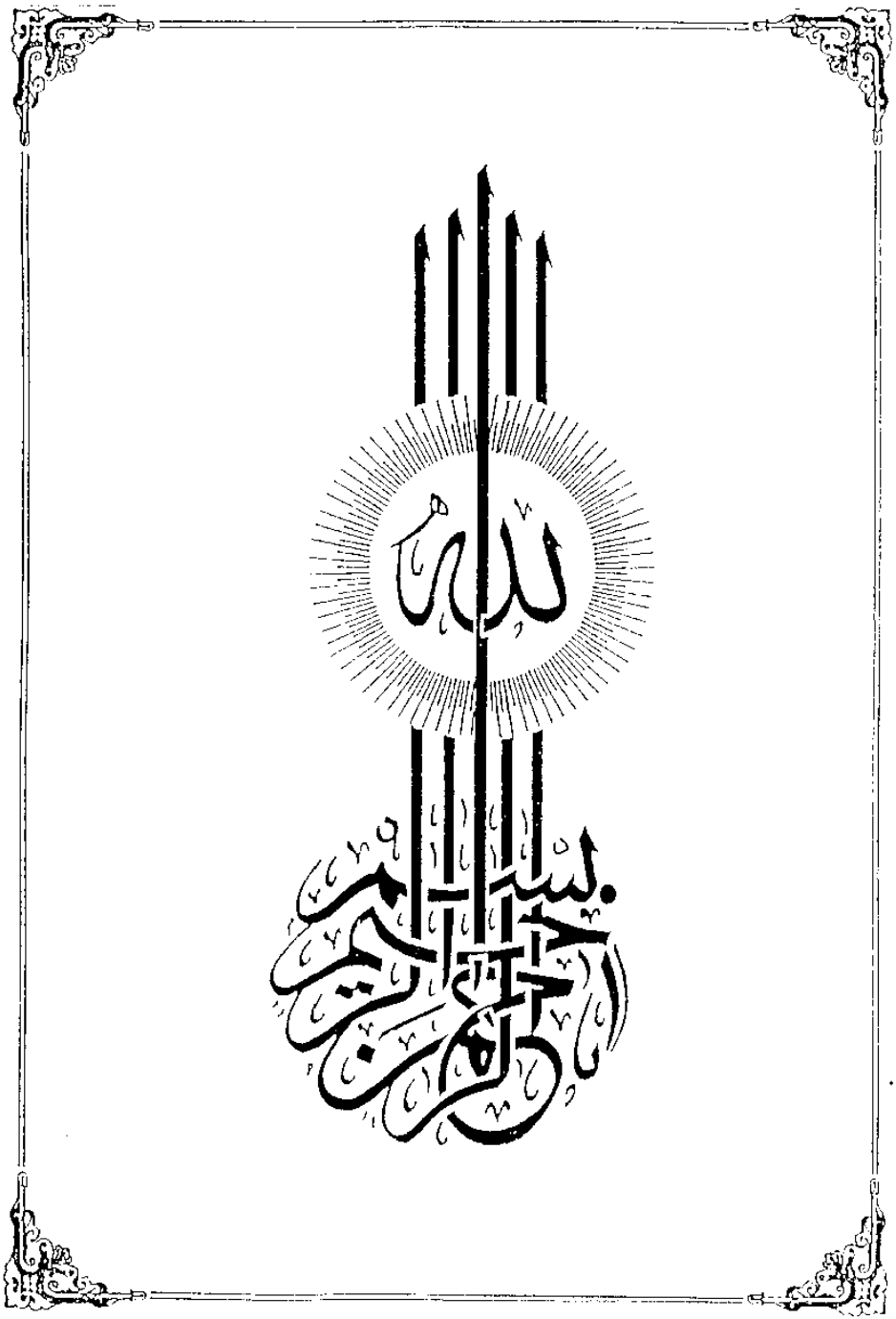

TO MY PARENTS,

MY WIFE

AND MY DAUGHTER

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Thanks to **God**

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INTRODUCTION AND AIM OF WORK

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Traumatic disorders of the knee are common injuries. Prompt assessment of the extent of these damages is essential for appropriate management of significant knee injury.

The clinical diagnosis of these disorders is difficult particularly in acute cases and diagnosis is usually performed by means of plain radiography; however, internal derangement of the ligaments, menisci, occult cartilage and bone injuries are not diagnosed except by arthrography, arthroscopy or even surgery.

The advent of magnetic resonance imaging (MRI) has proved to be an excellent non-invasive diagnostic test for identifying the normal anatomy and internal derangement of the knee (*Reicher et al.*, 1987; *Lee et al.*, 1988; *Silverman et al.*, 1989; *Mink and Deutsch*, 1989).

Reicher et al. began a revolution in knee diagnosis in 1985 with their initial description of the detection of meniscal tears and other pathology with MR imaging. In the past 5 years, MR imaging of the knee has become the most commonly preformed non-neurologic MR examination and has completely replaced knee arthrography in most institutions (*Burk et al.*, 1986).

The use of MR imaging as a non-invasive screening method has also helped to shift the role of arthroscopy from diagnosis

toward therapeutic intervention. The examination is easy to perform and is well tolerated by almost all patients with the exception of those with known contraindications to MR imaging (*Burk et al.*, 1990).

The aim of this study is to emphasize the MRI manifestations of the traumatic disorders of the knee.

ANATOMY OF THE KNEE JOINT

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The knee is a synovial joint between femur and tibia. The joint can flex or extend like a hinge. Extension is for propulsion and flexion is used prior to this and also to absorb the shock (by quadriceps) in landing.

In addition the flexed knee can rotate, as in change of direction at speed. This active rotation is a matter of choice, and is not to be confused with the passive and inevitable rotation that occurs in straightening the knee in the "screw-home" mechanism. During all these movements the knee is adapted to be weight-bearing and stable in any position (*Last*, 1978).

Bony Contours:

The plateau of the tibia possesses two separate articular facets, each slightly concave. The medial facet lies wholly on the upper surface of the condyle, but the lateral facet curves back over the posterior margin of the tibial condyle. This bevelled margin allows withdrawal of the lateral meniscus by the popliteus muscle. The femur has two condyles, separated posteriorly by a deep notch, but fusing anteriorly into a trochlear groove for articulation with the patella. The lateral ridge of the trochlear groove is very prominent. The curve of the femoral condyles is cam-shaped (in lateral profile); it is flatter on the end of the

femur and more highly curved at the free posterior margin of each condyle. The distal surface of the medial condyle is narrower, longer and more curved than the lateral condyle. This is for the screw-home movement. The articulation surface of the patella is divided by a vertical ridge into a large lateral and a small medial surface. This latter is further divided by a vertical ride into two smaller areas. The large lateral surface glides around in contact with the lateral condyle of the femur in all ranges of flexion. In extension the area next to it lies on the trochlea, and the most medial of the three surfaces is not in articulation with the femur. In flexion this surface glides into articulation with the medial condyle, and the middle of the three surfaces lies free in the intercondylar notch of the femur (*Last*, 1978).

Capsule of the Knee Joint:

The capsule is a fibrous membrane of variable thickness containing areas of thickening that may be referred to as discrete ligaments (Figures 1 & 2) (*Insall*, 1984).

Posteriorly:

The capsule consists of vertical fibers that are attached: ***above*** to margins of the femoral condyles and the posterior margin of the intercondylar fossa, ***below*** to the posterior margins of the tibial condyles and the posterior border of inter-condylar area. This part of the capsule is blended above on each

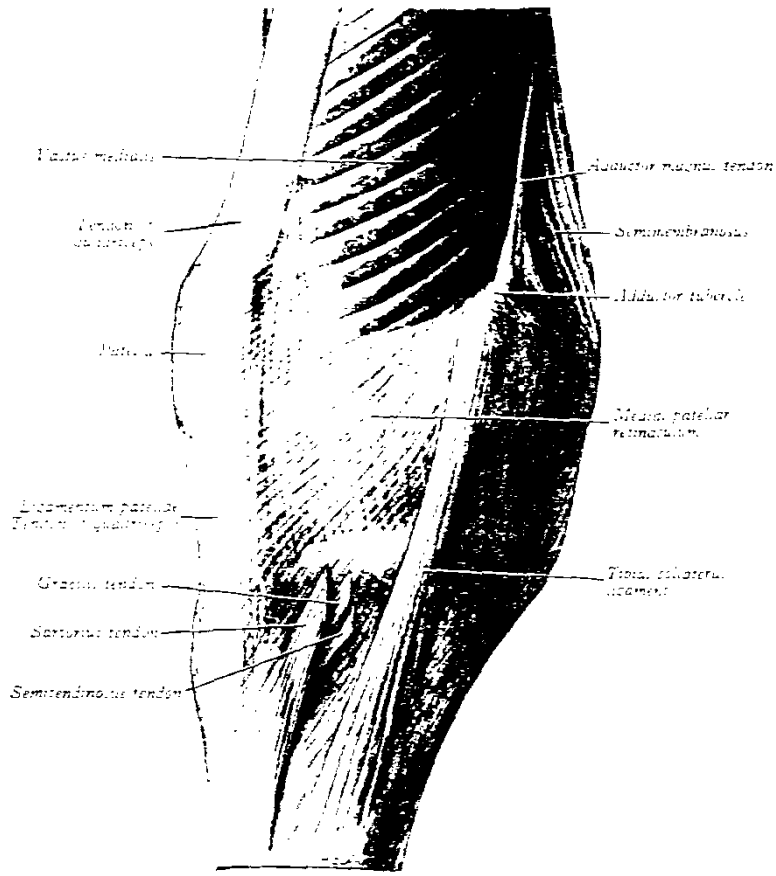

Fig. 1: The right knee joint, anteromedial aspect.
(Quoted from, Gray, 1976)

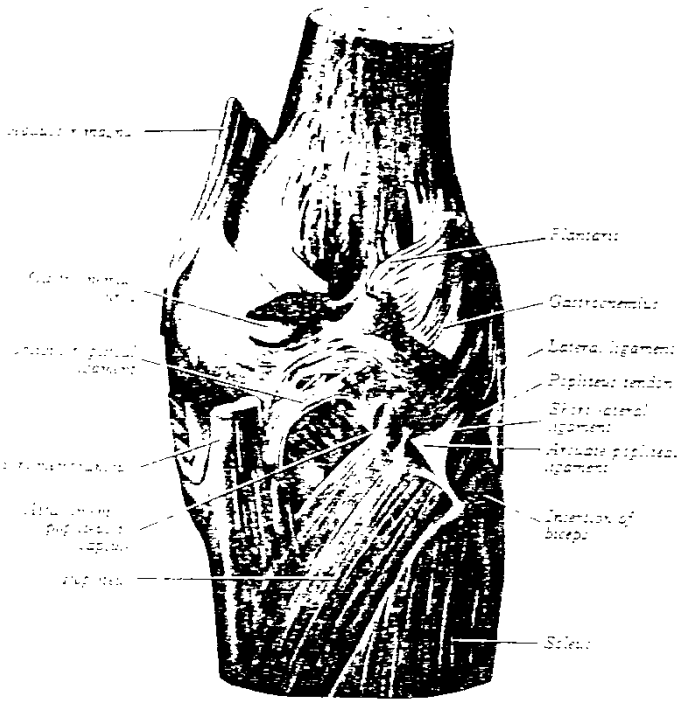

Fig. 2: The right knee joint, posterior aspect.
(Quoted from, Gray, 1976)

side with the origin of the corresponding head of gastrocnemius. Centrally, it is augmented by fibers derived from the tendon of the semimembranosus forming the oblique popliteal ligament. The attachment of the capsule to the posterior surface of the lateral tibial condyle is interrupted and perforated by popliteal tendon (*Gray*, 1976).

Anteriorly:

The fibrous capsule is completely absent above the patella and over the patellar area. Elsewhere, it blends indistinguishably with expansions from the vastus medialis and lateralis. The expansions are attached to the margins of the patella and ligamentum patellae and extend backwards on each side as far as the corresponding collateral ligament and downwards to the condyles of the tibia. They form the medial and lateral patellar retinaculae, and the latter is further strengthened by the iliotibial tract.

Above the patella the deficiency of the fibrous capsule allows the suprapattellar bursa to communicate freely with the cavity of the joint (*Gray*, 1976).

On Its Deep Surface:

The fibrous capsule is attached to the periphery of each meniscus and connects it to the adjacent margin of the head of