MANAGEMENT OF AVASCULAR NECROSIS OF THE FEMORAL HEAD IN YOUNG ADULTS

ESSAY

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by

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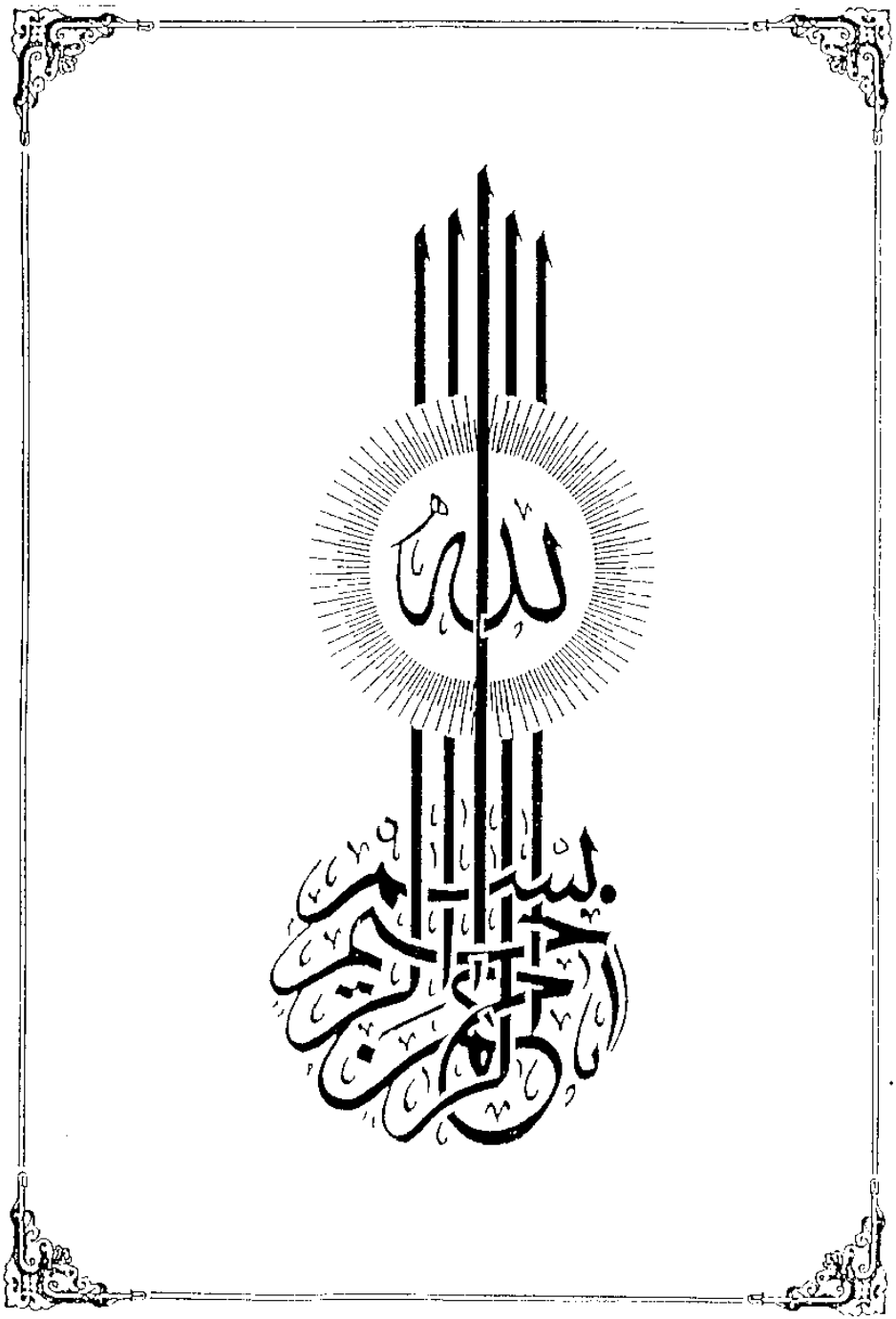
TO MY FATHER



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El-Zaher Hassan El-Zaher

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INTRODUCTION

Introduction :

Both the diagnosis and treatment of osteonecrosis represents challenges to orthopaedic surgeon. The most common cause of AVN of the femoral head is displaced subcapital or transcervical fractures i.e. traumatic, and usually affects the elderly population. In contradistinction, non-traumatic AVN occurs primarily in young adults and is often bilateral and can be progressive and disabling even with treatment.

Although the condition has been recognized for years and several etiologic associations are well described, the mechanism of the disease remains uncertain.

Various treatment modalities have been proposed, but few are uniformly successful, often because they have been instituted too late. In general, the earlier treatment begins, the better the results will be. Therefore, early diagnosis is essential and must be stressed.

The aim of this work is to stress on early diagnosis and the importance of various imaging techniques and to state the newer procedures of treatment.

CHAPTER I

VASCULAR ANATOMY

ANATOMICAL STRUCTURE OF THE HIP JOINT

The hip joint is a multiaxial joint and of the ball and socket type. It is formed by the articulation of the head of the femur directed upward, medially and slightly forward, with the cup shaped fossa on the lateral aspect of the hip bone directed laterally, downward and foreword known as the acetabulum.

A part of the floor of the acetabulum is roughened and non-articular termed the acetabular fossa, while the rest of the floor of the acetabulum forms an incomplete ring termed the lunate surface and is the articular surface of the acetabulum. This lunate surface is broadest at its upper part where the pressure of the body weight falls in the erect attitude and narrowest where it covers the pubic constituent *(Gray, 1989)*.

The margin of the acetabulum gives attachment to the thin fibrocartilagenous rim which is triangular in cross section known as the acetabular labrum and which increases the depth of the acetabulum and narrows its margin becoming fit closely on the head of the femur. The base of this rim is attached to the edge of the acetabulum and the apex corresponding to the free margin of the labrum. So the labrum acts as a sucker which resists outward displacement of the head and adds more stability to the hip joint.

The acetabulum is deficient below to form the acetabular notch that is bridged over by a ligament known as the transverse ligament which in reality is a part of the acetabular labrum, covering the notch to the acetabular foramen through which the vessels and nerves enter the joint. The strong flattened fibers of the transverse ligament cross the acetabular notch to complete the circle formed by the acetabular labrum which embraces the head of the femur closely to assist in holding it in its socket.

The articular surface of the head of the femur and the acetabulum are reciprocally curved and spheroid rather than spherical. The lunate surface of the acetabulum is covered with articular cartilage which is thickest where the surface is broadest, but the roughened part of the floor of the acetabular fossa within the surface is devoid of articular cartilage and lodges a fibroelastic pad of fat largely covered with synovial membrane. On the other hand, the head of the femur is completely covered with articular cartilage except over the small, roughened pit called the fovea to which the ligament teres of the head of the femur is attached. This ligament is a triangular, somewhat flattened band implanted by its apex onto the fovea of the femoral head; its base is attached by two bands one into each side of the acetabular notch and between these bony attachments it blends with the transverse ligament. As it lies within the joint, it is ensheathed by synovial membrane, so the ligament is intracapsular, extrasynovial. Infront the cartilage extends laterally to cover a small area on the adjoining part of the neck of the femur; it is thickest at the center of the head, and thinner toward the periphery *(Gray, 1989).* (Fig1.1)

Capsule and ligaments of the hip joint :

The hip joint capsule is a closely fitting fibrous ligament that attaches proximally around the rim of the acetabular labrum and transverse ligament, and it encircles the femoral head.

The capsule attaches anteriorly along the intertrochanteric line and posteriorly along the junction of the middle and distal thirds of the femoral neck. The capsule is constricted along the narrowest part of the femoral neck by the zona orbicularis - a deep sling of collagenous fibers. An inferior recess is formed by an impression made by the transverse ligament, which is situated at the inferior portion of the acetabulum. The iliopsoas muscle is anterior to the joint capsule, separated by the iliopsoas bursa with which the joint frequently communicates. The joint capsule encloses the femoral head, which is attached to the acetabulum by the ligamentum teres *(Mitchell et al., 1986).* (Fig.1.2)

-Ilio-femoral ligament: The stem of the "Y" arises from the lower half of the anterior inferior iliac spine and from the acetabular rim. The diverging limbs are attached to the upper and lower ends of the intertrochanteric line.

Figure (1.1)

Snell

Figure (1.2)

-Pubo-femoral ligament: Passes from the ilio-pubic eminence and obturator crest to the capsule on the inferior part of the neck of the femur.

- Ischio-femoral ligament: Arises from the postero-inferior margin of the acetabulum, and its fibers, passing laterally to the capsule, spiral upwards and are continued into a band of fibers that run in the capsule transversely around the neck of the femur.

Synovial membrane of the hip joint :

Lining the inner surface of the capsule, the synovial membrane of the hip joint commences at the margin of the articular cartilage of the head of the femur. It covers the portion of the neck which is contained within the joint capsule, covers both surfaces of the acetabular labrum, ensheathed the ligament of the head of the femur, and covers the mass of fat contained in the acetabular fossa except the articular surface *(Gray, 1989)*.

Vascular anatomy

The arterial supply of the proximal end of the femur has been studied extensively. *Crock* (1980) describes the arteries of the proximal end of the femur in 3 groups :

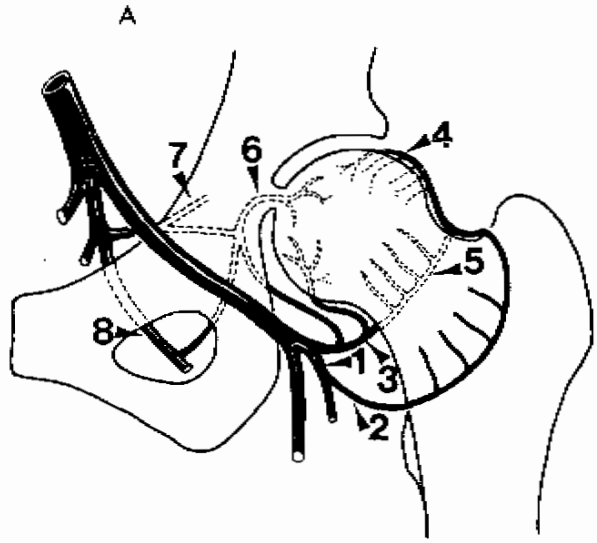
1. An extracapsular arterial ring located at the base of the femoral neck.(Fig.1.3)
2. Ascending cervical branches of the extracapsular ring on the surface of the femoral neck.(Fig.1.4)
3. The arteries of the round ligament.(Fig.1.3)

The extracapsular arterial ring :

It is formed posteriorly by a large branch of the medial femoral circumflex artery and anteriorly by branches of the lateral femoral circumflex artery. The superior and inferior gluteal arteries also have minor contribution to this ring.(Fig.1.5)

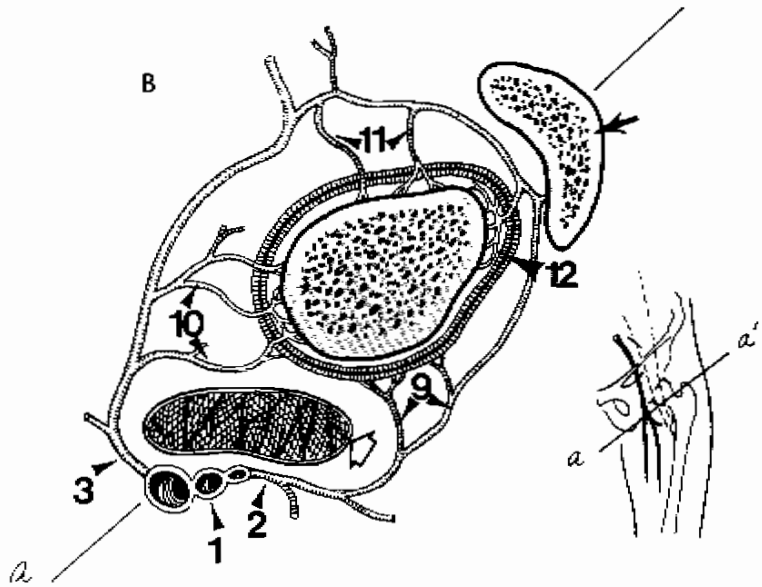
The ascending cervical branches :

It arises from the extracapsular arterial ring. Anteriorly, they penetrate the capsule of the hip joint at the intertrochanteric line and posteriorly, they pass beneath the orbicular fibers of the capsule.(Fig.1.5)



1- Profunda femoris artery 2- Lateral circumflex artery
3- Medial circumflex artery 4- Superior retinacular (lateral epiphyseal) artery
5- Inferior retinacular (inferior metaphyseal) artery 6- Foveal (medial epiphyseal) artery
7- Inferior gluteal artery 8- Obturator artery

Figure (1.3) Resnick & Niwayama



Proximal left femur cross seetion at the neck base shows
The greater trochanter (arrow) and iliopsoas muscle (open arrow). Note the profunda femoris artery (1) and the lateral (2) and medial (3) circumflex arteries. From the lateral circumflex arteries are derived the anterior ascending cervical arteries (9). From the medial circumflex artery are derived the medial (10), posterior (11) and lateral (12) ascending cervical arteries, which, in combination with the anterior ascending cervical arteries, form a subsynovial anastomotic ring on the surface of the femoral neck at the margin of the articular cartilage

Figure (1.4) Resnick & Niwayama, 1988