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## ORTHOPAEDIC SURGERY BOARD REVIEW MANUAL

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## Total Hip Arthroplasty

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# Total Hip Arthroplasty

## I. INTRODUCTION

Total hip arthroplasty (THA) has become one of the most successful surgical procedures. Initial surgical intervention aimed at restoring joint surfaces of the hip centered on realignment osteotomy of the upper femur. The first “arthroplasty” may have been Gluck’s attempt in the 1800s to insert an ivory ball onto the neck of the femur. Eventual attempts at replacing the worn surfaces involved the use of cobalt-chromium alloy (Vitallium) by Smith-Petersen followed by the addition of an intramedullary stem by Moore. In 1948, Wiles inserted a ball-and-socket hip prosthesis, and 3 years later McKee and Farrar implanted their first stainless steel total hip prosthesis. Sir John Charnley used methylmethacrylate to cement both the femoral and acetabular components in 1958. In 1961, high-density polyethylene was used as an alternative bearing surface to oppose the femoral head. These pioneers and others opened the door to what has become one of the most successful operative procedures ever developed.

## II. ANATOMY

### A. Femur

1. The average **angle** between the neck and the shaft of the femur is 127 degrees in adults.
2. The **center of the head** of the femur is approximately one diameter medial to and level with the tip of the greater trochanter.
3. Femoral **version** is determined by the angle between the femoral condyles and the axis of the neck of the femur. Average anteversion in adults is 10 to 15 degrees.

### B. Acetabulum

1. The acetabulum is formed through **fusion of the ischium, ilium, and pubis**.
2. The lateral column includes the ilium and the superior dome. The anterior column is composed primarily of the pubis and the posterior column of the ischium.
3. On **radiographic** evaluation, the true position of the acetabulum is determined by the intersection of the **line of Köhler** (drawn from the

acetabular teardrop to the lateral tangent of the pelvic ring) and the **line of Shenton** (curve formed by the top of the obturator foramen and medial neck of the femur to the level of the lesser trochanter).

4. **Correct acetabular version** seats the implant in approximately 45 degrees of abduction and 15 degrees of anteversion. The position can be determined with use of internal or external landmarks.
5. The **labrum** deepens the acetabulum and is most prominent at the posterior superior region of the acetabulum.

### C. Capsule

1. The capsule extends to the intertrochanteric line anteriorly and the femoral neck posteriorly. It is reinforced anteriorly by the iliofemoral ligament of Bigelow.
2. The ligamentum teres lies in the acetabular fovea and extends to the femoral head. This structure contains branches of the obturator artery.
3. The capsule becomes thickened with degenerative disease of the hip.

### D. Nerves

1. The **lateral femoral cutaneous nerve** can be encountered during the anterior approach to the hip. It lies 2 to 3 in (5 to 7.5 cm) below the anterior superior iliac spine.
2. The **femoral nerve can be injured** with excessive retraction or poor placement of retractors along the anterior acetabulum.
3. Six different arrangements of the **sciatic nerve** in relation to the piriformis muscle have been described.<sup>1</sup> The nerve passes below the piriformis muscle in 85% of instances. It is protected by the short external rotator muscles during the posterior exposure for THA.
4. The **superior gluteal nerve** is in the space between the gluteus medius and gluteus minimus muscles. When the abductors are split, a “safe area” is present 5 cm from the tip of the greater trochanter.<sup>2</sup> The nerve can be damaged when the anterior portion of the gluteus medius muscle is retracted during an antero-lateral approach to the hip.