Radiological Evaluation of Postoperative Complications of Total Hip Replacement

Essay

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CONTENTS

Abbreviations

- AP Antro posterior
- BMD Bone mineral density
- CRP C-reactive protein
- CT computed tomography
- DEXA dual energy x ray absorptiometry
- DVT Deep venous thrombosis
- ESR Erythrocyte sedimentation rate
- FDG Flurodeoxyglucose
- HO Heterotopic ossification
- MARS Metal artifact reduction sequences
- MDP Methylenediphosphonate
- MRI Magnetic imaging resonance
- PACU Postanesthesia care unit
- PE Pulmonary emboli
- PET Positron emission tomography
- PMMA Polymethylmethacrylate
- PPI Periprosthetic infection
- RRL Relative radiation level
- SPECT Single photon emission computed tomography
- THA Total hip arthroplasty
- THR Total hip replacement
- US Ultrasonography
- WBC White blood cells

List of Figures

Introduction

Hip replacement surgery is one of the most important surgical advances of the last century, In addition to marked reduction in pain and improvement in sleep, most people regain range of motion, physical ability, and quality of life. (Simic 2005)

The earliest recorded attempts at hip replacement (Gluck T, 1891), which were carried out in Germany, used ivory to replace the femoral head (the ball on the femur) (Gomez et al 2005) . The first total hip replacement is thought to have been done in London by Phillip Wiles in 1938. The procedure was further developed in the 1950s by pioneers such as McKee and Farrar. (Petty 1991)

Since its establishment in 1960 , THR has become one of the most widely performed procedures in orthopedics, It is estimated that approximately 1-3% of the older adult population (those 65 years and older) will undergo THA at some point, with the average age being 66 (Wilcock 1978) , In 2002, more than 200 000 THA procedures were performed in the US (Rockville 2004) , Now with an average cost of $45,000. (Barnaby 2008)

Unfortunately, as any operation, total hip replacement has complications which include heterotopic bone formation, mechanical aseptic loosening, prosthetic or

periprosthetic fracture, dislocation, superficial and deep infections, and foreign-body granulomatosis (ie, osteolysis). Such complications are a common source of patient morbidity and may necessitate revision arthroplastic surgery. (Pfirrmann et al 2005)

Recognizing and diagnosing these complications are often challenging because the presentation and findings are often nonspecific and frequently subtle. Radiography remains the cornerstone of evaluation and is complemented by arthrography, radionuclide scanning, sonography, CT, and MR imaging. (Keogh et al 2003)

The appropriate examination of a symptomatic patient who has undergone THA includes diagnostic imaging evaluation. This can involve radiography (Manaster et al 1996) , nuclear medicine studies with bone and gallium scanning (Kraemer et al 1993) , joint aspiration (Roberts et al 1992) , and arthrography. (Cheung et al 1997)

The two-dimensional nature of radiographs limits their ability to accurately determine component alignment, such as the true version of the acetabular component in a total hip arthroplasty. CT has been proven to be more reliable than radiographic analysis, as well as intraoperative estimation of component alignment, providing a direct three-dimensional evaluation of cup version in total hip arthroplasty. (Wines et al 2006)

Several investigations of FDG PET for the evaluation of suspected infection have had promising results. (Zhuang et al 2001)

MR imaging has been shown to be a valuable diagnostic tool in patients who have undergone total hip replacement especially in assessment of abductor tendons and muscles. (White et al 2000)

Studies have shown that sonography is useful in the detection of periprosthetic infection characterized by a significant increase in periprosthetic fluid and by extracapsular fluid collections. (Foldes et al 1992)

AIM OF THE WORK

The aim of this study is the assessment of the role of different radiological and imaging modalities in the evaluation of complications after total hip replacement.

Anatomy of hip joint

Articulation

The hip joint is a synovial joint formed by the articulation of the rounded head of the femur and the cup-like acetabulum of the pelvis. It forms the primary connection between the bones of the lower limb and the axial skeleton of the trunk and pelvis. Both joint surfaces are covered with a strong but lubricated layer called articular hyaline cartilage. The cuplike acetabulum forms at the union of three pelvic bones — the ilium, pubis, and ischium (Faller et al 2004)

The Y-shaped growth plate that separates them, the triradiate cartilage, is fused definitively at ages 14-16 (Thieme Atlas of Anatomy 2006)

It is a special type of spheroidal or ball and socket joint where the roughly spherical femoral head is largely contained within the acetabulum and has an average radius of curvature of 2.5cm (Thieme Atlas of Anatomy 2006)

The acetabulum grasps almost half the femoral ball, a grip augmented by a ring-shaped fibrocartilaginous lip, the acetabular labrum, which extends the joint beyond the equator (Faller et al 2004)

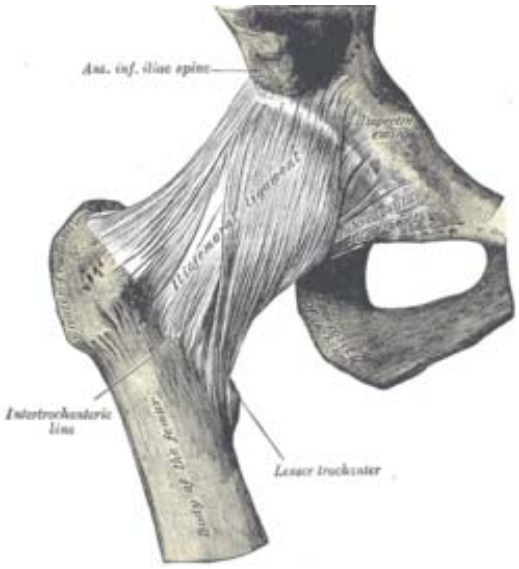

Fig (1) Right hip-joint from the front showing iliofemoral ligament and pubofemoral ligament . (Grey`s anatomy 2000)

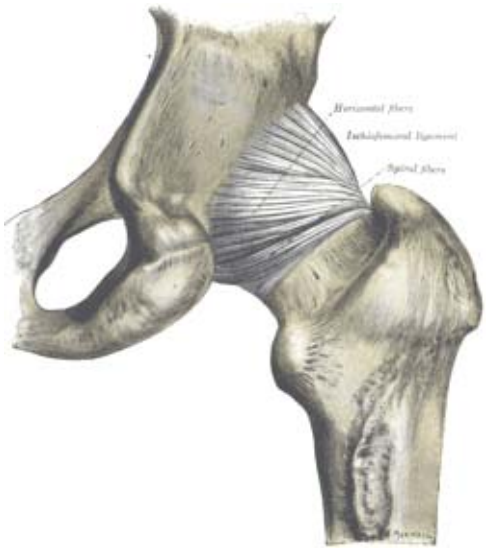

Fig (2) The hip-joint from behind showing ischiofemoral ligament

(Grey`s anatomy 2000)