Background

- Total hip replacements (THR) are widely performed throughout the UK with over 700,000 primary THR operations occurring in between 2003 and 2014 (NJR Annual Report 2015).
- Following surgery, plain radiographs are the imaging modality of choice in both the immediate post-operative period and for subsequent follow up.
- The initial radiograph allows not only evaluation of the intra-operative fixation technique but any complications that may have occurred. It also serves as a reference for comparing future radiographs.

Aims

- To categorise the different prostheses available, describe a systematic approach in how to interpret the post arthroplasty radiograph and review commonly occurring complications, with a strong emphasis on plain radiographs.

Methodology

- In a retrospective study, patients whom had a complication following a THR were identified from a database and their imaging findings subsequently reviewed.

Radiograph Interpretation

- An understanding of the expected position of both the femoral and acetabular components is essential to assess for complications. We will highlight how to assess these below.

- Leg length - Two lines are drawn: a pelvic reference line that connects the inferior margins of the acetabular tear drops and a femoral reference line connecting the lesser trochanters. A perpendicular line is then made between both lines. Discrepancy of 1cm between both sides is generally accepted.

- Horizontal centre of rotation - distance between the femoral head and the inferior margin of the acetabular tear drop. This should be the same bilaterally.

- Vertical centre of rotation - distance between the femoral head and the trans-ischial tuberosity line. Again this should be the same on both sides.

- Acetabular inclination - angle between a line drawn through the rim of the acetabulum and a line parallel to the femoral shaft is between 30 and 50 degrees. A greater angle predisposes to an increased risk of dislocation.

- Femoral stem position - the stem should lie in a neutral position in parallel to the femoral shaft.

- With regards to the cemented prostheses, it is important to review both the cement-prosthesis and cement bone interface. A radiolucent zone should be less than 2mm. A lucency greater than this or one that increases in size is suggestive of loosening.

- Polyethylene wear - the femoral head should lie evenly within the acetabulum.

Complications

- These can typically be broadly described as intra-operative and post-operative.
- Complications include peri-prosthetic fracture, nerve injury and cement extrusion.
- Post-operative complications include dislocation, loosening, fracture, metallosis and heterotopic bone formation.

- Dislocated THR
- Medial cement extrusion
- Peri-prosthetic fracture
- Heterotopic bone ossification
- Polyethylene wear
- Loosening

- Other types of THR include:
  - Hip resurfacing, whereby the femoral head is replaced by a metallic cap and this articulates with an acetabular cup.
  - Custom made prostheses
  - Mega prosthesis in case of bone tumours
  - Hip resurfacing arthroplasty and a cemented Right THR
  - Hybrid THR are more common than reverse hybrid ones
  - Reverse hybrid THR = cemented acetabular cup and cementless femoral stem
  - Hybrid THR = cemented femoral stem and uncemented acetabular cup
  - Femoral stem position - the stem should lie in a neutral position in parallel to the femoral shaft.
  - Acetabular inclination

- ALVALS (aseptic, lymphocyte-dominated vasculitis-associated lesion)

- Figure 1 – Plain radiograph showing a Left resurfacing arthroplasty and a cemented Right THR
- Figure 2 – Plain radiograph showing a Left reverse hybrid THR and a custom made Right sided THR
- Figure 3 – Plain radiograph showing how to measure leg length
- Figure 4 – Plain radiograph showing how to measure centre of rotation
- Figure 5 – Plain radiograph showing how to measure acetabular inclination
- Figure 6 – Plain radiograph showing a dislocated Left THR
- Figure 7 – Plain radiograph showing medial cement extrusion
- Figure 8 – Plain radiographs showing a peri-prosthetic fracture
- Figure 9 – Plain radiograph showing a Left heterotopic bone ossification
- Figure 10 – Plain radiograph showing the femoral head lying eccentrically within the right acetabulum.
- Figure 11 – Plain radiograph showing marked loosening
- Figure 12 – Ultrasound showing mixed solid / cystic peri-implant mass / pseudotumour associated lesion (ALVALS)