

Attachment 2

MoM hip arthroplasty follow up and interpretation of follow up results

1) If the patient has symptoms or the implant makes abnormal noises (regardless of the blood metal ion levels)

- a. MARS MRI for all of these patients
 - i. If there are no abnormal findings in the MARS MRI, follow up is recommended to be carried out as followed:
 - Clinical examination, symptom questionnaire, and blood metal ion levels every year
 - Plain radiographs every other year is sufficient
 - Repeating MARS MRI is recommended if blood metal ion levels increase or there is progression in symptoms

2) Asymptomatic patients with blood metal ion levels below 5µg/l

- a. Every patient with MoM hip arthroplasty should go through the following examination at least once: clinical examination (orthopedic surgeon or physiotherapist) and/or symptom questionnaire, plain radiographs, and blood metal ion level measurement (cobalt (Co) and chromium (Cr) levels)
- b. If nothing is abnormal in the aforementioned tests, follow up is recommended to be carried out as follows:
 - i. Regular follow up every 2 years
 - Symptoms questionnaire (OHS + more detailed questions) and blood metal ion level measurements
 - Plain hip radiographs every fourth year
 - In case of a long distance (teleconference, video, etc.) follow up, the orthopedic surgeon interpreting the results should be specialized to arthroplasty surgery

3) Asymptomatic patient with blood Cr or Co level above 5µg/l

- a. MARS MRI should be performed on all of these patients

- i. If there are no abnormal findings in the MARS MRI, follow up is recommended to be carried out as follows:
 - Clinical examination, symptom questionnaire, and blood metal ion level measurements each year
 - Plain radiographs and MRI every 2 years
 - MRI should be repeated at 1 year from previous MRI if blood metal ion levels have significantly increased at 1 year follow up

4) Very high blood metal ion levels without other abnormal findings (Cr or Co level above 20µg/l)

- a. With very high ion levels (above 20µg/l) metal wear related reaction is likely (Hart et al. 2014)
- b. At blood metal ion levels above 20µg/l, risk for systemic effects is increased
 - i. One should also consider patient's other symptoms (cardiologic, neurologic, rashes)
- c. MARS MRI as the follow up for all of these patients
- d. Revision should be considered regardless of if the patient is asymptomatic or if no abnormal findings are found in the MRI, because very high ion levels may indicate more serious ALVAL-reaction and worse soft tissue damage (necrosis)

5) Gold standard for follow up is always MARS MRI

- a. Reliable MRI interpretation always demands evaluation from a specialized radiologist
- b. Secondary follow up is ultrasound (US), which must always be performed by a specialized radiologist. If the US is done, a needle sample should be taken simultaneously and cell count (including white cell type counts), bacterial culture, and synovial fluid Cr and Co levels should be taken from the sample

6) When revision should be considered?

- a. Very high blood metal ion levels (above 20µg/l), regardless of if the patient is asymptomatic or if no abnormal findings are found in the MRI, because very high ion levels may indicate more serious ALVAL-reaction and worse soft tissue damage (necrosis).

- b. If there is one or more of the following findings in the MRI:
 - i. Clear pseudotumor
 - ii. Signs of abductor damage
 - iii. Clear osteolysis
 - iv. Significantly thickened joint capsule (>10mm)
- c. If the patient has difficult symptoms or clear mechanical abnormalities in the joint movement (for example a squeaking or creaking joint, or cogwheel type of motion) regardless of the blood metal ion levels or MRI findings
- d. In differential diagnosis, the possibility of silent periprosthetic joint infection should be considered: erythrocyte sedimentation rate and c-reactive protein should be measured for symptomatic patients and a synovial fluid sample is recommended if infection parameters are elevated

7) Blood metal ion level follow up after revision

- a. Literature on the benefits and clinical significance of routine follow up of blood metal ion levels after revision surgery is limited
- b. Routine blood level follow up after revision surgery is not mandatory