

Massive metallosis in ceramic-on-metal bearing

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1 Background

To reduce prosthetic loosening caused by particle wear and take advantage of larger heads to prevent hip dislocations, new hard-on-hard bearing combinations were tested in the first decade of the 21st century. Ceramic-on-metal (CoM) bearings showed significantly lower particle wear compared to metal-on-metal (MoM) bearings in laboratory settings.^{1,2} FDA approval for CoM bearings was given in 2011.³ More recent in vivo studies showed serum ion levels (Co and Cr) are lower in CoM compared to MoM (metal-on-metal) bearings three years after implantation, but seem to rise after 5 years.^{4,5} The reason for increased wear rates remains controversial. Edge loading, as well as incorrect component positioning or third body wear have been cited as causes. So far only few case reports exist describing implant loosening due to metallosis related pseudotumor.^{6,7}

Case

We present the case of a 50 year old female patient who was seen in our clinic for a second opinion with hip pain after a complicated history of multiple previous surgeries. Born with bilateral high hip dislocations in 1970 she underwent several hip surgeries to preserve her hip joints. On the right side, including revision surgeries due to a staphylococcus infection a total of 18 operations had been performed until finally a total hip prosthesis was implanted in 2010 using an uncemented stem (sur mesure, Symbios) and cup (Pinnacle, DePuy) with a ceramic-on-metal bearing.

Preoperative

Clinical presentation

- Ambulatory only on crutches for 2 years due to right sided hip pain
- No pain on palpation, normal range of motion, but missing abductor force

X-ray (image 1)

- Cup inclination 45° and anteversion of 3° was measured in a scintigraphy.



Image 1: Preoperative ap pelvis and cross table view of the right hip showing the eccentric position of the head in the cup with multiple cysts surrounding the acetabular component. Despite irregular bony appearance around the stem there was no loosening visible in the Spect-CT. The cross-table-view shows the anteriorly uncovered cup.

Surgery

A stepped trochanteric flip osteotomy was chosen as approach. The osteotomy surfaces showed completely black bone. (Image 2) After careful dissection of the severely altered abductor muscles from the capsule, fluid was aspirated from the joint to reduce intraarticular pressure. The aspirated liquid was also black. (Image 3)

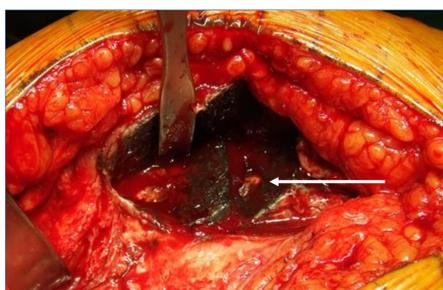


Image 2: Trochanteric osteotomy. The white arrow points to the osteotomy surfaces



Image 3: Aspirated intra-articular fluid

The capsule with massive metallosis was opened and resected in toto. (Image 4).

Inspection of the joint revealed that the entire anterior bony half of the acetabulum was abraded, leaving half of the metal back hanging free. Therefore, and for reasons of debridement, a complete exchange of the implants was necessary. The implants were removed, followed by a thorough debridement, preserving as much bone as possible for the subsequent acetabular reconstruction despite the alterations caused by the metallosis.

Reconstruction of the acetabular defect was accomplished using a shell formed out of a femoral allograft head which is held in position with an acetabular reinforcement ring with hook. The stem was replaced with a CLS stem after removal of only the most severely altered bone, particularly in the trochanteric region. This defect was also filled with allograft. The greater trochanter was re-attached using a cerclage wire and a screw.



Image 4: Massive metallosis visible on debrided tissue



Image 5: The asterisk (*) is showing the metallic marks on the ceramic head and the arrow the eccentric wear of the liner

Postoperative

Outcome at one year follow up

- Little to no pain
- Walking without walking aides for short distances
- Normal range of motion
- Stable implants with well visible allograft (Image 6)



Image 6: Stable cup and stem after revision surgery on the right hip.



Discussion

Eccentric wear of the liner as well as metallic marks on the ceramic head (Image 5) were visible after removal. We therefore hypothesize that despite acceptable position of the implants according to Lewinnek, edge loading was the main cause for the metallic wear.¹⁰ The age of the bearing may be of less importance. Nevertheless, since metal wear has been shown to increase over time in CoM bearings, this effect may have contributed to metallosis.^{4,5}

Conclusion

CoM bearings are still FDA approved to this day, but have never been widely used in Switzerland.^{8,9} Due to the negative experience with this case without a clear cause being identifiable, we recommend monitoring of all these patients especially as recent findings show a possible increase in serum ion levels (chromium) after five years. Therefore, regular controls of serum ion levels and in case of elevated values or clinical symptoms MRI imaging to rule out pseudotumor formation seems mandatory.

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