Introduction: The fate of HA-coating on the joint prosthesis long after implantation is still unknown. The purpose of this study is to examine the changes of HA-coating layers on smooth surfaced acetabular components which were revised due to aseptic loosening.

Methods:

Patients and implants: Seven retrieved HA-coated acetabular components in the consecutive 37 total hip arthroplasties were studied. The components were made of titanium-alloy and the surface except screw holes were coated with HA at 20\(\mu\)m in thickness (Moore 7 HA, Kyocera, Japan). The surfaces were sand-blasted and the average surface roughness was 3.7\(\mu\)m. The acetabular components were revised after median 84 months (48-90) due to aseptic loosening and the femoral components were remained in situ.

Identification of the disappeared HA-coating: Scanning electron microscope (SEM) and elemental analysis were used to determine the disappearance of HA-coating and the exposure of titanium-alloy substrate. NIH image was used to quantify the remaining or disappearance of HA-coating.

Histological analysis: Immunohistochemical analysis of the tissue around the loosened components were performed to identify the presence of macrophages using EMB 11 antibody. SEM and the elemental analysis was used to identify the particles in the tissue.

Results:

Clinical results: The clinical results of this series of HA-coated smooth acetabular components were poor. Ten years survival rate without revision is 70% and the survival rate without radiographical loosening is 62%.

Disappearance of HA-coating: The HA-coating disappeared to the various degrees in all the acetabular components (fig 1 and 2). The average rate of disappearance was 79.9% (48-90). Even in the remaining area of HA-coating, the coating layers were thinned. The yearly rate of the disappearance was 11.1% /year.

Histology and identification of particles: Histological analysis revealed the fibrous tissue formation without aggressive granulomatous reaction. Accumulated macrophages containing particles were occasionally seen. Elemental analysis and the polarized microscope revealed that most particles were titanium-alloy and polyethylene. There were only small number of particles that were calcium and phosphate positive. Delaminated HA-coating layers were not identified.

Conclusion:

HA-coating layers on the acetabular components disappeared with time. The mechanism of disappearance is unclear, however, it seemed to be resorption rather than delamination or fragmentation of HA-coating. HA-coated smooth surfaced acetabular components have high risks of loosening after disappearance of HA-coating.