Imaging of skin attachment on Hydroxyapatite (HA) coated bone anchored hearing implants

D. Kapsokalyvas[1], M. van Hoof[2], S. Wigren[3], R.J. Stokroos[2], F.C.S. Ramaekers[1], M.A.M.J. van Zandvoort[1]
(1) Department of Molecular Cell Biology, GROW-School for Oncology and Developmental Biology, Maastricht University Medical Center, PO Box 616, 6200 MD Maastricht, The Netherlands
(2) Department of Otorhinolaryngology and Head and Neck Surgery, Maastricht University Medical Center, PO Box 5800, 6202 AZ Maastricht, The Netherlands
(3) Cochlear Bone Anchored Solutions AB, Mölnlycke, Sweden
e-mail: d.kapsokalyvas@maastrichtuniversity.nl

KEY WORDS: two-photon microscopy, hydroxyapatite, implant, skin

Percutaneous implants such as bone conduction hearing implants suffer from complications which includes inflammation of the surrounding skin. Recently, a hydroxyapatite (HA) coated abutment was introduced. It was hypothesized that the hydroxyapatite coating should enable integration with the adjacent skin when used in combination with soft tissue preservation surgery. Research has shown that such integration is not achieved with titanium, which is the abutment material used since the origin of bone conduction hearing implants. In comparison, a sealed skin-abutment interface should prevent bacterial colonization and reduce peri-abutment dermatitis. Until now, only evidence from animal research or research in related fields was available to support the primary theory. Here we investigate, if skin integration is possible in patients using a HA-coated abutment.

This was accomplished with Two-Photon Microscopy (TPM). Clinically retrieved abutments from patients were stained for DNA, collagen IV and integrin-α6. The full length of the abutment was visualized by stitching adjacent stacks. This resulted to a single image covering the full 8mm length of the abutment. Based on this analysis it was made possible to visualize the regions of skin-abutment interface. Mainly epidermal attachment was visualized in the upper layers of the abutment while dermal attachment was visible at deeper regions of the abutment. These findings will improve our understanding of the skin-abutment surface interaction and the complex mechanisms that lead to a long standing skin-implant integration.