Use of High Performance Polymers (BioHPP) in the oral rehabilitation of implants

The purpose of this work is to evaluate the macro and micro aspects of healing abutments in BioHPP (High Performance Polymer).

Different types of BioHPP healing abutments were produced using two distinct techniques (press and luted). A periodontal evaluation was performed for both types of healing abutment, which allowed an analysis of the perimplant soft tissue conditions to be conducted.

We performed a microscopical evaluation to record the extent of plaque adhesion to the surfaces of a BioHPP healing abutment, whilst considering a healing abutment sample in titanium. Microscopic and macroscopic evaluations were performed to evaluate the clinical behaviour, reaction of the soft tissue and biocompatibility of the perimplant tissue around the healing abutments.

Finally, the study concluded with an analysis of the different possible morphological and structural diversities in the BioHPP healing abutments, with the objective of producing new generation definitive abutments.

At the Department of Implantology, Dental Clinic, IRCCS Fondazione Policlinico Ospedale Maggiore, Università degli Studi di Milano, from June 2012 to June 2013, twenty-one partially edentulous patients, who were in need of implant-prosthesis rehabilitation of the maxilla and mandible, were given an evaluation.

Forty-six implants were placed, with a minimum of two implants per patient being immediate placements of a healing abutment in titanium and at least one healing abutment in BioHpp (luted or press), chosen at random.

After a period of four months from surgery, a periodontal examination (PPD, PL, BOP) was performed. At the end of the evaluation, the healing abutments were removed from the oral cavity and sent to the analysis laboratory of the Cologne University, so that they could be examined.

Assessed in the laboratory were as follows:

- The amount of plaque adhesion on the surface of the healing abutment in BioHPP and Titanium
- The possible structural and morphological differences between the two types of BioHPP healing abutments.

The histomorphometrical analysis revealed a greater plaque accumulation on the surfaces of the BioHPP healing abutments compared to the titanium ones.

With a comparison of the periodontal index (PPD and BOP) recorded for the three types of healing abutments, you can see that the average values present physiological value with periodontal health for all implants that were considered. On the other hand, plaque adhesion was found to be lower for the healing abutment in Titanium compared to the healing abutments BioHPP luted and press.

The healing abutments compared to the titanium ones.

The use of BioHPP in dentistry is rather new, but in the last couple of years its practice is growing, especially in the field of prosthetics. However, despite the growing interest in this material, there are still very few studies in literature which consider it. The University of Regensburg assessed the response to the failure of composite restorations in BioHPP structures compared to metal composite structures.

Another study, led by the University of Jena, has considered the performance of BioHPP by evaluating the resistance to abrasion, the tendency for an exogenous discoloration, and the quality and structure of the surface.

Volpe et coll. have examined the biocompatibility of a type of reinforced PEEK with carbon, by assessing in detail the bacterial colonisation of healing screw surfaces in titanium and PEEK.

There are no studies yet regarding the biocompatibility and the connection between BioHPP and the soft tissues.

Advantages
- Adequate chemical, physical and mechanical properties for manufacturing of implant devices.
- By virtue of its all-white color, BioHPP presents high esthetic characteristics. (Gobel R. 2013)
- High biocompatibility, similar to titanium.
- Low cost for material production.

Disadvantages
- High level of plaque accumulation for BioHPP healing abutment in comparison to Titanium.
- Similar percentage of plaque adhesion on PEEK and titanium surfaces in vitro studies.
- The healing abutments considered in the study are prototypes. Very high polishing to improve success and reduce plaque formation.

• Stefano Volpe, Damiano Verrocchi, Peter Andersson, Jan Gottlow, Lars Sannerby. Comparison of early bacterial colonization of PEEK and titanium healing abutments using real-time PCR.
• Carola Kolbeck. Study in vitro of a bridge of four elements in peek on natural teeth.TCM(Ltermal and mechanical cycles) and test of ultimate strength Report numero 140.