

The effects of customized dental implant healing caps on tissues around the implant

Study protocol

The study was designed as a randomized controlled clinical trial. 30 dental implants were placed in study participants that were recruited at the University Clinic of Dentistry, Vienna, if they needed dental implant placement, and assigned to two groups. Each group followed a different prosthetic protocol after dental implant placement. In both groups, pre-operative soft tissue scanning (TRIOS, 3shape, Denmark) was performed.

After implant placement (C1, MIS Implants Technologies Ltd., Israel) in group 1 participants, impression was performed intra-operatively by intraoral scanning. Based on the collected data, an individual healing abutment was instantly produced at the dental laboratory unit utilizing CAD-software (Ceramill Motion 2 (5X) DNA Generation, Amman Girrbach, Germany) and subsequently affixed to the implant. The definitive crown was delivered after healing time.

Group 2 was treated according to standard prosthetic protocol after implant placement (C1, MIS Implants Technologies Ltd., Israel), involving the use of conventional healing abutments, implant level impressions, as well as abutment disconnections and reconnections before delivery of the definitive crown.

In both treatment groups, peri-implant crevicular fluid (PICF) was collected using sterile paper points to assess protein levels of *C-reactive protein* (CRP), interferon- γ , tumor necrosis factor (TNF)- α , interleukin (IL)-1 α , IL-1 β , IL-2, IL-4, IL-6, IL-8, IL-10, IL-12A, IL-17A, macrophage inflammatory protein (MIP)-1 α , *matrix metalloproteinase* (MMP)-13, osteopontin, osteoactivin, Receptor Activator of NF- κ B (RANK) and TGF- β by multiplex ELISA arrays, as well as microbial analysis. PICF sampling as well as radiographic assessments were performed 1 week after implantat placement at suture removal, at 3 and at 6 months afterwards.

INCLUSION CRITERIA

>18 years old, male or female, one missing tooth (postitions 1, 2, 6 or 7 in the upper jaw; 6 or 7 in the lower jaw), adequate bone quality and availabilty for implant placement, no signs of inflammation in the region where implant placement is planned, good systemic health conditions, stable occlusion, willing to participate and attend follow-up appointments.

EXCLUSION CRITERIA

Presence of untreated periodontitis, smokers (> 10 cigarettes per day), alcoholism or drug abuse, history of chemotherapy or radiation, diabetes with > 7,5 HbA1c, metabolic disorders such as osteoporosis, severe bruxism.