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Cost-effectiveness modeling of dental implant 1st line strategy versus bridge

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Objective: We assess the cost-effectiveness of dental implant 1st line strategy versus fixed partial denture (and denture) in patients suffering of one single missing tooth.

Method: The model used a simulation decision framework over a 20-year period. Potential treatment switches can occur every 5 years. Transition probabilities come from literature, epidemiological reports or expert opinions. They have been programmed using specific distribution ranges to simulate the patients and practice variability, and to take into account parameters uncertainty. Direct medical costs have been assessed according to a specific cost survey in France. Probabilistic sensitivity analyses were conducted using 5000 Monte-Carlo simulations generating confidence intervals of model outcomes.

Results: The cost distribution indicates a peak at 3000€ for the bridge strategy. The distribution for the implant strategy is more flat, showing the maximum ranging from 2500 to 3500€. The model simulations establish that total mean cost of the bridge 1st line strategy is 4385€ per patient over 20 years (1850€ to 17267€), providing 69% of success rate. Total mean cost of the implant 1st line strategy is 3517 Euros per patient over 20 years (1990€ to 10221€), with 92% of success rate. Differences are statistically significant for both total mean costs ($p < 0.001$) and success rate ($p < 0.001$). The mean cost-effectiveness indicates that the bridge strategy is significantly higher ($p < 0.001$) than the implant strategy with 6286€/success versus 3819€/success respectively.

Conclusion: This simulation modeling approach is the very first robust model in the field of implantology. Implant as the 1st line strategy appears to be the ''dominant'' strategy, considering the lower overall costs and the higher success rate.

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Determination of implant loading timing in human: A pilot study

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The immediate and early loading of implants appear to be a viable treatment option in the fully edentulous ridges. Some reports have shown clinical results successfully. Various designs of implant and prosthetic components are recommended by different manufacturers for immediate and early loading of implants. Though histomorphometric studies in humans as well as in animals have been reported for some implant systems, a few show remarkable results, it is not possible to extrapolate these results to other implant designs.

The aim of this study was to perform a histologic and histomorphometric analysis of the peri-implant tissue reaction and the bone-implant interface in three early loaded implants (5 days, 20 days, 50 days after surgical treatments) and an unloaded implant in the edentulous maxilla, and to compare these results for determining proper timing of supra-structure placement.

GS-II implant(Osstem, Korea) was used for this study. GS-II implant fixture is a dual-threaded internal connection type with upper microthreads and Cell-Nest surfaces (anodic oxidation treatment).

The histologic data showed that the osseointegration was achieved well in both loaded and unloaded conditions. The time of loading implants did not affect the oseeointegration much. Implant design modifications and implant surface treatments can affect bone responses in loading timing of implants. Maybe these developments could lead to favorable bone responses. However, in order to have a more proper and faster way of loading implants, more prospective studies and randomized controlled trials are needed.

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Titanium hydride and hydrogen concentration in acid etched titanium implants

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Titanium acid etching is popular to texture the surface of dental implants. During etching, the titanium oxide protective layer of the implants dissolves while native Hydrogen ions (H^+) are released in the bath. H^+ ions may form a titanium hydride (TiH) layer at the implant surface and lead to formation of TiH needles embritling titanium. The aim of this study was to measure the concentration of H in the implants and TiH at the surface of cp titanium and alloyed implants.

Five implant systems were investigated. Implants were made of cp titanium (Straumann-SLA, Ankylos-Cell Plus, 3i-Osseotite) or titanium alloy (3i-Prevail, MIS-Biocom). TiH concentration was determined by X-Ray diffraction, H concentration by thermodesorption.

TiH_{2-x} was present on all cp titanium implants, concentration varied between 5% to 32%. No hydride was found in titanium alloy. H concentration varied between 56 to 105 ppm, whatever cp titanium and titanium alloy.

Low solubility of H in α-Titanium is responsible for precipitation of H into TiH. The surface is enriched in TiH_{2-x} according to the vigor of the etching conditions. High solubility of H in the β phase of the α-β titanium alloy prevented H precipitation into TiH.

Measurement of H showed that all implants, even those lacking TiH_{2-x} at the surface, were enriched in H. In all implants, Hydrogen concentration was within the normative limits of 130 ppm.

TiH needles are expected to be present in cp titanium and therefore must be investigated in these implants, but not necessarily in titanium alloy.

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A prospective clinical investigation of a skeletal orthodontic anchorage system®

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Aim: Of this prospective study was to evaluate the success rate of the Orthodontic Skeletal Anchorage System® – a new anchorage device.

Material and methods: Nineteen patients (4 male, 15 female) were included in this prospective clinical study after ethic commission approval. 30 plates of the Orthodontic Skeletal Anchorage System were inserted in the maxilla in the area of the zygomatic buttress and in the mandible in the canine or molar area. The plates were loaded for orthodontic purposes either directly or indirectly after a healing period of the surrounding soft tissues of 2–3 weeks. For each plate the loading type, the force magnitude and the eventual loss rate was documented. 4 weeks after placement the patients' acceptance was evaluated.

Results: 25 plates were placed in the upper, 5 in the lower jaw. 21 were used for mesialisation of a tooth segment, 5 for distalisation of the whole arch, 2 for intrusion of molars and 2 for extrusion of impacted teeth. 2 plates got lost before loading, in one case an inflammation of the surrounding tissue was registered in the other case primary stability was not accomplished. 79% of the patients would agree again in the placement of a plate as part of their orthodontic treatment if necessary.

Conclusions: The results of the present investigation showed a comparable success rate (93.3%) with data reported in literature. Due to the apical screw position the Orthodontic Skeletal Anchorage System offers efficient possibility without risking interference between the roots and the anchoring device.

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Bone healing response to different implant surface topographies in dogs

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Objective: This study was to evaluate the effect of surface topographies to the bone healing by analyzing histologically and histomorphometrically and compare the bone healing process between micro roughened surfaces and nano-micro roughened surfaces periodically.

Material and methods: Eight different surface topographies of dental implants were designed to mandibles of dogs and installed on them. Machined surface implants (Exfeel, Megagen, Korea) were used as the control group. 4 nano-treated surface implants (TiO_2 sputter coating, Heat-treated TiO_2 sputter coating, CaP sputter coating, Heat treated CaP sputter coating) and 3 micro-treated surface implants[resorbable blast media (RBM), sandblast and acid-etched (SAE), anodized RBM] were used as experiment groups. All 72 implants were installed on the mandibles of 9 dogs. 3 dogs were sacrificed respectively at 2, 4, 8 weeks. After making the histology sample, they were analyzed histologically and compared with BIC (Bone to implant contact) for the histomorphometrical analysis.

Result: In histological analysis, there were a large number of new bone formations on the adjacent area of all implants in the 2 weeks group. At 4 weeks, although there were general bone formations, the new bone was distinguished from the basal bone. At 8 weeks, the new bone became matured and connected tightly to the basal bone.

In histomorphometrical analysis, 2 weeks group had lower value than 4 and 8 weeks group, and there was no difference between 4 and 8 weeks group. There were no differences between the 8 experiment groups.

Conclusion: There were no differences depending on surface topographies.

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The effects of nanotubular structure on cell response and osseointegration

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This study was performed to evaluate the wettability, to assess the cell response *in vitro* and to evaluate osseointegration of the titanium surface with nanotubular structure *in vivo*. For the wettability and cell response, four different kinds of surface-treated titanium discs (polished surface, micro-roughened surface, nanotubular surface and nanotubular micro-roughened surface) were fabricated. Nanotubular structure was fabricated by anodic oxidation. For the wettability test, the image was captured after a single drop of solution (distilled water and plasma) and contact angle was measured. MC3T3-E1 osteoblast cell was incubated during 6 hours for cell response. The cell morphology was evaluated using the scanning electron microscope. The cell viability was assessed using the XTT assay. ALP level was measured using colorimetric assay. For the test of osseointegration, nanotubular surface and nanotubular micro-roughened surface implants (2.0 × 5.0) were inserted into the tibia of Wistar rats. After 3 weeks, the tibias were harvested