Alkali treatment - new concept of titanium implant surface modification

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This study presents properties of recently developed alkali-treated titanium implant surface and evaluates the effect of early-loading protocol on the success rate of the alkali-treated implants.

Four titanium implant surfaces - alkali-treated, machined, sandblasted, and acid-etched - were tested. They were analyzed using electron microscopy and x-ray photoelectron spectroscopy. The wettability was determined using dynamic contact angle measurement and the real surface area was measured using krypton adsorption isotherm. The level of surface hydration was evaluated by infrared spectroscopy. In the 34-month clinical study the success rate of 1013 alkali-treated implants (Impladent STI-Bio, Lasak Ltd. Prague, Czech Republic) was evaluated. The healing time of these implants was 50% shorter than the conventional period.

The alkali treatment of the titanium created a porous, hydrated, and reactive titanium oxide surface. The contact angle of the alkali-etched surface significantly decreased (Q=29.9°) compared to that of the acid-etched (Q=119.7°) and sand-blasted (Q=79.9°) surfaces. The level of surface hydration was increased 14 times compared to the acid-etched surface. The relative surface area of the machined, acid-etched, and alkali-etched titanium was 1.4, 7.2, and 137.9 respectively. In the clinical study no difference between the success rates of early loading and delayed loading protocol was found.

The alkali-treated surface proved to possess more favourable properties compared with other tested surfaces. The 50% reduction of the standard healing period had no significant effect on the implant success rate.

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