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Osseoconduction of a sandblasted and etched titanium alloy surface in type IV bone: a human histologic evaluation

ABSTRACT n°Y9ZG9

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Background:
Machined surface implants placed in type IV bone of poor density are at a higher risk of failure than implants placed in normal and dense bone quality. Implants with a sandblasted and etched (SAE) textured surface placed in a poor bone quality environment has been documented to decrease the risk of failure when compared to machined surface implants. Histologic information about the osseoconduction capacity of SAE titanium alloy surfaces placed in sites of poor bone density in humans is scarce.

Aim/Hypothesis:
To evaluate the osseoconduction of a SAE titanium alloy surface placed in human type IV bone. The bone-implant contact (BIC) was compared to the initial expected BIC (IE-BIC) as proposed by Trisi 2002. Aim was to determine if the surface is bone neutral (BIC=IE-BIC) or bone conductive (BIC>IE-BIC).

Materials and Methods:
Four edentulous patients were scheduled to receive dental implants (C1, MIS) to support a full-arch prosthesis. Each patient received 2 additional customized implants (Ø3.5x8mm, V3, MIS) to be harvested after healing; 4 implants were placed in the mandible and in the maxilla. After 6mo they were retrieved with the surrounding bone and undecalcified histologic slices were prepared. The bony environment of each implant side was assessed. Sides that displayed a type IV bone were included in the study. They were: the vestibular and palatal sides of 2 implants placed in the maxilla, the palatal side of another maxillary implant and the vestibular side of a mandibular implant, 6 implant sides. BIC was first measured on the 6 implant sides; then IE-BIC was evaluated according to Trisi et al. (2002) by superimposing the profile of the implant threads 0.25mm away from its actual position; IE-BIC was determined as the percentage of bone contact that intercepted the implant surface on each side.

Results:

The mean BIC of the 6 sides in contact with type IV bone of poor density was 62.5±10.6% (min 45.4% - max 77.1%); the mean IE-BIC was 33.1±4.4% (min 26.5% - max 40.9%). The BIC was superior to the IE-BIC; this SAE titanium alloy surface can be considered as bone conductive. The BIC/IE-BIC ratio was 1.81±0.38. The BIC of each of the 6 sides was higher than the corresponding IE-BIC; it varied between +33% and +151%.

Conclusions and Clinical Implications:

This limited number of human histology samples documents for the first time that the present SAE titanium alloy implant surface is not bone neutral but osseoconductive when placed in a poor bone density environment in humans; the average BIC was 1.81 higher than the IE-BIC. This may explain the predictable clinical behavior of implants with this SAE textured titanium alloy surface in the posterior area of the maxilla.

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DECLARATION OF CONFLICTS OF INTEREST

Conflicts of interest in the last three years, with the following companies :

- Clinical research / scientific work : MIS
- Consultant, expert : MIS
- Courses, trainings : No
- Advertising material : No
- Invitations to national or international conventions : MIS
- Shareholding : No
- Possession of a patent or inventor of a product : No