

## Vertical osteoconductivity and early bone formation of different implants in a subperiosteal model

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### INTRODUCTION:

Osteoconductive characteristics of different implant surface coatings are in the focus of current interest. The aim of the present study was to compare the vertical osteoconductivity at the implant shoulder of supracrestal inserted calcium-phosphate coated implants (CaP), Titanium-Zirconium (TiZr), Titanium (Ti) with conventional sand-blasted/acid-etched (SLA) implants in a rabbit model.

### METHODS:

There were used implants with a similar geometrical design: Bioactive (CaP) and SLA implants (both Alfa Gate Implant System, Israel), Titanium (Ti) and Roxolid (TiZr) dental implants (both Straumann" Bone Level System; Institut Straumann, Switzerland) were used. The Ti and TiZr implants had the modified sand blasted, large grit and acid etched, hydrophilic (SLActive) surface. Implant length (8 mm) and diameter (3.3 mm) were the same as well. The study was planned in accordance with the ARRIVE guidelines and performed on 12, 9-month-old, 4–5 kg, New Zealand white rabbits as an experimental animal model. Each rabbit received 1 TiZr implant, 1 CaP implant on the right tibia bone; 1 Ti and 1 SLA implant on the left tibia. Though, implants were inserted only 5 mm into the bone and 3 mm remained above the bone level (supracortical) to examine possible vertical osteoconductive properties (Fig. 1). The animals were randomly allocated to three groups regarding the observation periods: 10, 20 and 30 days.

### RESULTS:

The quality of bone and vertical bone apposition was measured. The following parameters were evaluated at an original magnification of x 10:

1. Percentage of linear bone fill (PLF; %): this was determined at the mesial and distal implants' shoulders. In brief, the relation between the total volume and the new-formed bone in a 3 x 3 mm region of interest above the cortical bone was evaluated. Total mean values were calculated.

2. Marginal vertical bone height (VBH; mm): within the chosen 3 x 3 mm region, the height of new mineralized bone was measured on five, arbitrary chosen and equally distributed points at the mesial and distal side. Mean values were calculated for each sample.

3. Percentage of vertical bone-to-implant contact (vBIC; %): this value was calculated as the length of the implant surface along the 3 mm of exposed implant surface that was in direct apposition to (new) bone x 100%.



Fig. 1: Clinical picture of the inserted implant. The cortical bone stayed intact during the cleaning procedure.

### DISCUSSION & CONCLUSIONS:

A significant delay in vertical osteoconductivity at the earliest time point under examination was seen for TiZr implants when compared to their Ti counterparts. For the later points, TiZr as well as Ti implants demonstrated comparable values in this animal model. The results showed for the first time that calcium-phosphate coated surfaces on supracrestal inserted implants have vertical osteoconductive characteristics and increase the bone-implant contact at the implant shoulder. PLF was significantly higher in SLA-CaP implants (11.2%). BIC-D was significantly increased in the SLA-CaP implants (13.0%) as well.