of the present study was to investigate whether this resorbable CaP layer has a gap healing capacity too. Tissue-implant contact (both mineralized and osteoid) and tissue density were measured in a gap model after 4 and 8 weeks of implantation.

Materials and Methods

The study was authorized by the local committee (Ref.No.: 35-918/86/00). 40 dumbbell shaped 30 mm long titanium (Ti6Al4V) implants were placed according to the press fit technique. Before surgery implants were cleaned for 20 min in 80% alcohol with ultrasounds; the implant surface was not significant (p=0.653), however the variable: animal by bone and gap formation was uncompleted. After 4 and 8 weeks, bone-implant contact in the gap for the test group was 12.49% ± 7.67 and 32.25% ± 12.58 respectively; for the control group it was 0.01% ± 0.03 and 0.7% ± 0.73 respectively (Fig. 1). Remnants of the resorbable CaP coating were found after 4 and 8 weeks. For bone-implant contact differences were found according to implant surface (p=0.004) and the interaction between implant surface and time (p=0.0127). A significant increase of the percentage of bone-implant contact was found between 4 and 8 weeks for the resorbable CaP-coating group but not for the TPS-coating group (p=0.9318). The additional CaP layer led to significantly higher values of bone-implant contact in comparison to the control TPS surface. For osteoid tissue-implant contact, the difference between groups according to implant surface was significant (p=0.05), however the variable: animal showed a significance (p=0.0158). For bone density in the gap, no difference was found between the two assessed surfaces (p=0.3708), neither after 4 nor 8 weeks. A tendency for less mineralized bone tissue in the gap was observed after 8 weeks vs. 4 weeks (Fig. 2). For formation of osteoid tissue in the gap, no difference was found between the 2 assessed surfaces (p=0.7874). For both surfaces however, a tendency of more osteoid tissue formation was observed after 8 weeks vs. 4 weeks (data not shown). Localization, i.e. intertrochanteric or intercondylar, had no significant influence on the data; similarly, no interaction could be evidenced between implant type and the localization.

Discussion

In this gap model, the resorbable CaP layer showed a gap healing capacity because the bone-implant contact was higher than the control after 4 and 8 weeks. Probably, dissolution of the CaP layer at the implant surface led to high local concentrations of Ca and P ions. The latter high concentrations might have a chemotaxis effect on osteoblasts (4) and increased bone formation at the surface. Nevertheless, the CaP coating did not affect bone density in the gap. After 8 weeks, tendency for a decrease of bone density in the gap was observed for both surfaces, but was not significant. These first results indicate that a resorbable bioactive layer may accelerate the gap healing process. Nevertheless, further studies over longer healing periods are indicated with this model. Finally, the transcortical model in the Göttinger minipig proved to be relevant and robust.

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References