Four implants (ASTRA-Tech) of at least 10mm length inserted in the anterior area Group 2: Six implants (ASTRA-Tech) of at least 10mm length inserted in the anterior area and bicuspid area. In each patient also four implants were placed in the interforaminal region of the mandible. After 3 months of osseointegration, a bar-supported overdenture was constructed. In this clinical trial the following items are evaluated: Implant survival, overdenture survival, peri-implant bone changes and patient satisfaction.

Results: After a functional period of 1 year implant survival was 100% in group 1 and 99.4% (one implant lost) in group 2. Overdenture survival was 100% in both groups. The mean marginal bone resorption was 0.23mm (SD _ 0.58) in group 1 and 0.31mm (SD _ 0.29) in group 2. Patient satisfaction was measured with a general satisfaction score (from 1 to 10). General satisfaction improved significant from score 5 (pretreatment) to score 9 (after 1 year) in both groups.

Conclusions and clinical implications: In this study, no significant differences could be detected between the two groups in implant survival, overdenture survival and peri-implant bone height changes. There was a significant increase in patient satisfaction within the two groups, 1 year after treatment. For reason of cost-effectiveness, four bar-connected implants to support a maxillary overdenture is the method of choice.

Crown-implant ratio measured on digital dental casts and intraoral radiographs

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Background: Implant companies manufacture ever decreasing implant lengths, possibly resulting in increasing crown–implant ratios. Two different definitions are used for crown-implant ratio: anatomical crown-implant ratio, calculated by dividing the length of the anatomical crown by the length of the implant and clinical crown–implant ratio, calculated by dividing the length of that portion of crown and implant above the alveolar bone by the length of the implant portion within the alveolar bone. Both ratios are measured on radiographs. The clinical crown-implant ratio is said to offer a more realistic clinical scenario. However, measuring crown height on a radiograph is not the most realistic height from a clinical perspective, as the most coronal part of the crownmay not be point of the crown that is in function. More realistic could be to determine the actual contact point with the antagonistic tooth and calculate the distance to the top of the implant or the first bone-to-implant contact. The development of digitizing dental casts offers new possibilities in measuring in a three-dimensional space.

Aim: The aim of this study was to compare crown–implant ratio calculated on an intraoral radiograph with crown-implant ratio calculated on digitized dental casts with determination of a functional contact point with an antagonistic tooth.

Methods: Fifty patients (86 implants, length 8.5mm) with single, implant-supported crowns in the posterior region of maxilla and/or mandible were included. Intraoral digital radiographs were analyzed using computer software to perform linear measurements and crown-implant ratios were calculated. The dental casts with implant analogue(s) and the dental casts of antagonistic jaw were digitized. Contact point of implant-supported crown with antagonistic tooth was recorded clinically and marked in the three-dimensional articulating models. Height of the crown from implant analogue to contact point was measured and crown-implant ratio was calculated.

Results: Mean crown height measured on radiographs was 10.99 _ 1.78mm, resulting in a crown–implant ratio of 1.29 _ 0.21. Mean crown height measured on digitized casts was 9.83 _ 1.57mm, resulting in a crown-implant ratio of 1.16 _ 0.19. Although there is a difference between the methods, the Bland and Altman plot showed a strong agreement in this difference per patient (95% confidence interval).

Conclusions and clinical implications: Crown height measured on radiographs gives higher values compared with measurements on digitized casts. Realistic crown–implant ratios should be measured on a combination of a radiograph (for determination of marginal bone level) and digitized casts (for determination of contact point with antagonistic tooth).

Tissue-level implants in overdenture applications: a 3-year clinical follow-up

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Background: A straight walled, self-tapping implant, with a 3mm transmucosal machined collar, was designed to be placed using a one-stage surgical protocol in cases where prosthetic rehabilitation with for example an overdenture is necessary. Thus, a second surgical procedure to uncover the implant is avoided. Aim: To evaluate clinical performance of tissue-level implants placed in edentulous patients

scheduled for treatment with an overdenture.
Methods: Two clinics performed a retrospective analysis with regard to this implant type. All implants placed during 2006 with a radiographic follow-up of at least 1 year were consecutively included in this retrospective analysis. Implants were placed in edentulous maxillae and mandibles. Descriptive statistical analysis of available data was performed, including life table calculations to derive cumulative survival rate (CSR).
Results: Forty-eight (48) patients were treated with 132 implants (Replace Select TC, Nobel Biocare, Sweden). Four implants (3%) were placed in the maxilla and 128 implants (97%) were placed in the mandible. Four implants (3%) were placed in healed sites 9 months after extraction, whereas 128 implants (97%) were placed 3 months after extraction. No bone grafting was performed, either at implant surgery or before the surgery. Surgical techniques included flap surgery only. Final prosthetic delivery was performed at 9 weeks (80%) or 12 weeks postsurgery (20%), depending on the clinical procedure of the respective center. Existing prosthetics were modified to facilitate stressfree healing, during the healing period. All patients received their permanent prosthetics: 30 overdentures were connected to two implants and 18 were connected to four implants. All overdentures were connected using bar attachments. All patients had dentures in the opposing jaw. All patients were followed for an average of 34 months (range 20–47 months, SD¼6.0). One of the 132 implants included in the analysis failed (at prosthetic delivery), resulting in a CSR of 99.2%.
Conclusions and clinical implications: The results of this retrospective study, with an average 3-year follow-up, indicate that a straight walled, self-tapping implant with a 3mm transmucosal machined collar can be considered a safe and viable implant for edentulous patients.

Layer-by-layer assembled, BMP-2-incorporated biomimetic calcium-phosphate granules induce bone formation

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Background: Current clinical bone-defect-filling materials for repairing critical-sized bone defects have various limitations. Autologous bone graft, the "gold-standard" treatment, is associated not only with donor-site morbidity but also with limited availability. These limitations also hamper its combined administration with granular biomaterials which are accessible on a large scale but not osteoinductive. We have hereby developed a novel layer-by-layer assembled, biomimetic calcium-phosphate (BioCP) granules for substituting autologous bone. The BioCP can incorporate and slowly release BMP-2, and thus it significantly promotes bone formation when it is mixed directly with granular bone-defect-filling biomaterials such as deproteinized bovine bone (DBB) on the spot of a surgical operation.
Aim: In vivo evaluation of the degradability and osteoinductivity of the BioCP with or without incorporated BMP-2 in the presence or absence of DBB.
Methods: In vitro: BioCP granules were produced by layer-bylayer assembling crystalline CaP and amorphous CaP alternatively for three times using our well-established biomimetic methods. BMP-2 was incorporated into the outer crystalline layer to confer osteoinductivity. We characterized its morphology using scanning electron microscopy. BMP-2 loading was evaluated using enzyme-linked immunosorbent assay. In vivo: Samples (0.35 cc per sample) were implanted subcutaneously inrats and retrieved after 5 weeks for a histomorphometric analysisof bone and BMP-2-incorporated BioCP. Six experimental groups (n¼6 animals per group) were established: (i) BMP-2-incorporated BioCP (97 _ 8 mg BMP-2); (ii) BioCP; (iii) 1:4 (V:V) mixture of BMP-2-incorporated BioCP and DBB (19.4 _ 2 mg BMP-2); and (iv) 1:4 (V:V) mixture of BioCP and DBB; (v) DBB with adsorbed BMP-2 (10 mg BMP-2); (vi) DBB alone. Data were presented as mean _ SD and compared using a one-way analysis of variance with the level of significance set at $P < 0.05$.
Results: The BioCP presented morphology of irregular clusters of microspheres with a crystalline outer layer. Its size varied from 0.1 to 1mm. Five weeks after implantation, BMP-2-incorporated BioCP induced tremendous new bone regardless of DBB, while either of BioCP or DBB or their 1:4 combination failed to do so. The percentage of bone in intragranular space in group i (32.8 _ 6.9%) and iii (11.0 _ 3.5%) is significantly higher than in group v (1.3 _ 0.26%). The degradation rate of BMP-2-incorporated BioCP was significantly lower than BioCP regardless of DBB. Such a difference was also significant in the presence of DBB. DBB degraded insignificantly.
Conclusions and clinical implications: BMP-2-incorporated BioCP bears good osteoinductivity and proper biodegradability, and can thus significantly promote bone regeneration of granular bone-defect-filling materials.