10. Implantation of Octacalcium Phosphate (OCP) in Rat Skull Defects Enhances Bone Repair

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Treatment of large bone defects is the most common problem confronted in oral and maxillofacial surgery. Our previous studies have indicated that the synthetic octacalcium phosphate (OCP) stimulates osteogenesis if implanted subperiosteally in murine bone. The present study was designed to investigate whether the implanted OCP promotes bone repair of defects created experimentally in rat calvaria. The process of bone repair was examined radiomorphomertrically and histologically.

Standardized defects were created on male Wistar rat calvaria. The OCP granules were implanted into the defect. The control rats were processed in the same way except that nothing was implanted. Ten rats were fixed as a group after 12 weeks for both the experimental and control groups. The skulls were resected and the radiopacity within the defect was measured and analyzed. Thereafter the specimens were decalcified and examined histologically.

The radiopacity in the skull defects of the experimental group was significantly higher than the control. Histological examination showed that bone was formed around the OCP implants scattered in the defect as well as from the edge of the bone defect. The defects of the control rats were filled with fibrous connective tissue and bone formation was observed from the edge.

The present study demonstrated that bone repair is enhanced by implantation of OCP in skull defects.

11. Experimental Study of Periodontal Healing with Self-Setting Hydroxyapatite (G-5)

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When self-setting hydroxyapatite (G-5) was used for retrograde root canal filling, we observed retrogration of cementum at the resected root apex and healing of the root apex tissue. In this experiment we studied the usefulness of cervical root surface dentin filling materials as well as the healing of periodontal tissue. Female beagle dogs (body weight of about 10 kg) were studied. A cervical mucoperiosteal flap was developed at the premolar region. Next, a cavity (diameter of about 4 mm; depth ofabout 1 mm), which passed through the alveolar bone and cementum to the dentin, was formed with a trephine bar directly below the coronal region. The cavity was filled with G-5, glass-ionomer-cement. After 4 weeks and 12 weeks, the dogs were sacrificed. Specimens were prepared according to conventional procedures, stained with hematoxylin-eosin stain, and examined histopathologically. Fibrous tissue was noted around G-5 4 weeks after G-5 filling. After 12 weeks new cementum, contiguous with the cementum at the resected area, was formed in close contact with G-5. In addition, there were some signs of alveolar bone growth from the resected surface of the alveolar bone towards the crown side.

12. Experimental Study of Neuropeptide Containing Nerve Fibres (NCN) During Regeneration after Bioceramic Implantation in the Mandible

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We investigated the occurrence and distribution of NCN in periosteum and soft tissue adjacent to the region of implantation in the mandible in dogs. Periosteum and soft tissue were obtained from the mandibular body of 5 dogs at the site of implantation of hydroxylapatite, tricalciumphosphate and mixture of both components. Protein gene product 9.5 (PGP), vasoactive intestinal peptide (VIP), neuropeptide Y (NPY), substance P (SP), calcitonin gene related peptide (CGRP) and gastrin releasing peptide (GRP) were detected immunohistochemically in the tissue at 1, 3 and 4 months after implantation. Few PGP immunoreactive nerve fibres were found in the outer layer of periosteum, endomysium, around the secretory parts of glands and in the wall of blood vessels in the tissue obtained 3 and 4 months after implantation. Only NCN was occasionally seen in the same location of tissue obtained 1 month after implantation. NPY was found located in cells of local ganglia. No VIP, SP, CGRP, GRP, NPY were detected in nerve fibres. No differences were detected in the amount of NCN related to the kind of material used for implantation.

Presence and distribution of NCN seem to be a time depending process and does not correlate to the kind of bioceramic.

13. "Tooth Apatite" as a Bone Substitute

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"Tooth apatite" is prepared using the following procedure. Extracted teeth are treated with H_2O_2 and the surface debris are removed. The teeth are preserved at −72°C and later heated at 1000°C, after which they are ground to a powder with a particle size of 400–700 pm. The powder is then freeze-dried and sterilized with ethylene oxide.

The powder was used in an animal experiment, using rab-