



The bone tissue responses to prehydrated and collagenated cortico-cancellous porcine bone grafts: a study in rabbit maxillary defects

ABSTRACT

Bone substitutes of xenogeneic origin are frequently used as grafting materials for filling bone defects and maxillary sinus floor augmentation procedures. To be effective, bone substitutes must have osteoconductive properties and be completely replaced with new bone with time. In order to improve the clinical handling, it is possible to add collagen gel to prehydrated and collagenated porcine bone (PCPB) particles, with the result of a sticky and moldable material which facilitates its application in the site to be filled.

As the possible influence of the gel on the bone tissue response is not known, the objective of the study was to histologically evaluate the bone tissue responses to PCPB graft with or without collagen gel and to evaluate the resorption/degradation properties of the biomaterials.

For these study, bilateral bone defects (dimensions: 5x8x3 mm) were created in the maxilla of 14 rabbits. The defects were filled with prehydrated and collagenated cortico-cancellous porcine bone (PCPB) particles (OsteoBiol® Gen-Os®, TecnoSS®, Giaveno, Italy - granulometry: 250-1000 µm) as control material, or PCPB particles mixed with collagen gel (OsteoBiol® mp3®, TecnoSS®, granulometry: 600-1000 µm) as test material. A collagen membrane (OsteoBiol® Evolution, TecnoSS®) was used to cover the defect and to prevent migration of the particles and the wounds were closed with resorbable sutures. Animals were killed after 2 (n=3), 4 (n=3), and 8 weeks (n=8) for histological and morphometrical evaluations.

According to the results of these evaluations, there was no obvious difference between the test and control materials. There were no signs of adverse reactions, and both osteogenesis and angiogenesis followed ordinary time frames. Both materials showed bone formation directly on the particles by typical osteoblastic seams. The bone area increased with time (2-8 weeks) for both sides, from 16,2% (control) and 19,2% (test) to 42,7 and 43,8%, respectively. The PCPB, whether mixed with collagen gel or not, was resorbed by osteoclasts as well as part of remodeling with the formation of osteons within the particles. Morphometry showed a decrease of PCPB area from 19,4% (control) and 23,8% (test) after 2 weeks to 3,7 and 9,3% after 8 weeks, respectively. The histology showed that the membrane had fulfilled its function and was well integrated with the overlaying soft tissues.

CONCLUSIONS

From the findings of this study, it is possible to conclude that mixing collagen gel and PCPB to facilitate the clinical handling does not influence the bone tissue responses to the material, which exhibited osteoconductive properties and was resorbed with time. Both graft materials exhibited osteoconductive properties as bone formation with typical osteoblastic seams observed directly on the surface of the grafted particles. The morphometric measurements showed increased bone area with time in parallel with a decrease of the graft area. The Authors concluded that *“collagenated porcine bone exhibits good biocompatibility and osteoconductive properties, whether mixed with collagen gel or not. In this model, the material was resorbed by surface osteoclasts as well as part of remodeling with the formation of osteons”*.

EXPERIMENTAL STUDIES

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