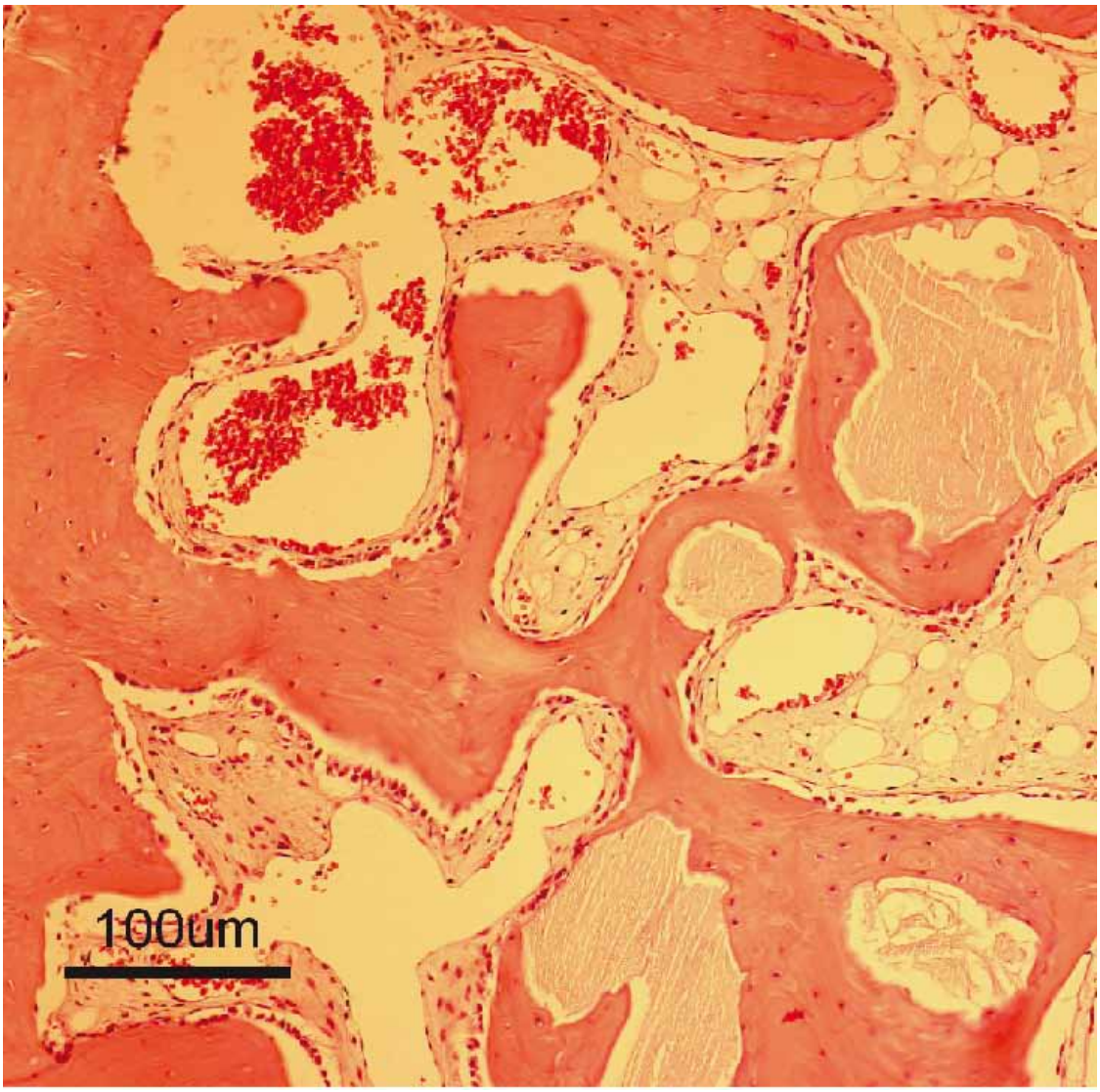
Estudios experimentales



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EXPERIMENTAL STUDIES

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

U Nannmark[1]
L Sennerby[2]

1 | Institute of Biomedicine, Sahlgrenska Academy, Göteborg University, Göteborg, Sweden
2 | Department of Biomaterials, Sahlgrenska Academy, Göteborg University, Göteborg, Sweden

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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"*.

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EXPERIMENTAL STUDIES

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Bone regeneration in iliac crestal defects: an experimental study on sheep

A Scarano[1]
F Lorusso[2]
L Ravera[2]
C Mortellaro[3]
A Piattelli[2]

1 | Department of Medical, Oral and Biotechnological Sciences and CeSI-MeT, University of Chieti-Pescara, Chieti, Italy
2 | Department of Medical, Oral and Biotechnological Sciences, University of Chieti-Pescara, Italy
3 | Oral Surgery Unit, University of Eastern Piedmont, Novara, Italy

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ABSTRACT

Successful implant placement requires adequate alveolar ridge dimensions and, if the implant site presents a lack of bone, Guided Bone Regeneration (GBR) is the surgical procedure commonly performed in order to provide an augmentation in terms of volume for the insertion of dental implants. Several types of membranes and biomaterials have been proposed for GBR techniques and the selection of the most appropriate grafting material is one of the key factors in achieving adequate bone formation.
The aim of the present study was to determine the in vivo tissue responses and gap healing patterns around dental implants treated with cortico-cancellous porcine bone blocks, collagenated cortico-cancellous porcine bone versus only membrane in a standardized sheep peri-implant gap-defect model. In the iliac crest of six sheep 4 defects were created for the insertion of an implant and the defects were filled with 1) control, only membrane (OsteoBiol® *Evolution*, Tecnoss®, Giaveno, Italy); 2) 250–1000 μm cortico-cancellous particulate porcine bone mix (OsteoBiol® *Gen-Os*®, Tecnoss®) + resorbable equine pericardium membrane (OsteoBiol® *Evolution*) (test 1); 3) cancellous equine bone blocks (OsteoBiol® *Sp-Block*, Tecnoss®) + resorbable membrane (OsteoBiol® *Evolution*) (test 2); 4) pre-hydrated collagenated cortico-cancellous porcine bone mix (90% granulated mix, 10% collagen gel) (OsteoBiol® *mp3*®, Tecnoss®) + membrane (OsteoBiol® *Evolution*) (test 3). The animals were sacrificed after a 4-month healing period and all specimens were processed and analyzed with histomorphometry, with the result that all experimental groups showed an increase of new bone. From the findings it is evident that particles of cortico-cancellous porcine bone 250–1000 μm particulate mix (CCPB) favour bone formation with a result similar to those obtained with pre-hydrated collagenated cortico-cancellous porcine bone mix (PCCPB). All biomaterials used in the present study were characterized by the presence of bone formation and absence of inflammatory cell infiltrates. However, the defect treated by membrane alone was characterized by the presence of soft tissues and a little immature bone.

CONCLUSIONS

As stated by the Authors, "*the function of the graft is not only to improve the space-making capabilities of the membrane, but also to provide additional points on which osteoblasts can start forming new bone. We have shown that CCPB and PCCPB promote bone regeneration in large defects (7 mm wide and 4 mm deep) around dental implants*".
In conclusion, this study demonstrates that particulate porcine bone mix and porcine cortico-cancellous collagenated pre-hydrated bone mix, used as scaffolds, induce bone regeneration and these findings suggest that these biomaterials are characterized by a high biocompatibility and can induce a faster and greater bone formation.

Grafted with

OsteoBiol® *Gen-Os*®
OsteoBiol® *mp3*®
OsteoBiol® *Sp-Block*

MEMBRANE
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