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Corticocancellous porcine bone in the healing of human extraction sockets: combining histomorphometry with osteoblast gene expression profiles in vivo

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ABSTRACT

In case of tooth extraction, significant structural changes and bone resorption - both horizontally and vertically - have been reported, with the detrimental consequence of important dimensional changes in the alveolar bone. In order to preserve the alveolar bone volume, it is common to graft a biomaterial into the socket immediately following the tooth extraction. The aim of this study was to evaluate the use of porcine bone graft in fresh sockets via histomorphometric and *in vivo* gene expression profiling.
For this prospective split-mouth study, 15 patients with a mean age of 53,7 years (range: 32-70 years) requiring the extraction of two teeth - one on each side of the arch in the molar or premolar regions - were selected. The inclusion criteria for the sockets were the presence of three bone walls and loss of the buccal plate. Following a split-mouth design, half the sockets received xenogeneic cortico-cancellous porcine bone (OsteoBiol® *Gen-Os*®, Tecnoss®, Giaveno, Italy) (PB group) and the contralateral sockets were left unfilled (control group). Four months after surgery, four cylindrical specimens were taken from each patient (two from the PB-grafted site and two from the control site) and the samples were processed for osteoblast expansion and in vivo gene expression analysis and for histomorphometry. The healing process occurred without complications and the grafted sites showed statistically significantly higher mean vital bone and lower mean connective tissue values than the control sites. The histological examination revealed an absence of inflammatory cells, along with bone formation in all grafted sites (39,6±9,4% in PB vs. 29,5%±5,0% in control group) and the presence of biomaterial particles (34,4%±5,1%) and connective tissue (26,0%±9,9% in PB vs. 57,7%±6,9% in control group). In bone samples taken from PB-group, a better bone matrix formation and a decrease in osteoclastogenesis and bone resorption were observed. The consequent higher amount of new formed bone can be explained by the better mRNA gene expression of proteins such as Osteopontin (OPN) and type I collagen, together with a minor expression of Osteoprotegerin (OPG).

CONCLUSIONS

Due to the absence of inflammatory signs around the graft particles, the close contact between graft particles, and the newly formed lamellar bone present in the specimens, this study suggests that cortico-cancellous PB can be used successfully for ridge preservation. Moreover, the histological examination and the biomolecular evaluation confirmed the good biocompatibility and the high osteoconductivity of xenogeneic porcine bone. At any case, the Authors suggest that further studies are needed to better understand the long-term clinical and biological outcomes of this biomaterial.

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