

Immunohistochemical and molecular analysis of bone remodelling pattern in alveolar socket

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Following tooth extraction, the alveolar bone remodelling process starts. Bundle bone and buccal wall resorption occur early with horizontal and vertical bone crest reduction [1]. The use of bone substitutes has been proposed to limit bone resorption, thus allowing further dental rehabilitation [2]. Aim of this project was to characterize by a molecular and morphological approach the physiological remodelling of post-extractive alveolar socket and to compare it with the bone remodelling occurring after alveolar bone reconstruction with an alloplastic material.

Thirty-six patients needing tooth extraction were enrolled and equally divided into three groups: A) baseline, B) spontaneous healing, C) biomaterial. In each group, 2 biopsies per site were harvested during tooth extraction (group A) or 4-6 months after tooth extraction (groups B and C). In group B, patients recovered spontaneously, while in group C the alveolar socket was filled with a magnesium-enriched hydroxyapatite. One biopsy was processed for immunohistochemistry to localise TNF- α , IL-6, RANK, RANKL and OPG. The second biopsy underwent a Real-Time PCR analysis for the same biomarkers in order to evaluate gene expression. In groups B and C, a third biopsy was retrieved and processed for ground section aiming to assess tissue composition. Differences between the three groups were investigated using Kruskal Wallis test ($p < 0,05$) followed by post-hoc tests.

All samples showed a normal structure without inflammatory infiltrate. At immunohistochemical analysis, all biomarkers except for OPG had increased. Significant differences were found between the three groups for TNF- α ($p < 0,05$), IL-6 ($p < 0,001$), RANK ($p < 0,01$) and RANKL ($p < 0,001$), between groups A and C for IL-6 ($p \leq 0,001$), RANK ($p \leq 0,01$), RANKL ($p \leq 0,001$) and between B and C for IL-6 ($p \leq 0,01$). Gene expression did not show statistical differences. Crumbles of biomaterial surrounded by regenerated bone were evident. A higher percentage of mineral component was obtained in group B than in C.

The biomarkers selected in the current study were involved in the alveolar remodelling and the biomaterial used for socket preservation did not influence the process.

References

- [1] Nevins et al. (2006) *Int J Periodontics Restorative Dent* 26:19-29.
- [2] Rasperini et al. (2010) *Int J Periodontics Restorative Dent* 30:265-73.

Keywords

Bone turnover, post-extraction site, immunohistochemistry, bone substitute, gene expression.