

Barrier Membrane Influence Histology of Guided Bone Regenerations: A Systematic Review and Meta-Analysis

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Abstract : Objective: Guided bone regeneration (GBR) aims to replace the missing bone with a new structure to achieve long-term stability of rehabilitations. The aim of the present systematic review and meta-analysis is to determine the effect of barrier membranes on histological outcomes after GBR procedures. Moreover, the effect of the grafting material and tissue gain were analyzed. Materials & methods: Two independent reviewers performed an electronic search in Pubmed and Scopus, identifying all eligible publications up to March 2020. Only randomized controlled trials (RCTs) assessing a histological analysis of augmented areas were included. Results: A total of 6 publications were included for the present systematic review. A total of 110 biopsied sites were analysed; 10 corresponded to vertical bone augmentation procedures, whereas 100 analysed horizontal regeneration procedures. A mean tissue gain of $3 \pm 1.48\text{mm}$ was obtained for horizontal defects. Histological assessment of new bone formation, residual particle and sub-epithelial connective tissue (SCT) was reported. The four main barrier membranes used were natural collagen membranes, e-PTFE, polylactic resorbable membranes and acellular dermal matrix membranes (AMDG). The analysis demonstrated that resorbable membranes result in higher values of new bone formation and lower values of residual particles and SCT. Xenograft resulted in lower new bone formation compared to allograft; however, no statistically significant differences were observed regarding residual particle and SCT. Overall, regeneration procedures adding autogenous bone, plasma derivate or growth factors achieved in general greater new bone formation and tissue gain. Conclusions: There is limited evidence favoring the effect of a certain type of barrier membrane in GBR. Data needs to be evaluated carefully; however, resorbable membranes are correlated with greater new bone formation values, especially when combined with allograft materials and/or the addition of autogenous bone, platelet rich plasma (PRP) or growth factors in the regeneration area. More studies assessing the histological outcomes of different GBR protocols and procedures testing different biomaterials are needed to maximize the clinical and histological outcomes in bone regeneration science.

Keywords : barrier membrane, graft material, guided bone regeneration, implant surgery, histology

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