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EVALUATION OF TEFGEN, BIOMEND AND ATRISORB AS GUIDED BONE REGENERATIVE BARRIERS: A COMPUTERIZED, HISTOPATHOLOGIC AND DIGITAL RADIOGRAPHIC STUDY

Mona Y. Abd El-Razzak*, Hussein Saudi**

ABSTRACT

The objectives of this study were to determine and compare osseous regeneration with three guided tissue regeneration membrane types (TefGen, BioMend and Atrisorb) and the use of no membrane (control) by means of quantitative and qualitative digitized radiography and histology in a well accepted bone wound model and to evaluate the reliability of quantitative and qualitative digitized radiography as a non-invasive tool for assessment of guided bone regeneration in humans. Four bilateral equal osseous defects were created in 5 rabbit femurs with 2 mm round carbide bur. In each femur, three defects were covered with one of the test membranes while the fourth received no membrane and served as a control. At the end of eight weeks, rabbits were sacrificed, the femurs were removed and decalcified. Sections through the defects were stained with H. & E. then evaluated by light microscopy and computerized digitized radiography. Data were statistically analyzed. Histopathologic and radiographic evaluations revealed that TefGen, BioMend and Atrisorb protected defects were associated with significantly greater bone formation than control defects. The used software were sensitive enough to correlate radiographic and histopathologic findings. The studied membranes deserve further long term study with larger sample size as they allowed successful guided bone regeneration.

INTRODUCTION

Predictable regeneration of osseous defects caused by periodontal disease and multiple tooth extraction is a significant challenge in periodontal therapy, prosthodontic therapy, and oral-maxillofacial surgical therapy[10]. Tissue regeneration with occlusive membranes has been successfully obtained in both periodontal and implant surgery[19,43,44].

This biologic principle is known as guided tissue regeneration (GTR), and is applied to procedures aiming either at the regeneration of lost periodontal structures (i.e., regeneration of cementum, periodontal ligament and alveolar bone) resulting from periodontitis, and those with the goal of regeneration of alveolar bone only, such as in bone augmentation prior to or in association with the placement of osteointegrated dental implant i.e., guided bone regeneration (GBR)[35].

GTR membranes function as biocompatible physical barriers that prevent proliferation of nonosteogenic connective tissue (and epithelium) into tissue sites and allow proliferation of slower-growing osteogenic and periodontal connective tissues into the sites[10].

The keys for achieving predictable results in guided bone regeneration (GBR) are, according to Buser et al.[7], the use of an appropriate barrier membrane, membrane stabilization and close adaptation to the surrounding bone, creation and maintenance of secluded space, achievement of primary soft tissue healing and a sufficient healing period.

A porous, biologically inert, nonbiodegradable membrane marketed as Gore-Tex (W.L. Gore and Assoc., Flagstaff, Ariz.) is composed of expanded polytetrafluoroethylene (ePTFE) and is the most commonly used membrane for GTR therapy[1,38]. This material appears to be well tolerated[37]. The membrane is placed in the wound site during an initial surgical procedure, allowed to remain for several weeks, and then must be removed in a subsequent surgical procedure. The ePTFE membrane is a multilayer, multistranded structure to which connective tissue cells and fibers become attached, thus mechanically locking the membrane into the tissues[10]. ePTFE have earlier been shown to improve healing of different types of bone defects, to be able to restore earlier existing bone and to produce bone neogenesis[49]. However, the need of strict follow-up second intervention to remove the barrier, as well as problems related to soft tissue management over the implanted membrane[4,42] and infection at the interface[12,40] led to continuing research to produce and test new materials with improved characteristics of compatibility that would not only be well tolerated, but also could be gradually replaced by newly formed tissues[17]. If these membranes adequately perform the biocompatible physical barrier function necessary for

* Assistant Professor, Periodontology, Oral Medicine and Radiology Dept., Faculty of Dentistry, Tanta University.
** Lecturer, Periodontology, Oral Medicine and Radiology Dept., Faculty of Dentistry, Tanta University.