

BACTERIAL COLONIZATION OF THE TOOTH FACING SURFACE OF EXPOSED NONRESORBABLE AND BIOABSORBABLE BARRIER MATERIALS: A SCANNING ELECTRON MICROSCOPIC STUDY

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ABSTRACT

This study was conducted in order to evaluate the effect of bacterial colonization of the tooth facing surface of exposed nonresorbable expanded polytetrafluoroethylene (ePTFE) membrane, titanium-reinforced ePTFE membrane (TRM) and bioabsorbable collagen membrane on the outcome of the membrane supported regenerative therapy. Ten subjects affected by chronic adult periodontitis were enrolled in the study. Three non-furcation sites per patient, associated with an angular bony defect and a probing attachment level (PAL) of > 5 mm and a sufficient zone of keratinized gingiva > 2 mm were selected. The defects were randomly classified into three equal groups to be treated according to the principles of guided periodontal tissue regeneration (GPTR) using either ePTFE membrane, TRM or processed type I collagen membrane. Tetracyclin (1g/day) for 2 weeks was prescribed in addition to chlorhexidine for post-surgical protocol. All patients were recalled once a week for 5 weeks for professional tooth cleaning. At the 5th week, clinically exposed membranes were removed and processed to be examined by scanning electron microscope. Professional tooth cleaning and plaque control reinforcement were given at one month intervals for the duration of the study. PAL change was calculated after 6 months for each treated site. The percentage of exposure and of fields positive for bacterial colonization were found to be positively correlated to each other while they were negatively correlated to PAL gain of the exposed membranes ($r=0.98$). PAL gain was reduced in all sites with partially exposed membranes compared to sites with no membrane exposure, this was only significant in case of TRM ($p \leq 0.05$). SEM analysis revealed that all exposed areas were bacteria positive fields. In the mid portion of the membranes, TRM had the highest percentage of positive fields, 60% vs. 33.3 & 25% for ePTFE and collagen membranes respectively, while no bacteria positive fields were observed in the apical portions of all examined membranes. It was concluded that bacterial colonization of the exposed portion of the membranes does not affect the healing process which takes place deeper. The mid portion of the membrane inner surface is a critical area in the healing process.

INTRODUCTION

The ultimate goal of periodontal therapy is to regenerate the attachment apparatus lost due to periodontal disease. Studies in animal models as well as in humans demonstrated that it was possible to promote regeneration of new connective tissue attachment by selectively favouring repopulation of the detached root surface by periodontal ligament cells^(7,17). This biologic principle is known as guided tissue regeneration (GTR). Quinone and Caffesse⁽²⁰⁾ stated that the term GTR 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). They suggested the introduction of the term guided periodontal tissue regeneration (GPTR) to specify those GTR procedures in which a physical barrier is placed between the gingival flap and the instrumented root surface in order to facilitate periodontal regeneration. This barrier prevents the gingival tis-

sues (epithelium and connective tissue) from contacting the root during healing and creates an area into which progenitor cells from the periodontal ligament and/or alveolar bone can migrate⁽¹⁰⁾.

To date, the majority of studies relating to GPTR have used expanded polytetrafluoroethylene (ePTFE) barrier membranes (Gore-Tex, W:L. Gore & Associates Inc., Flagstaff, AZ) which are considered the gold standard by which other membranes are compared⁽¹⁾. The microstructure of ePTFE membranes provides a matrix for cellular infiltration and collagen penetration. It consists of solid nodes interconnected by fine highly oriented fibrils. The ePTFE nodes and fibrils form a unique porous structure. The material is neither woven nor knitted. Consequently, ePTFE does not fray when it is trimmed and it is not abrasive. Its porous structure results in softness and flexibility and provides excellent handling characteristics (Gore Regenerative Technologies, Gore-Tex Augmentation Material, technical manual 5/91).

Whatever was the material employed or the surgical technique used with GPTR, one of the main problems is the creation and maintenance

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