



Ligaplants: A Tissue-Engineered Ligament

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Abstract

Periodontitis is multifactorial disease which results in loss of tooth. Osseo-integrated implants are most used for replacement of missing teeth. However, it fails to regenerate lost periodontium. Ligaplants are incorporation of periodontal ligament cells on the surface of implant. This imparts regenerative properties of periodontal ligament cells to implants. These tissue specific properties would enhance the properties of implants like dissipation of forces to bone and stimulating bone regeneration. Thus, tissue engineering of periodontal ligament cells and combining them with implants would serve as novel approach in replacement of missing teeth.

Keywords: Ligaplants; Periodontal Ligament; Implants; Tissue Engineering

Implants are increasingly becoming popular method for restoration of missing tooth. However, it has a major drawback that it doesn't regenerate the lost periodontium. Conventional osseo-integrated implants lack periodontal ligament and the advantageous properties associated with it. To overcome this, a novel approach using tissue engineered periodontal ligament have been introduced.

Ligaplants are combination of implants and periodontal ligament cells. Addition of these tissue specific properties to implants would enhance regeneration. Ligaplants dissipates the forces to adjacent bone as in case of normal tooth. Periodontal ligament cells with proprioceptive properties would help Ligaplants sense the forces on it. Also, Ligaplants can successfully be placed in patients with skeletal growth process as they could be moved orthodontically. Various cells like osteoblasts, cementoblasts, fibroblasts, undifferentiated mesenchymal cells, present in periodontal ligament (PDL) would help in repair and regeneration.

Preparation of Ligaplants can be done by culturing PDL cells in bioreactor. There are a set of precautions that need to be followed while preparing Ligaplants which include, adequate sterilization protocol, proper culturing techniques, micromechanical movements that are essential for firm attachment of cells to the implant, duration of surface treatment of implant, maintaining optimum space between implant and culture for the cells to attach. The advantages associated with Ligaplants include transmission of forces from implant to bone and induction of bone formation in bony defects. This would make them suitable to be placed in areas of adjacent tooth with intra-bony defects. In case of peri-implantitis the

amount of bone loss would also be reduced. Extra caution should be observed while culturing, as it is a sensitive process. Failure may result if improper techniques are used, as this may promote differentiation of non-periodontal ligament cells. Poor host response can also result in failure of Ligaplants.

Various animal studies have been carried out with positive results in term of regeneration. However, similar results in humans need to be evaluated. Ligaplants as tooth replacements have comparative advantages over osseo-integrated implants, due to their potential for periodontal tissue regeneration. Thus, Ligaplants may develop as a revolutionary solution to regeneration in addition to implant dentistry.