국외특강 II Preclinical Evaluation of Osteogenic Protein-1 for Periodontal Ligament Regeneration & Osseous Reconstruction

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Periodontitis is a chronic inflammatory disease that causes loss of connective tissue attachment to the root surface and loss of the alveolar bone, resulting in the loss of teeth. The ultimate goal of periodontal regenerative therapy is to achieve complete regeneration of periodontal tissue lost as a result of periodontal disease. Both osseous reconstruction and periodontal regeneration require new bone formation. However, rapid repopulation of PDL fibroblasts and PDL formation are the most crucial step for the successful periodontal regeneration, while rapid repopulation of osteoblasts and bone formation are required for osseous reconstruction. Therfore, the selection of appropriate stimulants capable of promoring the formation of the PDL or bone is osseous reconstruction and periodontal regenertion. Bone formation is achieved by (1) commitment of multipotential stem cells to osteogenic cell lineage, (2) their differentiation into osteoblasts, and (3) matrix protein formation and mineralization by osteoblasts. Bone formation by morphogenic proteins (BMPs)m particularly BMP-2 and (osteogenic protein-1, OP-1)has been well documented both in vitro and in vivo, and thus their clinical application to promote osseous reconstruction and periodontal regeneration has been proposed and investigated. Recently, we studied the effects of OP-1 on rat multipotential (ROB C26) cell differentiation into osteogenic cells, differentiation of mouse preosteoblastic (MC3T3 E1) cells into osteoblasts. Also, we examined the effects of OP-1 on rat periodontal ligament (PDL) cell differentiation and periodontal regeneration of Class III furcation defects in the beagle dog. The results indicate that OP-1 treatment was unable to induce the commitment of ROB C26 cells into osteogenic cells, while a combination of OP-1 and dexamethasone (Dex) did. OP-1 accelerated MC3T3 cell differentiation into osteoblasts and matrix formation. Interestingly, OP-1 treatment of PDL cells promoted the expression of alkaline phosphatase (ALP) and osteoclcine (OC), but failed to induce BSP expression and mineralization. A combination of OP-1 and Dex (OP-1/Dex) induced PDL cells to express ALP, BSP and OC and form minerlaized tissue. The application of OP-1 at high doses to furcation defects induced severe ankylosis, wheras low dose OP-1 promoted periodontal regeneration without ankylosis. Therefore, we recommend the application of a combination of OP-1 and Dex (OP-1/Dex) for osseous reconstruction, and low dose OP-1 alone for periodontal regeneration.