Plasma Surface Modification of Artificial Bones for Bone Regeneration

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In recent years, plasma technologies for biomedical applications have been extensively studied because of their potentially large future market [1]. Clinically, various types of porous hydroxyapatite (HA) have been used as materials for bone substitutes in the field of orthopedics because of their superior properties as scaffolds for osteogenic cells, such as high osteoconductivity, high biocompatibility and sufficient mechanical strength [2]. However, the properties as a bone substitute may be further improved for wider clinical applications if the surface is further biofunctionalized by plasma treatment. It has been found that a dielectric barrier discharge (DBD) plasma treatment promotes hydrophilicity of interconnected porous calcium hydroxyapatite (IP-CHA) surfaces [3], which indicates the possibility of further increase of the osteoconductivity. In the present study, we have investigated effects of plasmas on surface modification of artificial bones made of IP-CHA both *in vitro* and *in vivo*. Several results in the animal experiments have shown plasma-treatment can improve bone healing by IP-CHA, enhancing hydrophilicity of IP-CHA and its osteogenic potential in vitro (Figure1). The study has indicated that appropriate plasma application is a potent tool for modifying biological functions of artificial bones.

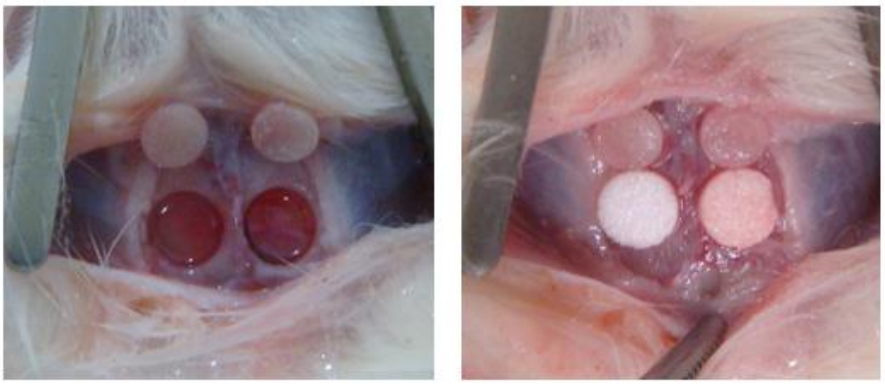

Figure 1 : Critical calvarial defects in rats were implanted with untreated IP-CHA in left and plasma-treated IP-CHA in right. Plasma-treatment increases the blood inflow into the IP-CHA.

References

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