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Osteoconductivity Control Based on the Chemical Properties of the Implant Surface

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Abstract

Metallic materials, such as Ti, Zr, Nb, Ta, and their alloys, and also stainless steels are widely attractive as osteoconductive materials in the dental and orthopedic fields. Ceramics and polymers are also commonly used as biomaterials. However, they do not have high osteoconductivity in their pure form, and surface coatings with bioactive substances, such as hydroxyapatite or TiO_2, are needed before implantation into the bone. Many reports claim that the surface chemical properties of implants, in particular, hydrophilicity and hydrophobicity, strongly affect the biological reactions. However, the effect of surface properties on osteoconductivity is not clear. In this review, we focus on the relationship between the surface hydrophilicity of metallic implants and osteoconductivity using *in vivo* evaluation, and the control of the osteoconductivity is discussed from the viewpoint of protein adsorption in implants.

Keywords

Hydrophilicity, Hydrophobicity, Osteoconductivity, Protein Adsorption, Surface Modification

1. Introduction

Valve metals, such as Ti, Zr, Nb, Ta, and their alloys and also stainless steels are widely used in orthopedic and dental implants. Ceramic and polymer materials are also commonly used as biomaterials, as they have high corrosion resistance in saltwater environments and high chemical stability in the body. They also have good biocompatibility, and their long-term success rates are well documented [1] [2]. However, when used in living bodies, Ti in its pure form does not always encourage hard-tissue growth onto its surface; the same is true for sintered ceramics and polymers. Therefore, the development of appropriate surface treatments