学位論文内容の要旨

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学 位 論 文 題 名

Supersonic modification of a crystal surface by partial dissolution-precipitation treatment improves bioabsorbability of synthetic hydroxyapatite

（超音波部分溶解・再析出処理合成ハイドロキシアパタイトの生体吸収性）

Even though synthetic hydroxyapatite (HAp) has a chemical composition similar to the mineral phase of bone, it is minimally absorbed and replaced by bone tissue. This could be because HAp is composed of compactly arranged apatite crystals with homogenously large grains. In this study, the surface and non-stoichiometry of synthetic HAp crystals was modified using supersonic partial dissolution-precipitation (PDP) method, and partially dissolved and precipitated HAp (PDP-HAp) was developed. PDP-HAp possessed a microstructure that differs from that of the original synthetic HAp. Nano-crystals were precipitated on the PDP-HAp grains, wherein numerous micropores and microcracks were formed. *In vivo* implantation using a rabbit bone defect model revealed that PDP-HAp was gradually absorbed and replaced by bone tissue beginning 8 weeks postsurgery, whereas HAp was not absorbed even at 16 weeks. More osteoclasts were induced in PDP-HAp than in HAp. The amount of bone formation in and around the material at 4 weeks was similar in both PDP-HAp and HAp, but it remained unchanged in PDP-HAp in contrast to its decrease in HAp at 16 weeks. Consistent with the *in vivo* results, *in vitro* osteoclastogenesis demonstrated that more osteoclasts were induced when cultured on PDP-HAp compared with HAp, indicating that PDP-HAp was absorbed through the stimulation of osteoclastic activity. These results suggest that the PDP technique may have clinical utility to modify synthetic HAp for use as a superior bone graft substitute.