

Improvement of the osteoconductivity of β -TCP granule by coating its surface with dicalcium phosphate dihydrate

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論 文 名 : Improvement of the osteoconductivity of β -TCP granule by coating its surface with dicalcium phosphate dihydrate
(リン酸水素カルシウム二水和物の表面被覆による β -TCP 顆粒の骨伝導性向上)

区 分 : 甲

論 文 内 容 の 要 旨

β -tricalcium phosphate (β -TCP) has attracted much attention as an artificial bone substitute since it showed osteoconductivity and is replaced to be bone. We have found that tricalcium phosphate (TCP) could set when TCP granule are exposed to acidic calcium phosphate solution based on bridging of TCP granular with dicalcium phosphate dihydrate (DCPD). However, tissue response to DCPD coated β -TCP has not been investigated up to date. To fabricate β -TCP granule coated with 1 mass%, 5 mass% and 15 mass% DCPD, β -TCP granules were immersed in acidic calcium phosphate solution for 10, 30 and 60 min, respectively. SEM analyses confirmed that DCPD crystals were precipitated on the surface of the β -TCP granule. The osteoconductivity of DCPD coated β -TCP granule was evaluated using experimental animals, rats. The 9 mm in diameter of bone defect was made at rat calvarial, and the defect was reconstructed with 1 mass%, 5 mass%, 15 mass% DCPD coated β -TCP granule and β -TCP granule without coating. No inflammatory response was observed for β -TCP granules regardless of the presence and absence or the amount of DCPD coating. After 2 and 4 weeks implantation, the specimen were taken out with surrounding tissue and examined histologically. Based on the HE staining images, the new bone formation was observed from the edge of the defect towards the centre of the bone defect area in all specimens. At 2 weeks, the 5 mass% DCPD coated β -TCP granule showed highest new bone formation when compared with other specimens. The similar result also was obtained for 4 weeks implantation. We concluded that 5 mass% DCPD coated β -TCP granule could be an ideal artificial bone substitute due to its excellent tissue response and higher osteoconductivity.