

R-11. The in vivo and in vitro evaluation of chitosan nanofiber membrane

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연구배경

Chitosan has been known as a biodegradable and non-toxic natural polymer. It is known that chitosan enhanced wound healing and bone formation. In addition to this biomedical applicability, chitosan can regulate release of bioactive agents. The purposes of this study are to evaluate biocompatibility of chitosan nanofiber membrane and to examine the effect of chitosan nanofiber membrane on bone regeneration in rabbit calvarial defect. Chitosan nanofiber membranes were fabricated by chitosan nanofiber using electrospinning technique. They were nonwoven, three-dimensional porous.

연구방법 및 재료

In vitro cell attachment test and RT-PCR using MG63 cells was performed on chitosan nanofiber membrane. Chitosan nanofiber membrane was implanted in subcutaneous connective tissue after dissection and observed for 2, 4, 6 weeks in rat. Ten mm diameter round cranial defect were created and covered by chitosan nanofiber membrane in rabbits for 4 weeks. Decalcified specimens were made and observed by microscope.

연구결과

MG63 cells attached to chitosan nanofiber membrane comparing to control and the expression of protein in osteoblast was continuously increased. The shape of chitosan nanofiber membrane did not change for 6 weeks. No inflammation couldn't be seen on the surface of membrane and in its surrounding tissues. In rabbit calvarial defects, newbone bridge was formed at the all defect areas and fused to original old bone at 4 weeks. No distortion and resorption was observed in the grafted chitosan nanofiber membrane. However bone bridge formation and new bone formation at the center of the defect could not be seen in control.

결론

This study showed that newly developed chitosan nanofiber membrane was biocompatible and harmless on surrounding tissue and could provide suitable environment for proliferation and differentiation of osteoblast. It also showed that this membrane might help regeneration process in rabbit calvarial defect. This experiment showed that the biodegradable novel chitosan nanofiber membrane could be used as a possible tool for guided bone regeneration.

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