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피부암 치료용 ^{166}Ho-Patch 제조에 관한 연구

Study on the Preparation of ^{166}Ho-Patch for a Skin Cancer Treatment

김영미 · 김경화 · 한광희 · 박응우 · 신병철 · 박경배
한국원자력연구소,

이종두
연세대학교

요약

피부암치료용으로 홀뮴-166 (Max. 1.86 MeV (51 %), 1.78 MeV (48 %), mean 0.67 MeV의 β 에너지와 소량의 γ 에너지)을 포함하는 방사성 팻취를 제조하기 위하여 폴리우레탄(polyurethane)과 홀뮴 질산염($^{165}Ho(NO_3)_3 \cdot 5H_2O$)을 DMF와 THF의 혼합용액에 녹인 후 알루미늄 용기에 얇게 도포하여 완전히 용매를 휘발시켜 ^{165}Ho-Patch를 제조하였다. 이를 하나로(Φ_{th} = 1.25 X 10^{13} n/cm^2 · sec, power = 15 MW)에서 중성자 조사하여 ^{166}Ho-Patch를 제조하였다. 환자 병소의 크기와 모양에 따라 후방사화에 의해 쉽게 제조 가능한 ^{166}Ho-Patch를 피부암을 유발시킨 동물 모델과 피부암 환자를 대상으로 적용한 결과 무독성과 유효성 및 안전성이 입증되었다.

Abstract

Radioactive patch containing holmium-166 has been developed for skin cancer treatment, and then applied to animal model and patients with malignant skin cancer. ^{165}Ho-Patch prepared by dissolving polyurethane and $^{165}Ho(NO_3)_3 \cdot 5H_2O$ in mixing solvent of DMF and THF and casting on aluminium dish was irradiated in "HANARO" reactor (Φ_{th} = 1.25 X 10^{13} n/cm^2 · sec, power = 15 MW), which results in preparing ^{166}Ho-Patch emitting β energy of Max. 1.86 MeV (51 %), 1.78 MeV (48 %), mean 0.67 MeV and low γ energy. The ^{166}Ho-Patch specially designed was applied to the superficial skin cancers. Their efficacy and safety have been investigated for several months. Radioactive patch was ready to prepare by post-irradiation without special danger by radioactive material. Skin tumor could be successfully treated with ^{166}Ho-Patch in animal model and patients. In animal model and patients, the world's first noninvasive ^{166}Ho-Patch readily prepared by post-irradiation proved to be safe and effective in treatment for skin cancer.