

Cytotoxicity of the Calcium Alginate/ *N,O*-carboxymethylchitosan Hemostatic Sponge on Primary Human Gingival Fibroblasts

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Abstract

To date, chitosan-based hemostatic agents have gained increasing interest from their biocompatibility, inexpensiveness and hemostatic capability, especially in coagulopathic conditions. We have developed a functionally improved Calcium Alginate/*N,O*-carboxymethylchitosan (CA/NOCC) hemostatic sponge, shown to be biocompatible and biodegradable.

Objectives: To ensure its safe use with the gingival tissue, this study aimed to evaluate the cytotoxicity of CA/NOCC sponge on primary human gingival fibroblasts (GFs).

Methods: Human GFs were cultured with or without the CA/NOCC sponge. Cell morphology was assessed by scanning electron microscopy. Cell viability and proliferation were determined by MTT assays. The levels of Ca²⁺ released into the culture medium were also measured.

Results: Gingival fibroblasts cultured with the CA/NOCC sponge demonstrated lowered cell density, and significant ultrastructural changes of the cell membrane, by forming numerous blebs and fibrils. From MTT assays, approximately 30% decrease in the proliferation rate was observed. Moreover, the levels of Ca²⁺, up to 4.6 mM, were detected in the medium of GFs cultured with the CA/NOCC sponge.

Conclusions: It could be implicated that the cytopathic effects on the morphology and proliferative ability of GFs may result from the high level of Ca²⁺ released from the CA/NOCC hemostatic sponge.

Keywords: CA/NOCC sponge, calcium ion, cell morphology, cell proliferation

Introduction

Uncontrolled bleeding is potentially one of the most life-threatening complications in oral surgical procedures, especially for patients with coagulopathic conditions. Reductions in the morbidity and mortality rates, from excessive hemorrhaging, were most likely due to the development and utilization of numerous types of hemostatic agents. However, studies are still ongoing in search

for a novel hemostatic material with overall characteristics of biocompatibility, biodegradability, non-immunogenicity, affordability, ease of use, and efficacy in bleeding control in both normal and coagulopathic conditions.⁽¹⁾ To date, Gelfoam[®] and Surgicel[®] are still widely used for intraoral bleeding control due to their biocompatibilities, accessibilities, ease of usage and storage.^(1,2) Nonetheless, their hemostatic efficiencies, when used in patients