



Acta Scientiae Veterinariae

ISSN: 1678-0345

ActaSciVet@ufrgs.br

Universidade Federal do Rio Grande do Sul
Brasil

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Acta Scientiae Veterinariae, vol. 35, núm. 3, 2007, pp. 381-383
Universidade Federal do Rio Grande do Sul
Porto Alegre, Brasil

Available in: <http://www.redalyc.org/articulo.oa?id=289021852016>

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Chitosan film for treatment of cutaneous wound in a female cat

Filme de quitosana para o tratamento de ferida cutânea em uma gata

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ABSTRACT

Chitosan and alginate have the capacity to absorb the secretion, to stimulate collagen production and to restore tissue lesions, and were proved to be biocompatible and biodegradable. This article describes the treatment of an open infected bite-injury located on the right side of the abdominal-chest region, with subcutaneous-tissue loss, in a cat. Chitosan and chitosan-alginate films developed in the Department of Biotechnological Process of the Chemical Engineering School of the State University of Campinas (Unicamp) were used to cover the wound. These film dressings were changed at intervals of 48, 72 hours, and at 4, 7, 14, 21, and 24 days. On the 30th day the patient was released. Facing the satisfactory evolution of the injury, one may conclude that both films were effective for the treatment of the described case, leading to a healthy granulation reconstruction of the tissue, and to quick healing and scarring within 30 days.

Key words: cat, chitosan, healing wound.

RESUMO

A quitosana e o alginato têm a capacidade de absorver secreções para estimular a produção de colágeno e recuperar tecidos lesados, sendo comprovadamente biocompatíveis e biodegradáveis. Este artigo descreve o tratamento de uma ferida aberta em uma gata, localizada na região toraco-abdominal direita, com perda de tecido subcutâneo. Foram usados filmes de quitosana e quitosana-alginato desenvolvidos no Departamento de Processos Biotecnológicos da Faculdade de Engenharia Química da UNICAMP para a cobertura da lesão. Estes filmes foram trocados com intervalos de 48, 72 horas e 4, 7, 14, 21 e 24 dias. No 30º dia a paciente foi liberada. Devido à evolução satisfatória da lesão, foi possível concluir que ambos os filmes foram efetivos no tratamento do caso descrito, formando um tecido de granulação saudável na reconstrução tecidual, recuperando rapidamente em 30 dias.

Descritores: gato, quitosana, reparação de feridas.

INTRODUCTION

Cutaneous injuries due to animal bites are common in cats, whilst their treatments are usually discouraging. Such wounds tend to occur on the head, neck, thorax and abdomen [4] and the skin might slide upon subjacent fasciae, widening wound borders. The removal of subcutaneous tissue in cats inhibits the formation of granulation tissue [1]. The treatment of a wound after eight or more hours should aim to establish a healthy wound bed, free of devitalized tissue and other materials, and also free of any infection [3]. Dressings are usually employed for this purpose, which should compile the following properties: exudates and toxins absorption, maintenance of wound humidity and warmth, appropriate gas exchanges, avoid new contamination; it should also be non toxic, and easily removed, handled and sterilized [5]. Chitosan is a natural polymer obtained from chitin, with biocompatibility, biodegradability, and healing stimulation properties and it may also be used as haemostatic and drug-releasing agent. The natural fonts of chitin are the hard shell of water crustaceous, insects' exoskeleton and cell wall of fungi; for being a residue of the fishing industry, it has low cost [2,6]. Open wounds of dogs and cats, treated with chitosan, show a granulation tissue rich in mitotic cells, leading to minimum scar formation [8]. Also, it should be stressed that in cats, granulation tissue is more significant [7]. Similarly, alginate is a natural polymer obtained from seaweeds, being widely employed in wound treatment. This article describes the treatment of an open infected bite-injury located on the right side of the abdominal-chest region, with subcutaneous-tissue loss, in a cat.

CASE REPORT

A Siamese one-year-old cat (1,5 Kg - 3,2 £) from the routine of the hospital presented with a wide contaminated wound in the right lateral thoracic-abdominal area, with loss of subcutaneous tissue. Chitosan and chitosan-alginate films developed in the Department of Biotechnological Process of the School of Chemical Engineering of Unicamp (Campinas-SP-Brasil) were employed [2]. Two kind of sterile films were used; chitosan and chitosan-alginate, both hydrated in Ringer-Lactate Solution before applying to the wound. The films were fixated onto integrous skin

by cyanoacrilate (Figure 1). After the 14th day, only films with no alginate were used. A bandage was placed over the films. A subcutaneous shot of amoxicillin was given (20 mg/kg), every 48 hours, up to five doses. No topical medication was used during the treatment. The films were changed on the following intervals: 48 and 72 hours, four, seven, 14, 21 and 24 days (Figures 2 & 3). At the 30th day, cutaneous repair was complete, and the scar observed was aesthetic, and with regular fur growth (Figure 4).

DISCUSSION

Although the changes of chitosana films are suggested every three days, on this report the option was to change it according to the wound resolution. Experimental rat wounds treated with chitosan gel have shown remarkable mesenchymal-cell proliferation and production of collagen fibers. Angiogenesis and neutrophil migration were credited to interleukine, liberated from stimulated fibroblasts [8]. The chitosan-alginate film, besides absorbing secretions, also stimulates reepithelization, and this can be clearly seen in Figure 2, when the wound had already shown granulation and reepithelization only 72 hours after placing the film. A bandage should keep the wound humid and warm, since the heat allows for a wound to heal faster and with more tensile force then it would be at room temperature. Easy removal and film transparency are important advantages of the treatment with chitosan films [6]. The clear films made it possible to visualize the wound, indicating the moment for its change, procedure which must be comfortable for the animal. In addition, the neocapilars of a wound healed by second intention are very fragile and may easily collapse in cases of trauma, resulting in hypo-perfusion, which leads to a hypoxic and acid environment, hindering cicatrization. Chitosan films have bactericidal and antifungal properties, what makes them more effective on the treatment of contaminated wounds than on the clean ones, since they stimulate infiltration of polymorphonuclear cells in the wound [8]. Facing the presented results, one may conclude that chitosan and chitosan-alginate-based films were effective on the treatment of a contaminated open wound in a cat, leading to remarkable cicatrization in 30 days.



Figure 1. Wound covered with a film based on chitosan film in a female cat.



Figure 2. Wound treated with a film based on chitosan 72 hours after the beginning of the treatment. We can note the epithelization on the wound edges and the granulation tissue.



Figure 3. Wound treated with a film based on chitosan 14 days after the beginning of the treatment.



Figure 4. Wound treated with a film based on chitosan 30 days after the beginning of the treatment.

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