11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Freeze-dried collagen membrane from porcine intestinal submucosa: a new promise of biological barrier for guided tissue regeneration

C. Jardelino[(1)*], I. I. Castro-Silva[(1)], D. R. Gomes[(1)], E. R. Takamori[(2)], A. Lenharo[(2)], J. M. Granjeiro[(1)]

(1) Nucleo de Terapia Celular, Instituto de Biologia and Hospital Universitario Antonio Pedro, Universidade Federal Fluminense, Niteroi, RJ, Brazil, e-mail: jmgranjeiro@gmail.com
(2) Sistema de Implantes Nacional – SIN. Sao Paulo, SP, Brazil, e-mail: esther.takamori@stractabiomedical.com.br
* Corresponding author: tinajlima@yahoo.com.br

Abstract. The aim of this study was to evaluate the tissue behavior of a new membrane made up of freeze-dried collagen I from porcine intestinal submucosa. The biomaterial was implanted subcutaneously into mice and after 1, 3 and 9 weeks animals were killed and samples were prepared to histological analysis. Mild revascularization and inflammatory reaction, moderate biodegradation was associated to the presence of new loose connective tissue and discrete giant multinucleated cells in the periphery of the material. In conclusion, the experimental collagen membrane can be considered biocompatible and partially reabsorbable.

Guided tissue and bone regeneration are based on the concept of creating a barrier to avoid undesirable tissue ingrowths and promote the proliferation of target cells involved to repair process. An optimal membrane should be biocompatible, occlusive, space maintaining, clinically manageable and degradable, but the ideal material is not available yet. Collagen is a biocompatible product and the porcine intestinal submucosa has been a suitable source of this raw material for guided tissue regeneration purposes. The aim of this study was to evaluate the tissue behavior to a new membrane made up of freeze-dried collagen I from porcine intestinal submucosa.

In this study, 3 samples were used for scanning electron microscopy analysis (SEM). For biological characterization, collagen membranes were implanted subcutaneously into mice (5 for experimental time). After 1, 3 and 9 weeks (ISO 10993-6), animals were killed and samples were prepared to histological analysis that used as staining method hematoxylin-eosin (H-E). The parameters evaluated were: biodegradation, vascularization, tissue integration and foreign body reactions.

SEM analysis showed fibrillar topography related to the collagen mesh (Figure 1). Histological evaluation showed the presence of mild peripheral revascularization and inflammatory infiltrate in 1 week, while from 3 to 9 weeks, small to moderate biodegradation and substitution of bioresorbed material by new loose connective tissue occurred, however maintaining its functional structure. Discrete presence of giant multinucleated cells in periphery of the material without relevant inflammatory reaction happened (Figure 2). In conclusion, the experimental freeze-dried collagen membrane can be considered biocompatible and partially reabsorbable, representing a new promise of biological barrier for guided tissue regeneration.

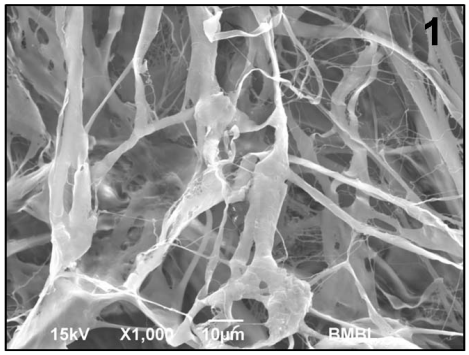

Figure 1: SEM image of collagen membrane.

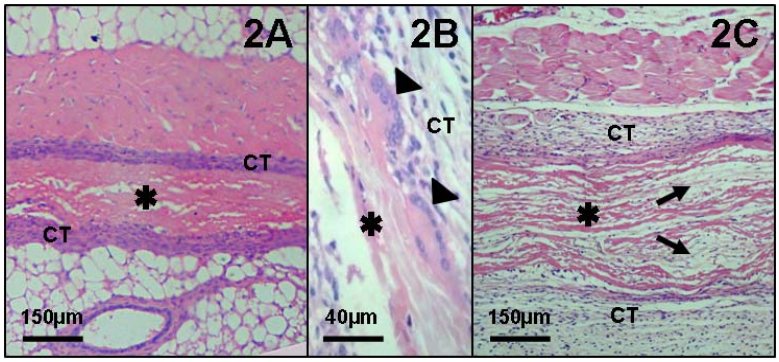

Figure 2: Photomicrography of collagen membrane (✱) in subcutaneous site. A: 1 week, B and C: 9 weeks. Head arrows: peripheral giant multinuclear cells, black arrows: hydrolysis of the material, CT: loose connective tissue, H-E.

References:

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