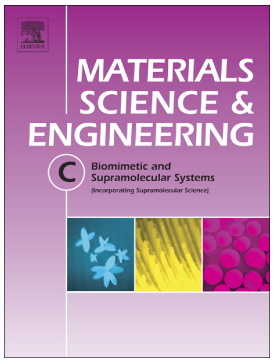

Surgical repair of abdominal wall defect with biomimetic nano/microfibrous hybrid scaffold

Wenbin Gong, Tao Cheng, Quanguo Liu, Qianru Xiao, Junsheng Li

PII: S0928-4931(18)30349-7
DOI: doi:10.1016/j.msec.2018.08.053
Reference: MSC 8847

To appear in: *Materials Science & Engineering C*

Received date: 2 February 2018
Revised date: 10 July 2018
Accepted date: 27 August 2018

Please cite this article as: Wenbin Gong, Tao Cheng, Quanguo Liu, Qianru Xiao, Junsheng Li , Surgical repair of abdominal wall defect with biomimetic nano/microfibrous hybrid scaffold. Msc (2018), doi:10.1016/j.msec.2018.08.053

Surgical repair of abdominal wall defect with biomimetic nano/microfibrous hybrid scaffold

Wenbin Gong,[a] Tao Cheng,[b] Quanguo Liu,[a] Qianru Xiao,[c] Junsheng Li[*b]

[a]School of medicine, Southeast University, Nanjing, China
[b]Department of General Surgery, Affiliated Zhongda Hospital, Southeast University, Nanjing, China
[c]State Key Laboratory of Bioelectronics, School of Biological Science and Medical Engineering, Southeast University, Nanjing, China

*Corresponding author: Junsheng. Li, Department of General Surgery, Affiliated Zhongda Hospital, Southeast University, Nanjing, 210009, China. E-mail: Lijunshenghd@126.com

Abstract

It is universal to repair abdominal wall defects with prosthetic materials in abdominal surgery worldwide, which are associated with high complications and organ damage. At present, the composite nanofibers composed of natural and synthetic polymers as the new type of nano structure scaffold have attracted considerable attention in the field of tissue engineering. In this study we examined the feasibility of using electrospun silk fibroin (SF)/poly (3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) hybrid scaffolds for repairing of abdominal wall defects. Both in vivo and in vitro characterization were evaluated to access efficacy of the nanofiber for tissue regeneration. Our results showed that the electrospun SF/PHBV nanofiber scaffolds could stimulate the expression of TGF-β1 and Collagen I in fibroblasts in vitro and then promote granulation and connective tissue depositions, but not result in a strong foreign body reaction in vivo. Moreover, we conjectured the potential molecular biological mechanism of SF/PHBV hybrid scaffolds in the process of tissue regeneration. Thus, the SF/PHBV hybrid nanofiber scaffolds have high efficiency and biocompatibility to repair abdominal wall defects.

Key words:

abdominal wall defects, hybrid scaffold, silk fibroin, poly (3-hydroxybutyrate-co-3-hydroxyvalerate), tissue regeneration

INTRODUCTION

Abdominal wall defects, as a result of abdominal trauma or congenital rupture, affect millions of people around the world in recent years and the number is still rising. Abdominal wall defects caused by abdominal trauma mostly are firearm injuries at wartime, while abdominal open injuries of the knife or sharp instrument stab in peacetime. In addition, abdominal wall defects such as gastroschisis and exomphalos are significant congenital malformations with high risk of compromised foetal development.[1,2] Whether it is abdominal trauma or congenital rupture, timely surgical treatment is necessary to reduce the organ damage and rate of complications, such as the occurrence of infection or acquired hernia, so as to decrease mortality. For the vast majority of cases, patients need synthetic materials to repair the defects. At present, the composite nanofibers composed of natural and synthetic polymers are able to combine with the good biocompatibility and nontoxicity of natural components, and degradation and mechanical properties of artificial polymers, as a new type of nano structure scaffold have attracted considerable attention in the field of tissue engineering. Ideal biomaterial can not only provide architectural support and cues conducive to tissue regeneration, but also act as a