

# **Bilayer Chitosan and Neurosurgical Applications**

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### Introduction

To evaluate the potential applications of a bilayer chitosan design, that enables its use as a membrane for meningeal tissue repair.

### **Methods**

In the in vitro phase, BChS was designed and elaborated, the following characteristics were evaluated: pore size, thickness, water absorption capacity, tensile strength, strain, and toughness. In the experimental phase, its behavior was analyzed in vivo as a dural substitute in 29 New Zealand rabbits, which were randomly assigned into three duraplasty groups with autologous dura, collagen matrix (CM) or BChS. We evaluated the sealing capacity, the ability to be saturable, the preservation of the adjacent cerebral cortex, and the inflammatory response in all groups, 10,21, or 180 days. Histology response of regeneration was evaluated through hematoxylin and eosin stain.

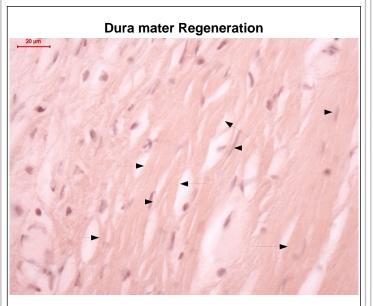
# Bilayer Chitosan NpL NpL Microscopic view of the designed membrane

### Results

BChS was standardized to obtain scaffoldings with a non porous layer and a porous layer. The pore size was 10 micrometers, total thickness was 400 micrometers, strain was 57.8%, and tensile strength was 5.5 gr/mm2. The physical characteristics of BChS allowed dural closure without cerebrospinal fluid (CSDF)leak. There were no differences in fluid leakage pressures between the BChS, dura, and CM groups. Histologic analysis showed fibroblast migration with adequate dural regeneration without evidence of fibrosis.

# **Conclusions**

BChS is an ideal alternative for a watertight dural closure because it can be sutured, and it induces organized regeneration with fibroblasts without evidence of fibrosis.



Evidence of organized collagen fibers without chitosan

# **Learning Objectives**

By the conclusion of this session, participants should be able to evaluate the potential applications of a bilayer chitosan membrane in meningeal tissue repair.

### References

José Humberto Sandoval-Sánchez, Rodrigo Ramos-Zúñiga, Sonia Luquín de Anda, Fernando López-Dellamary,Rocío Gonzalez-Castañeda, Juan De la Cruz Ramírez-Jaimes, Guadalupe Jorge-Espinoza. A New Bilayer Chitosan Scaffolding as a Dural Substitute: Experimental Evaluation. World Neurosurg (2012);77 (3-4): 577-82.

