

O8: Biorheology and Biotechnology-1

O8-1 Fabrication of Gradient Nanofibrous Scaffold for Interface Tissue Engineering

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For the special biomolecular composition, microstructure and micromechanics in the interfacial region, surgical reconstruction of ruptured ligament/tendon with soft tissue grafts creates bone-graft interfaces within bone tunnels, where mismatched properties can result in poor osteointegration and increased rate of graft failure. Therefore, improvements in bone-graft integration are critical to allow for earlier and more aggressive rehabilitation with the hope of promoting a speedier return to normal daily activities. In the current study, we developed a nanofibrous scaffold based on silk fibroin to mimic the native interfacial region, which had a gradually increase of mineral content demonstrated with scanning electron microscope, energy-dispersive X-ray spectroscopy and fourier transform infrared spectroscopy analysis. Furthermore, human mesenchymal stem cells were cultured on different areas of the scaffold with gradual mineralization and the effects of scaffold structure and topography on cell morphology, proliferation, viability and differentiation were also investigated. The fabricated scaffold showed a high proliferative capacity, viability and biocompatibility and could direct osteogenic or tenogenic differentiation. In summary, the fabrication of gradient scaffold based on silk fibroin can improve the integration and has the potential application in the interfacial tissue engineering. [This work was supported by the National Natural Science Foundation of China (Nos. 11532004, 31270990), and Innovation and Attracting Talents Program for College and University (“111” Project) (No. B06023)]

O8-2 Tanshinone Can Inhibit Inflammation and Angiogenesis in Several Chondrocytic Cells

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Objective:

To investigate the potential effects of tanshinone on oxidation, inflammation and angiogenesis in various kinds of chondrocytic cells.

Methods:

Various kinds of chondrocytic cells were used in this project such as human primary articular chondrocyte (PHC), SW1353 human chondrosarcoma cell line, C-28/I2 and T/C-28a2 human immortalized chondrocyte lines. Treatment of human TNF and IL1B polypeptides was used to stimulate inflammatory reaction. After the inflammatory response was activated, the authors evaluate the anti-inflammatory and anti-angiogenesis effects of 10mmol/L tanshinone treatment by merits of qRT-PCR and western blot which tested VEGF, PAK1, IL6 and IL10. The authors also tested the potential anti-oxidant effect of tanshinone on chondrocytic cells by BES-H₂O₂-Ac and AlamarBlue staining and flow cytometry.

Results:

After treatment of either TNF or IL1B polypeptides, PHC and other chondrocytic cell lines exhibited an upregulated inflammatory response by testing the expression of IL6 and IL10. The expression of interleukins had been suppressed after the following treatment of 10mmol/L tanshinone. Tanshinone treatment can also downregulate the expression of VEGF and PAK1 in TNF-treated and IL1B-treated PHC and other chondrocytic cells. After fluorescence analysis of BES-H₂O₂-Ac and AlamarBlue treated cells, authors found tanshinone can also play an antioxidant role.

Conclusion:

In human primary articular chondrocytes and other chondrocytic cell lines, tanshinone can inhibit angiogenesis, inflammation and oxidation after stimulation with TNF or IL1B. It gives an opportunity for tanshinone to take part in OA treating.

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O8-3 The Preliminary Research of Mechanical Compress Damage on Neurons Induced by Hematoma

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Hemorrhagic stroke is the most lethal and crippling cerebrovascular disease and with serious dyspnea among the survivors. Besides biochemistry damages, there are various mechanical factors in the process of cerebral hemorrhage. However, whether these mechanical factors play key roles in the occurrence and development of cerebral hemorrhage is rarely studied. In our studies, the primary process of neuron and tissue injury induced by hematoma is researched through brain slices and with the auxiliary proof of neuron culture. Brain slices were obtained through vibratome and cultured with Transwell, and then compressed by the mechanical compress system constructed by ourselves. The primary process of neuron damage is researched through lactate dehydrogenase detecting, fluorescent quantitative PCR, immunofluorescence and western-blot. The activity of neurons and glial cells declined rapidly after being compressed. The genes of ion channel proteins PIEZO and TRPV4 raised rapidly after being compressed, and continued to increase significantly and reach a peak value after 12 hours culture following stress removing. However, the PIEZO and TRPV4 protein expression increased after being compressed, but did not continue to rise. After being compressed, the intracellular Ca²⁺ concentration and the apoptosis promoting gene BAX increased rapidly while apoptosis restraining gene Bcl-2 decreased significantly, and the tendency continued after mechanical stress being removed. The high concentration of intracellular Ca²⁺ activates the expression of apoptosis promoting gene BAX and prevent Bcl-2, and ultimately accelerates cell apoptosis.

O8-4 Hemodynamic Analysis of Cerebral Aneurysms: Suggestions for Surgical Options

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Hemodynamic factors play a significant role in the development of cerebral aneurysms. Factors such as wall shear stress (WSS), blood velocity or pressure could change in time and may contribute to aneurysm growth and rupture. Now, computational fluid dynamics has become a popular tool for studying intracranial aneurysm hemodynamics and discriminating rupture status. In this study, we observed a rare case of a middle cerebral artery aneurysm in which a small aneurysm attaches to main aneurysm. We obtained the computed tomography angiography (CTA) data when the patient was admitted to the hospital, and calculated hemodynamic factors in this aneurysm. We found that there was an obvious vortex within the aneurysm, and the WSS in the small aneurysm was significantly lower, and high pressure occurs on the neck of the small aneurysm. Based on the calculation results, we recommend clamping the lateral aneurysm while the main aneurysm will not be treated for the time being. The patient's CTA data for three days after the surgery were further analyzed. And we found that the volume of the aneurysm after clipping significantly reduced, the blood flow within the aneurysm more stable, the WSS distribution of the aneurysm uniform, and the area of low shear stress significantly reduced, which indicated the surgery effect is good. Patient's CTA data for one-year post the surgery showed that the main tumor gradually shrank and the patient was in good condition. Overall, our study successfully assessed the hemodynamic environment of patients with cerebral aneurysms, and put forward a better surgery plan, which may be useful for clinical application. [Supported by the NKTR&DPC (2016YFC1102305), the NNSFC(11332003), the FRFCU (CDJXY230002, CDJZRPY0202, CDJQJ238814)]