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Usage of tissue engineering for stimulation of reparative processes in damaged liver

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Background: Tissue engineering and cell therapy is a new perspective method for recovery of function and the formation of new centers of regeneration of damaged organs.

Aim: The aim of this study was to create technology for the treatment of chronic liver failure (CLF) by growing the functionally active liver tissue and its regeneration.

Methods: CLF was modeled on Wistar rats by means of CCl₄. Mesenchymal stromal cells of bone marrow (MSC) were obtained from August rats by standard procedure. MSC (0.5-0.8x10⁶ cells/cm³) was cultivated for 10 days and then applied on the composition of heterogenic implantable hydrogel. Formed cell engineering constructions (CECs) were implanted into damaged rat liver. The animals were divided into two groups: control group 1 (n=25) without treatment-injected saline; and group 2 (n=25) with treatment-injected saline. Dynamics reduction of CLF; liver and CECs morphology were investigated within 365 days after implantation.

Results: In group 1, mortality rate was 48%, the formation of liver cirrhosis without recovery. In group 2, all biochemical indices returned to normal levels within 30-60 days. On the 90th day it was shown restoration of a hepatic lobe structure and liver architectonics, viable and proliferative activity of MSC. Also detected neogenic plethoric vessels and neogenic bile ducts were detected.

Conclusion: Studies found out that the proposed method of implantation of CECs with MSC is an effective method for stimulation of reparative regeneration in the damaged liver, treatment of CLF and can be used in clinical practice.

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