

Recent Technological Advances in Hepatogenic Differentiation of Stem Cells Relevant to Treatment of Liver Diseases

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Abstract:

Liver failure, in an acute or chronic form, is a growing health problem ranking as one of the leading causes of death worldwide. Inborn errors of metabolism characterized by defects in hepatic enzymes or other proteins with metabolic functions, such as receptors or transporters accompanied with environmental factors involve etiology and presentation of liver failure. Currently, the only established long-term successful treatment for these conditions is Orthotopic Liver Transplantation (OLT) with long-waiting lists of patients to be transplanted. In recent years, cellular therapy using human hepatocytes is being evaluated worldwide as an alternative to organ transplantation in patients with liver failure. Besides, scientists are trying to modify stem cells and their progenitor cells to improve their efficacy for treatment and repair of damaged tissue. The cell-based therapies have been a particularly active area of investigation in recent years. Experimental studies showed that transplantation of MSC-derived hepatocytes as well as MSC to a mice model of liver failure can effectively contribute to liver regeneration and rescue animals from liver failure. Clinical trials with mesenchymal stem cells (MSC) using autologous bone marrow cell fusion (ABMI) therapy in patient suffering with cirrhosis show improvement of liver function. Hepatocyte transplantation method has been performed for indications such as, acute liver failure (ALF), end-stage liver disease, and inborn errors of metabolism. The cell based therapy for liver diseases comprises of two stages, firstly, the cell isolation and preparation, secondly, the transplantation stage. The protocols used for cell preparation and infusion from peripheral vein have been successfully performed in animal models as well as clinical trials.

In recent years using tissue engineering protocols, 3D scaffolds of different composition have been prepared which support MSC proliferation and differentiation into active hepatocytes. The biocompatible nanofibrous biomatrix scaffolds that support and enhance stem cell proliferation and differentiation are useful for transplantation and development of bioartificial liver system. Very recently scientists focused on decellularization of the liver organ and cell seeding of whole liver which is implicated for transplantation. The advantages and disadvantages of these protocols will be discussed in this meeting.

Keyword: Acute liver failure, Cell therapy, Stem cells.

Oral Presentation

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