Therapeutic potential of unrestricted somatic stem cells isolated from placental cord blood for cardiac repair post myocardial infarction.


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Abstract

OBJECTIVE: Unrestricted somatic stem cells (USSCs) were successfully identified from human cord blood. However, the efficacy of USSC transplantation for improving left ventricular (LV) function post myocardial infarction (MI) is still controversial.

METHODS AND RESULTS: PBS, 1x10(6) human fibroblasts (Fbr), 1x10(5) USSCs (LD), or 1x10(6) USSCs (HD) were transplanted intramyocardially 20 minutes after ligating the LAD of nude rats. Echocardiography and a microtip conductance catheter at day 28 revealed a dose-dependent improvement of LV function after USSC transplantation. Necropsy examination revealed dose-dependent augmentation of capillary density and inhibition of LV fibrosis. Dual-label immunohistochemistry for cardiac troponin-I and human nuclear antigen (HNA) demonstrated that human cardiomyocytes (CMCs) were dose-dependently generated in ischemic myocardium 28 days after USSC transplantation. Similarly, dual-label immunostaining for smooth muscle actin and class I human leukocyte antigen or that for von Willebrand factor and HNA also revealed a dose-dependent vasculogenesis after USSC transplantation. RT-PCR indicated that expression of human-specific genes of CMCs, smooth muscle cells, and endothelial cell markers in infarcted myocardium were significantly augmented in USSC-treated animals compared with control groups.

CONCLUSIONS: USSC transplantation leads to functional improvement and recovery from MI and exhibits a significant and dose-dependent potential for concurrent cardiomyogenesis and vasculogenesis.