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MESENCHYMAL STEM CELLS PRECONDITIONED WITH HIGH DENSITY LIPOPROTEIN RESIST OXIDATIVE STRESS-INDUCED APOPTOSIS AND IMPROVE CARDIAC FUNCTION IN A RAT MODEL OF MYOCARDIAL INFARCTION

Jianfeng Xu[1], Juying Qian[1], Xinxing Xie[1], Jianying Ma[1], Li Lin[2], Aijun Sun[1], Yunzeng Zou[1], Junbo Ge[11]Zhongshan Hospital, Shanghai, China; [2]Eastern Hospital, Hong Kong, China

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Objective To explore the effect of high density lipoprotein (HDL) on mesenchymal stem cells (MSCs) implanted in infarcted myocardium, and to unveil the role of MAPK/ERK1/2 pathways in the potential mechanism of it.

Methods MSCs were collected from the femora of Sprague–Dawley rats and were treated with PBS (CON group), HDL (HDL group), H_2O_2 (H_2O_2 group), HDL and H_2O_2 (EXP group), respectively. The expressions of proteins related with apoptosis, such as phosphor-ERK1/2, Bcl-2 and Bax were examined by Western-Blot assay; cell apoptosis was detected by TUNEL staining. In vivo study, acute myocardial infarction model was developed in female SD rats which were given an intramyocardial injection of one of the following cells derived from male rats: MSCs or HDL-preconditioned MSCs. After 4 days, the survival rates of MSCs were compared by means of measuring sry gene with real-time PCR. After 4 weeks, the cardiac remodelling and the percentage of fibrosis of heart were measured by echocardiograph and Masson's staining respectively.

Results In comparison with H_2O_2 group, expression of phospho-ERK1/2 was significantly lower in EXP group, and the ratio of expression of Bcl-2 to that of Bax increased (3.4±0.7 vs 5.2±1.2, $p<0.05$). TUNEL assay indicated that the percentages of MSCs apoptosis reduced evidently in EXP group compared with in H_2O_2 group ((13.3±2.7)% vs (22.8±3.9)%, $p<0.05$). In vivo study, the expression of sry gene showed that preconditioning with HDL improved the survival rates of the transplanted MSCs compared to the untreated MSCs (6.5±1.7 folds vs 2.3±0.5 folds, $p<0.05$); the echocardiological analysis demonstrated that HDL-preconditioned MSCs improved left ventricular ejection fraction significantly ((50.97±10.4)% vs (26.54±7.2)%, $p<0.05$). Furthermore, the percentage of fibrosis in the left ventricle wall was lower in HDL-preconditioned MSCs group than that in MSCs group ((18.35±7.8)% vs (30.62±6.2)%, $p<0.05$).

Conclusion HDL enhanced the viability of MSCs in an oxidative stress circumstance, leading to prevent myocardial remodelling and to improve cardiac function. MAPK/ERK1/2 pathways were probably one of the underlying mechanisms involved in it.