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Combined therapy with shock wave and autologous bone marrow-derived mesenchymal stem cells alleviates left ventricular dysfunction and remodeling through inhibiting inflammatory stimuli, oxidative stress & enhancing angiogenesis in a swine myocardial infarction model

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Background: We hypothesized that combined therapy with shock wave (SW) and autologous bone marrow-derived mesenchymal stem cells (BMDMSCs) are superior for alleviating left ventricular (LV) dysfunction.

Methods & Results: Male mini-pigs (n=30) equally divided into group one (sham control), group two [Acute myocardial infarction (AMI) by left coronary artery ligation], group three (AMI-SW), group four (AMI-BMDMSC) and group five (AMI-SW-BMDMSC) were sacrificed by day 60 and the hearts were collected for studies. Baseline LV injection fraction [LVEF (%)] and LV chamber size did not differ among the five groups (p>0.5). By day 60, LVEF was highest in group one and lowest in group two, significantly higher in group five than that in groups three and four, and significantly higher in group four than that in group three (p<0.001). Cellular and protein levels of VEGF, CXCR4, and SDF-1 α were significantly increased progressively from groups one to five (all p<0.05). Small vessel number and protein expressions of CD31 and eNOS were highest in groups one and five, lowest in group two, and significantly higher in group four than those in group three (p<0.001). Protein (MMP-9, TNF-1 α and NF- κ B) and cellular (CD14+, CD40+) levels of inflammatory biomarkers, protein expressions of oxidative stress (oxidized protein, NOX-1, NOX-2), apoptosis (Bax, caspase-3, PARP), infarct size, and LV dimensions showed a pattern opposite to that of LVEF among all groups (all p<0.001).

Conclusions: Combined SW-BMDMSC therapy is superior for improving LVEF, reducing infarct size and inhibiting LV remodeling.

Biography

Jiunn-Jye Sheu is a Cardiovascular Surgeon in Kaohsiung Chang Gung Memorial Hospital, Taiwan. He has completed his graduation from Taipei Medical University. Currently, he is pursuing his PhD with major research focused on "plasma generating machine and its wound healing effect". He has published more than 75 scientific papers in PubMed. His research interest includes heart remodeling and heart muscle regeneration.

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