Background: Retrograde coronary venous delivery of basic fibroblast growth factor (bFGF) or bone marrow mesenchymal stem cells (MSCs) have been demonstrated to target infarcted myocardium. The present study aimed to determine whether combining bFGF with MSCs via coronary vein infusion would further preserve cardiac function for myocardial repair in a canine model of myocardial infarction.

Methods: Under hypoxic conditions, the migration capacity was assessed in MSCs cultured with bFGF, vascular endothelial growth factor or insulin-like growth factor. The differentiation potential was also evaluated in MSCs with or without bFGF in vitro. For in vivo experiments, dogs underwent ligation of left anterior descending coronary artery to create myocardial infarction (MI). After one week, combined bFGF (200ng/mL) and MSCs (1×10^8 cells) (n=5), MSCs alone (1×10^8 cells, n=5), bFGF alone (200ng/mL, n=5), or placebo (phosphate-buffered saline, n=3) was retrogradely infused into anterior interventricular vein. Serial echocardiography studies were performed at baseline, 1 week after MI (before infusion) and 4 weeks after infusion. Then, hearts were harvested for histology analysis.

Results: The number of migrated cells was higher in MSCs cultured with bFGF compared with other growth factors, and bFGF also promoted MSCs differentiation into myocardiocytes. Four weeks after treatment, left ventricular ejection fraction was significantly better in the bFGF/MSCs and MSCs alone group (both P<0.05 versus control group). However, the radial strain value of the infarct border area was improved only in the combination-treated group, accompanied by greater infarct size reduction (P<0.05). Immunofluorescence showed that bFGF significantly increased retention of the enhanced green fluorescence protein-labeled MSCs in the infarcted area, with enhanced cell differentiation into myocardiocytes and vessels (all P<0.05).

Conclusions: Retrograde coronary vein infusion of bFGF promotes MSCs engraftment in the infarcted myocardium, accompanied by enhanced angiomyogenesis. Combination of bFGF with MSCs restores cardiac function and regional contractility, with greater infarct size reduction.