

Transendocardial autologous bone marrow in chronic myocardial infarction using a helical needle catheter: 1-year follow-up in an open-label, nonrandomized, single-center pilot study (the TABMMI study)

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Background Cell therapy has shown benefit in preclinical and clinical studies, although debate continues on the mechanism of action and the most appropriate methods for performing such therapies. We assessed the hypothesis that helical needle transendocardial (TE) delivery of autologous bone marrow (ABM) mononuclear cells around regions of hypo- or akinesia in patients after chronic myocardial infarction (MI) would be safe and possibly improve ejection fraction (EF).

Methods and results Ten stable post-MI patients with an EF <40% were enrolled. Autologous bone marrow cells were aspirated from the iliac crest and delivered percutaneously with a TE helical needle catheter. A total of 86×10^6 cells were injected into 7.1 ± 3.1 sites around the infarct to target the peri-infarct zones. Two-dimensional echocardiographic left ventricle EF measurements, 24-hour Holter, and exercise tolerance testing were performed at baseline, day of procedure, 1 and 12 weeks, and 6 and 12 months. There were no adverse events associated with the catheter-based cell transplantation procedure. At 6 and 12 months, all patients showed an improvement in left ventricle EF over baseline (35.2 ± 4.6 to 40.8 ± 4.5 , $P = .003$ at 6 months; 35.2 ± 4.6 to 42.3 ± 5.1 , $P = .0001$ at 12 months).

Conclusions Autologous bone marrow cells delivered with the helical needle TE catheter was safe in this small uncontrolled study in patients with chronic MI. Increased EF and other positive data trends support continued development of this therapeutic strategy in larger controlled trials. (Am Heart J 2007;154:79.e1-79.e7.)

In the field of cell therapy, clinical studies using autologous bone marrow (ABM) cells have been performed in a surgical setting for ischemia and chronic infarction,^{1,2} percutaneously with intracoronary (IC) catheters for acute myocardial infarction (MI),³⁻⁷ or percutaneously with transendocardial (TE) delivery catheters for ischemia and ischemic heart failure.⁸⁻¹⁰ To date, the combined data from more than 600 patients treated suggest that this therapeutic strategy is safe

regardless of administration method used. However, there are inconsistent results from the IC studies performed to date due to a variety of factors.⁴⁻⁷ The discrepant results reported in some of these trial results have been possibly related to the lack of statistical power, differences in timing of delivery after MI onset, or suboptimal cell processing.

The purpose of the present study was to assess the safety of a unique TE delivery system for the delivery of ABM to segments of the peri-infarct region in a setting of chronic MI in stable patients having ejection fractions (EFs) <40%. This differs from earlier studies in (1) the TE delivery system used, (2) that the patients selected have chronic MI and are relatively stable compared with most patients with acute MI described in existing clinical data sets, and (3) the targeting of the TE delivery to the distal border regions based on a theoretical consideration of desired postdelivery cell distribution.

Methods

This study was approved by the Argentina National Institute for Coordination of Ablation and Implantation, the Argentina National Administration for Medication and Medical Technol-

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