Background

Direct injection of autologous bone marrow mononuclear cells (BM MNCs) into the myocardium of heart failure (HF) patients may result in improved cardiovascular outcomes, including functional recovery and symptoms relief. An extensive Cochrane meta-analysis of randomized controlled trials assessed application of BM MNCs in HF patients with ischemic heart disease (IHD) found that BM MNC treatment significantly reduced all-cause mortality, nonfatal MI, and arrhythmias at 12 months follow-up, although heterogeneity among the trials limited the robustness of the analysis.4 The Cochrane review also demonstrated that intracoronary delivery of autologous BM MNCs is safe. However, a robust randomized controlled trial is required to confirm the clinical efficacy.

Study Purpose

To determine the safety and efficacy of CardiAMP cell therapy for treating post-infarct heart failure.

Study Design

Prospective, multi-center, randomized, controlled patient- and evaluator-blinded IDE trial comparing treatment with the CardiAMP cell therapy to a diagnostic procedure in 250 patients with NYHA class II or III heart failure and ejection fraction between 20% and 40%.

Primary Endpoint

1. Overall survival at 12 months
2. Time to first MACE at 12-months follow-up
3. Change in quality of life as measured by the MLWHFQ (Minnesota Living with Heart Failure Questionnaire) at 12-months follow-up
4. Time to first MACCE at 12-months follow-up
5. Overall survival at 12 months

Secondary Hierarchical Endpoints

- Procedure technical success.
- Other inclusion and exclusion criteria are previously published.5,10
- Cell Potency Assay (CPA) score of 3 (see section below)
- Ambulatory and capable of performing 6MWD >100 m and <450 m
- On stable evidence-based medical/device tx >30 days
- Typically takes ~25 minutes
- Process is a density-tuned dual buoy separation to isolate the BM MNC fraction
- Independent Cell Analysis Core Laboratory (Center for Cell and Gene Therapy, University of Houston, TX)
- Therapeutic response. The results are expressed as a proprietary Cell Potency Analysis (CPA) score.
- Patients randomized to active treatment then undergo 10 transendocardial injections of 0.5 mL high-dose BM MNC in the peri-infarct myocardial segments using the Helix system.
- BM MNC treatment significantly reduced all-cause mortality, nonfatal MI, and arrhythmias at 12 months follow-up, although heterogeneity among the trials limited the robustness of the analysis.

Study Population

- 21 to 90 years old
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- Left ventricular ejection fraction (LVEF) of 20% - 40%
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Study Flow

- Visit Day 0
- Follow-up Months
- Post-procedure
- Cell Potency Assay
- Cell Collection
- Cell Delivery
- Pre-procedure
- Patient meets study eligibility requirements
- Treatment Arm
- Cell Preparation and CPA
- Cell Transplantation
- Follow-up
- Patient randomized to active or control arm
- Cellectra 

Figure 1. CardiAMP Cell Therapy Trial for Heart Failure

Figure 2. Flowchart: Primary vs Control Arm

Figure 3. Figure 3. (a) Bone marrow aspirate is obtained from the posterior iliac crest and transferred into the cell separation chamber (CardiAMP CS). (b) The cell separation device is centrifuged and the cell-poor plasma layer is removed. (c) The resulting suspended product is drawn into a 10 mL transfer and is immediately delivered into 1 mL syringes for transendocardial injections. (d) The helical catheter has a helical shaped needle with a distal lumen to administer the cell suspension and a proximal lumen to collect additional product. (e) The remaining nucleated product is drawn into a 10 mL syringe and is immediately distributed into 1 mL syringes for transendocardial injections. (f) The helical catheter has a helical shaped needle with a distal lumen to administer the cell suspension and a proximal lumen to collect additional product.

Figure 4. Figure 4. (a) CardiAMP Cell Therapy. Autologous cells are collected for cell potency assay analyzed during screening. (b) Cell Potency Assay (CPA) score. For example, a lower limit of the effective dose threshold for CD34+ cell is one component of the assay; these cells are associated with favorable angiogenic and regenerative properties.

Figure 5. Four-q.png

Figure 6. Figure 6. Study Flow

Figure 7. Figure 7. Author Disclosures & Study Sites

Figure 8. Figure 8. Time points for clinical assessments and procedures.

Further Information

See clinicaltrials.gov (NCT02438306) and www.CardiAMP.com

Caution: Investigational device. Limited by United States law to investigational use