Heart disease is the leading cause of death in both the United States and the world. Current treatments range from medical therapy, such as ACE inhibitors, beta-blockers, inotropes, etc, to surgical therapy such as ventricular assist device implantation and heart transplantation. Both therapeutic interventions have included various types of stem cell injections (iPSCs, fibroblasts, mesenchymal stromal cells), etc., exosome delivery, and isolated growth factors. All of these techniques have had limited utility in clinical trials and practice, and demonstrated only modest improvements in ejection fraction (1). This first-in-man case follows the first patient (henceforth referred to as [GG]) ever treated with a second-generation xenograft cardiac patch for severe heart failure and demonstrates additional cardiac recovery beyond that expected from bypass surgery alone.

Patient Presentation

[GG] is a 29 year old male without any known medical history who experienced chest discomfort while exercising and subsequently collapsed. Upon EMS arrival, ECG showed anterior ST segment elevation. The patient then experienced palpitations and electrical activity, and after three short-lived resuscitation attempts experienced return of spontaneous circulation (GCS) was consistently hypotensive (80-85% following EMS contact, and upon arrival at the community hospital was intubated, anticoagulated, and transferred to Vidant for emergent cardiac evaluation. Angiography demonstrated a severe multivessel coronary artery disease with a completely occluded mid-LAD. Emergent mid-LAD angioplasty was performed, but due to ongoing hypotension and persistent hypoxia the patient required support with veno-arterial extracorporeal membrane oxygenation. Ejection fraction was demonstrated to be 10% by transthoracic echocardiography.

On postoperative day 4, after demonstration of neurological improvement,[GG] underwent a triple coronary artery bypass and had a novel xenograft bioscaffold patch applied to the infarcted left ventricular territory. The patient was extubated the following day. On postoperative day 7, a cardiac MRI was performed showing an ejection fraction of 30%, and he was discharged to a rehabilitation facility; on postoperative day 28, he was discharged to home.

INTERVENTION

The xenograft applied to the infarcted left ventricle.

RESULTS

The successful functional recovery of cardiomyocytes in [GG] following treatment with xenograft bioscaffold suggests this therapy holds great potential for the treatment of severe heart failure. Mr. [GG] presented with a preoperative ejection fraction of 10%, requiring full mechanical support, and progressively improved to an essentially normal ejection fraction over the course of a year. While revascularization therapy is expected to provide some functional benefit, the improvement seen is extremely variable and not expected to be of this magnitude—typically myocardial revascularization therapy reaches improvements of 5-15%, and practically never all the way to the “normal” range of >50%, especially with the degree of damage seen on cardiac MRI. Future prospective studies are strongly indicated to more rigorously evaluate the impact and therapeutic benefit of such xenograft bioscaffolds in patients with severe heart failure.

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REFERENCES


