Video Article

Homologous biomaterial cell patch for effective repair of infarcted myocardium

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Abstract

Despite recent advances in pharmacological and surgical approaches to rescue injured myocardium, ischemic heart disease remains the leading cause of heart failure and death.1 The most common methods of cell delivery for myocardial therapy are intravenous2 or by direct intramyocardial injection into an infarcted area.3 It is difficult, however, to control deposition of grafted cells using these methods.4,5 Recent progress in myocardial cell patch techniques offers a potentially beneficial strategy for tissue engineering aimed at heart regeneration to reverse deleterious tissue effects following myocardial infarction (MI). Natural internal biomaterials, such as peritoneum, omentum, diaphragm, or pericardium represent an emerging substrate that has been demonstrated to promote wound healing and stimulate revascularization of ischemic tissues.6,7 O'Shaughnessy was first to report cardio-omentopexy procedures in which pedicled omental grafts were attached to the surface of the ischemic heart through the diaphragm in humans.8 Recently we developed and reported a method of gene manipulated cell patch using a homologous peritoneum substrate that we applied after myocardial infarction (MI) to repair scarred myocardium.9 Native biomaterials used as substrates are an attractive option when used in combination with stem/progenitor cells and have demonstrated complementary outcome features including improved cardiac contractility (via direct myogenesis or due to paracrine effects from stem cells), enhanced tissue nutrition (via angiogenesis), and enhanced cell survival (via anti-apoptosis), which combine to reduce myocardial remodeling, limit infarction size and improve heart mechanical performance.

Disclosures

No conflicts of interest declared.