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Editorial on Cardiac Regeneration and Repair

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Editorial

Cardiac regeneration is a broad effort that uses cutting-edge science, such as stem cell and cell-free therapy, to repair irreversibly damaged heart tissue. Reparative tools have been developed to use the body's natural ability to regenerate to restore damaged heart tissue and function. The heart attack (acute myocardial infarction). In the United States, heart attacks are the leading cause of death and illness. To address the unpredictability of these events, the Center for Regenerative Medicine has created novel, cell-free therapies that work alongside current standards of care. Now, researchers are planning a clinical trial to deliver regenerative therapy following surgical stent implantation in order to reduce injury and protect the heart from inflammation [1-3].

Coronary artery disease causes chest pain. Mayo Clinic researchers are developing a novel gel containing the most recent generation of gene therapy technology to assist the heart in the formation of new blood vessels. These biological bypass grafts will be offered to patients who have exhausted all other options and are unable to benefit from stenting or coronary bypass surgery (coronary artery bypass grafting). Small vessel disease causes chest pain (coronary microvascular disease). The Center for Regenerative Medicine is developing a cell-based therapy to improve the integrity and health of the smallest blood vessels in the heart. The therapy will benefit patients who have persistent chest pain despite a negative angiogram and optimal medical treatment. Failure of the heart (congestive heart failure). Stem cell therapy is already a treatment option for patients suffering from advanced heart failure as a result of a heart attack. New discoveries are being made to improve the regenerative therapeutic impact of stem cells for many patients in need.

A left ventricular assist device [4,5] the Mayo Clinic is taking part in a multicenter study sponsored by the National Institutes of Health to see if stem cell therapy combined with a mechanical circulatory support device benefits patients more. The leading cause of death worldwide is ischemic heart disease. Myocardial infarction causes irreversible cardiomyocyte loss, which leads to adverse remodelling and heart failure. A goal of cardiac biology and regenerative medicine is to find new sources of cardiomyocytes and promote their formation. Many different types of putative Cardiac Stem Cells (CSCs) have been reported to regenerate the injured myocardium by differentiating into new cardiomyocytes over the last decade. Some of these CSCs have been reported to be therapeutically effective after being translated from bench to bed. Recent basic research studies on stem cell tracing, however, have begun to call into question their fundamental biology and mechanisms of action, raising serious concerns about CSCs' myogenic potential. Cardiovascular disease is the leading cause of morbidity and mortality in the world, killing an estimated 17.9 million people each year.

Ischemic heart disease, the most common type of cardiovascular disease, is caused by plaque buildup within the coronary arteries, which supply oxygen and nutrients to the myocardium. Reduced or blocked blood flow through the coronaries during Myocardial Infarction (MI) results in a dramatic and irreversible loss of cardiomyocytes, with estimates ranging from billions to trillions of cells. The remaining cardiomyocytes are unable to remuscularize and restore lost cells due to the heart's limited regenerative capacity. Compensatory scarring to replace dead tissue impairs cardiac function and eventually leads to heart failure. Cell therapy has been extensively researched as a potential treatment for ischemic heart disease over the last two decades. A wide range of cells, including Bone Marrow Cells (BMCs), mesenchymal stem cells, and endogenous CSCs, have been studied for therapeutic delivery. The initial investigation of BMCs for regenerating injured myocardium led to basic and clinical research to isolate and deliver c-Kit+ BMCs for the treatment of ischemic diseases. Early clinical trials revealed inconsistent but minor improvements in cardiac function, generating excitement and hope for the treatment of ischemic heart disease among patients, clinicians, and scientists. These earlier studies were frequently conducted in small phase I or II cohorts and relied on selective post hoc analyses.

Conflict of Interest

None.

References

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