

Stem cell therapy of Coronary Heart Disease

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Stem cell therapy of Coronary Heart Disease: Aspects and Perspectives

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Coronary heart disease (CHD) today occupies the first place among the main causes of death of the population of the whole world and goes to one of the first places in the structure of morbidity and mortality. Atherosclerosis and associated dyslipidemia (DLP) and coronary heart disease are accompanied by oxidative stress due to excessive formation of free radicals and reactive oxygen species in the cell. Despite the achievements of modern pharmacotherapy, as well as surgical methods of treatment of coronary heart disease, there is a certain group of patients in whom all these methods of treatment are ineffective.

This group includes patients with:

- refractory angina;
- distal type of atherosclerotic lesion of coronary vessels;
- extensive complicated myocardial infarctions with a history of severe heart failure (in 60% of cases after acute myocardial infarction, remodeling processes are largely unavoidable).

Most of these patients have already had various variants of myocardial revascularization (percutaneous balloon angioplasty, stenting, CABG), but often due to reocclusions of the restored segments and the presence of distal atherosclerotic lesions of the coronary arteries, repeated reconstructions of the coronary arteries are not possible.

Thus, the main method of treatment for this group of patients remains conservative therapy, which at that time is ineffective, and, in cases of severe heart failure, the only option is heart transplantation. However, the problem of the lack of donor organs and the lack of effectiveness of replacement mechanical devices remains extremely acute and unresolved to date.

In this analysis of clinical researches we consider examples of clinical studies that have played a significant role in developing the prerequisites for further clinical and experimental study of cell technologies and we also emphasize the sources, types, methods of stem cell delivery in the treatment of ischemic cardiomyopathy and heart failure, the benefits and current limitations of stem cell monitoring. It was established that atherosclerosis of the coronary arteries has a progressive course, therefore, after a shunt operation, a continuing lesion of the coronary vessels is quite expected.

Stem cells are present in muscles, bone marrow and are involved in muscle regeneration. Cells of the side population (SP) express markers of CD45 and stem cell antigen (Sca-1), characteristic of hematopoietic cells. The cells of the SP are located between the muscle fibers and are closely connected with the blood vessels. The cells of the SP population have both myogenic and hematopoietic potential. Unlike other adult SCs, muscle SCs when administered to recipients are not rejected by their immune system, since there are no protein markers on the surface of these SCs. Stem cells of the heart. It has now been established that the heart

contains a pool of immature cardiomyocytes and has a certain regenerative potential. The source of cardiac SC are cells from cardiogenic plates in embryogenesis expressing the transcription factor islet-1, which remain in the heart after birth and can enter the cell cycle in the adult body.

A group of researchers at University Hospitals Leicester (UK) studied the joint use of CABG and cell therapy. The study included 5 patients with acute myocardial infarction no more than one month old, hemodynamically significant changes in three coronary vessels, and the presence of an unstable angina clinic. The mononuclear fraction of the bone marrow was injected into the non-revascularized zones of the left ventricular myocardium. The inability to revascularize was associated with severe calcification or diffuse coronary artery disease. As a result, there was an increase in the average LV FV from 45.8 to 53.2% 2 months after surgery, as well as an improvement in perfusion in the infarction zone. The increase in the ejection fraction was not correlated with the number of transplanted mononuclear cells, CD34+ and AC133+ cells.

C. Steam in 2003, during Aortocoronary bypass surgery an intramiocardial injection of bone marrow cells was performed and researchers demonstrated the safety and feasibility of direct injection of bone marrow cells. In a study of 14 patients with CABG (coronary artery bypass graft), the authors divided them into 3 groups: isolated injection of bone marrow cells, CABG, and a combination of techniques. Bone marrow cells were taken from the sternum immediately after sternotomy and injected directly into the ventricular wall. There was an improvement in contractility in the segments, which carried out the injection of bone marrow cells and CABG, the procedure is safe and has not caused complications.

Conclusion

The use of stem cell therapy is an exciting and dynamic area of research, with huge potential for improving the condition of patients with cardiovascular diseases, which are the main cause of death in developed countries. The results of clinical studies conducted in the last decade are encouraging in terms of the possibility of creating and widely using effective and safe medical technology based on the transplantation of stem cells to cardiological patients, that is, on the implementation of methods and approaches of regenerative medicine. The accumulated results allow us to hope for good prospects for the therapeutic use of SC, and, in particular, autologous and allogeneic MSCS, as the most studied and safe of SC. After ten years of experimental research, cell therapy has entered the phase of clinical trials and has already proved its effectiveness in patients with AMI and chronic ischemia. It is necessary not only to accumulate the results of clinical studies, but first of all, to minimize the trauma of cell delivery methods and study their feasibility. Cell therapy in the treatment of coronary heart disease efficiency, reliability, development of indications for delivery methods.

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