Transplantation of Stem Cells of Different Origin for the Treatment of Lower Limb Ischemia
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Investigations In Vitro

The purpose of our work was to investigate the effect of transplantation of stem cells of various origins, normal, senescent bone marrow cells, isolated and cultured adipose cells and cord blood stem cells on the development of angiogenesis in a model of severe limb ischemia of patients with atherosclerosis.

RESULTS of Clinical Investigations

We examined 38 patients with lower extremity ischemia; patients were diagnosed with ischemia of 10-15 degree according to Fontaine. All patients were diagnosed with the necessity of performing reconstructive surgery on the arterial bed due to evident distal ischemia. 11 patients underwent transplantation of their own bone marrow cells, 10 patients underwent transplantation of cultured adipose tissue cells, and 10 patients underwent cord blood cells transplantation.

The surgery consisted of three parts. At the first stage, the determination of the possibility of endovascular revascularization of the leg was carried out in vitro, on media that promote endovascular revascularization.

At the second stage, the study of cell transplantation was carried out in laboratory animals with ischemia. After transplantation, morphological and histological studies and electronic microscopy were performed.

As the third stage, the results of cell transplantation were studied on patients with severe lower limb ischemia. Laser Doppler flowmetry, multidimensional color, electronic microscopy, morphological studies were performed.

The work was also carried out to determine the quality of life and the distance of patients walking.

RESULTS of Experimental Investigations

The prevalence of atherosclerosis today is extremely high in the world and in Europe. The mortality rate of cardiovascular disease ranges from 65 to 70% per 10 thousand people. The lesion of the arterial bed of the lower limbs is a fairly frequent phenomenon, which, with its aggressiveness, leads to the amputation of one or two limbs and subsequent disability of patients. The spectrum of endovascular and open surgical interventions on the arterial bed of the lower limbs is a necessary element of this cardio-vascular treatment. They also may involve interventions on bypasses, performed from 20 to 80% with the development of critical limb ischemia. As a rule, these are patients with lesions of the arterial bed in arteries, to whom it is not possible to perform revascularization surgery.

Stimulation of the processes of angiogenesis in the ischemic zone is a method that can reduce the complication of ischemia and preserve the limb in our state. There are various methods to stimulate angiogenesis processes. The use of anecortesin protein, transfer of the angiogenes growth function gene into adipose cells, stimulation of protein’s own angiogenic cells in the ischemic zone, and transplantation of angiogenic cells from the outside.

CONCLUSION

Transplantation of cord blood cells and mesenchymal stem cells of adipose tissue to patients with complications of transplanted limbs, allows to significantly improve the postoperative results of patients.

Before transplantation

5 months after the transplantation

Importance of cell transplantation in the process of angiogenesis: the image shows the formation of layers of new capillary vessels. The image is a result of an electronic microscopy study of a patient's limb.