Tissue Engineering Research and Cell Regenerative Therapy for Cardiovascular Diseases (CVD); National Cardiovascular Center (Japan) Trials

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Research and translational pilot study of regernerative medicine for CVD on-going at the National Cardiovascular Center, Japan, will be reported at this meeting.

The first is a novel method to create acellular matrix of the porcine cardiac valve and aorta, which may have more durability with growth potential and less immuno genecity than current bioprosthesis. By using a new method developed in our center, the tissues become completely cell-free and disinfected in vitro incubation test including PERV. The collagen and elastin fibers are maintained and there are no significant changes in biomechanical properties of the breaking strength and elasticity. Our method is the utilization of high pressure (980MPa(10,000atm)) at 4 °C with DNAase and RNAase enzymatic treatment. Tissue engineered valve was implanted in the pig. The inner surface of the graft was completely covered with endothelial cells at 12 weeks after implantation. Smooth muscle cells were also observed into the acellular aortic tissue, but slight calcification of the wall still remains.

The second is a prospective, nonrandomized, open-labeled pilot study of the patients with severe chronic heart failure. Approximately 20ml bone marrow is auspicated and 400-600 ml peripheral blood is collected to prepare serum for culture of mesenchymal stem cells (MSCs) for 3 weeks at cell processing center. The cultured MSCs secret large amount of VEGF and HGF. Patients received $3.9\pm0.9x10^7$ cells into 40 different points of the LV wall either by catheter injection or direct injection at operation. MSC transplantation significantly increased LVEF with no adverse effects. Myocardial and angiogenetic regenerative therapy is quite promising utilizing autologous bone marrow MSCs in humans.