Histological Evaluation of Tissue-Engineered Heart Valves Implanted in the Juvenile Sheep model: Is There a Need of In-Vitro Seeding?


Background and aim of the study
A new-generation heart valve was developed to improve long-term durability. This study aim was evaluate to evaluate need for in-vitro autologous endothelial cell seeding of a decellularized valve scaffold.

Methods
A seeded (group I, n=6) or non-seeded (group II, n=6) decellularized valve was implanted into the right ventricular outflow tract of 12 juvenile sheep. In group I, a jugular vein was harvested to characterize and expand endothelial cells (Ecs). The scaffold was seeded in vitro, using a sedimentation technique. In group II non-seeded decellularized scaffolds were implanted and explantation was performed at three and six months. Valves were evaluated by echocardiography, gross pathology, X-raradiography, histology, and immunohistochemistry.

Results
In group I, the EC seeding density was 1.06 ± 0.01 x10^5 cells/cm^2, with a cell viability of 95.7 ± 1.4 %. No regurgitation was visualized by echocardiography. Gross pathology showed smooth leaflets without retraction; calcification was absent at X-raradiography, and this was confirmed by von Kossa staining. Histologically, group I valves showed a persistence of ECs, whereas a monolayer of host ECs was seen at six months in group II valves. Host fibroblasts were available in both groups, and numbers increased over time. Differences were identified in the recellularization density of in-vitro-seeded and non-seeded valves up to three months, but no such difference seen after six months.

Conclusions
Based on results of this studies in a sheep model, there appears to be no need for in-vitro cell seeding of decellularized scaffolds.

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