Is it feasible to implant transcatheter a tissue engineered pulmonary valve without tissue distortion?

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Abstract

Objective:

Today glutaraldheyd fixed pulmonary valves are implanted in clinical trails, however limited by absence of regeneration, remodelling and growth potential. This feasibility study was performed to evaluate deliver-related tissue distortion of tissue engineered (TE) heart valves during implantation.

Methods:

The use injectable TE heart valves was mounted on a self-expanding nitinol stent (n=7) and delivered into the pulmonary position of seven pigs (26-31 kg), performing a stenotomy or limited lateral thoracotomy. Prior to implantation, the injectable TE heart valve was crimped by using an applicator. The positioning of the implant was guided by fluoroscopy. Hemodynamic measurements were performed by epicardial echocardiography, angiography and invasive pressure measurements. Finally, the animals were sacrificed and the injectable TE heart valves were inspected by gross examination and histology.

Results:

Orthotropic delivery of the implanted TE heart valves (diameter 19mm) were successfully performed in all, expect in one due to valve migrated become of size discrepancy. Angiographically all other valves (n=6) showed normal valve function, supported by epicardial echocardiography in which no increase flow velocity was measured, neither valve regurgitation. Invasive pressure measurements showed a mean pressure gradient of 5mmHg. Histological evaluation demonstrated no integrity changes of extracellular matrix and absence of collagen and elastin distortion.

Conclusion:

Transcatheter implantation of an injectable TE heart valve seems to be possible without tissue distortion due to the delivery system.