A “Left atrial mitral-valve prosthesis” for interventional mitral valve (re)placement

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Objective: Due to anatomical reasons, interventional placement of heart valve prosthesis in mitral position is challenging. We aimed for a totally new approach, inserting a valve-bearing prosthesis strutting on the entire left atrial wall, the mitral ring and the pulmonary veins. A design study was performed and the resulting prosthesis evaluated in the animal.

Material and Methods: Prosthesis design was derived from moulds of porcine left atria. A nitinol-skeleton was sutured onto interlaced yarns of polyvinylfluourid. Into the resulting collapsible hollow body a biological valve was sewn. Animal experiments: In 4 pigs (50 kg), under general anesthesia, a thoracotomy was performed. Under extracorporeal circulation, the left atrium was incised. Prior to implantation, an artificial regurgitation was created by an incision in the posterior mitral leaflet. The compressed prosthesis was inserted into the left atrium and released. After re-suturing the atrium extracorporeal support was tapered. Echocardiographic and radiologic evaluations were carried out. After euthanasia, autopsy was performed.

Results: Echocardiography demonstrated the functionality of the prosthesis parallel to the native valve. Regurgitation was reduced. Angiographically, antegrade flow through the fully expanded prosthesis was visualized. Autopsy revealed proper positioning without major trauma. No significant thrombosis occurred.

Conclusions: Our investigations proved the feasibility and excellent functionality of a stentbased sutureless off-pump creation of an AAC. This approach might be used for other purposes, for instance off-pump installation of assist devices.

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