Images in cardio-thoracic surgery

Percutaneous valve replacement: a novel low-profile polyurethane valved stent

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To circumvent size restrictions of percutaneous heart valves, we designed a novel low-profile valved stent made of polyurethane which fits into a 14-French delivery device (Fig. 1). Transfemoral implantation in pulmonary position was evaluated in two sheep. Competent valves with low gradients were seen at the 1-month follow-up (Fig. 2).

Fig. 1. (a) Oblique view from top of a self-expanding nitinol stent (length 28 mm, diameter 24 mm, Nitinol Devices & Components Inc., Fremont, CA, USA) containing a three leaflet polyurethane valve. Leaflets have a thickness of approximately 100–150 μm. The stent valves are produced in a dip coating technique (by Mecora GmbH, Aachen, Germany). (b) Low-profile polyurethane valved stent was folded to fit into a 14-French catheter. A modified commercially available endovascular stent-graft system for the treatment of abdominal and thoracic aortic aneurysms (Medtronic, Talent™, Santa Rosa, CA, USA) served as delivery device. The intervention was performed as described previously (Attmann, Lutter et al., Ann Thorac Surg 2005;80:969–75).

Fig. 2. Angiography of the pulmonary artery one month after valved stent implantation. Pictures in chronological order from (a) to (d). Catheter-induced mild pulmonary insufficiency. Daebritz et al. (Eur J Cardiothorac Surg 2004;25:946–52) were able to show that a surgically implanted flexible polymeric heart valve prosthesis was superior to current bioprostheses in animal testing. The durability of our new stent-mounted polyurethane valve needs to be corroborated. Repetitive follow-up assessment will be continuously performed for determination of the long-term functioning and durability.

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