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Percutaneous aortic valve replacement: Resection of human aortic valves in formalin-fixed human preparations

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Objectives:

Transluminal in vitro resection of severe calcified human aortic valves has already been successfully carried out by our group. The aim of this study was to analyze laser-assisted resection of human aortic valves in situ in seven formalin-fixed human preparations.

Method:

After a mini-thoracotomy, the aortic valve isolation chamber (AVIC) system was inserted into the descending aorta and pushed forward transluminally into the aortic position to generate a separate operation space between the subvalvular and the proximal ascending aortic area. After deployment and sealing of AVIC, a stable function with a continuous chamber was established (3/7). The endoscopically guided laser fiber was delivered via the right carotid artery. After fixation of a leaflet by a forceps catheter, the native leaflets were resected each by a Thulium:YAG laser with 20 W power rating. Macro- and micropathology of surrounding anatomical structures were analyzed.

Results:

The duration of transluminal AVIC positioning and deployment took 7.2 ± 4.4 min. The resection was completed in all leaflets and took, on average, 6.8 ± 3.3 min/leaflet. The aortic wall was moderately injured in 3/7 cases and the aortic annulus in two cases with one aortic wall perforation. The surrounding tissue, the coronary ostia, the mitral valve and the left ventricular outflow tract remained unaffected.

Conclusions:

This study demonstrates the feasibility of endovascular resection of human aortic valves in situ. This subsequent step will lead towards a complete percutaneous replacement (resection and implantation) of human aortic valves.