

The Off-Pump Implantation of an Apicoaortic Valved Graft is Safe and has No Negative Impact on Coronary Flow and Hemodynamics

*Nikolaos Tsirikos Karapanos, Scott Suddendorf, Zhuo Li, Marianne Huebner, Soon Park, Lyle Joyce, Richard Daly
Mayo Clinic, Rochester, MN, USA*

Winner – ISMICS 2011 Robert Emery Young Investigator Award

OBJECTIVES: To date percutaneous aortic valve implantation is performed in a strictly selected group of patients. We sought to develop a minimally invasive Off-Pump, ascending aorta non-touch technique for the treatment of severe aortic valve stenosis with the use of an Apicoaortic Valved Graft (AAVG). To determine the hemodynamic effect of the Off-Pump AAVG implantation we performed a quantitative coronary flow analysis in a swine model of severe aortic stenosis.

METHODS: In ten swine, blood-flow was measured in the Pulmonary Artery, LAD, Circumflex, RCA, Right Common Carotid Artery, and Right Internal Mammary Artery, along with Left and Right Ventricular Pressures (LVP, RVP), Aortic Pressure and Pulmonary Artery Pressure. A novel AAVG was implanted Off-Pump on the LV apex using a specially designed implantation tool and anastomosed to the descending thoracic aorta. Aortic flow was measured both proximally and distally of the AAVG-to-descending thoracic aorta anastomosis. Within the AAVG, tissue valves were used in 6 and mechanical valves were used in 4 animals. Post AAVG implantation, epicardial echo confirmed occlusion of the LVOT by a valvuloplasty balloon inserted through the Left Common Carotid Artery and advanced into the LV. Simultaneous measurements of all parameters were made at baseline, at post AAVG implantation and after IV Dobutamine administration.

RESULTS: Blood loss was minimal during the procedure. Post AAVG implantation and LVOT occlusion, the aortic flow proximal to the AAVG-to-descending thoracic aorta anastomosis changed from antegrade to retrograde (from $+1500 \pm 435$ to -529 ± 241 ml/min)

CONCLUSIONS: The Off-Pump, ascending aorta non-touch implantation of an AAVG is safe, reproducible and has no negative impact on coronary flow and hemodynamics. This minimally invasive approach is ready for clinical use as an alternative to percutaneous aortic valve implantation. In addition, to the best of our knowledge, this is the first study where eight blood flows were measured simultaneously during an AAVG implantation.

Table-1 Hemodynamic changes

		Baseline	AAVG	p-value*
CO	L/min	2.3 ± 0.4	2.3 ± 0.4	NS
HR	bpm	90 ± 16	94 ± 13	NS
LADF	ml/min	24 ± 17	23 ± 12	NS
CxF	ml/min	19 ± 7	21 ± 10	NS
RCAF	ml/min	31 ± 13	31 ± 15	NS
TCF	ml/min	74 ± 35	75 ± 34	NS
RCCAF	ml/min	188 ± 69	185 ± 67	NS
RIMAF	ml/min	39 ± 10	39 ± 10	NS
P-AoF	ml/min	1508 ± 435	-529 ± 241	<0.001
D-AoF	ml/min	1460 ± 428	1435 ± 443	NS
LVP-S	mmHg	85 ± 16	88 ± 20	NS
AoP-S	mmHg	71 ± 9	71 ± 13	NS
RVP-S	mmHg	41 ± 9	41 ± 9	NS
PAP-S	mmHg	33 ± 6	33 ± 5	NS

Only change in flow after graft installed and native aortic valve occluded was a reverse in aorta flow above graft (from south to north). All other flows remained constant.

