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Arterial Retroperfusion by a Percutaneous Stent-Based Ventricle to Coronary Vein Bypass (vVPASS™)

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Background: Arterialization of coronary veins is a potential treatment modality in no option patients. Chronic arterialization of coronary veins, however, is associated with an increase of coronary venous pressure which might be complicated by hemorrhagic infarction. A stent-based ventricle to vein bypass (VPASS™) is an attractive new approach to chronic venous arterialization trying to avoid chronic pressure overload due to passive diastolic drainage of the vein after systolic retroperfusion. In this study, the efficacy of vVPASS™ was compared to catheter-based pressure-regulated arterial retroinfusion previously shown to maximize preservation of regional myocardial function during acute ischemia.

Methods: In 8 pigs a retroinfusion catheter was placed in the anterior cardiac vein. Regional myocardial function (sonomicrometry) was determined during LAD occlusion with and without support by pressure-regulated retroinfusion. Thereafter, vVPASS™ was established using a percutaneous ultrasound-guided puncture from the anterior cardiac vein to the left ventricle with subsequent implantation of a ePTFE covered stent graft.

Results: After balloon occlusion of the LAD and of the proximal anterior cardiac vein, venous pressure in the distal anterior cardiac vein increased to 70 ± 2 mmHg (systolic) resp. 58 ± 2 mmHg (mean) compared to 57 ± 3 mmHg resp. 50 ± 2 mmHg during pressure-regulated retroinfusion. Significant preservation of subendocardial segment shortening (%baseline) was observed after vVPASS™ ($66 \pm 10\%$) and during selective retroinfusion ($71 \pm 7\%$) compared to control LAD occlusion ($5 \pm 5\%$). **Conclusion:** Percutaneous implantation of a PTFE covered stent (vVPASS™) was feasible and associated with significant preservation of regional myocardial function during acute ischemia in pigs at reasonable levels of mean coronary venous pressure to avoid tissue damage during chronic application.