

## MP3-20

### Creation of the Fontan circulation in sheep: A survival model.

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Introduction: Patients with a single-ventricle survive thanks to the Fontan palliation. Nevertheless, there is a growing number of Fontan patients with progressive heart failure. To validate therapeutic options in these patients we developed a chronic Fontan large animal model.

Methods: A Fontan circulation was surgically created in 26 sheep (63.9 +/- 6.2 kg) without the use of cardiopulmonary bypass. The superior vena cava was anastomosed end-to-side to the pulmonary artery. The inferior vena cava was connected to the pulmonary artery by an ePTFE conduit and the inferior vena cava-right atrium junction was ligated (Fig. 1). In that way, all venous return, except coronary sinus blood flow, was drained passively to the pulmonary circulation. Heart rate, arterial blood pressure, central venous pressure and cardiac output (CO) were recorded at the start of the surgery and after Fontan completion. Animals were followed for 21 weeks. A postoperative cardiac MRI was performed at 2 weeks in a small subgroup of animals (n=3).

Results: Total cavopulmonary connection was successfully performed in all 26 animals. Eleven animals (42%) died in the first 24 hours postoperatively. After creation of the Fontan circulation, central venous pressure increased significantly ( $4.7 \pm 2.9$  vs.  $14.9 \pm 2.5$  mm Hg,  $p < 0.001$ ), mean arterial blood pressure decreased significantly ( $66.4 \pm 14.9$  vs.  $56.4 \pm 13.5$  mm Hg,  $p < 0.001$ ) and cardiac output decreased significantly ( $5.05 \pm 2$  vs.  $1.7 \pm 1$  L/min,  $p < 0.001$ ). Right ventricular output was significantly lower than total cardiac output ( $0.34 \pm 0.24$  vs.  $4.64 \pm 2.06$  L/min,  $p < 0.01$ ) in the subgroup of animals that underwent a cardiac MRI. Four animals completed the 21 weeks follow-up period.

Conclusions: This study demonstrates that it is feasible to create a chronic animal model of the Fontan circulation. This animal model not only could facilitate future studies on the pathophysiology of the failing Fontan circulation but might also play a crucial role in the development and the study of advanced therapeutic approaches, like cavopulmonary assist devices, to treat patients with a failing Fontan circulation.

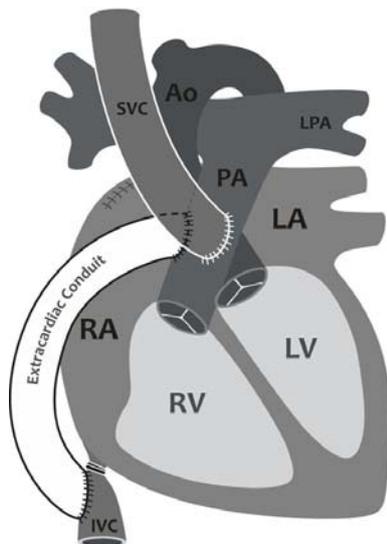


Fig 1: Schematic illustration of the experimental technique. SVC: Superior vena cava, IVC: Inferior vena cava, Ao: Aorta, PA: Main pulmonary artery, LPA: Left pulmonary artery, LA: Left atrium, RA: Right atrium, LV: Left ventricle, RV: Right ventricle.