Acute Animal Experiments of a Magnetically Levitated Axial Flow VAD

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Abstract Body: Background: The **LEV**itated impeller, **V**entricular **A**ssist **D**evice (LEV-VAD) is a magnetically suspended axial flow rotary blood pump developed for long term circulatory support using a novel large-gap hybrid magnetic bearing system. In contrast to currently available rotary VADs, this pump has a single unobstructed blood flow path and no mechanical bearings. **Methods:** Two prototypes were assembled and tested on the bench for reliability, robustness, and hemolysis. Acute *in vivo* studies were performed to determine the fit, physiological performance, rate of hemolysis, and thrombogenicity of the device. Two pumps were implanted in successive days into healthy bovine models via a left thoracotomy. The inflow of the pump cannulated the left ventricle and outflow Dacron vascular graft was anastomosed to the thoracic aorta. The pump speed was adjusted to maintain nearly full support of the animals for the duration of the experiment. **Results:** On the bench, the pump levitation was robust across all operating conditions and causes blood damage comparable to the BP-80. In the first animal experiment, the pump was run at a high speed in order to provide full support and unload the left ventricle during ventricular fibrillation. Electric defibrillation disrupted levitation, but the pump was easily restarted after each instance. The second animal, intended as an acute experiment, was standing and eating six hours post-surgery. Physiological data, pump performance, power consumption, and bearing performance were collected for 10 hours post surgery for both animals. An intrinsic measurement of flow and pressure rise was shown valid over a range of pump operating conditions. The pump caused negligible hemolysis.