

Intracardiac Devices for Continuous Heart Failure Monitoring

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Technical Abstract:

Heart failure (HF) describes an inability of the heart to provide adequate blood flow to the body. This progressive disorder affects over 5.7 million people in the United States. There is a 20 % lifetime risk of developing heart failure for both men and women, double for those with high blood-pressure. Mortality rate is 30-40% within one year after diagnosis, increasing to 60-70% after 5 years. In other words: one in five Americans will be diagnosed with heart failure during the course of their lives, of these, two thirds will die within five years of diagnosis. The estimated total cost of HF in the U.S. for 2009 is \$37.2 billion.

Measurements of pulmonary arterial pressures, typically with either a central venous pressure (CVP) catheter, or a pulmonary artery catheter (PAC), are currently used to diagnose and/or monitor heart failure. Both are prone to user error, and limited to an acute clinical setting. Further: neither measures left heart function or cardiac output directly. We utilize a new device, describe here, to better understand the temporal progression of heart failure in animals under a range of different conditions. By coupling a medically approved stent with a sub-mm³ fully wireless implantable cardiac monitoring integrated circuit (IC) of our own design, we have created an active cardiac sensing platform which can measure pressure, flow, ECG, and oxygenation from the left and right heart. Placement can be in the pulmonary artery and vein, using catheter deployment and trans-septal surgical procedures. Paired devices allow for true left-right differential pressure and flow measurements.