Artificial Cardiac Pacemaker
ThankGod Ugochukwu, Biomedical Engineering, University of Rhode Island
BME 281 First Presentation, September 20, 2015 <tugochukwu@my.uri.edu>

Abstract—As you age your whole body starts to slow down as well as your heart. Sometimes your heartbeat will slow down too much or it's electrical conduction system would get blocked and at that point, a pacemaker is very much needed.

I. INTRODUCTION

It's a sad when hearing of anyone that has passed away. Cardiac deaths account for 300,000 to 400,000 deaths annually in the U.S, and a lot of them had an arrhythmia called ventricular fibrillation. Arrhythmia is when your heat is beating irregularly, and if bad enough needs to be cured using a pacemaker. The primary purpose of a pacemaker is to maintain an adequate heart rate, either because the heart's natural pacemaker isn't fast enough, or because there is a block in the heart's electrical conduction system. In 1889, the idea of the pacemaker was created, and in 1926 a small portable apparatus was created and two years later was used to revive a stillborn infant. In 1958 the first implantable pacemaker was created and a lot is being done now to continue the advancement of these devices.[1]

II. METHODS

Pacemakers are small little devices that contain a powerful battery that lasts from five to ten years. There are three basic kinds of pacemakers. Single-chambered, which only has one pacing lead placed into a chamber of the heart. Dual-chambered, which has the lead placed in two chambers of the heart, one for the atrium and the other for the ventricle. This matches the natural pacing of the heart better and can coordinate function between the atria and the ventricles.

Rate-Responsive, which have sensors that automatically adjust to the changes in a person's physically activity. There are lastly other devices such as implantable cardioverter defibrillators that can also function as pacemakers in certain situations.[2]

III. RESULTS

An experiment was done regarding the effects of HCN4 mutations on the hyperpolarization-activated “funny” current. They wanted to see the effects of different mutations of HCN on the the funny current in both resting and exercised situations. The figure below shows the difference in beats per minute of the different HCN4 mutations in both resting (left) and exercised (right) situations. [3]

IV. DISCUSSION

With the lifespan of humans increasing, the development of pacemakers will be extremely important since heart problems are more relevant to the elderly. The improvement of pacemakers will be based off of increasing their battery life while fully internal. The next generation of pacemakers are ones that are powered by the beating of the heart that it's regulating. If the case the pacemaker will never die battery-wise, and will always be available to regulate ones heart beat eliminating any kind of sudden cardiac death. Another benefit is the fact that only 40 percent of the pacemaker consists of the pulse generator and related electronics and 60 percent is devoted to the battery, so with all that extra space they can greatly increase the usefulness of the pacemaker. They are also lead-less and with a lead-less pacemaker, surgeons wouldn't have to open up the chest cavity. Lastly they remove a potential point of failure because with the lead, the heart's movement is constantly tugging on it but without the lead there wouldn't be such a problem.[4]

REFERENCES