Artificial Hearts: Going Beyond Human Evolution

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***Abstract*—Artificial hearts are not only the future of hearts, but the future of many other organs as well. The HeartMate II is an artificial heart that goes beyond natural process and sets its own method of pumping blood, solving mechanical and structural dilemmas, as well as showing the world that the body can survive without a pulse.**

I. Introduction

The heart, being such a perfect piece of evolutionary machinery, has some significant flaws that occur every once in a while. Particularly, disease or other complications that hinder the hearts actual function. However, due to the nature in which technology is advancing, it isn't as crazy as it was before to talk about artificial hearts. Artificial hearts in the last 50 years have been clunky machines that mimic the pace of the natural heart, and require pumps, batteries, and other extraneous material. Today, due to a complete accident, Dr. Bud Frazier and Dr. William Cohn developed a continuous-flow artificial heart, which works like a turbine.

II. The Story

Dr. Frazier and Dr. Cohn were experimenting with LVAD's (Left Ventricular Assist Device), using them to completely replace calf's hearts in order to see if such could be done to a human. Initial testing went spectacular, and the calves were living and doing well. Using an Archimedes' screw design, the turbine pushed blood continuously through the chamber, with no pulse needed. This design allowed for low maintenance, because the screw itself would become lubricated by the blood. At the time, it was only used for assist purposes only. However, in November 2003, the HeartMate II was installed into a young man from Central Africa, to assist his failing heart. The man spoke little English, and instead of coming back for a checkup, he disappeared for 8 months. He came back, and was lacking a heartbeat. During the time he was gone, his heart had failed, and the HeartMate II had completely taken control of pumping the blood, through the useless heart, and through the body. The cool part: the man said he felt fine that entire time.

III. What it means

With this surprising turn of events for the Central African man, the HeartMate II was taken into light by scientists worldwide. The developers received FDA approval in 2008, allowing wider research and use scale, and the device was installed in 11,000 people worldwide. With the wide scale use, doctors started seeing the theoretical benefits with continuously flowing hearts. Not only can it assist extremely well, and completely replace the heart in some cases, but it can help reverse heart damage by relieving the stress on the heart itself. The heart seems to actually focus more on repair rather than keeping up with beating when there is less of a load to maintain.

IV. Today, and the future

Today, the HeartMate II is being installed in people to replace their hearts rather than just to assist. One of the first official cases was that of Craig Lewis, with a case of amyloidosis, had his heart completely replaced. He went 5 weeks with no heart, but eventually died due to complications of the amyloidosis and his liver. The artificial heart gave him 5 weeks to say his goodbyes, which was 5 weeks longer than anyone expected him to live. The heart was then implemented into a calf called Meeko, to prove it can replace the heart. Twenty-eight people attended the surgery, and the doctors worked diligently to replace the calf's heart, which was once beating with a pressure of 120 over 80, to a solid 78. The calf has been fine ever since, proving the heart works, fantastic, if not better, than the original natural heart.

The future of this device looks extremely strong as well. As of writing, the FDA is still in the process of FDA approvals and trials, before 100% human capacity. The possibilities of the artificial heart expand well beyond just the heart as well. The engineering thinking behind this heart was not only to replicate how the natural heart works, but to *improve* on it. Taking the pump out of the equation allows the heart to flow faster and slower depending on how much patients are exercising, solving many mechanical challenges. Thinking outside the box beyond the heart can possibly solve so many more cases too. Instead of trying to mimic the function of natural processes, we can improve on them and try to make them better, using different ideas and methods; just like this continuous-flow heart.

References

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