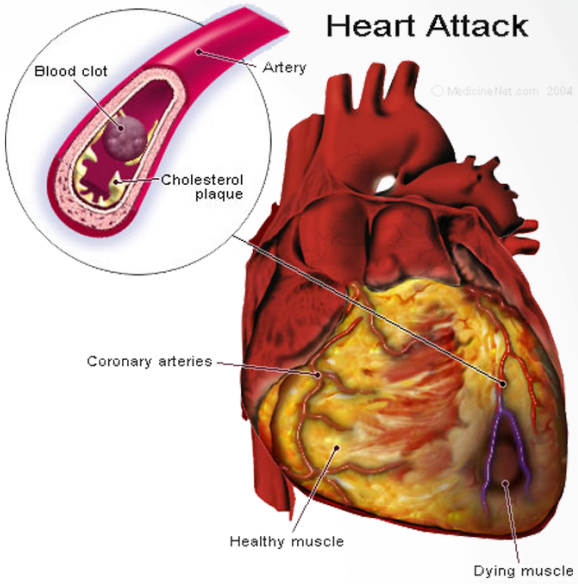
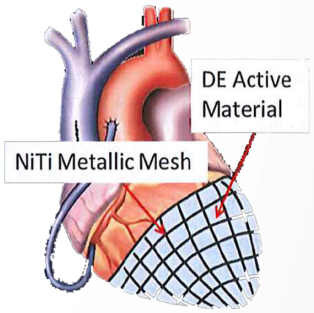
HEART ASSISTIVE MESH

SYSTEM AND METHOD FOR IMPLANTABLE ELECROACTIVE POLYMER HEART ASSISTIVE MESH

Heart failure can be characterized by a decrease in cardiac function, which in turn leads to an inability for enough blood to pump to meet the body's demands. Heart failure is diagnosed on almost 550,000 people per year, and one of the leading diseases in this realm is cardiovacular disease (CVD). Approximately 17.3 million people die annually from CVD. There is an estimation that this number will rise to 23.3 million by the year 2030.



Common techniques to repair heart failure include heart transplant, ventricular assist devices (VAD), and total artificial heart devices (TAH). Although sometimes successful, there are many issues that arise with these medical interventions. Some are not eligible for a heart transplant, and those who are must wait a significant amount of time for a suitable donor to become available. Those who are ineligible qualify for VADs that can be used as a bridge to transplant or long-term destination therapy. The trouble with these is that VADs can cause pump thrombosis and strokes, and they lack the fatigue resistance necessary,



Oftentimes, estimated to be 72.9% of the time, VADs suffer fatal device failures which leads to a high mortality rate in the patients that select this method of medical treatment. There are also occasions where the VAD that is installed within the left ventricle causes the right ventricle to fail. These VADs are unnatural to the body and do not accurately replicate what they are meant to do.

Application & Advantages

In order to solve the issues that are brought about with the use of traditional VADs, there is a need for a device that mimics the natural functions of the heart muscle contractions. This can be accomplished by developing a supportive mesh that is created with electroactive polymers, which use voltage differrentials that allow contractions to occur just as a natural heart would. The mesh conforms to the natural shape of the heart to add support and provide necessary contractions in the ventricle.

Nickel and Titanium are the two elements that make up the mesh. Electroactive polymers, which are created by these elements, are soft and active materials that assist with the beating of the heart. Instead of opting for invasive surgeries such as replacing the entirety of the heart or utilizing the technology of a VAD, this new material can reduce the risk of heart failue and help with the heart's recovery.

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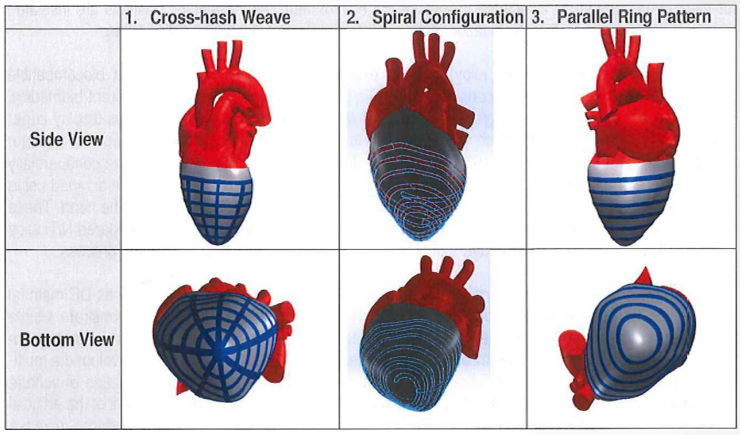
Through extensive resesarch and testing, Dr. Cluff and his team have invented a new mesh that will save lives and prevent difficulties that would be present with other healing options. There is improved cardiac function performance, as many factors have been taken into consideration in the creation process. The team focused on improving ejection fraction and LV pressure, stress-to-strain ratio, pressure conditions, deformation, energy conversion efficiency, and fatigue properties.

In order to achieve the needed function of the heart contracting, the muscles are “wringed” in a spiral direction. This causes the improved pumping of blood throughout the system. The mesh will conform to the heart, and by doing this, will allow for the contraction and relaxation mechanisms of the heart to be replaced. Its installation can allow for the heart to repair itself, while also improving its function and assisting in the overall health of a patient.

As it has been mentioned, cardiovascular disease affects many people. Although the mesh does not cure the disease, it has the capability to be installed into a mature, healthy heart and reduce the myocardial workload by 10-20% each heartbeat. This would significantly enchance the life of a typical human heart. Not only can the mesh help to repair a heart that has been taken over by cardiovascular disease, it can also assist in the ultimate prevention of heart issues. Healthy humans would be able to go past typical limitations and would have the increased endurance to make fitness activities easier on the heart.



Different patterns and configurations of the mesh

Inventor

Dr. Kim Cluff is an Assistant Professor of Biomedical Engineering at Wichita State. University. Dr. Cluff received his PhD from the University of Nebraska. He has received many awards during his time at WSU, including the John A. See Research Innovation Award and the Excellence in Teaching Award. Dr. Cluff’s research areas include biomedical sensors and imaging, hyperspectral imaging, fluorescnce microscopy, computational science, and instrumentation design.

THIS TECHNOLOGY IS PATENT PENDING

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