Scientists scan the human heart to create digital anatomical library

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On April 18th *JoVE* (*Journal of Visualized Experiments*) will publish a new video article by Dr. Paul A Iaizzo demonstrating the anatomical reconstruction of an active human heart. The research uses contrast-computed tomography (CT) to allow in-depth 3-D computer modeling of hearts that can be used for prolonged archiving.

Computational technology, when combined with advanced imaging techniques like CT, gives researchers extensive insight to the structure and function of human organs. While often these techniques may be applied to modeling structural elements like a vertebrate's skeletal system, applying these imaging capabilities to cardiac tissue can create maps of an individual heart's venous system and musculature. In *JoVE*'s new video article, surgeons and biomedical engineers from the University of Minnesota use these new technologies to create a digital library of human heart specimens.

Dr. Iaizzo's laboratory is able to collect human heart specimens from organ donors that were not deemed viable for transplant because the donor had been expired for too long, had a congenital heart defect, or the donor organ did not match a patient's immediate need. In these cases, Dr. Iaizzo and his colleagues around the world gain access to these organs for medical research and indexing. "We can look at a lot of the variations in heart anatomy [and] because everybody's heart is unique we can really understand variations and how the heart changes with disease."

By using contrast dyes and other reagents, Dr. Iaizzo can preserve and

prepare the donated hearts to be in a diastolic state, the part of a heartbeat where the heart is filled with blood from the ventricles before expelling it into the aortas. This brings a deeper insight into physiological attributes of the heart, including fluid capacity and pressure on the heart chambers. Once the preserved hearts are scanned, computer models are generated, which allow approximations and correlations to be established between various heart shapes and disorders. Dr. Iaizzo expects this to assist in the design of cardiac devices.

"You don't have an appreciation for these specimens, and that you can still add contrast agents to them, without the video component," Dr. Iaizzo says of his decision to publish his methods in a video article, "The *JoVE* video shows how you can critically develop these [3-D models]. If someone is developing devices that can go into a cardiac venous or arterial system, then you can really look at these before and after treatments and see how the therapy actually worked."

More information: Iaizzo et. al.; www.jove.com/video/50258/anato … ystem-using-contrast

Provided by The Journal of Visualized Experiments