Biomarker predicts success of Afib treatment

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Johns Hopkins researchers report successful use of heart imaging to predict the benefit or futility of catheter ablation, an increasingly popular way to treat atrial fibrillation, a common heart rhythm disorder.

The researchers caution that a more randomized and controlled clinical trial is needed before doctors can reliably use their cardiac imaging analysis routinely with patients, but if confirmed, they say the method should reduce ablation procedures unlikely to work, along with the procedures' substantial costs and complication risks.

The investigators described their findings Jan. 17 in the *Journal of the American College of Cardiology: Cardiovascular Imaging.*

Atrial fibrillation, diagnosed in 3.4 million Americans and the most common heart rhythm condition in the United States, is marked by irregular and sometimes extremely rapid heart rates that cause fatigue and shortness of breath, and significantly increase the risk of heart failure and stroke. Treatments include drugs to regulate the electrical pulses in the upper chambers of the heart and ¾ increasingly ¾ catheter ablation. The procedure involves general anesthesia and imaging guided use of a wire catheter threaded through a vein to the heart to make scores of tiny burns of tissue in which the irregular heartbeats arise.

However, an estimated 20 to 30 percent of the ablation procedures performed each year fail to prevent irregular heart rhythms, and cardiologists have long sought various biological or anatomical factors to help them determine in advance which patients are the best candidates

for ablation.

"In our study, we found that the best indicator of success is how in sync the left atrium chamber of the heart is when it relaxes," says Luisa Ciuffo, M.D., a postdoctoral fellow in the Division of Cardiology at the Johns Hopkins University School of Medicine. "Diseased, damaged hearts with a lot of scar tissue don't contract and relax at the same time throughout the atrium because it is more difficult to rhythmically contract the thicker, tougher damaged tissue."

For the study, designed to identify the best predictors, the researchers used data from 208 atrial fibrillation or "Afib" patients admitted to The Johns Hopkins Hospital to undergo ablation between June 2010 and December 2015.

Some 29 percent of the patients were women and the average age of all patients was 59. Prior to the ablation, each subject underwent computed tomography scans or MRIs of their hearts and were followed for an average of 20 months to assess recurrence of Afib, including a faster than normal heartbeat or an irregular heartbeat lasting longer than 30 seconds. Atrial fibrillation recurred in 101 patients.

The researchers then analyzed various characteristics of the imaging scans from 208 people in a subgroup: 107 of the people with successful ablations compared to 101 of those with failed ablations. The researchers investigated factors such as smallest and largest sizes of the left atria, the percentage of blood pushed out of the left atrium when the heart contracted and the amount of strain on the left atrium during heart contraction.

The analysis to determine the level of dys-synchrony in the left atrium took about nine minutes per case. Using the cardiac images, the atrium was divided up into 12 segments, and the researchers calculated the

relaxation time in each of the segments and then compared them to each other. Those hearts that had the most differences between the segments of the atrium ¾ a higher deviation ¾ were considered the most dys-synchronous.

Overall, the Johns Hopkins researchers found that patients with recurrent atrial fibrillation had on average more preoperative dys-synchrony throughout the left atrium than those who had successful ablations (3.9 percent versus 2.2 percent), with the higher value indicating more diseased atrium.

In a second part of the research, the investigators took the scans from a group of 103 patients, both with successful and unsuccessful ablations, analyzed the percentage of atrial dys-synchrony in the left atrium and assigned them to one of two groups: one less than or another greater than 2.86 percent.

They expected those people with values lower than 2.86 percent to be better candidates for ablation because atrial fibrillation would be less likely to recur than in those people with more than the 2.86 percent cutoff. They then compared these groupings to their actual outcomes after ablation. They found that their model had a 76 percent sensitivity ¾ the ability to correctly identify those who were unlikely to have successful ablations ¾ and 81 percent specificity ¾ the ability to correctly identify those who would most likely have successful ablations.

"We believe we are developing a tool that can help with personalized decision-making to help refine patient selection and thus reduce the failure rate by saving candidates with low potential benefit from futile procedures and complications," says senior author Hiroshi Ashikaga, M.D., Ph.D., assistant professor of medicine at the Johns Hopkins University School of Medicine.

An ablation procedure isn't cheap, says Ciuffo, sometimes costing as much as a new car. The cost of cardiac imaging typically performed before the ablation procedure is a fraction of the cost of the procedure.

Although the risk of complication is small, about 6 percent with ablation, there is still the chance of puncturing the heart or forming a fistula.

More information: Luisa Ciuffo et al. Intra-Atrial Dyssynchrony During Sinus Rhythm Predicts Recurrence After the First Catheter Ablation for Atrial Fibrillation, *JACC: Cardiovascular Imaging* (2018). DOI: 10.1016/j.jcmg.2017.11.028

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