Irregular heartbeat linked to genetic mutation, study shows

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Every day for 10 years, a seemingly heart-healthy 53-year-old woman experienced rapid and irregular heartbeats. She had no personal or family history of hypertension or hyperthyroidism. She did not suffer from myocardial or coronary artery disease, or any abnormalities of the heart as best doctors and medical science could determine. Yet, she complained of heart palpitations and dizziness nearly to the point of fainting.

For the patient in this case study, her symptoms first appeared 10 years ago and they persisted through the years. The symptoms peaked in the morning and occurred more frequently as time went on. Doctors prescribed medication, but it proved to be ineffective.

As a next step, Mayo Clinic physician researchers explored and confirmed the presence of a genetic mutation that clearly established an inherited predisposition to atrial fibrillation.

Their study findings appear in the February issue of *Nature Clinical Practice Cardiovascular Medicine* (http://www.nature.com/clinicalpractice/cardio).

"Why certain patients develop atrial fibrillation while others do not, despite comparable environmental stress exposure, might ultimately depend on their genetic makeup," the authors write.

Atrial fibrillation is recognized more often in the elderly who have

underlying structural heart disease. But in this study, Mayo Clinic researchers address the gene-based form of atrial fibrillation that affects younger people who do not otherwise harbor risk factors for the disease. The case was compared to 2,000 individuals who did not carry the mutation or suffer from atrial fibrillation.

The Mayo Clinic study is the first to identify an atrial fibrillation-associated genetic mutation of the ATP-sensitive potassium (KATP) channel. Researchers uncovered its role as a safeguard against atrial arrhythmia under stress conditions. The fail-safe mechanism present in most people to
provide electrical stability to the heart under stress was defective in this patient. The sequencing of
KATP channel genes, using genomic DNA extracted from the patient's peripheral white blood cells, revealed a genetic mutation.

The discovery of the genetic mutation's role in contributing to atrial fibrillation may ultimately improve physicians' ability to identify patients who have a hereditary predisposition to atrial fibrillation, which is often complicated by increased risk for stroke and heart failure.

"Our findings support the emerging understanding of atrial fibrillation in younger patients as an inherited disease of ion channels, the building blocks of electrical pathways," says Timothy Olson, M.D., a pediatric cardiologist and lead author of the study.

Because medications were ineffective in this case, the Mayo Clinic team treated the woman's atrial fibrillation by targeting high-energy radio waves to an area of the atrium -- an upper heart chamber -- most vulnerable to stress-induced electrical instability. This approach highlights the capacity to successfully treat patients who have genetic forms of atrial fibrillation.

"This case is a fine example of individualized medicine in practice, highlighting the benefit of translating molecular technology into an understanding of disease processes in the clinical setting," says Andre Terzic, M.D., Ph.D., a cardiologist and senior author of the study.

Source: Mayo Clinic