# The shape of your heart matters

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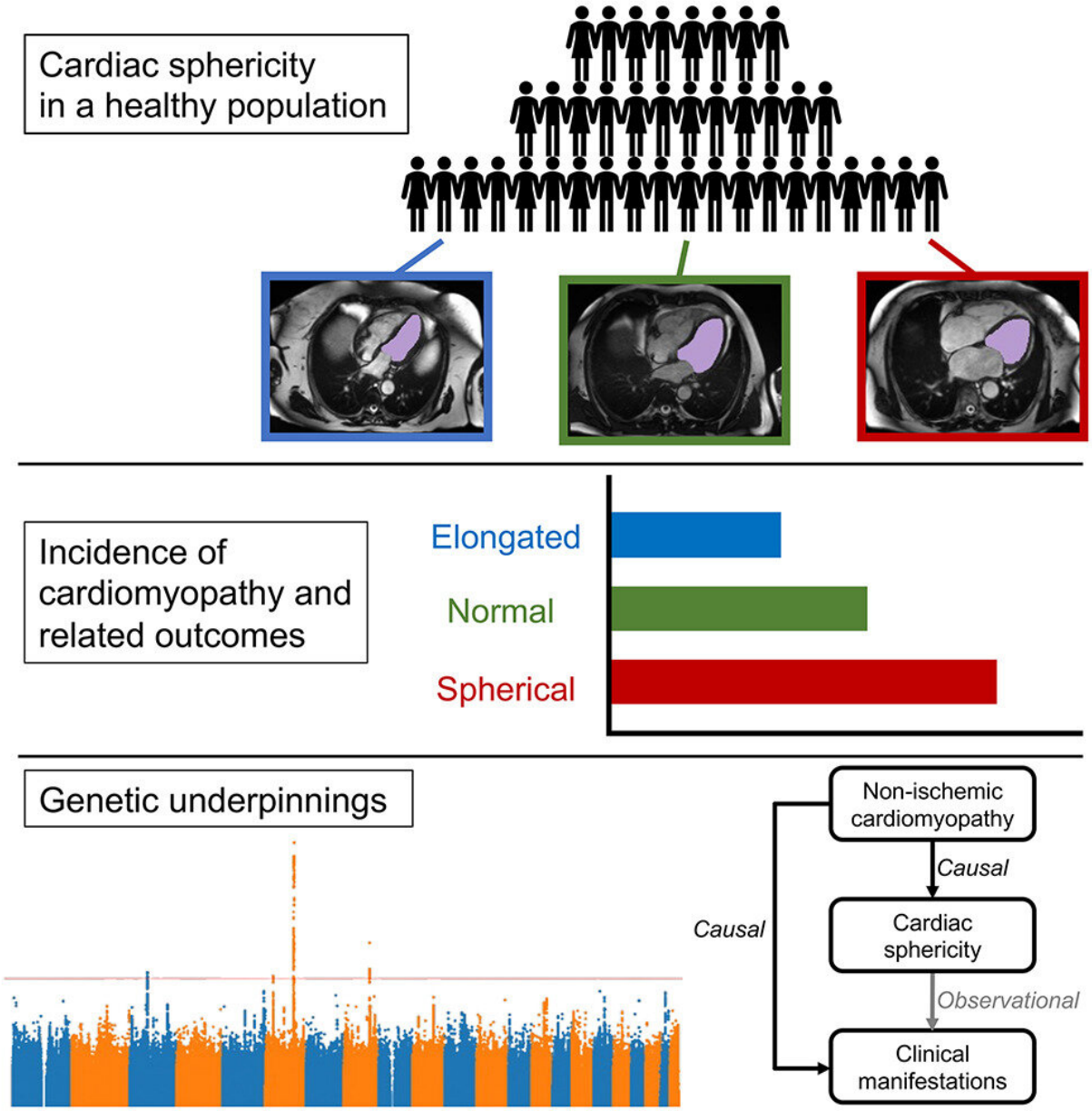


Deep learning-enabled analysis of medical images identifies cardiac sphericity as

an early marker of cardiomyopathy and related outcomes. Credit: Med/Vukadinovic et al.

Curious to know if you're at risk for two common heart conditions? Your doctor may want to check the shape of your heart.

Investigators from the Smidt Heart Institute at Cedars-Sinai have discovered that patients who have round hearts shaped like baseballs are more likely to develop future heart failure and atrial fibrillation than patients who have longer hearts shaped like the traditional Valentine heart.

Their findings, published in *Med*, used deep learning and advanced imaging analysis to study the genetics of heart structure. Their results were telling.

"We found that individuals with spherical hearts were 31% more likely to develop atrial fibrillation and 24% more likely to develop cardiomyopathy, a type of heart muscle disease," said David Ouyang, MD, a cardiologist in the Smidt Heart Institute and a researcher in the Division of Artificial Intelligence in Medicine.

The risk was identified after investigators analyzed cardiac MRI images from 38,897 healthy individuals from the UK Biobank. Using this same database, researchers then used computational models to identify genetic markers of the heart that are associated with these cardiac conditions.

"By looking at the genetics of sphericity, we found four genes associated with cardiomyopathy: PLN, ANGPT1, PDZRN3, and HLA DR/DQ," said Ouyang. "The first three of these genes were also associated with a greater risk of developing atrial fibrillation."

Atrial fibrillation, the most common type of abnormal heart rhythm disorder, greatly increases a person's risk of having a stroke. The condition is rising in prevalence and projected to affect 12.1 million people in the U.S. by 2030.

Cardiomyopathy is a type of heart muscle disease that makes it harder for the heart to pump blood to the rest of the body and can eventually lead to heart failure. The main types of cardiomyopathies—dilated, hypertrophic, arrhythmogenic and restrictive—affect as many as 1 of every 500 adults.

Cedars-Sinai cardiologists say the shape of one's heart changes over years, typically becoming rounder over time and especially after a major cardiac event like a heart attack.

"A change in the heart's shape may be a first sign of disease," said Christine M. Albert, MD, MPH, chair of the Department of Cardiology in the Smidt Heart Institute and a study author. "Understanding how a heart changes when faced with illness—coupled with now having more reliable and intuitive imaging to support this knowledge—is a critical step in prevention for two life-altering diseases."

Ouyang says the findings provide more clarity on the potential use of cardiac imaging to diagnose more effectively—and prevent—many conditions. He also emphasized the need for additional studies.

"Large biobanks with cardiac imaging data now offer an opportunity to analyze and define variation in cardiac structure and function that was not possible using traditional approaches," said Ouyang. "Deep learning and computer vision also allow for faster as well as more comprehensive cardiac measures that may help to identify genetic variations affecting a heart—up to years or even decades before any obvious heart disease develops."

**More information:** Shoa L. Clarke, Deep learning-enabled analysis of medical images identifies cardiac sphericity as an early marker of cardiomyopathy and related outcomes, *Med* (2023). DOI: 10.1016/j.medj.2023.02.009.
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