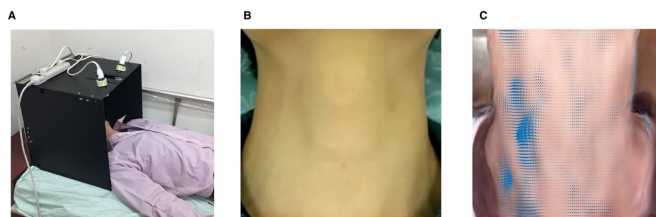


Smartphone video motion analysis detects narrowed neck arteries that may lead to stroke

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Video recording and processing. A, Video recording setup. B, Original video recording. C, Video processing and highlighting the movements of every pixel in each frame. Credit: *Journal of the American Heart Association* (2022). DOI: 10.1161/JAHA.122.025702

Motion analysis of video recorded on a smartphone accurately detected narrowed arteries in the neck, which are a risk factor for stroke, according to new research published today in the *Journal of the American Heart Association*, an open access, peer-reviewed journal of the American Heart Association.

Fatty deposits (plaque) can accumulate in arteries causing them to narrow (stenosis). Narrowed arteries in the [carotid artery](#) (in the neck) can cause an [ischemic stroke](#), which occurs when a vessel that supplies blood to the brain is obstructed by a clot. Nearly 87% of all strokes are ischemic strokes.

"Between 2% and 5% of strokes each year occur in people with no symptoms, so better and earlier detection of stroke risk is needed," said lead study author Hsien-Li Kao, M.D., an interventional cardiologist at National Taiwan University Hospital in Taipei, Taiwan.

"This was an exciting 'eureka' moment for us," Kao said. "Existing diagnostic methods—ultrasound, CT

and MRI—require screening with specialized medical imaging equipment and personnel. Analysis of video recorded on a smartphone is non-invasive and easy to perform, so it may provide an opportunity to increase screening. Though more research and development are needed, the recordings and motion analysis may be able to be implemented remotely, or a downloadable app may even be feasible."

Arteries in the neck are just beneath the skin's surface and changes in the velocity and pattern of blood flow through them are reflected in the motion of the overlying skin, Kao explained. However, these differences are too subtle to be detected by the naked eye.

This study, conducted between 2016 and 2019, used motion magnification and pixel analysis to detect the minute changes in pulse characteristics on the skin's surface captured in a smartphone video recording.

A group of 202 Taiwanese adults (average age of 68 years; roughly 79% men) who received care at a single Taiwanese hospital participated in the study. Among the participants, 54% had significant [carotid artery stenosis](#), meaning they had at least 50% blockage that was previously diagnosed by ultrasound, while 46% did not have significant stenosis. Recordings were captured with participants laying on their back, with their head tilted back in a custom-made box that minimized outside movement. An Apple iPhone 6, 64GB, was mounted to the box to capture a 30-second video recording of the person's neck. The older generation phone was used as researchers believed it would be more common to the average user, Kao explained.

Researchers found that the video motion analysis

algorithm had an 87% accuracy rate of detecting stenosis in the group known to have carotid artery stenosis. All study participants also had standard Doppler ultrasound testing to confirm narrowing in their [arteries](#) and to gauge and validate the estimates from the video [motion analysis](#).

"More research is needed to determine whether video recorded on smartphones is a promising approach to help expedite and increase stroke screening," Kao said. "Carotid artery stenosis is silent until a stroke happens. With this method, clinicians may be able to record a video of the patient's neck with a smartphone, upload the videos for analysis and receive a report within five minutes. The early detection of carotid artery stenosis may improve patient outcomes."

There were several limitations to the study including the small number of study participants, all of whom were considered at high risk for a cardiovascular event. In addition, neck length and neck angle were not analyzed, which may affect the results of the video analysis. Skin color is not likely to hinder applications to a broader population since a standard lighting method was used for this assessment, according to Kao.

More information: Cheng?Hsuan Tsai et al, Detection of Carotid Artery Stenosis Based on Video Motion Analysis for Fast Screening, *Journal of the American Heart Association* (2022). [DOI: 10.1161/JAHA.122.025702](#)

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