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Brain Activity and the Broken Heart Syndrome

A new study uncovers potential mechanisms that may contribute to "broken heart syndrome," or Takotsubo syndrome (TTS), a temporary heart condition that is brought on by stressful situations and emotions. The research, which was led by investigators at Massachusetts General Hospital (MGH), indicates that a heart-brain connection likely plays a major role.

The team analysed brain imaging scans from 104 patients (41 who subsequently developed TTS and 63 who did not) to determine whether increased stress-associated metabolic activity in the brain leads to an elevated risk of developing TTS. "Areas of the brain that have higher metabolic activity tend to be in greater use. Hence, higher activity in the stress-associated centers of the brain suggests that the individual has a more active response to stress," explains senior author Ahmed Tawakol, MD, director of Nuclear Cardiology and co-director of the Cardiovascular Imaging Research Center at MGH.

The imaging tests, which were being conducted in patients for other medical reasons, revealed that heightened activity in the brain's amygdala predicted the development of subsequent TTS, as well as the timing of the syndrome. For example, individuals who had the highest amygdalar activity developed TTS within a year after imaging, while those with intermediate values developed TTS several years later.

"We show that TTS happens not only because one encounters a rare, dreadfully disturbing event--such as the death of a spouse or child, as the classical examples have it. Rather, individuals with high stress-related brain activity appear to be primed to develop TTS--and can develop the syndrome upon exposure to more common stressors, even a routine colonoscopy or a bone fracture," says Tawakol.

The scientists also identified a relationship between stress-related brain activity and bone marrow activity in individuals. Because bone marrow produces different types of blood cells involved with carrying oxygen, mounting immune responses, and clotting blood, stress-related brain activity may influence the activity of cells that affect cardiovascular health.

In applying the results to the clinic, Tawakol hopes that interventions that lower stress-related brain activity will make it more difficult to develop TTS. "Studies should test whether such approaches to decrease stress-associated brain activity decrease the chance that TTS will recur among patients with prior episodes of TTS," he says. He also underscores the need for more studies into the impact of stress reduction--or drug interventions targeting stress-related brain activity--on heart health.

Source: Massachusetts General Hospital

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