Wireless pain management for drug-resistant conditions offers promising alternative to surgery, study finds

March 31 2022

Sunil A. Sheth, MD, associate professor of neurology with McGovern Medical

School at UTHealth Houston. Credit: UTHealth Houston

Using a 1-millimeter-sized wireless implant to stimulate peripheral nerves from within blood vessels has the potential to treat neuropathic pain resistant to medical therapy, according to a team of multi-institutional researchers including Sunil A. Sheth, MD, of UTHealth Houston.

Sheth, an associate professor of neurology and director of the vascular neurology program with McGovern Medical School at UTHealth Houston, was co-principal investigator of a study published today in *Nature Biomedical Engineering*. Other co-principal investigators included The University of Texas Medical Branch neurosurgeon Peter Tze Man Kan, MD, MPH; and Rice University neuroengineer Jacob Robinson, Ph.D.

After receiving a grant from the National Institutes of Health in 2019, the three teamed up to create implantable, wirelessly powered nerve stimulators that can be used in place of opioids for pain management. The implants—roughly the size of a grain of rice—are small enough to be placed on stents and delivered within blood vessels adjacent to specific areas of the central and peripheral nervous system.

"We're getting more and more data showing that neuromodulation, or technology that acts directly upon nerves, is effective for a huge range of disorders—depression, migraine, Parkinson's disease, epilepsy, dementia, etc. – but there's a barrier to using these techniques because of the risks associated with doing surgery to implant the device, such as the risk of infection," Sheth said. "If you can lower that bar and dramatically reduce those risks by using a wireless, endovascular method, there are a lot of people who could benefit from neuromodulation."

Neuropathic pain can be a disabling disorder that accounts for nearly 40% of chronic pain sufferers, often leading to anxiety, depression, and opioid addiction. Previous research revealed electrical stimulation is an effective treatment for reducing pain when doctors target the spinal cord and dorsal root ganglia (DRG), a bundle of nerves that carry sensory information to the spinal cord. However, existing DRG stimulators require invasive surgery to implant a battery pack and pulse generator.

With this new type of technology, the researchers say they have found a way to perform minimally invasive bioelectronic therapy that helps with more precise placement of the implant and more predictable outcomes.

Ultimately, Sheth hopes to seek regulatory approval of the device from the FDA.

"We're doing some longer-term studies to ensure this approach is safe and that the device can stay in the body for a long time without causing problems," said Sheth, estimating the process will take a few years.

More information: Sunil Sheth, A wireless millimetric magnetoelectric implant for the endovascular stimulation of peripheral nerves, *Nature Biomedical Engineering* (2022). DOI: 10.1038/s41551-022-00873-7. www.nature.com/articles/s41551-022-00873-7

Provided by University of Texas Health Science Center at Houston