Implantable tactile sensing system shows promise for neuroprosthetics

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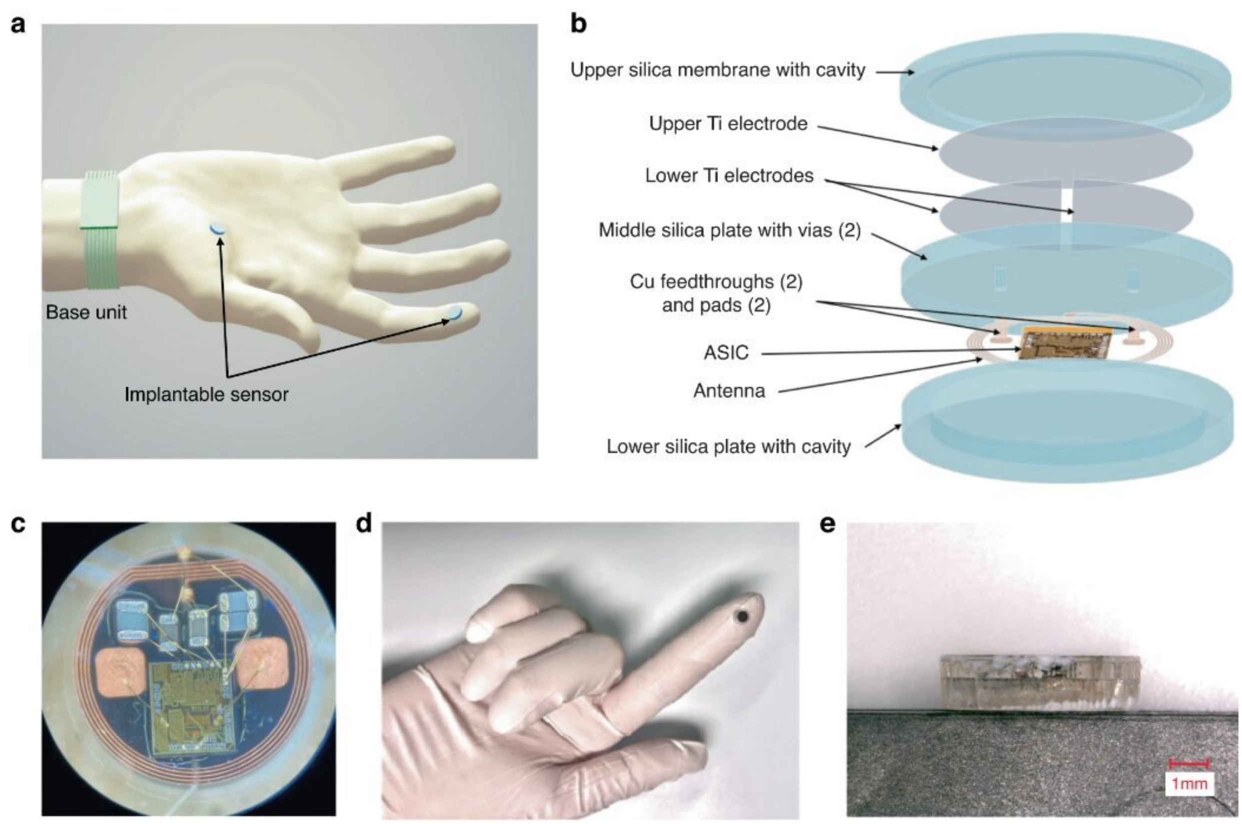

Implantable, wireless, battery-free tactile sensing system. Credit: *Microsystems & Nanoengineering*

Tactile mechanoreceptors are essential for environmental interaction and movement. Traditional tactile sensors in wearables and robotics often fall short, especially in restoring touch in cases of paralysis.

Brain-machine interfaces lack the crucial fingertip tactile sensing necessary for dexterity. However, implantable tactile sensors developed using MEMS technology offer a promising solution. They aim for closed-loop hand reanimation in paralyzed individuals, potentially enhancing their functional independence and quality of life.

In a study published in the journal *Microsystems & Nanoengineering*, scientists made a remarkable leap forward in neuroprosthetic technology by developing an implantable tactile sensing system. This system is designed to restore the sense of touch in paralyzed hands, promising to revolutionize how patients recover hand function after paralysis.

The research introduced a microfabricated capacitive pressure sensor designed for subdermal placement in fingertips as a solution for neuroprosthetic systems. Unlike traditional wearable tactile sensors, this implantable device interacts directly with a patient's paralyzed hand.

It comprises a custom integrated circuit for wireless powering and data transmission, encapsulated in a laser-fused hermetic silica package for enhanced durability and safety. This miniature device underwent meticulous validation through simulations, benchtop assessments, and primate hand testing, demonstrating its ability to accurately measure applied skin forces with a resolution of 4.3 mN.

When its output is encoded in the brain via microstimulation, the sensor provides tactile feedback, simulating the natural sense of touch. This innovative approach not only holds the potential to vastly improve neuroprosthetic systems' functionality and user experience but also sets the stage for various other implantable sensing applications, representing a significant advancement in medical technology.

The research team states, "This implantable system represents a significant breakthrough in tactile sensing technology. It's a giant step towards restoring natural hand functions and improving the quality of life for individuals with paralysis."

In conclusion, the sensor's output, encoded in the brain via microstimulation, provides tactile feedback, significantly enhancing neuroprosthetic systems. This advancement not only promises to restore hand function and improve tactile perception for patients but also expands the potential for various other implantable sensing system applications.

More information: Lin Du et al, An implantable, wireless, battery-free system for tactile pressure sensing, *Microsystems & Nanoengineering* (2023). DOI: 10.1038/s41378-023-00602-3

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