

Neural device implantation for electrical stimulation of neural/biological tissue

Summary: Stanford researchers at the Melosh Lab have proposed a non-invasive, high electrode density, high resolution (100 micrometers to 10 nanometers) neural device implantation for electrical stimulation of neural/biological tissues. This flexible neural mesh is implanted through temporary attachment to a low-profile microwire.

Problem: The implantation of electronics into brain tissue is an integral path to interact with excitable cells with high temporal and spatial resolution. Major drawbacks of this method is the damage done to the biological tissue during and after the surgery and rejection of the implanted device.

Solution: This invention describes a method to assemble and self-align ultra-flexible electrodes onto a small microwire (shuttle) and its delivery into biological tissue with minimal damage. It allows the assembly of a large number of electrodes onto both planar and non-planar (3D) shuttles, which can be smaller than 10 micron in diameter, for very low damage insertion. The device uses ultra-conformable electrodes that are highly flexible and compliant and small enough not to perturb cellular functions. It is an easy way to manufacture extremely low-damaging implants for neural interfacing.

Figure

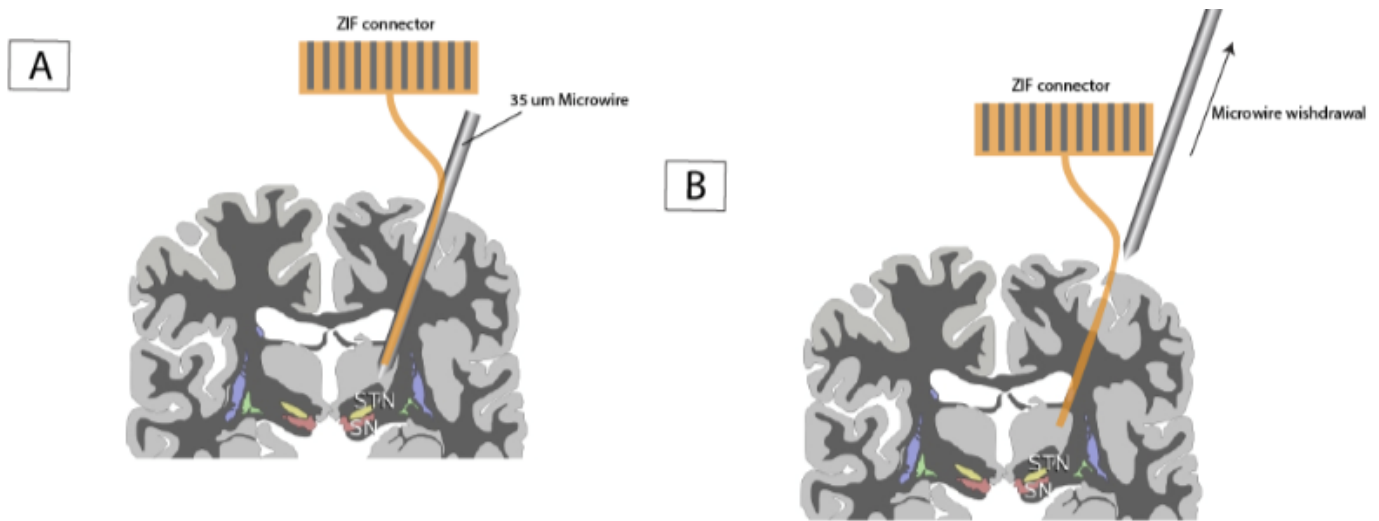


Figure description - Method of insertion of the “Neuroroot” film into the brain tissue. Once the ultra-flexible electrodes are attached onto the microwire, the device is inserted into brain tissues. The liquid present into the brain is enough to detach the electrodes from the microwire which is subsequently removed from the brain. This way only the mesh of ultra-flexible and ultra-low profile electrodes is remaining into brain tissues.

Stage of Research

- Continued research to assess low or non-existing inflammatory response from neural tissue during and after electrode implantation
- Implantation testing of high density electronics into difficult-to-access portion of the brain

Applications

- **Treatment of neurological and psychiatric disorders** via insertion of low-damaging interfacing electronics into excitable biological tissue

Advantages

- **Non-invasive, easy-to-scale, with high electrode density and high resolution** (100 micrometers to 10 nanometers)
- **Minimizes damage** done to the biological tissue during and after the surgery
- **Uses highly flexible, compliant, and ultra-conformable electrodes** that are small enough not to perturb cellular functions

Patents

- Published Application: [20210085961](#)

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