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Experts map surgical approaches for auditory brainstem implantation

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A technique called auditory brainstem implantation can restore hearing for patients who can't benefit from cochlear implants. A team of US and Japanese experts has mapped out the surgical anatomy and approaches for auditory brainstem implantation in the June issue of *Operative Neurosurgery*.

Dr. Albert L. Rhoton, Jr., and colleagues of University of Florida, Gainesville, and Fukuoka University, Japan, performed a series of meticulous dissections to demonstrate and illustrate surgical approaches to auditory brainstem implant placement. Their article shares exquisitely detailed anatomic color photographs, along with step-by-step descriptions of two alternative routes for neurosurgeons performing these demanding implant procedures.

Anatomy and Approaches for Auditory Brainstem Implantation

Auditory brainstem implants can restore varying degrees of hearing to patients with "retrocochlear" hearing loss. These patients have deafness caused by damage to the cochlear nerves—sometimes called the acoustic or auditory nerves—which transmit sound information from the inner ear to the brain. The cochlear nerve damage most commonly results from brain tumors associated with a genetic condition called neurofibromatosis type 2 (NF2).

Auditory brainstem implants are similar in principle to the more commonly placed cochlear implant, used in patients with damage to the cochlea—part of the inner ear. Because of the need to place the implant and electrodes in the brainstem, rather than the inner ear, the surgery required for auditory brainstem implantation is much more complex.

In a series of ten cadaver brainstem dissections, the researchers explored the anatomy of the region that the neurosurgeon must navigate to perform auditory brainstem implantation. They also mapped out the best neurosurgical approaches, both for surgery to remove the tumors and for auditory brainstem implant placement.

Based on their findings, Dr. Rhoton and colleagues detail two surgical approaches: a "translabyrinthine" and a "retrosigmoid" approach. They outline a step-by-step route for both approaches, designed to provide safe access to the area while minimizing trauma to the brainstem and surrounding structures. The authors highlight the value of using endoscopes to help in visualizing and accessing the target area for implant placement.

More than 1,000 auditory brainstem implant procedures have been performed worldwide so far. The procedure was previously approved only for patients with NF2 aged 12 years or older. Recently, clinical trials were approved for children with congenital malformations or other causes of retrocochlear deafness.

Minimizing damage to the brainstem and associated blood vessels appears to be a critical factor in achieving good speech recognition after auditory brainstem implantation. The hearing results are also better in patients with a shorter duration of deafness.

Dr. Rhoton and colleagues hope that their descriptions and illustrations will help to increase understanding of the anatomy and surgical

approaches to auditory brainstem implantation, contributing useful hearing to adults and children with NF2 and other causes of retrocochlear deafness.

More information: "Auditory Brainstem Implantation: Anatomy and Approaches" DOI: 10.1227/NEU.0000000000000736

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