Research Team Brings Back Sound for People Without Auditory Nerve Function

A multidisciplinary team of otolaryngology and neurosurgery specialists at the University of Miami Miller School of Medicine has introduced an auditory brainstem implant (ABI) program — one of just a handful in the U.S. — that uses signals to bring back sound for people without auditory nerve function.

An ABI works via electrodes surgically implanted on the brainstem. Patients wear an external processor that picks up sounds with a microphone, converts those sounds to electrical signals, and sends the signals to the electrodes on the
brainstem. The patient can then perceive those signals as sound and pitch.

Dr. Christine T. Dinh performs an auditory brainstem implant.

ABIs are approved by the Food and Drug Administration for people with neurofibromatosis type 2 (NF2), a condition that affects about one in 25,000 people. With NF2, tumors or their treatments damage the auditory nerve and cause profound hearing loss. Most people with NF2 generally are not candidates for cochlear implants, which require a working auditory nerve.

With a robust cochlear implant program in place since 1990, as well as one of the most experienced multispecialty skull base surgery programs, the team’s expertise in implanting and programming electronic hearing devices put them in a strong position to launch the ABI program.

The ABI program’s multidisciplinary component is key to its success. “When we consider auditory implants, while the process begins with the surgeon, the best outcomes rely on the
collaborative interactions among audiologists, electrophysiologists, psychologists, and family support,” said Christine T. Dinh, M.D., assistant professor of otolaryngology at the Miller School.

The skull base surgery team performed the University of Miami’s first implant surgery in March 2019, on a woman in her 60s whose NF2 was causing her hearing to decline.

During the surgery, state-of-the-art care and monitoring are crucial – hitting the wrong area of the brainstem could trigger dizziness, facial or vocal cord paralysis or even vital sign changes.

The team’s bilingual ABI audiologists, Sandra Velandia, Au.D., and Diane Martinez, Au.D., were able to communicate with the patient in Spanish, her native language, at her activation, and were able to obtain hearing responses on a majority of the device’s 21 contact electrodes.

“She did remarkably well at the initial stimulation,” said Fred F. Telischi, M.E.E., M.D., FACS, the James R. Chandler Chair in Otolaryngology and chairman of the Department of Otolaryngology.

Because of their more central location in the central nervous system’s auditory path, ABIs can’t generate the same high level (and sometimes even near normal) speech recognition seen with cochlear implants. Combined with other techniques like lip reading, though, they can make a big difference in understanding and communication.

The UM patient can distinguish sounds like a barking dog or a fire truck, but she understands very little speech with the
implant alone. And with lip reading alone, she understands about 25 percent. But with the ABI and lip reading combined, she boosts her understanding of words and sentences up to about 90 to 100 percent.

The team has since implanted two more patients, one by Dr. Telischi and Jacques Morcos, M.D., co-chair of the Department of Neurosurgery and director of skull base tumor surgery, and another by Dr. Dinh and Michael Ivan, M.D., M.B.S., skull base neurosurgeon and director of brain tumor research. One of those patients still has hearing in one ear, but he had an ABI placed because he needed tumor removal on one side and is at risk to lose hearing in the other ear someday.

“He can practice, and if he loses his hearing in the other ear, he won’t be completely deaf for a while,” Dr. Telischi said. The other patient awaits activation.