UT SOUTHWESTERN MEDICAL CENTER NEWS

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MRIs better at diagnosing needs for 'bionic ear' implants

DALLAS – Jan. 11, 2006 – Magnetic resonance imaging is a better diagnostic tool for cochlear ear implants than the more commonly used high-resolution computed tomography, a UT Southwestern study shows.

A cochlear implant, sometimes called a "bionic ear," allows patients with congenital hearing loss to bypass the problem and again perceive sound. Surgeons conduct radiologic studies using either an MRI or CT scan prior to implantation to determine abnormalities in the inner ear, conditions of related nerves and any obstructions in the ear ducts.

In the first head-to-head comparison, a research team led by Dr. Peter Roland, professor and chairman of otolaryngology, found that MRIs offered a more detailed view and better information on specifics. The results are reported online in the journal *Otology & Neurotology*.

"Thirty percent of patients we evaluated had abnormalities on MRI we would not have seen on CT, whereas in none of the patients were there findings on CT that we wouldn't have seen on MRI," said Dr. Roland, the study's senior author.

Some of those specifics help determine which surgical technique is used, the specific electrode arrays employed and can impact in which ear the cochlear implant is placed.

"In half the patients who had abnormalities on MRI that weren't seen on CT, it made a difference in which ear was selected for implantation," he said.

In the study, researchers evaluated the records of 56 implantation candidates, imaging 112 temporal bones. CT scans found as few as 6 percent of certain abnormalities.

On average, testing and anesthesiology costs for MRIs are 40 percent to 50 percent higher than those associated with CTs.

The implant is essentially a bionic ear, Dr. Roland said. The ear normally translates sound waves – a mechanical form of energy – to electrical impulses, which the brain perceives as sound. Implants bypass the dysfunctional inner ear and mirror the natural mechanical-to-electrical-impulse translation, a different process than hearing aids, which simply amplify the sound waves.

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Cochlear implantation is targeted to those with nerve deafness, which patients can be born with or can acquire as part of the aging process, from injury, from excessive noise or from toxic reactions.

The implants work best for individuals who have lost hearing after they have acquired speech, and are more effective in those with recent hearing loss. They also work very well with those born deaf, provided they are implanted early, such as before age 7 or 8.

"The earlier you implant the device, the better the results," Dr. Roland said.

In about 1 percent or 2 percent of cases, the implants can become infected. In related research, Dr. Roland analyzed how the implants become infected and concluded that cochlear implant material allows a biofilm to form that bacteria live in. The biofilm makes it difficult for antibiotics to reach the bacteria, altering the metabolism and limiting the effectiveness of antibiotics.

"Eradicating the infection with antibiotics is very difficult and sometimes impossible," Dr. Roland said. "In those cases, the implant has to be removed. The patient can't hear again until the implant is put back again, which is often six to eight weeks. So it's a very unpleasant experience, especially for children."

The study was the first to remove an uninfected implant – the failure was electronic – and find no biofilm. That indicated to researchers that the biofilms cause infection, he said.

Researchers found nooks and crannies in the design of the implants that contribute to biofilm development, giving designers some new information to help eliminate the problem.

"We're also working on techniques to alter the surface structures of cochlear implants at the nano level to keep these biofilms from forming," Dr. Roland said.

Other UT Southwestern researchers involved in the study included Drs. Timothy Booth, associate professor of radiology, and David Parry, a former resident.

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