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Sunday, November 14, 2010

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## TECH BEAT: Hearing brought to you by cochlear implants

Elizabeth H. "Liz" Casey/For the Times-Standard  
Posted: 11/04/2010 01:22:22 AM PDT

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# TECH BEAT: Hearing brought to you by cochlear implants

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Say what? An estimated 35 million Americans, or 11.3 percent, suffer from hearing loss, and the majority of them, some 80 percent, do not use traditional hearing aids because of discomfort with the quality, feel, or look of the devices. Or, in the case of babies and small children, conventional hearing aids do not always properly fit.

Good news. Cochlear implants, also known as middle-ear implants, are an excellent alternative to conventional hearing aids and are drastically improving the lives of the hearing challenged. According to a USA Today article on the subject, published in 2009, "About 150,000 people worldwide have received cochlear implants. In the USA, roughly 30,000 adults and 30,000 children wear them."

Cochlear implants are comprised of two main components: an internal, surgically implanted device that consists of a receiver and a transducer, and an external component, called an audio processor-typically worn behind the ear, that converts sounds to digital signals. These devices are ideal for people who have lost their hearing due to disease, nerve damage, or accidents, as well as people who have not had favorable results with conventional hearing aids.

Middle-ear implants offer many advantages over traditional hearing aids. They eliminate the plugged ear feeling that many people complain of with conventional hearing aids, because the implants are not located in the ear canal. The implants fail less often than regular hearing aids,

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because they are not affected by moisture or ear wax. The devices significantly reduce or eliminate feedback noise, such as the whistling or humming that often accompany the use of hearing aids. Cochlear implants provide a much better range of sound frequency with clearer, cleaner sound quality, because they are digital devices. And, lastly, because these devices contain a computer on the outside of the body, they are highly adaptable and programmable. This means that as a patient uses the device and requires minor adjustments, those adjustments, called mapping, can be made easily.

In normal hearing, the outer ear acts as a cup to grab and funnel sound that travels across the air in waves. Sound waves enter the ear canal, stimulate the ear drum, and travel to the middle ear where little bones, called ossicles, begin to vibrate. The vibrations then travel to the inner ear where they stimulate the auditory nerve to send electrical nerve impulses to the brain. The brain then interprets those nerve impulses as various sounds.

With a cochlear implant, sounds hit a tiny, external microphone that conducts the sounds upward to an audio processor, which is, in essence, a micro computer contained in a clip that seats itself at the top or back of the ear. The processor converts the sound into digitized data. The data is sent via a magnetic device to the cochlear implant, which is located below the skin, near the ear. The implant then sends the digital data to the auditory nerve, which in turn, forwards the information to the brain via thin wires that have been surgically placed inside the inner ear. The middle-ear implant completely by-passes a person's ear canals and eardrums, thus increasing the user's comfort level.

One of the most significant sectors of humanity being helped by cochlear devices are deaf children and even some hearing-challenged babies. If the devices are implanted early enough, the children's brains are more adaptable to re-wiring their electrical impulses and accommodating the input of the new sound stimuli.

According to experts, many of these children will hear well enough that they will not have to learn sign language and can attend regular schools.

While cochlear implants are amazing technology, they are far from perfect. For one thing, people in situations with large amounts of ambient noise, such as airports, crowded restaurants, or stadiums, will still have challenges with their hearing, because cochlear implants do not completely filter out ambient noise. The surgeries to implant these devices are very expensive. And, when implanted into children, the kids still require a good deal of hearing and speech therapy afterwards, which can add to the cost.

But, for the millions of Americans who suffer from hearing loss, the answer might lie in an innovative technology that eventually restores much of a person's hearing and quality of life. Cochlear implants are increasing in popularity because they are so discreet, comfortable, and once mapped to the patient, whether adults or children, they work very well. For the hearing challenged among us, this is indeed some good news.

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