



# **WORLD SKULL BASE E-LEARNING MATERIAL**

## **Auditory Brainstem Implants**

# Auditory brainstem implant

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An **auditory brainstem implant** (ABI) is a surgically implanted electronic device that provides a sense of sound to a person who is profoundly deaf, due to sensorineural hearing impairment (due to illness or injury damaging the cochlea or auditory nerve, and so precluding the use of a cochlear implant).

The auditory brain stem implant uses similar technology as the cochlear implant, but instead of electrical stimulation being used to stimulate the cochlea, it is used to stimulate the brain stem of the recipient.

Only about a thousand recipients have been implanted with an auditory brain stem implant, due to the nature of the surgery required to implant the device (as it requires brain surgery to implant the device) and the limited effectiveness of the implant (most auditory brain stem implant recipients only have an awareness of sound - recipients won't be able to hear musical melodies, only the beat).<sup>[1]</sup>

In the United States ABIs were previously only approved for adults (18 & over) and only for patients with neurofibromatosis type II (NF2). In January 2013, the US FDA approved a clinical trial of auditory brainstem implants for children.<sup>[2]</sup> At the end of May 2013, Grayson Clamp became the first child in the United States to receive an auditory brain-stem implant at age 3.<sup>[3]</sup> In Europe, ABIs have been used in children and adults, and in patients with NF2 as well as other auditory complications, such as auditory nerve aplasia and cochlea ossification.<sup>[4]</sup> Speech perception in non-NF2 patients on average has been reported to be higher than that of NF2 patients.<sup>[5]</sup>

## Implant history

The auditory brainstem was first implanted in humans in 1979 at the House Ear Institute, CA, USA.<sup>[6][7]</sup> This original ABI consisted of two ball electrodes which were implanted near the surface of the cochlear nucleus. A change from a percutaneous connection to a wireless transcutaneous connection, and from ball electrodes to flat electrodes were the only changes to the implant until 1991, where 25 people had received the ABI.<sup>[8]</sup>

In the US in 1992 an eight electrode implant was developed by Cochlear Limited, the House Ear Institute and Huntington Medical Research Institute.<sup>[9]</sup> An electrode array with 21 electrodes developed by Cochlear Limited was developed for the European market at the same time.<sup>[10]</sup> The processor for both the eight and 20 electrode implants used Nucleus 22 ABI (Cochlear Limited) external speech processors. Since 1999 a 21 electrode array implant has been used with the Nucleus 24 ABI (Cochlear Limited) speech processor.

A 12 electrode array implant with a speech processor based on the C40+ cochlear implant (Med-El)<sup>[11]</sup> and a 16 electrode array implant with the Clarion-1.2 cochlear implant (Advanced Bionics)<sup>[12]</sup> have also been developed.

## References

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- [2] <http://www.sciencedaily.com/releases/2013/01/130122101334.htm>
- [3] <http://news.yahoo.com/blogs/lookout/deaf-child-hears-first-time-160928369.html?vp=1>
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## Further reading

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## External links

- Nucleus ABI24M (<http://www.cochlear.co.uk/products/670.asp>) Brief description of the Nucleus Auditory Brainstem Implant (the Nucleus ABI24M)
- Picture & brief description ([http://www.medel.at/english/30\\_Products/01\\_MAESTRO/Cochlear\\_Implants/08\\_Advanced\\_Electrode\\_Design.php](http://www.medel.at/english/30_Products/01_MAESTRO/Cochlear_Implants/08_Advanced_Electrode_Design.php)) of the MedEl ABI electrode array

# Article Sources and Contributors

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