The following audiological tests are performed in adults:
- unaided and aided warble tone
- speech detection thresholds
- speech discrimination test
- environmental sound tests

Performance in the weaker ear with appropriate, powerful hearing aids is compared to that of the patient with a cochlear implant (see selection criteria). Recruitment and discomfort are also taken into account.6-8.

Children must fulfill the same criteria as adults. There are also more specific requirements:
- tympanometry rules out otitis media with effusion
- behavioral-audiometry or play-audiometry is used

The child must have used an appropriate hearing aid for at least 6 months, with inadequate results.12.

Potential candidate for a cochlear implant:
- unable to obtain aided speech detection threshold of 70 dB SPL and hearing level of approx. 53 dB HL or better
- poor performance on the discrimination test with conventional amplification, with scores of less than 10% on the W-22 word list

Electrical stimulation test at either the promontory or the round window membrane is not critical in candidate selection. It is often useful, however, to reassure the patient that hearing can be restored in the other ear.13.
Materials and Methods

We have studied the histopathological changes in the temporal bones of 4 deceased individuals, one with cochlear-saccular degeneration, another with Mondini displasia, another with an ossification of the basal turn of the cochlea and the round window post meningitis and the forth patients who was implanted 10 years before.

These patients were donors and agreed during their life to donate post mortem their temporal bones to the House Ear Institute Los Angeles, CA, USA as a contribution to a better knowledge of temporal bone diseases.

We have removed the temporal bones in our usual way

Results and Discussion

There are general criteria for implantation. We have researched in our study on temporal bone, the anatomic indications and contraindications for cochlear implant placement.

Physical and radiological evaluation

Any active infection of the external and/or middle ear or eardrum perforations must be treated before inserting a cochlear implant.

High resolution computed tomography may demonstrate:

- agenesis of the cochlea: absolute contraindication
- reduction of IAC diameter (1-2 mm) is synonym of acoustic nerve aplasia: absolute contraindication
- fibrous and/or osseous occlusion of the cochlea: relative contraindication.

The outcome may be poorer than normal because of partial insertion of the electrode array. The use of both Gd-enhanced T1-weighted MR images and additional gradient-echo images (0.7 mm thick) enables a certain definition of the extent of cochlear fibrosis. The high signal intralabyrinthine fluid is replaced by the low signal fibrous tissue.

In our temporal bones we have found a cochlear hypoplasia (Mondini's deformity) that we feel is not a contraindication to implantation. In fact the interscalar septi are missing between the apical and middle turns but the operation is feasible (Figure 1).

A other individual had a cochlear-saccular degeneration (Sheibe deformity) which proved to be an absolute contraindication to the implant (Figure 2). In the Figure 2 is visible that the organ of Corti is represented by a clump of cells and that there are no dendrites in the osseous spiral lamina.

A third individual had an ossification of the basal turn of the cochlea and the round window area post meningitis (Figure 3). In many cases meningitis ossificate just the round window area and is not a contraindication to cochlear implant, but in this case the complete ossification of the basal turn of the cochlea represent

![Figure 1. Mondini dysplasia. Interscalar septi are missing between the apical and middle turns (arrows). x15.](image1)

![Figure 2. Cochlear saccular degeneration (Sheibe deformity). The organ of Corti is represented by a clump of cells. There are no dendrites in the osseous spiral lamina. The saccular macula has degenerated (large arrow). Some ganglion cells remain (small arrow). x56.](image2)
an absolute contraindication; the electrode could not be inserted along the cochlea\textsuperscript{20-22}.

A fourth individual had a previous implant. It is visible that the implant has not provoked any significant alteration (Figure 4).

**Conclusion**

1) Cochlear implants are not experimental
2) Cochlear implants are not hearing aids
3) Appropriate candidates have profound bilateral sensorineural hearing loss and do not benefit from conventional amplification
4) Surgical and postoperative complications have been minimal\textsuperscript{23-25}
5) Implants increase auditory abilities and, as a result, improve speech production skills
6) Postlingually deafened adults with a short duration of deafness are excellent candidates for a cochlear implant\textsuperscript{26}
7) Although postlingually deafened children in aural rehabilitation programs demonstrate the fastest and greatest development of auditory skills as a group, congenitally and prelingually deafened children show substantial benefit from a cochlear implant\textsuperscript{27-30}
8) Complete physical and radiological evaluation must be ruled out before any attempt of surgery. Complete agenesis of the cochlea and an abnormal acoustic nerve, the result of either congenital malformation, trauma or surgery, are contraindications for cochlear implant placement.

### References


