

Management of profound hearing loss after meningitis

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Bacterial meningitis in France

✓ Incidence in France in 2004 (/100,000)

• <i>Streptococcus pneumoniae</i> : 0.96 (46 %)	} Stable since 1991
• <i>Neisseria meningitidis</i> 0.58 (32 %)	
• <i>Streptococcus agalactiae</i> (B) 0.18 (11 %)	
• <i>Haemophilus influenzae</i> 0.09 (6 %)	} Regular decrease
• <i>Listeria monocytogenes</i> 0.08 (5 %)	

⇒ 1130 cases in 2004

- *Mycobacteria tuberculosis* 0.17

✓ Similar epidemiology in USA

Bacterial meningitis

- Hearing loss in 6 to 37 %
- Severe to profound SNHL in 5 %
- Systematic audiometry 1 month after meningitis

- 80 % of patients with profound hearing loss have some
- degree of labyrinthine ossification (scala tympani, basal turn)

Bacterial meningitis

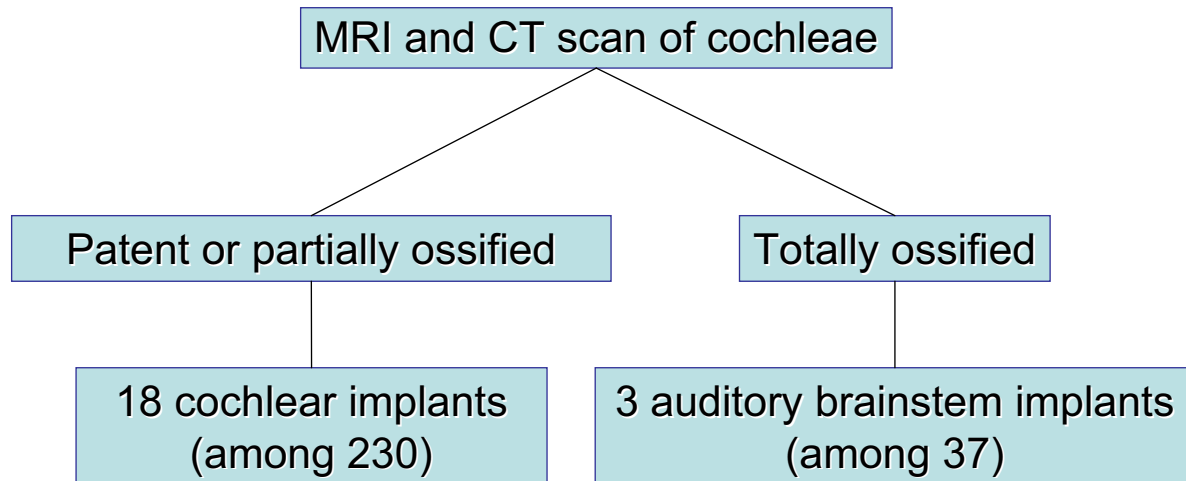
Pathophysiology

- Inflammatory mediators cell or vascular injury, leading to fibrosis and ossification
- Spread through the cochlear aqueduc

- Bacterial agents:
 - *Streptococcus pneumoniae*: 31 %
 - *Haemophilus influenzae*: 6 %

Hearing rehabilitation after meningitis

Implantation after bacterial meningitis : 8 % of our adult patients (n=267)



Cochlear implant population

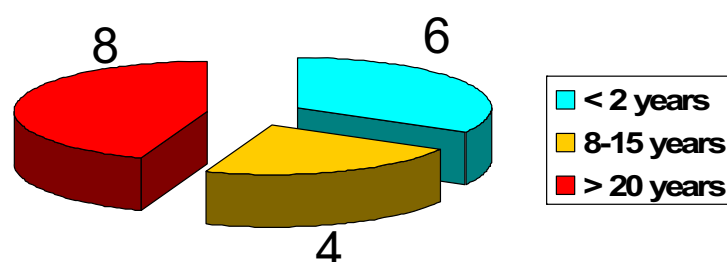
■ Age

- Meningitis (n=18) : 45 years (range: 29-76)
- Other etiologies (n=102) : 51 years (range: 13-81)

■ Neurological sequelae :

- Minor cognitive deficit: 2
- Lower limb paresis: 1

■ Duration of profound SNHL:

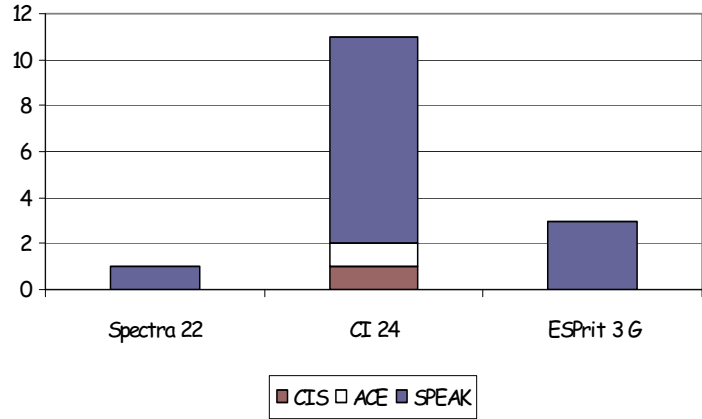


Cochlear implant population

Implant devices

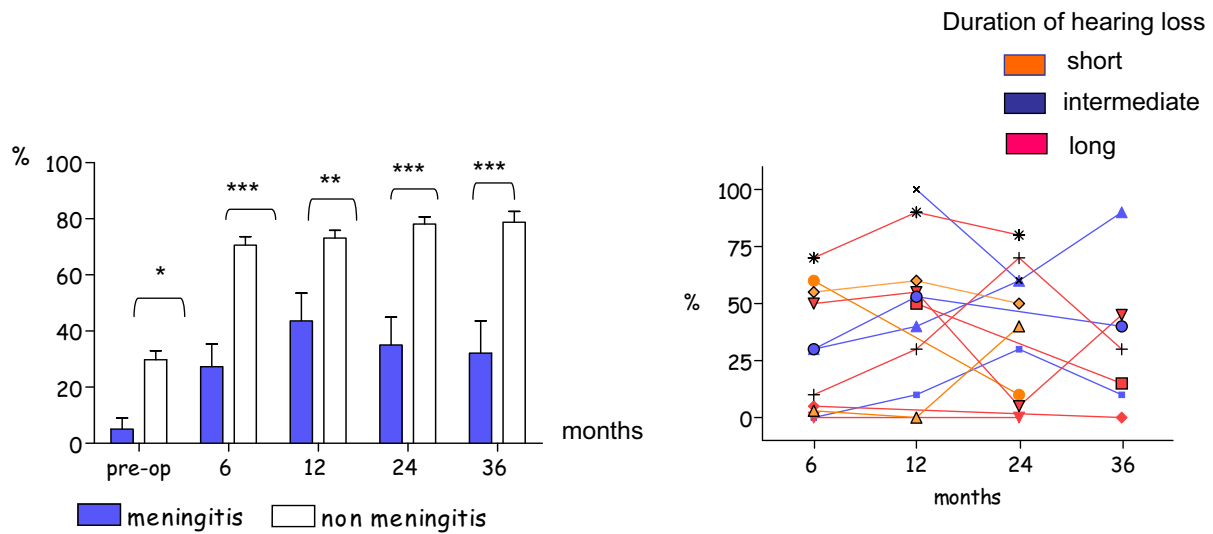
- Unilateral Nucleus: 15
- Bilateral MED-EL: 2
- Full electrode insertion in all cases

Speech processing strategy (Nucleus)



Speech performances

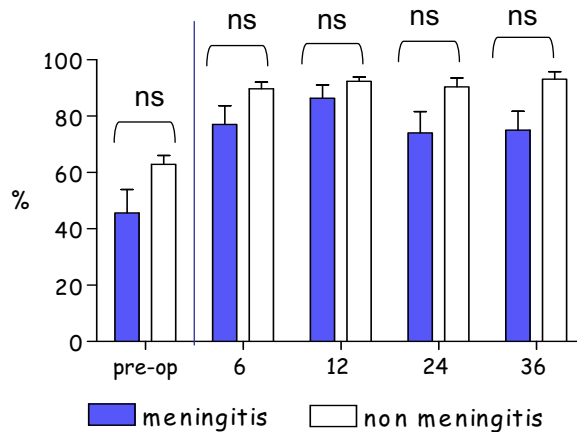
Disyllabic words with implant in quiet



*: $p < 0,05$ - ** : $p < 0,005$ - ***: $p < 0,0001$, ANOVA

Speech performances

Disyllabic words implant + lipreading in quiet

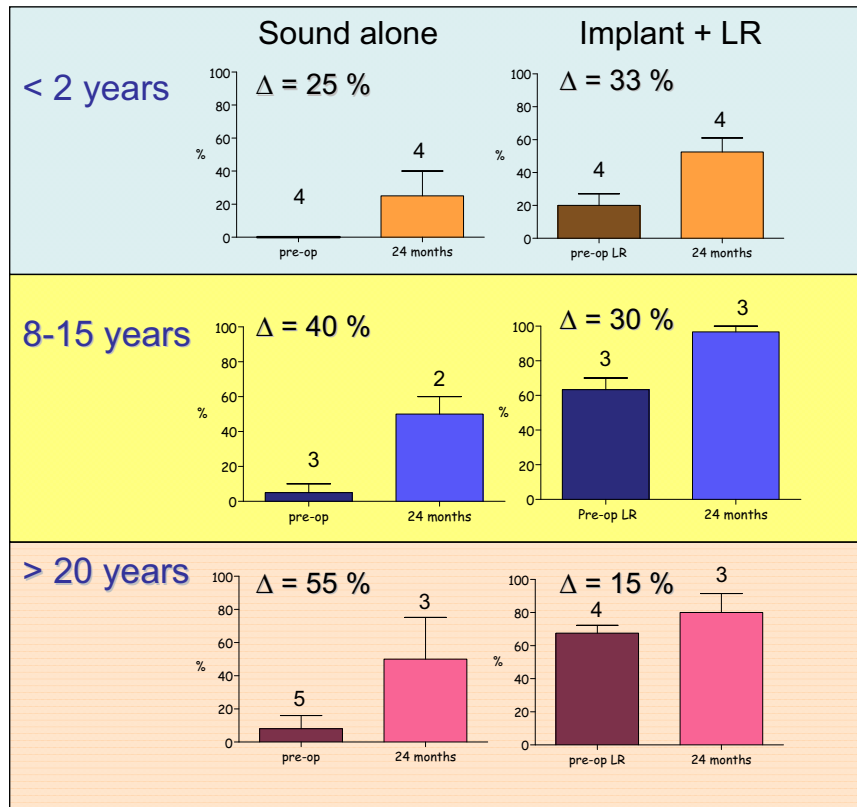


Cochlear implant fitting

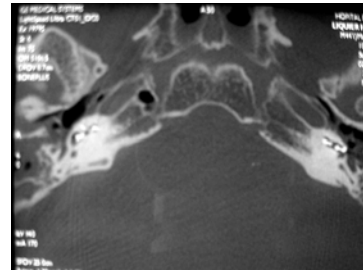
- Number of activated electrodes stable over time (12 to 22)
- Impedance, C and M level were not correlated to speech performances and were stable over time
- These parameters were similar between meningitis and non meningitis cases.
- One patient with facial stimulation

Performances and duration SNHL

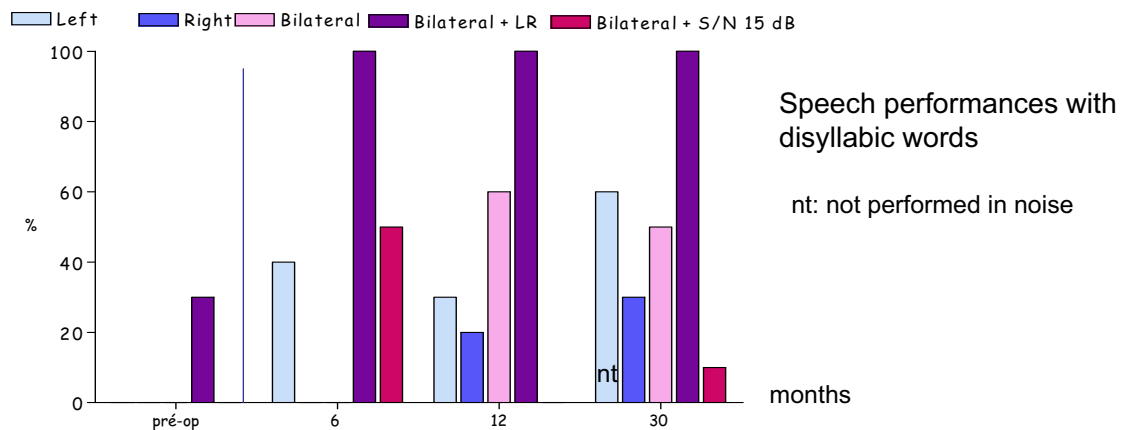
Duration of hearing loss



Bilateral implantation



- 44 year-old male
- Profound SNHL after meningitis Bilateral and simultaneous implantation one year after SNHL (MED-EL® COMBI 40/40+)



ABI in ossified cochleae

Rational

- Impossibility of cochlear implantation in totally ossified cochleas
- Poor results of cochlear implant in
- Partially ossified cochlea:
 - poor contact between the electrode and the nerve endings
 - peripheral nerve degeneration in the cochlea associated with the ossification



(*Dequine et al.1993, Sood et al.1995, Gibson et al. 1995, Rauch et al. 1997, Balakany et al.1998*)

ABI in ossified cochlea

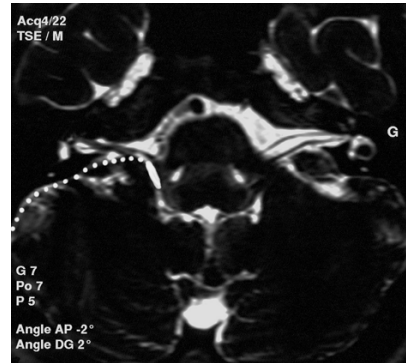
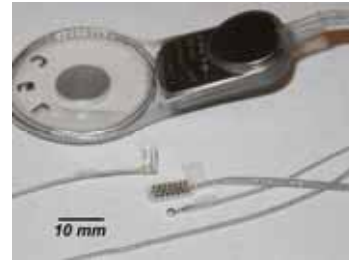
Population

- 3 patients with pneumococcal meningitis with rapid profound SNHL
- Duration of deafness : 2,3 and 4 years
- Cochlear implantation in two cases with no benefit
- Negative promontory test
- Absence of fluid in cochlea on MRI CIS sequences

ABI in ossified cochlea

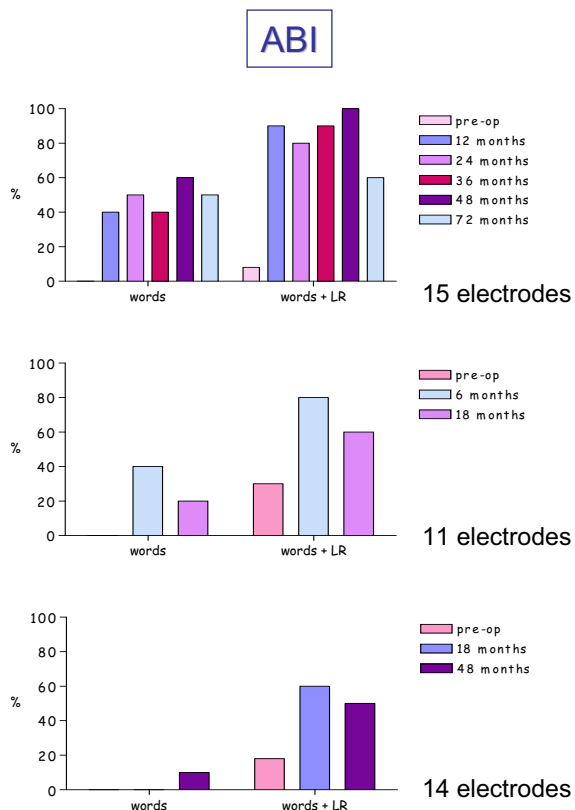
Surgery

- Translabyrinthine (n=1) and retrosigmoid (n=2) approaches, Nucleus ABI inserted
- No postoperative complication
- Number of active electrodes: 11, 14 and 15

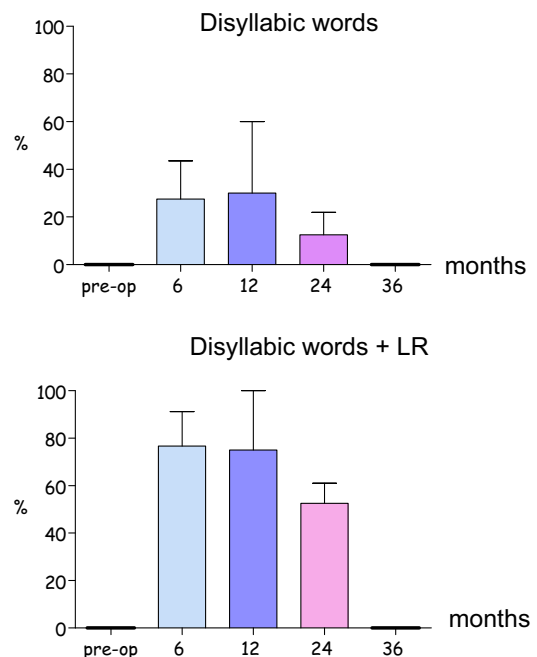


Bozorg-Grayeli et al. *Audiol Neurotol* 2006

ABI Results



CI, short duration of SNHL, n = 4



Conclusions

- In post-meningitis profound hearing loss, cochlear implantation is an emergency. This implantation should be bilateral and simultaneous in adults.
- Speech performances were poorer compared to other etiologies, whatever the duration of the deafness
- Speech performances did not improve over time.
- ABI should be proposed as the first option in totally ossified cochlea.
- In case of poor or important deterioration of speech performances with cochlear implant over time, ABI could be discussed.

Performances in children

- ✓ Pre- and postlingually deafened children with postmeningitis hearing loss showed significant improvement in their speech perception abilities after implant.
- ✓ Performances are poorer in case of
 - partial ossified cochlea
 - partial cochlear implant insertion
 - neurological complication of the meningitis (hydrocephalus)

*Rauch Laryngoscope 1997,
El-Kashlan Otol Neurotol 2003,
Francis Arch Otolaryngol Head Neck Surg 2004,
Rotteveel Clin Otolaryngol 2005*