Meningitis and Cochlear Implantation

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Introduction

- Cochlear implantation has transformed the lives of thousands.
- FDA, MDA, and BfArM recently issued notices that cochlear implant recipients could be at greater risk of meningitis.
- The most common organism was the Pneumococcus.
- A survey of cochlear implant centers was begun in June 2002.
The majority occurred in children – some within days and some within many months after surgery.

The onset of meningitis varied from days to years following implant surgery.

The addition of the positioner to the electrode may put patient at greater risk.

The incidence of spontaneous meningitis in this population group may be greater than that of normal group.
What should be done to protect patients?

- There may have been an association with the positioner type electrode.

- Cochlear implant candidates, as well as those already implanted, may benefit from vaccination.

- (children under 5, those with inner structural abnormalities such as enlarged vestibular aqueduct or Mondini dysplasia, and those with altered immunity)
- Communicate the risk of meningitis to patient and family.

- Implanted patients who develop symptoms or signs of acute otitis media, meningitis, or other febrile illness should be treated urgently.

- All serious infections in implanted patients should be reported to the appropriate public health authorities.
Risk of Bacterial Meningitis in Children with Cochlear Implants

Jennita Reefhuis, et al
The New England Journal of Medicine
July 31, 2003

- 4264 children; CI before age 6

- 29 episodes of post CI bacterial meningitis

- 9 were perioperative (<= 30 days after OP)

- 20 were sporadic (> 30 days after OP)
• 62% were associated with S. penumoniae

• Two children had meningitis caused by Hib.

• Postimplanation bacterial meningitis was strongly associated with the use of an implant with a positioner.

• The reasons for the association between the use of the positioner and the occurrence of meningitis are unclear.

• In perioperative cases, bacteria may be introduced at the time of OP.
In sporadic cases, bacteria often enter through the middle and inner ear.

Patients should receive pneumococcal and Hib vaccinations.

Children should receive caccinations two or more weeks before surgery.

It is unclear whether explantation of the device with a positioner would lower the risk of meningitis.
Explantation would place the child at risk for operative complications, including perioperative meningitis.
Antibiotics

- The penicillins, certain cephalosporins (3rd and 4th generation), the carbapenems, fluoroquinolones, and rifampin provide high CSF levels.

- Chloramphenicol is primarily bacteriostatic and acts by inhibition of protein synthesis by interfering with the transfer of activated amino acids from soluble RNA to ribosomes.

- Active against Aerobic gram-positive microorganisms: *Staphylococcus aureus*, streptococci, including *Streptococcus pneumoniae*
- **Aerobic gram-negative microorganisms**: *Enterobacter sp.*, *Escherichia coli*, *Haemophilus influenzae*, *Klebsiella sp.*, *Moraxella lacunata* (Morax-Axenfeld bacillus), *Neisseria sp.*

- **Ceftriaxone (Rocephin) – 3rd generation cephalosporin** with broad spectrum G(−) activity. Lower efficacy against G(+) but excellent activity against susceptible pneumococcal organism.

- **Cefotaxime (Claforan)** -- Third-generation cephalosporin used to treat suspected or documented bacterial meningitis caused by susceptible organisms such as *H influenzae* or *N meningitides*
Penicillin G (Pfizerpen) -- Beta-lactam antibiotic. Active against many gram-positive organisms. DOC for syphilitic meningitis and susceptible organisms (eg, *N meningitides*, penicillin-susceptible *S pneumoniae*).

Vancomycin (Vancocin) -- Glycopeptide antibiotic active against staphylococci, streptococci, and other gram-positive bacteria. Because of poor CSF penetration, higher dose is required for meningitis than for other infections.
Ampicillin -- Indicated for *L monocytogenes* and *S agalactiae* meningitis, usually in combination with gentamicin.