Meningitis after cochlear implantation

The risk is low, and preventive measures can reduce this further

Since the 1980s, more than 80,000 people have received cochlear implants worldwide. These implants are designed to enable people who are severely or profoundly deaf to experience sound and speech. Since 1990, implantation has become standard treatment for people who cannot communicate effectively despite well fitted hearing aids. Children who are deaf when they are born can perceive sound and learn to speak if they receive cochlear implants at a young age (ideally under 18 months). The use of cochlear implants has been thought to be safe. But since 2002 the number of patients with meningitis related to cochlear implantation has increased worldwide. Mortality and neurological complications after meningitis are high. We need to investigate the reasons for this and look at measures to reduce them.

*Streptococcus pneumoniae* is the most common organism involved. The incidence of pneumococcal meningitis was found to be more than that of an age matched cohort in the general population. Risk factors include: a particular design of implant (withdrawn from the market in 2002); inner ear malformations; leakage of cerebral spinal fluid after implantation; presence of a verticuloperitoneal shunt; and a history of otitis media.

An animal model of implant related pneumococcal meningitis has been developed. This model has been used to quantify the bacterial threshold for pneumococcal meningitis and to study the pathogenesis of the disease and interventional strategies for reducing risk. A laboratory study showed that the presence of a cochlear implant in healthy animals reduced the number of bacteria needed to induce pneumococcal meningitis and therefore increased the risk of meningitis. Moreover, the surgical insertion of the implant, which involves fracturing the bony structures of the inner ear, was also an independent factor for subsequent risk of pneumococcal meningitis.

Patients and their carers need to be informed of the risk of developing meningitis after implantation. This is especially true for patients with pre-existing risk factors. Patients should be told that although a cochlear implant increases the relative risk of pneumococcal meningitis compared with the age matched population, the absolute risk of meningitis is still low and the benefits of the implant outweigh this low risk.

What can be done to reduce the risk of meningitis? The risk of developing meningitis after cochlear implantation can be lowered by implementing several strategies. All implant recipients should be given vaccines that cover *Streptococcus pneumoniae* as recommended by the US Centers for Disease Control and Prevention. Patients who develop symptoms of acute otitis media or bacteraemia should be assessed and treated urgently. This is particularly important for recipients of cochlear implants who have other pre-existing risk factors. Oral antibiotics may be adequate for most episodes of uncomplicated acute otitis media in implant recipients. Intravenous antibiotics should be combined with mastoid drainage to prevent meningitis in recipients with mastoiditis. We recommend the insertion of tympanostomy tubes and the use of prophylactic antibiotics in implanted children prone to otitis media until they grow out of their susceptibility to otitis media.

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