

INTRATYMPANIC GENTAMICIN PERFUSIONS

ENDOLYMPHATIC HYDROPS (ELH, Meniere's disease)

Risks, Complications and Post-operative Instructions

The inner ear comprises a bony casing (the otic capsule), containing perilymph, a fluid similar to the cerebrospinal fluid that surrounds the brain. Within this fluid floats the membranous labyrinth, a complex of tubular/saccular membranes containing endolymph. This fluid is specialised to serve the sensory nerve endings of hearing and balance within the ear. To maintain its consistency, the perilymph is continually formed within the membranous labyrinth, then drained away via an outlying small sac: the saccus endolymphaticus.

For uncertain reasons, the sac drainage may fail, resulting in the membranous labyrinth becoming distended and dysfunctional: endolymphatic hydrops (ELH). This manifests as the clinical condition called Meniere's disease after its discoverer.

Characteristics

ELH manifests with four classical features that typically occur in episodes:

- Fullness, pressure, blockage sensations in the affected ear.
- Tinnitus: electronic, ringing, buzzing, white noise.
- Nerve deafness, usually with a low frequency component. Often severe. May be fluctuant at the onset of the condition.
- Rotatory Vertigo: Spinning sensation, may last for hours, commonly followed by severe disequilibrium (unsteadiness with movement).

The episodes are often with little warning, disabling, and associated with nausea, vomiting, and possibly diarrhoea. They are grossly socially disruptive. Late in the disease, drop attacks may occur. These are episodes of sudden collapse, without loss of consciousness.

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Treatment

A variety of medical and dietary measures may improve the condition, but success is variable.

Alternatively, gentamicin perfusions may be used. Gentamicin is a common antibiotic that has a toxic effect on the balance function of the ear. If the middle ear is flooded with a gentamicin solution, some crosses into the inner ear, reducing the vertigo produced by the ELH. Perfusions are usually preceded by placing a temporary vent tube in the ear to nullify pressure increases that may result from the perfusion action, preventing “blow-back” of the solution. The process is an office procedure, performed with little discomfort using topical anaesthesia (a numbing droplet on the eardrum).

Several perfusions may be needed, performed with little discomfort under local anaesthetic as an office procedure. The aim of the procedure is to produce mild unsteadiness (dysequilibrium) that comes on in the days after the perfusion, and after which rotatory vertigo generally diminishes. Further perfusions are given if the vertigo persists. The technique is effective in over 80% of cases, although some require a “top-up” many months later.

More information

- [Endolymphatic Hydrops / Meniere's Disease](#)
- [Inner Ear Symptoms](#)

RISKS AND COMPLICATIONS

The downside of perfusions is the degree of dysequilibrium encountered. This balance upset is due to reduction of balance function in the ear treated, and may be severe in some cases, especially in females, where the lighter bodily tissues presumably admit more of the drug into the inner ear. This more severe reaction may take 6-8 weeks to clear, and the patient needs to know this risk prior to treatment. Fortunately, severe reactions generally herald a complete cure of the rotatory vertigo.

A further complicating factor arises if the patient is unable to distinguish between this dysequilibrium and another attack of true ELH: the surgeon may be uncertain whether to administer a further dose that may exacerbate matters.

Gentamicin may also damage the hearing. The effect of perfusions in this respect is uncertain, as active ELH also causes progressive deafness.

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SUBSEQUENT MANAGEMENT

If disequilibrium is troublesome, several strategies are available.

Severe dysequilibrium, as outlined above, occurs when the brain has not compensated for the drop in function of the affected ear. In younger patients, recovery may be relatively rapid, but in the older case this is more protracted and long-term difficulties may persist. Expert balance rehabilitation physiotherapy is strongly advocated, and persistence with this management is desirable for best outcomes.

When dysequilibrium is severe, however, one's intellectual centres are used to help compensate. Distraction of these centres can significantly impede compensation; the patient should avoid a number of such situations:

Financial concern: avoid debt, excessive spending.

Friction: minimise family confrontations.

Fatigue: avoid physical over-exertion (e.g. over-zealous rehabilitation).

Movement: Reduce excessive multidirectional movements.

Decision-making: Constant demands for decision impact heavily on executives/managers.

Other **worries, stresses:** to be avoided

Benign Positional Vertigo (BPV)

Lastly, ELH cases may be prone to BPV, due to debris resulting from the disease. BPV occurs when particulate debris irritates balance receptors in the ear, causing rotatory vertigo in specific bodily positions or movements, including arising, looking up, rolling over in bed, or sudden horizontal movements. The problem is often remedied by specialized exercises (Epley manoeuvres) that reposition the offending particles away from the sensitive site.

ELH is a complex, damaging and often distressing condition. Fortunately treatment will terminate the vertigo, or this will burn out spontaneously in the long term, if untreated.

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Surgery

Operative intervention may be employed in several roles.

i. Saccus Decompression/Drainage

Removal of the mastoid bone and its air cells from over the saccus endolymphaticus relieves or cures ELH in up to 70% of cases. The surgery is controversial, as the exact beneficial action is uncertain. The efficacy of sac drainage undertaken during this surgery is also questionable. When successful, symptoms are alleviated and hearing stabilised, although cases may relapse later. This is often the treatment of choice in early cases, to retain hearing, and for this reason a decompression operation may be preferred to a perfusion.

ii. Section of the Eighth Nerve

Neurosurgical-type division of the nerve attempts to halt the dizziness without loss of hearing. The surgery is more invasive, requires advanced skills, and may be ineffective in salvaging hearing, as the ELH continues to damage this aspect in the ear; the nerve section does not halt this aspect. Dysequilibrium may be severe afterwards.

iii. Labyrinthectomy .

Removal of the balance elements of the inner ear is effective in eliminating rotatory vertigo, and is done when the hearing is severely damaged, or when the symptoms dictate this course, usually prostration or drop attacks. Dysequilibrium may be severe after this procedure; the patient is counselled clearly re this, as with the perfusions and the nerve section surgery. Hearing will be totally lost.

Hearing Rehabilitation

ELH or its management commonly result in severe deafness, with loss of speech discrimination ability, such that conventional hearing aids may be ineffective. Several hearing options are available.

CROS / BiCROS aids help to eliminate the “head shadow” dead zone of single sided deafness. These use a receiver on the deaf ear that transmits by Bluetooth to an aid in the better ear (which, in the BiCROS variant also aids the better ear).

Active bone conduction devices (Med EL Bonebridge, Cochlear BAHA) act similarly to the CROS aid, but by using skull vibration, and can be implanted at the initial surgery. They can be used only when the better ear has excellent hearing, and do not restore full audiological ability (direction finding, stereo, or the improved hearing with two ears – binaural summation). They help greatly at a table, groups, committees etc.

The concern with the bone conduction implants is the possibility of later onset ELH in the contralateral ear, which would negate their effectiveness.

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Cochlear implants may also be effective. When the hearing is severely damaged, particularly in rapid onset cases or when contralateral disease is present, cochlear implantation of the worse ear is considered to provide a stable and effective means of communication. The sound quality from a cochlear device is not as clear as the bone conduction implants, but is independent of the other ear and immune to further ELH effects. They help greatly to avoid the socio-economic disruption of bilateral Meniere's and, particularly in younger patients, are an increasingly employed management.

Please let us know at Queensland Otolaryngology if you have any concerns or questions, whether before or after:

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