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Editorial

Transtympanic medicine instillation- my experience

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Introduction

Ototoxicity is often prescribed for a variety of ear pathology. Their usefulness is well-known in treating external and middle ear problems. The procedure, in which a drug is deposited in the middle ear via an intact tympanic membrane to treat various inner ear disorders, is called transtympanic (TT) medical therapy.

This is a new, attractive and useful technique for various reasons. The drug dosage delivered in the inner ear via this route is in high concentration.¹ The drug gets delivered directly to the site of pathology and avoids any systemic side effects.¹ The therapy is convenient to give in the outpatient department.

The drug gets absorbed through the round window membrane by passive diffusion, hence duration of contact and concentration instilled is very important. Various techniques are available, like direct injection of medicine through the tympanic membrane into the middle ear, placing a grommet or sustained release wick or tube. The placement of a tympanostomy tube avoids recurrent piercing of the eardrum but carries the risk of persistent perforation.² The sustained release may be achieved with a microcatheter through a tympanic membrane placed over a round window or by placing the microwick, which the patient keeps soaked by placing ear drops.³ Even these have failed to be reliable in delivering the predicted dose.

My technique is to make the patient lie supine with the affected ear up and head turned 45 degrees, anaesthetize the drum with 10% xylocaine spray. The medicine to be injected is prewarmed in hand (holding the syringe) to avoid caloric reaction, the amount may vary from 0.3ml to 1ml depending upon the middle ear space. Using a 26-gauge spinal needle, under microscopic vision, pierce the tympanic membrane in the anterior-inferior quadrant (no need for a separate hole for air escape) and instill the medicine in the middle ear cavity until full. The patient is asked to avoid swallowing and yawning movements and maintain the position for 30 minutes minimum.

The TT infiltration of dexamethasone injection (immunomodulatory) is useful in a variety of problems like sudden sensorineural hearing loss (SSNHL), Meniere's disease, tinnitus and autoimmune hearing loss. It causes immune suppression, helps in ion homeostasis and provides protection against inflammatory mediators. It provides good control of vertigo in patients with Meniere's disease, reducing both the frequency and severity of vertigo spells. The TT dexamethasone injection is now the primary modality for SSNHL, though earlier it was recommended after the failure of oral steroid treatment. It increases the blood flow to the inner ear and thus helps in treating the abnormal ringing sensation i.e., tinnitus. The procedure is repeated twice weekly, for 2 weeks in patients with tinnitus, though daily injection for 3 consecutive days is recommended for patients with SSNHL.

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The injection of gentamicin (vestibulotoxic aminoglycoside) is ablative and useful in non-responding Meniere's disease patients. The chemical ablation of the labyrinth helps in creating a lasting vestibular hypofunction till central compensation occurs. Thus, almost treats repeated episodes of vertigo in Meniere's patients. Injection Gentamicin is available in a concentration of 40mg/ml. It is recommended to buffer it with 8.4% bicarbonate to a pH of 6.4, thus final concentration becomes 26mg/ml. Since its TT administration may lead to hearing loss, thus not recommended in patients with bilateral disease. In patients with unilateral disease, it is given 3 times daily for consecutive 4 days.

One study found TT injection useful for gene therapy by introducing viral vectors, though still in animal models.⁴ Another study reported blockage of cochlear N-methyl-D-aspartate receptors with AM-101, and found it useful in treating tinnitus due to glutamate excitotoxicity.⁵ In patients with autoimmune disease, TT tumor necrosis factor-alpha inhibitor (infliximab) injections have shown improvement in hearing and lessen relapse.⁶

Major limitation of TT is a difference in absorption into the inner ear, due to the different permeability of the round window membrane, variation in round window niche shape and presence of web/ mucosal folds. Since it is an invasive procedure, many patients disagree with the same. Few feel short-lasting pain, and vertigo and there is a risk of otitis media and permanent perforation. The drugs get distributed in the inner ear by passive diffusion, hence for more apical distribution multiple injections or a sustained release technique is required. The drug dose, schedule, duration and means of delivery are not yet standardized. Most studies from the West recommend an injection of dexamethasone in the concentration of 10mg/ml and even some have used 24mg/ml, but in India only 4mg/ml is

available. This may be an important limitation, since it is the concentration of the drug that matters, leading to suboptimal results.

TT therapy is contraindicated in patients with impacted wax, otitis externa, otitis media and uncooperative patients.

Conflict of Interest

None.

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