

Intratympanic or Transtympanic Drug Therapy ?

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The Round Window is the main gateway to the Inner Ear. Other Gates includes the oval window and the semicircular canals. Drug Delivery to the Inner Ear by the Intratympanic way via the round window membrane can be done, or by Intralabyrinthine injection via the round window or semicircular canals.

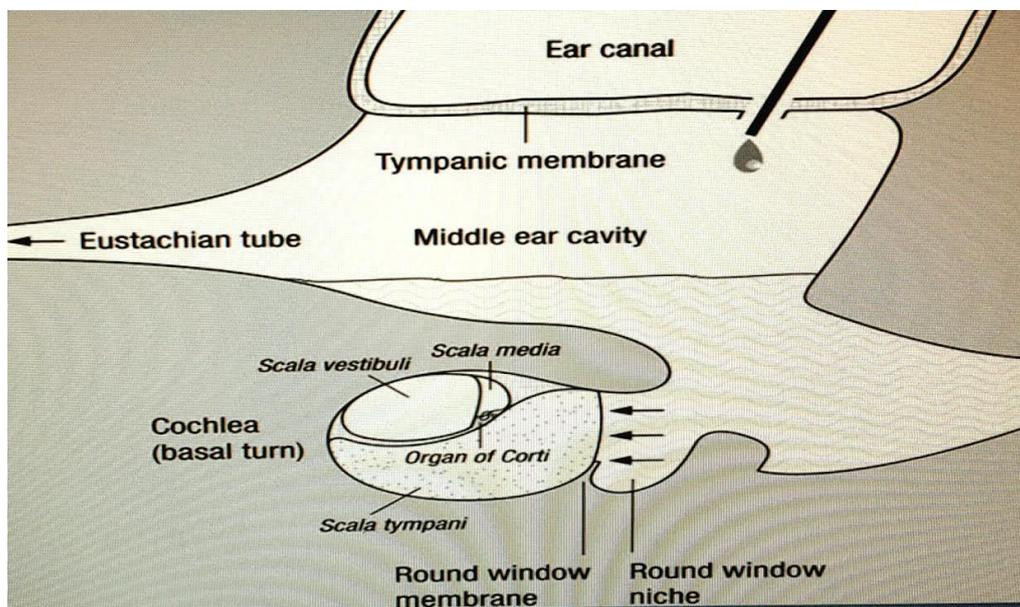
In 1981, Stewart and Belal studied the surgical anatomy and pathology of the round window in 272 temporal bones. In 68 normal temporal Bones that belonged to persons their age varied from infancy to 87 years. The niche was like a triangular prism with the base at RW membrane and 3 walls. The mean horizontal diameter was 1.5 mm while the mean vertical diameter was 1.2 mm.

The entrance to the round window may be altered within the entrance or by structures outside the niche. A false round window membrane was found in 55 percent of the temporal bones examined, Silverstein (1995) found a partial membrane in 17 percent and complete 12 percent. While Elzamil and Linthicum (2000) found round window obstruction in 33 percent of 202 temporal bones: fat or fibrous tissue plugs 13 percent and membrane in 20 percent.

In intra tympanic drug therapy, if the target site is the basal coil of the cochlea or vestibular system, one shot IT treatment suffices. If the apical coils of the cochlea are the target, multiple shots, pumps, catheters, biogradable polymers and cochleostomy, may be needed.

IT drug therapy may be done in acute sensorineural Hearing Loss due to idiopathic sudden HL, noise trauma, ototoxicity, ischemia, infection, head trauma,... or in auto-immune hearing loss. Some tinnitus cases may benefit from IT therapy. Also, IT therapy may be done for vertigo due to Meniere's disease delayed hydrops or preoperative before acoustic turner surgery or cochlear implantation.

The following drugs have been used in IT drug therapy: Glucocorticoids (most common dexamethasone), aminoglycosides (gentamycin), anaesthetics, neurotransmitters for tinnitus, monoclonal antibodies for autoimmune sensorineural hearing loss, apoptosis inhibitors for noise induced hearing loss, stem cell, gene vectors, growth factors for hair cell loss.



Many factors play a role of how much drug reaches the inner ear e.g. concentration gradient , round window membrane permeability , contact period , drug particle size, electric charges,...

Of concern with IT, is the presence of round window false membrane and the fact that almost 90 percent of the drug injected goes down the Eustachian tube at the time of the injection. Therefore, the most important variant in IT drug therapy is the technique of injection whether it is done by intratympanic, exploratory tympanotomy or transtympanic injection.

IT drug therapy may be done by office injections, subannulus catheter (Schucknecht, 1957) or via exploratory tympanotomy (Lesser, 2010). Transtympanic (IT) drug therapy is done by endoscopic assisted techniques using round window gelfoam or round window pumps,...



The office setup in IT drug therapy is simple. It is usually done in the office under local anaesthesia. Injection is done in the anterosuperior quadrant of the eardrum. Success rate is usually 50 percent.

The aim of transtympanic drug therapy (TT) is to be sure of RW patency! Transtympanic drug therapy can be done either Microscopic or Endoscopic.