

Tinnitus

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- **Def** - A sound perceived for more than five minutes at a time, in the absence of any external acoustical or electrical stimulation of the ear and not occurring immediately after exposure to loud noise
- **Epidemiology**
 - Up to 20% of the population experience tinnitus at any point of time
 - 1/3rd of population have had tinnitus at some stage in their lives
 - Age → 40 -70 yrs
 - Prevalence increases with age
 - M > F
 - 6-8% of those affected are severe
 - 80% of people don't seek help
 - 40% of patients experience depression
- **Types**
 - Objective
 - Caused by sounds generated somewhere in the body
 - Occasionally can be heard by doctor as well with help of stethoscope over ear
 - Usually produced by para auditory structures
 - Sound is conducted to cochlea through bone conduction → processed as any other sound
 - Subjective (Most Common)
 - Perception of meaningless sounds heard only by patient without any physical sound being present
- **Causes**
 - Objective
 - Pulsatile (AVVA BHEJ CVP)
 - Arteriovenous malformations
 - Vascular tumors e.g. glomus
 - Venous hum (C2 tr pr pressing IJV → turn head opp. ↓)
 - Atherosclerosis
 - Benign intracranial hypertension
 - Hyperdynamic circulation
 - Pregnancy
 - Anemia
 - Thyrotoxicosis
 - Beri Beri
 - Ectopic carotid artery
 - Jugular bulb dehiscent
 - Cardiac murmurs
 - Vascular loops

- Persistent stapedial artery
- Non pulsatile (STEMP)
 - Stapedial ms spasm
 - TM joint syndrome
 - Eustachian tube patulous
 - Maggots in EAC
 - Palatal myoclonus
 - Clicking tinnitus
 - Does not correspond with pulse
 - Rapid (60-200 beats/min), intermittent
 - Contracture of tensor palatini, levator veli palatini, tensor tympani, salpingopharyngeus, superior constrictors
 - Muscle spasm seen orally or transnasally
 - Rhythmic compliance change on tympanogram
 - EMG of palatal muscles confirms
- Subjective (ONIMPO)
 - Otologic
 - Hearing loss
 - Presbycusis
 - Noise exposure
 - Otosclerosis
 - OME
 - Meniere's disease
 - Acoustic neuroma
 - Neurologic
 - Multiple sclerosis
 - Head trauma
 - Infectious
 - Syphilis
 - Meningitis
 - Metabolic
 - Thyroid disorders
 - Hyperlipidemia
 - B12 def
 - Psych
 - Depression/anxiety
 - Ototoxic drugs or substances (5As 4Cs DHooM → 54 ACs ki DHooM)
 - Analgesic
 - Aspirin, NSAIDs
 - Antibiotics
 - Aminoglycosides
 - Erythromycin
 - Vancomycin
 - Chloramphenicol
 - Tetracycline
 - Anti-depressants
 - Antimalarial

- Chloroquine
- Quinine
- Alcohol
- Caffeine
- Cocaine
- Chemotherapeutic agents
 - Cisplatin
 - Vincristine
 - Methotrexate
 - Bleomycin
- Contraceptive pills
- Diuretics loop
- Heavy metals
- Marijuana

Pathophysiology

- Conductive hearing loss
 - Decreases level of background noise
 - Normal para auditory sounds seem amplified
 - E.g. Impacted wax, otosclerosis, middle ear effusion, perforated TM
 - Treating the cause of conductive hearing loss may alleviate the tinnitus
- SNHL
 - Poorly understood mechanisms
 - Range of theories
 - Loss of outer hair cells
 - Reorganization of central pathways with hearing loss (similar to phantom limb pain) → increased spontaneous activity of central nerves
 - Can be generated from any part from cochlea to CNS
 - Neurophysiologic Model proposed by Jasterboff
 - Initial tinnitus result of interaction of subsystems from cochlea to CNS
 - Stimulates limbic system → negative re enforcement → sympathetic autonomic nervous system stimulated → fear, anxiety, stress → further negative re enforcement
 - End result → vicious cycle → person can go into depression or even commit suicide

Management

- History
 - Quality
 - Pitch
 - Loudness
 - Constant/intermittent
 - Pulsatile / non pulsatile
 - Onset

- Alleviating/aggravating factors
- Associated causes
 - Infection
 - Trauma
 - Noise exposure
 - Medication usage
 - Medical history
 - Hearing loss
 - Vertigo
 - Pain
 - Family history
 - Impact on patient

Examination

- Gen exm (features of hyperdynamic circulation)
- Otoscopy (Glomus)
- Oral (palatal myoclonus)
- Dental (TM jnt, Bruxism)
- Auscultate over orbit/ EAC
- Light exercise can be done if pulsatile tinnitus suspected

Investigations

- PTA
 - **Pitch matching** → match pure tone with tinnitus → not reliable
 - **Loudness matching** → match loudness with pure tone → usually less than 7 dB
 - **Masking level** → Number of decibels to cover tinnitus
 - 0-3 dB = easy to mask
 - 4-10 dB = masking may be intrusive
 - > 10 dB = difficult to mask
- Tympanometry
- Speech discrimination
- BERA
- MRI with contrast
- Palatal EMG
- CECT (glomus)
- CBC (thyroid, lipid)

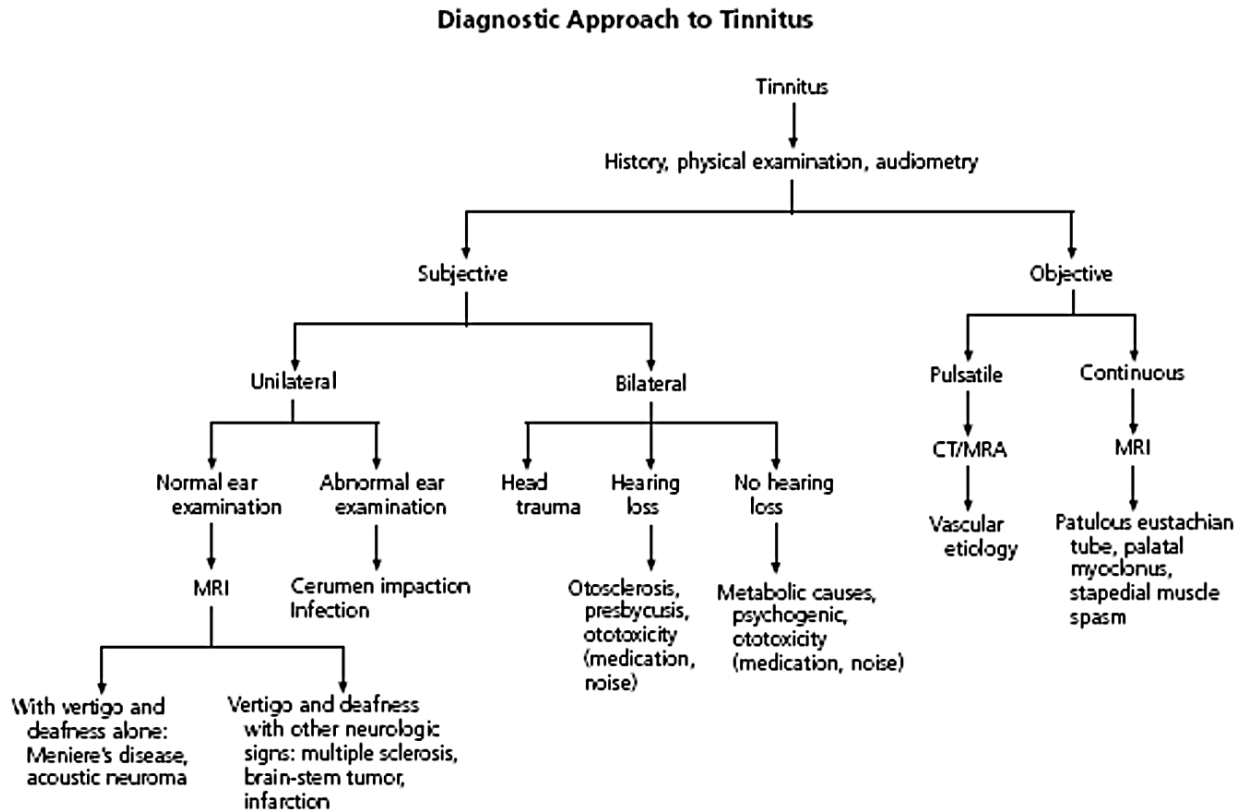


FIGURE 1. A proposed algorithm for diagnostic approach to tinnitus. (CT = computed tomography; MRA = magnetic resonance angiography; MRI = magnetic resonance imaging)

Treatment

- Advise
 - Reassurance
 - Avoid aggravating factors eg. noise, NSAIDs
 - Decreased intake of stimulants eg. caffeine and nicotine
 - Smoking cessation
 - Avoid medications known to cause tinnitus
 - Relaxation
 - Avoiding silence
 - White noise eg. Detuned radio
- Hearing Aids
 - Essentially for poor hearing
 - Mechanism – amplification of background noise can decrease tinnitus
 - Reduce contrast
 - Fatigue and stress of poor hearing is reduced allowing more resources (Habituation & Central adaptive plasticity) to be allocated to fight tinnitus
 - Up to 90% may benefit
- Tinnitus Masking Device
 - Essentially counteracts tinnitus
 - Maskers – produce sound in a controlled manner to mask tinnitus
 - Generate noise bands

- Tinnitus instruments
 - Hearing aid + tinnitus masker
- Tinnitus Retraining Therapy
 - Based on neurophysiologic model
 - Modify patient's response to tinnitus
 - Attention is directed towards meaningful stimuli
 - Methods
 - Directive counselling → Educate patient of potential mechanisms of tinnitus
 - Person centred counselling → Ways of dealing with stress
 - Cognitive Counselling → About patients false beliefs, attitudes or fears
 - Once patient understands, level of annoyance decreases → vicious circle is broken
 - Counselling is combined with masking for several hrs per day
- Habituation – Technique
 - Fitted binaurally with broad-band noise generator i.e. ear noise generator, table top generator
 - 6 hrs/day
 - Jastreboff → 6 months to ensure plastic changes in brain established
- Psychological Treatment
 - Relaxation therapy
 - Hypnosis
 - Cognitive Behavioural Therapy
- Medications → variously used with no research proven role
 - Carbamazepine
 - Diazepam
 - Alprazolam
 - Clonazepam
 - Nimodipine
 - Prostaglandin
 - Glutamate antagonist – caroverine
 - Betahistine
 - Vit C, Vit E
 - Nortryptiline, Amitryptiline
 - Piracetam
 - Ginkgo Biloba
- Electrical stimulation of cochlea
- Cochlear implant
- Acupuncture
- Surgery
 - For treatable cause e.g glomus
 - Cochlear nerve section in intractable tinnitus
- Recent advances → transcranial magnetic stimulation

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