

TINNITUS: A REVIEW

Background

1. Definition²
 - Perceived sound without acoustic stimulus, external to head. Unilateral or bilateral, ringing, thumping, buzzing, whistling or other sound; often associated with different disease types including hearing loss
2. General Information¹
 - Acute-lasts seconds to minutes for days to weeks. Associated with some medications, loud sounds. May resolve spontaneously
 - Chronic-lasts greater than 6 months
 - Subjective-perceived only by patient, common
 - Pulsatile: rhythmic sounds consistent with cardiac murmur
 - Syndromic: associated with specific disease process (e.g., Meniere's, acoustic neuroma)
 - Objective-examiner may also detect the sound, rare
 - Gaze Evoked-lateral eye movements increase loudness or pitch of perceived sound, rare
 - Spontaneous-occurs with normal hearing in totally silent environment

Pathophysiology

1. Pathology of Disease¹
 - Subjective-usually due to hearing loss from cochlear damage after loud noises (above 185 dB) or other causes creating central auditory pathway reorganization and abnormal interactions
 - Otologic: presbycusis, otosclerosis, otitis externa, otitis media, cerumen impaction, cholesteatoma, Meniere's disease
 - Drug-induced: NSAIDS, salicylates, aminoglycosides, loop diuretics, lead, chemo (vincristine, cisplatin), quinine, valproate
 - Neurogenic: traumatic brain injury, whiplash, multiple sclerosis, acoustic neuroma, cerebellar-pontine angle tumors
 - Metabolic: hypo/hyperthyroidism, DM
 - Infectious
 - Other: dental disorders, TMJ disorder, genetics, nerve damage from ENT surgery
 - Objective (pulsatile)-carotid stenosis, AVM, aortic stenosis, vascular tumors, anemia, Paget's disease of temporal bone, MS palatal myoclonus, stapedius spasm, Chiari malformation, auditory nerve compression, spontaneous acoustic emissions
2. Incidence, Prevalence¹
 - 10-15%, increases with age
 - 2.8% overall in US
 - 9.6% over age 65
 - almost 2:1 males to females
 - most affected men are Caucasians, elderly, people in southern US, veteran
3. Risk Factors²
 - Zinc deficiency possibly associated

- Associated conditions: insomnia, hearing loss, anxiety, depression, PTSD, suicide risk is associated with depression
- 4. Morbidity / Mortality¹
 - Associated conditions: insomnia, hearing loss, anxiety, depression, PTSD, suicide risk is associated with depression
 - 3rd most common service disability among veterans

Diagnostics⁴

1. History
 - Characterization of noise, intermittent vs. constant, unilateral vs. bilateral, pitch, onset, associated conditions (hearing loss, vertigo, pain), alleviating or aggravating factors (stress, insomnia, background noise, jaw movement), impact on patient or quality of life
 - Medications-ototoxic drugs
 - Past Medical History-ear infections, head injuries or surgeries, HTN, DM, SLE, RA, hypothyroid, anxiety, depression
 - Family History-hearing loss, tinnitus
2. Physical Examination
 - Focused on HEENT exam-mouth, ear, TMJ, neck
 - Carotid bruits
 - Neuro exam, cranial nerves, dix-hallpike maneuver, gait testing
3. Diagnostic Testing³
 - Laboratory evaluation- thyroid CBC, CMP, lipid panel if suggestion of medical disease
 - Diagnostic imaging (potential)
 - CT of head, MRI, CT angio, standard angiography, EEG, test for maskability
 - Other studies
 - Audiologic evaluation-pure tone, tympanometry, speech audiometry

Differential Diagnosis^{2,4}

1. Presbycusis
2. Vascular bruits/shunts/hums secondary to hypertension
3. Glomus tumors
4. Neurologic Disorder/muscle spasms
5. Eustachian Tube Dysfunction
6. TMJ Dysfunction
7. Ototoxic Medications
8. Cerumen Impaction
9. Otosclerosis
10. Meniere's Disease
11. Vestibular Schwannoma (acoustic neuroma)
12. Arnold-Chiari Malformation
13. Infection
14. Genetics
15. Congenital Hearing Loss
16. TIA
17. Barotrauma

Therapeutics

1. Acute Treatment⁵
 - Symptom management
 - modify perceived severity and reduce disabling impact
 - Medications
 - Antidepressants-Sertraline may reduce severity, but overall insufficient evidence to support use
 - GABA active drugs-Alprazolam may decrease intensity; gabapentin and baclofen not helpful
 - Acamprosate-may decrease severity for patients with sensorineural hearing loss
 - Botulinum Toxin-may improve symptoms for patients with subjective tinnitus if injected subcutaneously around the ear or directly into the tensor veli palatine muscle if tinnitus associated with palatal myoclonus
 - Zinc-beneficial effects appear dose related with benefit perceived at 50 mg/day and 220 mg/day, not 66 mg/day; conflicting evidence
 - Therapies proven NOT to help-misoprostol, intratympanic prednisone injections, ginkgo biloba, melatonin, hyperbaric oxygen therapy, acupuncture
2. Further Management (24 hrs)^{1,2}
 - Therapies
 - Acoustic Therapies
 - To mask noise, amplify hearing
 - Repetitive transcranial magnetic stimulation of tempoparietal cortex
 - CBT
 - To improve coping with tinnitus, reduce stress
 - Surgery
 - May be appropriate for pulsatile tinnitus caused by vascular anomalies
 - Referral
 - To comprehensive tinnitus management program for patients who get no relief after other treatments fail
3. Long-Term Care
 - Insufficient research has been conducted

Follow-Up

1. Return to Office²
 - As needed if not responding to treatment
 - Not enough information regarding time frame
2. Refer to Specialist or comprehensive management program
 - If refractory to treatments, medications

Prognosis¹

1. up to 25% of patients consider it a significant problem
2. many patients postpone evaluation or do not seek evaluation at all

3. habituation to symptoms may occur over time
4. perceived severity not correlated with loudness/type/quality of pitch
5. Severity improved in most patients enrolled in tinnitus management program
6. Tinnitus effect greater in patients with comorbidities (e.g., immobility, depression, insomnia, pain)
7. If poor maskability present, may be predictive of long-term distress
8. Chronic tinnitus following surgery more likely severe

Prevention²

1. Avoid ototoxic medications
2. Treat associated conditions (e.g., depression, insomnia)
3. Avoid facial trauma

Patient Education

1. <http://familydoctor.org/online/famdocen/home/common/ear/981.html>

References

1. Lockwood, AH, Salvi, RJ, et al. Tinnitus: Current Concepts. NEJM 2002, September; 347 (12) 904-910.
2. Folmer, RL et al. Tinnitus: questions to reveal the cause, answers to provide relief. J Fam Prac 2004, July; 53 (7) 532-540.
3. Weissman, JL, Hirsch, BE. Imaging of Tinnitus: a Review. Radiology 2000, August; 216 (2) 342-349.
4. Crummer, RW, Hassan, GA. Diagnostic Approach to Tinnitus. Am Fam Phys 2004, January; 69 (1) 120-126.
5. Patterson, MB, Balough, BJ. Review of Pharmacologic Therapy for Tinnitus. International Tinnitus Journal 2006, February; 12 (2) 149-158.

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