Tinnitus:
Common Complaint, Practical Approach

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Tinnitus is the perception of sound or noise without any external stimulation. It may be subjective (only the patient hears the noise) or objective (others hear the noise). It may also be constant or intermittent, pulsatile or non-pulsatile.

"I hear that tinnitus is quite common…"

Tinnitus affects about 10% of the population.[1] More than 360,000 Canadians have tinnitus in an annoying form and about 150,000 find that these noises seriously impair the quality of their lives.[2]

In 1953, Heller and Bergman took 80 tinnitus-free individuals and placed them in a soundproof room. The subjects were instructed to "report on any sounds that might be heard" during five minutes of total silence. Quite remarkably, 93% reported hearing a sound they could not attribute to an external source.[3]

Thomas's Tinnitus

- Thomas, 53, is a carpenter who has a noise in his right ear.
- The noise is new, high-pitched, constant and intrusive.
- He confides in you his fear of the worst. He recently lost a friend to brain cancer and he's pretty sure that he is next in line. Who will take care of his family should anything happen to him?

How would you manage Thomas? Go to page 88 to find out.

Where is tinnitus generated?

It has been proposed that hearing loss may lead to a reorganization of pathways in the central auditory system. The complexity of these changes may explain why it is so difficult to find a single effective treatment for tinnitus.

Some have considered tinnitus to be similar to phantom pain after limb amputation. Section of the cochlear nerve does not always abolish tinnitus.

It is hoped that a better understanding of the mechanisms underlying tinnitus generation will identify subgroups of patients who will be responsive to specific therapies.

What is pulsatile tinnitus?

Classic vascular neoplasms, like the *glomus jugulare* and *tympanicum*, are quite rare. They produce a bruit not altered by neck pressure, head position, posture or Valsalva manoeuver. Otoscopy may reveal a bluish or red mass behind the tympanic

membrane, which classically blanches with positive pressure applied by the pneumatic otoscope.

Benign intracranial hypotension in obese young women is an unusual phenomenon. These individuals have raised intracranial pressure > 20 cm H_20. Management includes exclusion of a space occupying lesion through neuro-imaging, weight loss, diuretics and, rarely, shunting.

Most arteriovenous malformations occur between branches of the occipital artery and the transverse sinus and are post-traumatic in nature. Dural arteriovenous fistulas may present in the absence of trauma and produce tinnitus.

Venous hums are normal in many children and in some adults. They may reflect a hyperdynamic circulation (anemia, thyrotoxicosis, pregnancy). The sound increases with deep breathing and Valsalva manoeuver. It decreases with light pressure on the neck.

What is clincking/fluttering tinnitus?

In cases of "clincking" or "fluttering" tinnitus, there are three entities to consider:

- palatal myoclonus,
- stapedial muscle spasm and
- patulous Eustachian tube.

1. Palatal myoclonus

Palatal myoclonus may be observed directly on oral examination. The patient perceives an intermittent clicking sound, sometimes likened to the fluttering of moth wings, ear fullness or distorted hearing. It may be associated with other dystonias. Tympanometry may show peaks with palatal contraction and electromyography of the palatal muscles is confirmatory. Treatment has included benzodiazepines, warm liquids and, rarely, botulinum toxin injection.

2. Idiopathic stapedial muscle spasm

Idiopathic stapedial muscle spasm produces a brief and intermittent rumbling, or crackling, sound often triggered by external noises. Treatment has included benzodiazepines and tympanotomy to divide the tendon.

FAQ

When should you order an MRI?

An MRI should be considered if there is sudden onset, unilateral symptoms, additional evidence of other cranial nerve dysfunction or other abnormality of hearing, balance, posture or gait.

Objective tinnitus should be considered separately, as it may imply a vascular or neuromuscular cause.

Table 1

Tinnitus

History

Ask the patient to give a clear description of the sound. Is it subjective/objective, constant/intermittent, unilateral/bilateral, of sudden/gradual onset? What is its pitch and loudness? Is there a relevant past exposure to audiovestibular damage?

Ask about noise exposure, ear infections, otologic surgery, head injury, ototoxic medications and a positive family history.

Are there associated features that might help with the diagnosis? Ask about Ménière's disease features, such as aural pressure, fullness, dysequillibrium, fluctuating hearing. How intrusive is the tinnitus? Is your patient getting a good night's sleep?

What factors accentuate the tinnitus? Ask about stress, lack of sleep, alcohol, diet, noise exposure and take a critical look at their regular medications as many will have tinnitus as a recognized side-effect.

Examination

A thorough head and neck examination should include the oral cavity to inspect the palate, teeth and the temporomandibular joints. The examination should include an otoscopic inspection and assessment of the cranial nerves, balance, posture and gait. In cases of pulsatile or clicking tinnitus, the sound should be compared to the pulse. The effects of gentle pressure on the neck, light exercise and the Valsalva manoeuvre should be noted. Auscultation will verify objective tinnitus.

Audiology

Hearing loss of > 30 dB is found in about three quarters of tinnitus patients. An audiologic assessment will include pure-tone thresholds, acoustic impedance, speech audiometry and tests for maskability.

Laboratory requests are rarely necessary, though patients with pulsatile tinnitus may be evaluated for disorders that cause a high cardiac output (*e.g.*, anemia and hyperthyroidism), valvular heart disease and occlusive cerebrovascular disease.

Imaging

If a retrocochlear cause is suspected, the gold-standard imaging modality is an MRI with gadolinium contrast. Special techniques useful in the investigation of pulsatile tinnitus may include duplex carotid ultrasound, MRI/MRA/MRV, CT and, ultimately, cerebral angiography.

MRA: Magnetic resonance angiography MRV: Magnetic resonance venography

3. Patulous Eustachian tube

Individuals with patulous Eustachian tube often report a sound similar to a roaring ocean. Lying down produces venous congestion in the nasopharynx and closes the tube, relieving symptoms. A tympanogram may show changes in compliance on nasal ventilation. The patient may have a history of weight loss or radiation to the nasopharynx. Treatments have included the use of

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caustics and mucosal irritants to improve tubal closure. Various compounds have also been injected into and around the torus tubarius.

What's the main challenge in managing tinnitus?

While many patients believe they have a serious medical problem, this is rarely the case. Although not a psychologic disorder, the problems it causes are within the psychologic arena and tinnitus is most harmful in patients who report co-existing problems with poor sleep, chronic pain, isolation and depression.

Treating these problems is often an important part of tinnitus management.

The challenge is to thoroughly assess your patient to identify those who may have:

- Serious,
- Sinister or
- Simply treatable tinnitus (Table 1).

What are the mainstays of management?

Hearing loss should be aided and further hazardous exposure to noise and ototoxicity should be avoided. Silence should also be avoided and steps taken to enrich the patient's sound environment to provide adequate masking without adding undue trauma.

Tinnitus retraining therapy is a welcome alternative to more invasive and, often, unproven therapies (Table 2). This neurophysiologic model links negative emotional associations with tinnitus-related neural activity, the goal being to habituate the patient to the sounds of tinnitus rather than to abolish the sounds altogether. Habituation therapy exposes the patient to low-level broadband noise through wearable noise generators. The exercises developed by Jastreboff and colleagues gradually decouple the emotional response to tinnitus.[4]

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Table 2

Current treatment options for tinnitus

- Masking
- Antidepressants
- Benzodiazepines
- Lidocaine
- Electrical neuro-stimulation
- Enoxaparin
- Dexamethasone
- Stapedectomy in otosclerosis
- Gentamicin
- Ultra high frequency muscle stimulation
- Acupuncture
- Carbamazepine
- Ginkgo biloba
- Gabapentin
- Pulsed electromagnetic stimulation
- Hyperbaric oxygen therapy
- Meniett™ device

Treating Thomas

An audiogram shows bilateral high frequency, noise-induced hearing loss. He has no other risks for audio-vestibular damage and his general health is good.

Thomas's otoneurologic examination is normal. The noise is subjective.

You tell him that you are happy with his initial assessment, but are concerned that he is not sleeping. With reassurance, you offer a course of hypnotics and, as his symptoms are new, unilateral and intrusive, you perform an MRI scan with gadolinium enhancement.

As Thomas's sleep pattern is re-established, he appears better able to cope with his tinnitus. He has found the use of a pillow-level noise generator very useful. The scan is normal and Thomas is greatly relieved.

You explain the biophysiologic model of tinnitus to him and offer a course of counselling and the contact details for a local support group.

You see Thomas some months later. He has stopped his night sedation and is on his way back to work. He proudly shows you his new ear-defenders.

He tells you that, although he still hears the noise, it no longer bothers him.

Take-home message

- Tinnitus is common.
- Sinister, Serious and Simply treatable causes can be easily identified through a methodical approach.
- Some of the more exotic causes of pulsatile and clicking tinnitus are rare, but are worth your consideration as they may require specific investigation and may be amenable to specific interventions.
- The precise cause of tinnitus is unknown, but most tinnitus is amenable to retraining therapy and gets better with time.
- Beware of miracle therapies. There is no “quick fix.”

You should aim to:

- Aid restful sleep (tinnitus exploits the tired and weary).
- Aid co-existing hearing loss (most will have a loss).
- Avoid further hearing damage (noise/ototoxic medications).
- Avoid silence (use “sound enrichment” strategies, masking devices).
- Offer empowerment through access to self-help groups. Take a look at the Tinnitus Support Group of Atlantic Canada (**tinnitusatlantic.tripod.com**).

References
1. The British Tinnitus Association: http://www.tinnitus.org.uk.
2. Tinnitus Association of Canada: http://www.kadis.com/ta/tinnitus.htm.
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4. Jastreboff PJ: Tinnitus retraining therapy. Br J Audiol. 1999; 33(1):68-70.