Tinnitus Care: What Should I Know When Starting to Provide Tinnitus Care?

Presenter: William H. Martin, PhD
Professor of Otolaryngology at the National University of Singapore

Moderator: Carolyn Smaka, AuD, Editor in Chief, AudiologyOnline

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Tinnitus Care: What Should I Know When Starting to Provide Tinnitus Care?

William Hal Martin, PhD
National University of Singapore
Center for Hearing, Speech & Balance

Tinnitus

• What is it?
• What causes it?
• How does it impact patients?
• Tinnitus treatment vs. management?
• Where do I start?
Tinnitus
from the Latin tinnire, meaning to ring

Ringing, hissing, humming, buzzing, roaring, crackling, sizzling, wooshing, howling, grinding ...

No one else hears it but you.

What is tinnitus?

• The perception of sound, typically in the absence of an external acoustic signal.
• Objective - mechanical source
• Subjective - physiological but non-mechanical source
• Neural signals interpreted by the brain as sound
### Epidemiology

- **1999-2004 National Health and Nutrition Examination Surveys (NHANES)**
  - Any tinnitus: 25.3% >80 million
    - 26.1% of men
    - 24.9% of women
  - Frequent tinnitus: 7.9% >25 million
    - 9.4% of men
    - 6.5% of women

Shargorodsky 2010

### Increased odds of frequent tinnitus:

- White, non-Hispanic
- > 40 years old
- Smoker
- Hypertensive
- Diabetic
- Overweight
- High cholesterol
- Noise exposure
- Major depressive disorder
- Generalized anxiety disorder
- Have hearing loss

Shargorodsky 2010
Tinnitus

- In adults, exposure to sudden or prolonged sounds is the most commonly reported factor related to the onset of tinnitus. Meikle, Creedon, Griest 2007
- Present after 90% of acoustic trauma events. Mrena et al 2004
- Tinnitus may be an early indicator of impending NIHL. Griest & Bishop 1998

One way to prevent tinnitus is to reduce lifetime sound exposure

Tinnitus in kids

- Tinnitus in 7 year olds
  12% experience tinnitus
  2.5% say onset after loud sound. Holgers, K-M, 2003
- Tinnitus in 5-12 year olds
  37.5% experience tinnitus “sensation”
  19.6% experience tinnitus “suffering”
  Noise exposure significant risk factor. Coelho et al, 2007
Tinnitus in kids

9 - 11 year old students were asked:

“Do you ever experience ringing or other noises in your ear(s) or head?”

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>never</td>
<td>24%</td>
</tr>
<tr>
<td>rarely</td>
<td>28%</td>
</tr>
<tr>
<td>sometimes</td>
<td>30%</td>
</tr>
<tr>
<td>often</td>
<td>11%</td>
</tr>
<tr>
<td>always</td>
<td>6%</td>
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n = 1949

Martin et al. 2011

What causes tinnitus?
Mechanisms of Tinnitus

- **INDUCTION** of tinnitus usually involves peripheral pathologies that result in imbalances of activity in the CNS. Abnormal spontaneous neural activity produces tinnitus perception.

- **MAINTENANCE** of tinnitus involves central auditory structures that are not necessarily impaired.

Peripheral triggers

- Cochlear damage
- Head & neck injury
- TMJ
- Other?
Central triggers

• Metabolic
• Neurologic disease
• Stress
• Brain injury
• Other?

Long term effects

• Deafferentation
• Cytotoxicity
• Excitatory/inhibitor imbalance
• Cortical reorganization
• Thalamocortical disrhythmias
• Other?
In what ways does tinnitus impact a patient’s life?

- Difficult to concentrate: 85%
- Difficult to relax: 85%
- Irritable or nervous: 83%
- Uncomfortable in quiet: 83%
- Tired or stressed: 81%
- Interfere with social activities: 74%
- Hard to interact pleasantly: 73%
- Problems with sleep: 73%
- Cause you to feel depressed: 70%
- Interfere with work activities: 66%

OHSU Tinnitus Clinic - Martin et al., 2002
Why does tinnitus become a problem?

SOUND PERCEPTION & EVALUATION
Auditory and other cortical areas

DETECTION
Sub-cortical areas

SOURCE
Cochlea & auditory nerve

Neurophysiological Model of Tinnitus
Jastreboff, 1990
SOUND PERCEPTION & EVALUATION
Auditory and other cortical areas

DETECTION
Sub-cortical areas

SOURCE
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EMOTIONAL ASSOCIATIONS
Limbic system

REACTIONS

ANNOYANCE
Sympathetic nervous system

Neurophysiological Model of Tinnitus
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Sympathetic nervous system

Neurophysiological Model of Tinnitus
Jastreboff, 1990
Problematic Tinnitus

• Novelty
• Fear
• Selective attention
• Reinforcement
• Negative counseling
  “There’s nothing that can be done about it”
  “You may have a brain tumor”

Goal of Treatment Program

• To medically or surgically resolve active disease processes causing tinnitus
• To eliminate the presence of tinnitus

Whenever possible, active disease processes should be identified and treated prior to tinnitus management
Most begin their journey with a visit to the doctor’s office.
Problematic Tinnitus

MD visit

Active disease

No active disease

Objective tinnitus

Vascular abnormalities

- Congential arteriovenous fistula
- Acquired arteriovenous shunt
- Glomus juglare
- High-riding carotid artery
- Carotid stenosis
- Persistent stapedial artery
- Dehiscent juglar bulb
- Vascular loop (e.g. AICA or PICA)
Objective tinnitus

Mechanical disorders
- Patent Eustachian tube
- Palatal myoclonus
- Temporomandibular joint disorder
- Stapedial muscle spasticity

Problematic Tinnitus

MD visit

Active disease

No active disease

Subjective tinnitus
Active disease

Subjective tinnitus

- Otosclerosis
- Infections – bacterial, viral, fungal
- Autoimmune hearing loss
- Endolymphatic hydrops / Meniere’s
- Neoplasms
- Otitis media
- Benign intracranial hypertension

Subjective tinnitus

- Genetic predisposition
- Ototoxicity
- Vascular – hypertension, CVA, cerebral aneurysm, arteriosclerosis
- Metabolic – anemia, hypothyroidism, diabetes mellitus
- Head or neck injury
Problematic Tinnitus

MD visit

Active disease

No active disease

Treatment

Resolved

Problematic Tinnitus

MD visit

Active disease

No active disease
Subjective tinnitus

- Presbycusis
- Noise induced hearing loss - chronic
- Noise induced hearing loss – acute
- Genetic predisposition
- Ototoxicity
- Otosclerosis
- Post-operative hearing loss
- Endolymphatic hydrops / Meniere’s
- Idiopathic tinnitus

Problematic Tinnitus

MD visit

- Active disease
  - Treatment
  - Resolved

- No active disease
  - Tinnitus Management
Tinnitus: Questions to reveal the cause, answers to provide relief

RL Folmer, WH Martin, YB Shi

*Journal of Family Practice* 53(7): 532-540, 2004

“As with chronic pain, the treatment of chronic tinnitus is more accurately described in terms of management rather than cure.”

Goal of Management Program

• Reduce *perception* of and *reaction* to tinnitus until it is no longer a controlling factor in the person’s life

• Provide long-term *relief* and *control*

Where do I start?
Exploring new realms

- Captain
- Ship
- Map
- Sextant
- Supplies
- Crew
- Funding

Exploring new realms: The Captain
The Tinnitus Specialist
Tinnitus Specialist

The role of the tinnitus specialist often exceeds the realm of traditional audiology in order to produce effective tinnitus management

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed
Tinnitus Specialist

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The Ship – Setting up your tinnitus clinic
Exploring new realms: The Ship

Facility:
Test booth
Room for counseling and education
Medical exam room (later)

Equipment:
Audiometric test equipment
Hearing aid fitting and testing equipment
Specialized tinnitus matching system (later)

The Map – Choosing a course of tinnitus management
Exploring new realms: The Map

Progressive Tinnitus Management
Clinical Handbook for Audiologists

James A. Henry
Tara L. Zaugg
Paula J. Myers
Caroline J. Kendall

VA National Center for Rehabilitative Auditory Research

Five hierarchical levels of tinnitus management

Google: Progressive Tinnitus Management
The Sextant –
How do I know the patient is on course?
Exploring new realms: The Sextant

Questionnaires

The Questionnaires

- Tinnitus, hearing and medical histories
- Modified Beck Depression Inventory
- Anxiety index
- Tinnitus severity index
Depression inventory

Beck, A.T. Beck, R.W.
Screening depressed patients in family practice. A rapid technique
Postgraduate Medicine. 52(6):81-5, 1972 Dec..

Anxiety inventory

State-Trait Anxiety Inventory for Adults
Self-Evaluation Questionnaire
STAI Form Y-1 and Form Y-2

Developed by Charles D. Spielberger
in collaboration with R.L. Gorsuch, R. Lusher, P.R. Vagg, and G.A. Jacobs
<table>
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<td>TFI OHSU</td>
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<tr>
<td>Tinnitus Handicap Index</td>
<td>THI tinnitus</td>
</tr>
<tr>
<td>Tinnitus Handicap Questionnaire</td>
<td>THQ Iowa</td>
</tr>
<tr>
<td>Tinnitus Reaction Questionnaire</td>
<td>TRQ tinnitus</td>
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**Rated severity indicators**

**Visual analogue scales**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Visual numerical scales**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
Exploring new realms: Supplies
Gathering tinnitus management tools

Acoustical therapy: Devices

- Amplification (hearing aids)
- Ear-level sound generators
- Combination units
- Bluetooth streamers
- Table-top sound generators
- Sound pillows
Acoustical therapy: Phone apps

Best Relaxation & Meditation Apps

Exploring new realms: The Crew
Assembling your tinnitus team
Inactivity

Communication problems

Conflicting medications

Diet

Family stress

Sound exposure

Work stress

Hearing loss

Depression

Anxiety disorders

Sleep

Blood pressure

TMJ neck

Litigation

Grief

Tinnitus

Psychiatrist

Clinic administrator

Tinnitus Physician

Psychologist

Tinnitus Specialist

Martin, 2010
Exploring new realms: Funding
How do you get paid for your work?

• Insurance coverage?
• Devices?
• Fee for service?
  – By procedure
  – Bundled services
  – Hourly
Help! Rescue us!