

# TINNITUS

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# INTRODUCTION

- *Tinnire* – to ring. Tinnitus - ringing in the ear.
- perception of sound in absence of stimulation / no external acoustic source.
- A Conscious experience of a sound that originates in the head of the owner.
- hissing, sizzling and buzzing, pulsatile
- can be persistent, intermittent
- Can be perceived in one or both ears

# EPIDEMIOLOGY

- According to the American Tinnitus association 50M people in the US have chronic tinnitus(>6mon)<sup>1</sup>
- Can occur in children<sup>2</sup>
- prevalence increases with age and with hearing loss<sup>3,4</sup>
- Male > females<sup>1</sup>
- peak age 40-70 years<sup>4</sup>
- Whites > blacks<sup>1</sup>
- Greater risk in smokers and low SES<sup>1</sup>

# CLASSIFICATION

## 1. OBJECTIVE:

- can be perceived by the patient and also by the examiner.
- Is from somatosounds generated by sources adjacent to or within the ears or by structures that transmit sounds to the ear
- Can be pulsatile or non pulsatile

## 2. SUBJECTIVE:

- Perceived only by the patient
- Can be pulsatile or non pulsatile

# ETIOLOGY

OBJECTIVE	SUBJECTIVE
AV malformations	Meniers disease
Aberrant carotid artery	Otosclerosis
Persistent stapedia artery	Acoustic neuroma
Glomus tumours	Noise exposure
Dehiscent jugular bulb	Head trauma
Benign intracranial hypertension	Ototoxic drugs(aminoglycosides, loop diuretics, aspirin, antimalarials, cisplatin, vincristine)
Venous hum	Presbycusis
Artherosclerosis	Middle ear effusions
Pagets disease	Menengitis
Palatal myoclonus	TMJ disorders
Tensor tympani/stapedial myoclonus	Syphillis
High output states: anaemia, pregnancy, thyrotoxicosis	Depression

# PATHOGENESIS

- Tinnitus can be triggered anywhere along the auditory system
- Majority of patients have sensorineural dysfunction
- Somatosounds in the proximity of the cochlear can be perceived as tinnitus, usually the somatosounds are of vascular or musculoskeletal origin
- Various theories have been postulated for pathogenesis of tinnitus without somatic origin

# PATHOGENESIS

## a) Discordant dysfunction theory<sup>5</sup>:

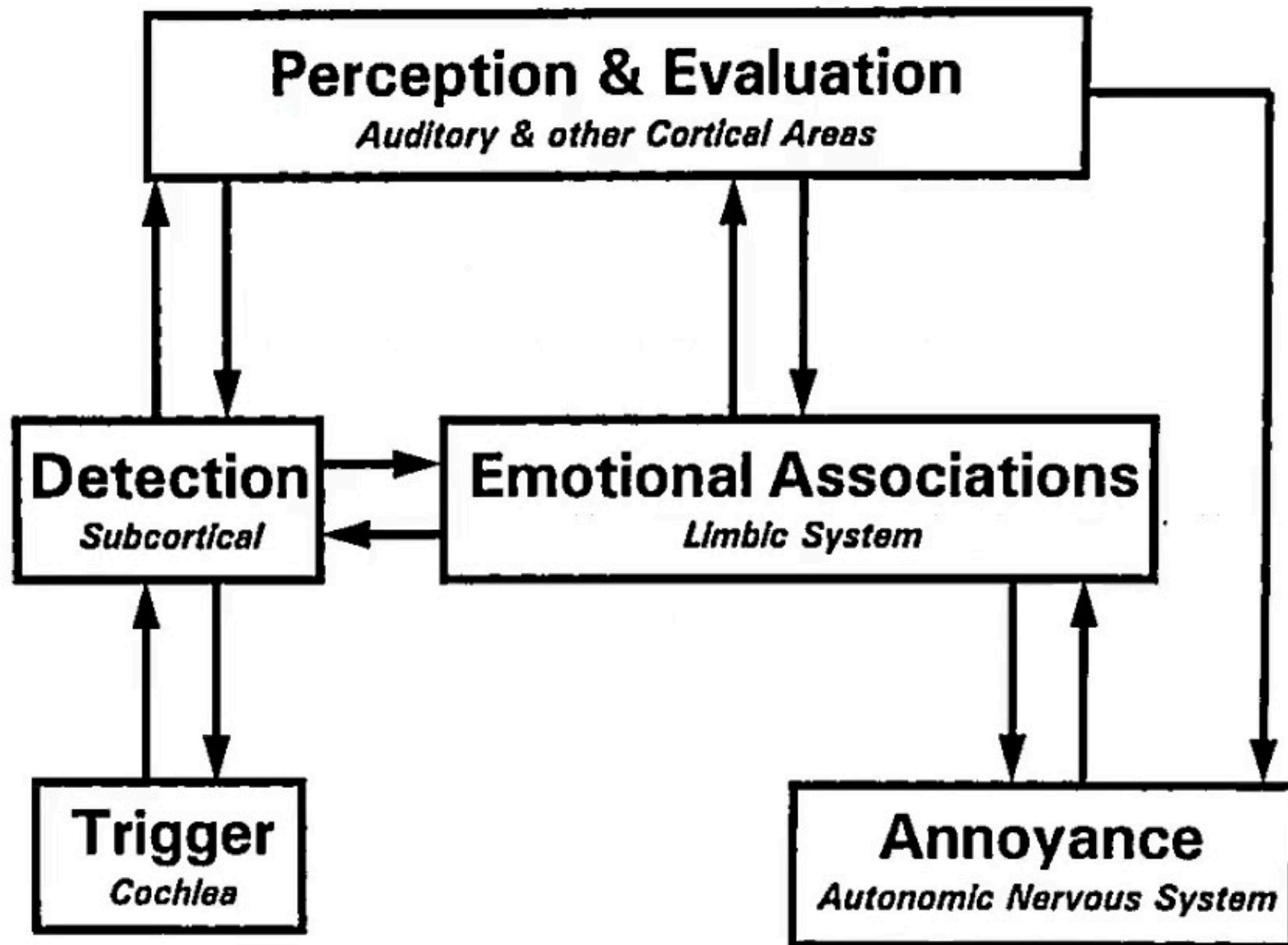
- Tinnitus is thought to originate from damaged or dysfunctional outer hair cell and relatively normal inner hair cells
- Increased neuronal activity is perceived as tinnitus by higher centres

# PATHOGENESIS

- b) Neural plasticity (like “phantom pain”) <sup>6</sup>
  - Deprivation of auditory input caused by hearing loss and exposure to loud noise causes hyperactivity in the nuclei of the auditory pathway
- c) Psychological disorders
  - Some patients with tinnitus have been shown to have other associated psychological disorders e.g. depressive illness



# JASTREBOFF NEUROPHYSIOLOGICAL MODEL<sup>11</sup>



# PATHOGENESIS

- f. Jastreboff neurophysiological model:
- Auditory pathway & several non auditory systems play essential role in tinnitus.
  - Stresses non auditory system dominates in determining annoyance level.
  - Proposes treatment by inducing & facilitating habituation to tinnitus signal.
  - Goal- To reach level though patient perceives tinnitus as unchanged, they aren't aware of it &/ or no annoyance occurs.

# HISTORY

1. Description of tinnitus : pulsatile, non-pulsatile, high pitch, low pitch, intermittent, constant
2. Aggravating or relieving factors
3. Previous ear disease, noise exposure
4. Hearing status
5. Head injury
6. TMJ dysfunction
7. Current/ previous medication
8. Medical conditions: hypertension, arteriosclerosis, neurologic illness/surgery
9. Ask specifically about: depression, anxiety, insomnia

# PHYSICAL EXAMINATION

- ENT EXAM: otoscopy, TFT, EUM
- Complete CNS exam : cranial nerves
- Auscultation for bruits: over the neck, periauricular area, temple, orbit, mastoid
- If tinnitus is of venous origin it can be suppressed by careful pressure on the jugular vein

# INVESTIGATIONS/EVALUATION

- Audiological assessment: PTA, tympanometry, acoustic reflex testing, speech audiometry, OAE, ABR
- Suspected vascular aetiology: angiography(MR or CT)
- FBC,ESR,U&Es,VDRL
- HRCT of temporal bone
- MRI: acoustic neuroma, chiari malformation, multiple sclerosis, raised ICP,

# TREATMENT

- Various treatments –most unsuccessful/unproven
- Treatment methods not able to reduce or eliminate the sensation on any consistent basis
- no drug that has been approved specifically for its treatment
- Counseling is key since most patients are frustrated and discouraged after being told by other health professionals “JUST LEARN TO LIVE WITH IT !” or “THERE IS NOTHING I CAN DO FOR YOU !”

# TREATMENT

- Various modalities:
  - a) Treatment of co-morbidities: depression, insomnia, drug toxicity, palatal myoclonus, glomus tumours e.t.c
  - b) Sound treatments/technologies
    - Hearing Aids
    - Masking devices
    - Neuromonics Tinnitus Treatment-combines acoustic stimulation with a structured program of counseling support by a clinician

# TREATMENT

## c) Behavioural treatment:

- Cognitive Behavioral Therapy
- Tinnitus Retraining Therapy
- Biofeedback, Education, and Relaxation Therapies

## d) Others :

- Transcranial magnetic stimulation
- Transcutaneous electrical stimulation
- Electrical stimulation and acupuncture



# COGNITIVE-BEHAVIORAL THERAPY

- Aim- to modify harmful behaviours & thoughts using “deconditioning” technique
- reduces arousal levels via relaxation therapy & changing –ve thoughts through cognitive therapy.
- Motivates the patient to alter their psychological response to their tinnitus by identifying and reinforcing coping strategies, distraction skills and relaxation techniques

# TINNITUS RETRAINING THERAPY

- Based on neurophysiological model.
- Goal-train CNS to interpret tinnitus as unimportant & ignore it.
- Has 2 components:-
  - intensive direct counselling.
  - sound therapy using sound generators which emit low level broad band noise.
- The patient reaches a point where they are unaware of the tinnitus unless they specifically and consciously focus on it

# TINNITUS RETRAINING THERAPY

- Conditioned reflexes involving connections of auditory with limbic & ANS are retrained such that the subconscious part of auditory pathway blocks the tinnitus signal.
- Acoustic input with unimportant information is ignored(habituation)
- Inducing & sustaining habituation of conditioned reflexes removes –ve impact of tinnitus

# MEDICAL

- Glutamate receptor antagonist –caroverine, memantine, Acamprosate
- Antidepressants-amitriptyline, nortriptyline, trimipramine
- Anxiolytics-Alprazolam
- Anticonvulsants- Carbamazepine, Gabapentin
- Vasodilators/ vasoactive substances- Prostaglandin E1
- Selective serotonin-reuptake inhibitors: fluoxetine and paroxetine
- Lidocaine IV /transtympanic

# MEDICAL

- Complementary and Alternative Medicine Therapies
  - Ginkgo Biloba Extract - glutamate antagonist, strong anti-oxidant
  - melatonin
  - Acupuncture and hyperbaric oxygen
  - diet modifications eg avoid high-sodium foods, caffeine, chocolate, and other stimulants

# BIOFEEDBACK AND RELAXATION THERAPIES

- control or habituate to the perceived ringing and the subsequent distress.
- Biofeedback therapy-listens to audio signal from EMG of frontalis muscle
- reduces perceived ringing & muscle tension
- strategies to self-manage their tinnitus.
- Relaxation therapies -focus pt's attention away from the sound; psychologically improving symptoms.