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Article

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Tinnitus after traumatic brain injury: an overview

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Abstract: Tinnitus is a frequent clinical feature encountered during follow up of Traumatic brain injury (TBI) that can be incapacitating in the long run. Literature suggests that post-TBI carries a higher psychological burden than tinnitus patients presenting with other non-traumatic or unknown etiologic. Posttraumatic tinnitus is of longer duration, frequently associated with hyperacusis and occurs in younger age group. If the symptoms are severe post-traumatic tinnitus can affect quality of life of the patients. The management of these patients needs detail evaluation and comprehensive rehabilitation plan.

Key words: Tinnitus, traumatic brain injury, auditory dysfunction

Introduction

Traumatic brain injury can lead to the damage to auditory nerve and cochlear structures resulting in hearing loss and labyrinthine dysfunction.^{1,2} Injury to cochlear hair cells can result in tinnitus which can persist a long time after TBI as a part of post-concussive symptoms.^{3,4} Many advancements have been made in the management of TBI, however little has been understood regarding the pathophysiology of post-traumatic tinnitus. Traumatic Brain Injury (TBI) has been reported to be associated with a spectrum

of sequel and the post-TBI tinnitus has been reported as a frequent yet difficult to treat symptom.^{5,6} It has been suggested that forces generated during trauma leads to neuronal dysfunction⁷ including injury to the otic capsule.^{8,9} or damage to the medullary somatosensory nuclei can cause tinnitus.¹⁰

Clinical spectrum

Tinnitus is a subjective feel and there is no specific test to confirm, all the details e.g. location, character, presence of hyperacusis, any rhythmicity or pulsatile component needs

to be obtained from the patient.^{11,12} Obviously these patients have history suggestive of traumatic brain injury and shall need standardized assessment to rule out other non-traumatic causes of tinnitus.¹³ Details needs to obtained include is the tinnitus affecting quality of life, whether it is disturbing sleep or concentration and increasing the psychological stress.¹⁴⁻¹⁶ Post-traumatic tinnitus needs to be differentiated from other non-traumatic causes of tinnitus. Usually post-traumatic tinnitus occur in younger patients, more severe in nature and accompanied by many other co-symptoms including frequent headache, impaired memory and concentration and transient episodes of depression.^{4,17}

Diagnosis

Selected audiological investigations will help to rule out treatable pathologies i.e. disruption of the ossicular chain disruption or any perilymphatic fistulas.¹⁸ Pure-tone audiometry shall help to assess any hearing impairment.¹⁹ In a patient who present with pulsatile tinnitus, we need to rule out trauma induced carotid-cavernous fistulas, arteriovenous malformations, and carotid artery dissections where the treatment approach will be entirely different.¹⁸ Appropriate imaging will help to rule out cervical spine injuries and any intracranial lesions as an underlying cause of tinnitus.^{11,18}

Management

The management of post-traumatic tinnitus is to control underlying pathology, management of any treatable cause and to suppress the tinnitus perception and thus to

improve the quality of life of the patient.^{20,21} Several categories of drugs have been used to manage post-traumatic tinnitus including drugs acting on vestibular system as well drugs to help to reduce concomitant psychological stress.²²⁻²⁴ Drugs which improve microcirculation in auditory systems have also not shown to be much effective.²⁵⁻²⁷ Betahistine, has been used to increase cochlear blood flow with variable success.²⁸ The management of post-traumatic tinnitus is largely conservative and surgery is reserved for the cases where there are underlying structural lesions as the cause of tinnitus (i.e. carotid-cavernous fistulas, arteriovenous malformations, and carotid artery dissections etc.)¹⁸ or there are any other underlying pathologies (i.e. Otosclerosis or Meniere's disease etc.).²⁹⁻³⁴ Brain stimulation techniques including repetitive transcranial magnetic stimulation are under investigation as non-invasive tool to manage tinnitus.³⁴⁻³⁹ Role of laser therapy has been explored in the management of tinnitus however how it works and much it is effective both are controversial.⁴⁰

Conclusion

Findings from this review hopefully going to help the health care providers and stakeholders working in this area of rehabilitation of TBI cases. Patients with tinnitus need extensive investigations regarding etiology and functional assessments to devise tailor-made plan of interventions to treat not only the auditory problems but also to address the associated deficits in patients recovering from TBI. Presently the treatment of post-traumatic tinnitus is directed towards

improving the quality of life as still there is not advancements to achieve definitive cure. In the clinical practice guidelines of the office practice of clinicians we need standard operative procedures (SOP) to help patients with tinnitus in an empathetic manner.

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