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SHORT COMMUNICATION

Effect of Heavy Exercise on Auditory system: A Pilot Study

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ABSTRACT
The increasing prevalence of ear-related complaints among athletes specially among weightlifters and individuals engaging in strenuous exercises has raised the concerns in the field of Shalakya (ENT). Symptoms such as ear fullness, vertigo, and tinnitus are becoming more common due to factors like barotrauma, Eustachian tube dysfunction, and disturbances in inner ear fluid dynamics. Repeated episodes of elevated blood pressure and intracranial pressure can lead to sensorineural hearing loss (SNHL) and noise-induced hearing loss (NIHL). This article explores the pathophysiology behind these conditions, highlights the associated risk factors, and presents preventive strategies. By integrating Ayurvedic practices like Dinacharya and Ritucharya, including Nasya therapy, Abhyanga, and Pranayama, alongside modern medical approaches, individuals can effectively manage and prevent these conditions. A holistic approach not only preserves auditory health but also prevents the progression of hearing loss. Early diagnosis and timely intervention are essential for effective management and improved quality of life.
Keywords- *Sports Injury, Sensorineural hearing loss, Noise-induced hearing loss, Dinacharya, Ritucharya, Nasya, Pranayama.*

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INTRODUCTION

Physical activities, especially certain sports or exercises, can raise the likelihood of ear injuries [1]. Below are ways in which sports can lead to ear injuries:

Trauma from Impact or Contact

Physical Contact: In contact sports like football, rugby, boxing, martial arts, or wrestling, the ears are at risk of direct trauma. [2] A blow to the head or ear, such as a punch, tackle, or fall, can cause injuries to the ear, including lacerations, bruising, or damage to the ear canal or eardrum.

Effect on Ear: Such impacts can lead to ruptured eardrums, hematomas [3] (blood collections), or external ear injuries (like "cauliflower ear" [4]), which occurs when the ear's cartilage is damaged due to repeated trauma, causing swelling and permanent deformity.

Barotrauma (Pressure Injuries)

Rapid Changes in Pressure: Certain exercises, particularly those involving diving [6], swimming, or altitude sports (such as mountain climbing), can expose the ear to rapid changes in pressure.

Effect on Ear: The middle ear is especially vulnerable to barotrauma[5], which occurs when the pressure inside the ear is not equalized with the outside environment. This can result in ear pain, temporary hearing loss, or even eardrum rupture if the pressure imbalance is not corrected, such as when diving too deep or ascending too quickly in altitude [5].

Water Exposure and Ear Infections (Swimmer's Ear)

Water Sports: Swimming, surfing, and other water-related sports can increase the risk of water entering the ear canal. If water is trapped in the ear, it can lead to bacterial or fungal infections (known as otitis externa or swimmer's ear) [7].

Effect on Ear: Continuous moisture and bacterial growth can cause pain, itching, and inflammation of the outer ear canal. Repeated exposure to water while swimming or diving can also increase the risk of ear canal injuries, such as scratches or abrasions, making the ear more susceptible to infections [8].

Repetitive Strain and Overuse

Strain from Exercise: Repetitive movements during certain types of exercise can strain the muscles and joints around the ear, particularly those in the neck and jaw area.[8] For example, repetitive head motions or exercises like rowing, lifting weights, or aerobic exercises involving rapid head movements can put undue stress on the structures surrounding the ear and especially on internal ear causing increased pressure at Reissner's membrane causing tinnitus and sometimes vertigo. If it continues for more time, it may lead to permanent damage to hair cells resulting into deafness [9, 10].

Effect on Ear: This can contribute to tinnitus (ringing in the ears), ear pain, or pressure caused by muscle tension in the neck and jaw, especially if the person is prone to jaw clenching or tension [10], which can also impact the ear.

Sudden Head Movements and Dizziness

Head Movements in Exercise: Some types of exercise, such as jumping, spinning can cause sudden shifts in body position or blood flow, which may lead to dizziness or vertigo.

Effect on Ear: The inner ear plays a critical role in balance, and any sudden change in movement can disrupt the vestibular system, leading to dizziness, vertigo, or a sensation of unbalanced motion. This can be particularly troublesome for those with pre-existing inner ear issues or conditions like benign paroxysmal positional vertigo (BPPV) [11, 12], which affects balance.

MATERIAL AND METHODS

In recent times, there has been a significant increase in patients visiting *Shalakya* (ENT) OPD with complaints of ear fullness, vertigo, and ringing or whistling sounds in the ears, particularly among individuals who engage in weightlifting and other strenuous exercises [13].

A pilot study was carried out at our hospital for ten patients who were athletes and had some complaints regarding auditory system.

Understanding the Symptoms [14]

Ear Fullness: A sensation of pressure or blockage in the ear that can affect hearing and balance.

Vertigo: A spinning or dizzy sensation that can disrupt balance and coordination.

Tinnitus: The perception of ringing, buzzing, or whistling sounds without an external source.

Pathophysiology

Barotrauma Mechanism [10]: During heavy lifting or intense exertion, the Valsalva manoeuvre (forceful exhalation against a closed airway) can lead to rapid changes in middle ear pressure. This disrupts the pressure equilibrium between the middle ear and the external environment, causing ear fullness and discomfort.

Eustachian Tube Dysfunction [15]: Intense physical activity can impair the Eustachian tube's ability to equalize pressure, leading to a sensation of blockage and potential fluid accumulation.

Inner Ear Fluid Dynamics [16]: Strenuous exercises can disturb the endolymphatic fluid balance in the inner ear, leading to vestibular disturbances and vertigo.

Cervical Spine and Vestibular Connection: Muscle tension and misalignment in the cervical spine from heavy lifting can affect the vestibular nuclei and auditory pathways, leading to dizziness and tinnitus.

Increased Blood Flow and Pressure [17]: Elevated blood pressure and increased cardiac output during exercise can affect the microcirculation in the cochlea and vestibular system, contributing to tinnitus and balance issues.[5]

Sensorineural Hearing Loss (SNHL) [18, 19]: Repeated episodes of barotrauma and increased intracranial pressure damage the delicate hair cells in the cochlea, leading to irreversible sensorineural hearing loss.

Noise-Induced Hearing Loss (NIHL) [20, 21]: The use of high-intensity headphones by youth or continuous exposure to loud gym environments during workouts causes cumulative damage to the auditory hair cells, leading to noise-induced hearing loss.

Risk Factors

- Excessive Valsalva Manoeuvre (forceful exhalation against a closed airway) [10]
- Poor posture during weightlifting
- Pre-existing ear or sinus conditions
- Use of high-intensity headphones or earplugs during workout.

Preventive Measures

Proper Breathing Techniques: Avoid holding breath during heavy lifts to prevent pressure build-up.

Gradual Progression: Increase the intensity of workouts gradually to allow the body to adapt.
Regular Ear Check-ups: Routine ear check-ups for early detection of any underlying issues.
Posture Correction: Maintaining proper form and alignment during exercises to minimize cervical strain.
Hydration and Nutrition: Supporting overall ear health with a balanced diet and adequate fluid intake.

RESULTS AND DISCUSSION

The increasing prevalence of ear-related issues among weightlifters highlights the need for a holistic approach to address these concerns. Conventional treatments focus on managing symptoms, but incorporating preventive strategies and lifestyle modifications can enhance overall ear health. Integrating ancient Ayurvedic practices [21], such as *Dinacharya* [22] (daily regimen) and *Ritucharya* [23] (seasonal regimen), can provide significant benefits in preventing and managing these symptoms.
Incorporating exercises as per *Dinacharya* (daily routine) and *Ritucharya* (seasonal regimen) is essential for maintaining the balance of doshas and promoting ear health:
Morning Practices (*Brahma Muhurta*): Practicing gentle yoga postures like *Bhujangasana, Matsyasana, and Shavasana* enhances blood circulation to the head and neck region, preventing stiffness and improving Eustachian tube function.
***Pranayama* (Breathing Exercises):** *Anulom Vilom* and *Bhramari Pranayama* help in regulating intracranial pressure and calming the nervous system, thereby reducing the risk of tinnitus and vertigo.
Seasonal Adjustments (*Ritucharya*) [24-26]:
***Vasant Ritu* (Spring):** Light and detoxifying exercises like *Surya Namaskar* and walking can help in balancing *Kapha dosha*, which is dominant during this season.
***Grishma Ritu* (Summer):** Cooling practices like *Shitali Pranayama* and gentle stretching reduce *Pitta dosha*, preventing inflammation in the ear and auditory pathways.
***Sharad Ritu* (Autumn):** Moderate exercises like walking are beneficial for balancing *Pitta.*
***Hemant* and *Shishir Ritu* (Winter):** Strength-building exercises like weight training and running can balance Vata and Kapha dosha when performed with proper warm-up and breathing techniques.
***Abhyanga* (Oil Massage):** Regular head and neck massage with medicated oils like *Ksheerabala* or *Mahanarayan Taila* enhances blood flow and reduces muscle tension.
***Shirodhara* (Oil Pouring on Forehead) [27]:** Continuous pouring of warm medicated oils like *Ksheerabala* or *Brahmi Taila* on the forehead calms the nervous system and balances *Vata* and *Pitta doshas*. It helps relieve stress-related ear issues such as tinnitus and vertigo by promoting mental relaxation and improving circulation in the head region.
***Nasya* (Nasal Administration of Medicated Oils):** Administration of medicated oils like *Anu Taila* or *Shadbindu Taila* through the nasal route helps clear the upper respiratory and auditory channels. It enhances blood circulation in the head and neck region, reduces inflammation, and balances *Vata*, thereby supporting ear health and relieving conditions like tinnitus, earache, and mild hearing loss [28].
***Karnapooran* (Ear Oil Instillation):** Regular instillation of warm medicated oils like *Bilva Taila* or *Nirgundi Taila* into the ears helps lubricate the ear canal, reduce dryness, and pacify aggravated *Vata*[29]. This practice supports auditory function, alleviates earache, tinnitus, and a feeling of fullness in the ears.

CONCLUSION

The growing incidence of ear-related complaints among weightlifters and athletes necessitates a proactive and holistic approach to preserve auditory health. Understanding the pathophysiology and adopting preventive measures can significantly reduce the risk of sensorineural and noise-induced hearing loss. By integrating Ayurvedic practices like *Dinacharya* and *Ritucharya* with modern medical interventions, individuals can achieve optimal ear health and prevent the progression of auditory disturbances. Timely diagnosis and expert guidance are crucial for effective management.

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