

## Current and Future Treatment Options for Hearing Loss

Somayeh Niknazar<sup>1,2</sup>, Shahrokh Khoshsiraf<sup>1\*</sup>

1. *Hearing Disorders Research Center, Loghman Hakim Medical Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.*

2. *Skull Base Research Center, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.*

**Correspondence to:** Shahrokh Khoshsiraf; Hearing Disorders Research Center, Loghman Hakim Hospital: Kamali Street, South Karegar Avenue, Tehran, Iran Shahid Beheshti University of Medical Sciences, Tehran, Iran Tell/Fax: +982151025182/+982155416130. Cell: +989121481025  
**Email:** [dr\\_khoshsiraf@yahoo.com](mailto:dr_khoshsiraf@yahoo.com)

Hearing loss is caused by several factors, such as genetic, aging, drug, infection and exposure to loud sound and around 360 million people worldwide have disabling hearing loss. Here, we discuss the current and future strategies for the treatment of hearing loss.

### Current Treatment for Hearing Loss

There are three basic types of hearing loss including conductive, sensorineural and mixed hearing loss. As the most common form of deafness, Sensorineural component accounts for around 90 percent of all hearing loss. Depend on the type, cause and severity of disease, some forms of hearing loss can be successfully treated by medicine, surgery and hearing aids. [1, 2]

### Conductive Hearing Loss Treatment

Conductive hearing loss is caused by problems which affect the outer ear (ear canal and ear drum) or middle ear and its ossicles (the malleus, incus, and stapes), such as congenital absence or abnormality of the external auditory canal, infection, cerumen or foreign body in the ear canal and traumatic injury. This condition delays or blocks the transmission of sound through the middle ear cavity to the inner ear. The conductive hearing loss is usually treated by medical interventions which focus on specific causes. However, in

the case of non-effective medical therapy, the hearing aids or cochlear implants are applied.

### Sensorineural Hearing Loss Treatment

When the inner ear, auditory nerve or brain cannot detect the sound waves, the Sensorineural hearing loss occurs, which can be a result of acoustic trauma, tumor, head trauma, aging, genetic and diseases. This form of hearing loss is generally due to the damage to the auditory hair cells. Since inner ear hair cells cannot be regenerated or recovered, sensorineural hearing loss is often irreversible, so the hearing aids are the most commonly used and effective treatment in these patients. When hearing aids are unable to restore the injured or lost hearing, hearing loss can be surgically improved by using cochlear implants.

### Mixed Hearing Loss Treatment

A combination of both conductive and sensorineural hearing loss is represented as Mixed hearing loss, which is caused by damage to the outer, middle and inner ear or auditory nerve. Depending on the reason, a combination of medication, surgery, hearing aids or a bone conduction implant (Baha®) may be used in mixed hearing loss.

### Future Treatment for Hearing Loss

For effective treatment of permanent injury to auditory system, researchers attempt to provide new biological approaches, such as stem cell and gene therapy [3, 4].

### **Stem Cell Therapy**

The possibility of replacement of damaged cells and tissues in all organs is provided by stem cells, which usually possess potential for self-renewal and differentiation. Recent research shows that cell therapy can be considered as a promising option on replacing or repairing of injured hair cells and spiral ganglion neurons in hearing loss. In fact, functional hair cell generation of the exogenous and endogenous stem/ progenitor cells is a major focus of research in this field.

### **Gene Therapy**

Gene therapy can also be a biological approach to deliver the therapeutic compounds into the cochlea, so the missing or defective genes of hair cells are replaced or repaired. In other words, gene therapy potentially induces hair cell regeneration by delivering the exogenous genes which are necessary for hair cell differentiation into the cochlea. Researchers try to discover a method which

could make gene therapy more effective for hearing loss.

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### **Conflict of Interest**

The authors declare no conflict of interest.

### **AUTHORS' ORCIDS**

Somayeh Niknazar: 0000-0002-9985-2144

Shahrokh Khoshshirat: 0000-0002-8568-627X

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