Journal of Health and Rehabilitation Research 2791-156X JHRR

For contributions to JHRR, contact at email: editor@jhrlmc.com

Editorial

Every One can Hear.

Sikander Ghayas Khan[1*]

[1]The University of Lahore

[*]*Corresponding Author: Sikander Ghayas Khan; Professor; Email: dr.sikander05@gmail.com*

Conflict of Interest: None.

*Khan SG., et al. (2023). 3(2): **DOI**: https://doi.org/10.61919/jhrr.v3i2.306*

Keywords: Cochlear Implants, Hearing Impairment, Mesenchymal Stem Cells, Regeneration Therapy, Stem Cell Research

The human ear, an integral part of our hearing and balance, is often affected by hearing impairment due to genetic defects, infections, head trauma, or exposure to loud noises. Although hearing aids and cochlear implants offer relief, they fall short of being a complete cure. However, the advent of stem cell research provides a promising way to treat hearing loss. This article focuses on stem cell therapy for hearing impairment, discussing its history, current research, and prospects in a medical research-oriented manner.

The concept of using stem cell therapy for hearing impairment is a relatively new paradigm. In the early 1990s, pioneering research began to explore stem cells as a potential remedy for hearing loss. Notably, W. Lou's 1994 study on the regeneration of hair cells in quails presented a groundbreaking discovery. The study revealed that nearly all hair cells in the damaged area could regenerate (1), fostering the potential use of stem cells to regenerate missing hair cells in humans, thereby restoring hearing.

A significant advancement occurred in 2012 with Dr. Sarah L. Boddy's team's work on differentiating mesenchymal stem cells (MSCs) into otic lineages. This study demonstrated that human MSCs could be induced to express genes crucial in otic lineages, suggesting that individuals with deafness could regain hearing ability through regeneration therapy (2). This breakthrough underlined stem cells' potential as a treatment for hearing loss.

Subsequently, the field has witnessed numerous studies and clinical trials. In 2017, researchers from Indiana University School of Medicine utilised induced pluripotent stem cells (iPSCs), akin to embryonic cells, to create inner ear organoids. These 3D structures mimic the inner ear's structure and function, offering a platform for studying ear development and testing therapies (3).

Another promising approach is using MSCs, found in bone marrow, adipose tissue, and elsewhere. These cells can differentiate into various cell types, including inner ear cells, and secrete molecules that aid tissue regeneration and reduce inflammation. Preclinical studies have demonstrated that MSCs can improve hearing and protect against noise-induced hearing loss in animal models (4).

Additionally, the potential of stem cell-derived exosomes in treating hearing loss is being explored. Exosomes are tiny vesicles containing signalling molecules. Studies indicate that MSC-derived exosomes can promote inner ear cell survival and combat oxidative stress, inflammation, and apoptosis, all contributing factors to hearing loss (5).

Despite these promising developments, several challenges remain before stem cell therapy becomes a mainstream treatment for hearing loss. These include optimising stem cell delivery to the inner ear, ensuring safety and efficacy, and developing standardised protocols for clinical trials.

In conclusion, stem cell-based therapies hold significant promise for treating various types of hearing loss, particularly sensorineural hearing loss, the most common form. With continued research and development, stem cell therapy could emerge as a novel method for restoring or improving hearing in individuals with hearing impairments, offering a valuable alternative to existing treatments like hearing aids and cochlear implants.

REFERENCES

1. Lou W, Dong M. Hair Cell Damage and Regeneration in the Quail Cochlea Following Kanamycin Ototoxicity. Zhonghua er bi yan hou ke za zhi. 1994 Jan 1;29(2):85-8.

2. Boddy SL, Chen W, Romero-Guevara R, Kottam L, Bellantuono I, Rivolta MN. Inner ear progenitor cells can be generated in vitro from human bone marrow mesenchymal stem cells. Regenerative medicine. 2012 Nov;7(6):757-67.

Journal of Health and Rehabilitation Research 2791-156X JHRR

3. Koehler KR, Nie J, Longworth-Mills E, Liu XP, Lee J, Holt JR, Hashino E. Generation of inner ear organoids containing functional hair cells from human pluripotent stem cells. Nature biotechnology. 2017 Jun;35(6):583-9.

4. Kanzaki S, Toyoda M, Umezawa A, Ogawa K. Application of mesenchymal stem cell therapy and inner ear regeneration for hearing loss: a review. International journal of molecular sciences. 2020 Aug 11;21(16):5764.

5. .Breglio AM, May LA, Barzik M, Welsh NC, Francis SP, Costain TQ, Wang L, Anderson DE, Petralia RS, Wang YX, Friedman TB. Exosomes mediate sensory hair cell protection in the inner ear. The Journal of clinical investigation. 2020 May 1;130(5):2657-72.