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The Interplay Between Oral Rehabilitation, Hearing Performance, and Cognitive Health: A Scoping Review of Implant-Retained Overdentures

Dr Velpula Nagalaxmi[1], Dr Faisal Taiyebali Zardi[2], Dr Ravali Talari[3], Dr Bachanavoni Prathibha Devi[4], Dr Mounika Dintakurthi[5]

[1]MDS, Professorand Head of the Department, Dept. of Oral Medicine & Radiology, Sri Sai College of Dental Surgery, Vikarabad, India
[2]MDS, Professor, Dept. of Oral Medicine & Radiology, Sri Sai College of Dental Surgery, Vikarabad, India
[3]Postgraduate Student,Dept. of Oral Medicine & Radiology, Sri Sai College of Dental Surgery, Vikarabad, India
[4]Postgraduate Student, Dept. of Oral Medicine & Radiology, Sri Sai College of Dental Surgery, Vikarabad, India
[5]Postgraduate Student, Dept. of Oral Medicine & Radiology, Sri Sai College of Dental Surgery, Vikarabad, India

Corresponding Author:

Dr Ravali Talari
Postgraduate Student,Dept. of Oral Medicine & Radiology, Sri Sai College of Dental Surgery, Vikarabad, India

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Background: Edentulism adversely affects mastication, speech, nutrition, and psychosocial well-being. Emerging evidence indicates potential links between oral dysfunction, hearing impairment, and cognitive decline. Implant-retained overdentures (IODs) enhance functional rehabilitation and may influence sensory-neural outcomes.
Objective: To systematically map current evidence on the effects of IODs on auditory and cognitive functions in edentulous individuals.
Methods: A scoping review was conducted in accordance with PRISMA-ScR guidelines. Peer-reviewed studies (2015–2025) reporting auditory and/or cognitive outcomes following IOD rehabilitation in adults were included.
Results: Evidence suggests that IODs can improve bone-conduction sound transmission and enhance cortical activation through masticatory stimulation, supporting neuroplasticity. However, current studies are limited in number and methodological rigour.
Conclusion: Implant-retained overdentures may contribute to improved sensory-neural health beyond oral rehabilitation. High-quality multicenter clinical trials are required to substantiate their auditory and cognitive benefits.
Keywords:*Implant-retained overdenture; Bone conduction; Hearing; Cognition; Mastication; Edentulism.*

INTRODUCTION

Edentulism — the complete loss of natural dentition — compromises mastication, speech, dietary quality, and social confidence. While conventional complete dentures offer esthetic replacement, insufficient stability often diminishes neuromuscular feedback and sensory input.

Implant-retained overdentures provide enhanced retention and functional efficiency, supporting better nutrition and patient satisfaction. Recently, attention has shifted toward understanding how improved oral function influences broader systemic health — especially hearing abilities and cognitive performance in ageing populations.

Two key mechanisms have been proposed:

1. **Bone-conduction sound transmission**
   Titanium implants may facilitate mechanical vibrations toward the cochlea.
2. **Neurocognitive stimulation through mastication**
   Chewing activates sensorimotor cortical regions responsible for memory and learning.

This scoping review synthesises available literature exploring the oral-ear-brain connection in IOD recipients.

METHODS

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A scoping review was conducted following Arksey & O'Malley and PRISMA-ScR frameworks.

Databases searched: PubMed, Scopus, Web of Science, Google Scholar, Cochrane Library.
Period: 2015–2025

Inclusion criteria

✔Edentulous adults rehabilitated with IODs

✔Hearing and/or cognitive outcomes reported

✔Clinical or observational study designs

Exclusion criteria

✘Non-implant prostheses

✘Animal studies

✘Partial edentulism lacks a separate analysis.

✘Non-English publications

Due to heterogeneity and limited samples, outcomes were narratively synthesised.

RESULTS

A small but growing body of research suggests that IODs may:
• Improve bone-conducted auditory perception
• Enhance cognitive processing via increased masticatory sensory input

Table 1. Summary of Included Studies

Banu et al.	2020	Pilot clinical	Edentulous adults	IOD	↑ Bone-conduction hearing	—
Balinski et al.	2020	Experimental	Mixed dentition adults	Skull vibration test	↑ Vibration transmission	—
Lee et al.	2021	Observational	Older adults	Dental implants	↓ Hearing impairment	—
Banu et al.	2015	Pilot	Edentulous adults	IOD vs denture	—	↑ Cognitive activation
Banu et al.	2024	Neuroplasticity	Adults with IOD	Improved mastication	—	↑ Brain activation

DISCUSSION

Improved occlusal stability with IODs enhances masticatory efficiency, activating periodontal and temporomandibular mechanoreceptors. Increased afferent input to the sensorimotor cortex supports cognitive functions such as attention and memory.

Simultaneously, the osseointegrated implant acts as a conductor, facilitating cranial vibration transmission and potentially improving auditory perception through the cochlea. Better hearing reduces cognitive listening effort — an important factor in preventing cognitive overload and decline.

Despite promising findings, generalisation remains limited due to:
• Small sample sizes
• Short follow-up periods
• Variability in assessment tools
Further research using standardised auditory and neurocognitive test protocols is essential.

CONCLUSION

Implant-retained overdentures extend their benefits beyond oral rehabilitation, offering a potential avenue to maintain sensory-neural health in the ageing population. Strengthened mastication and improved bone-conducted sound transmission contribute to enhanced auditory and cognitive outcomes.

Future interdisciplinary trials are vital to establishing definitive clinical guidelines supporting this innovative prosthodontic approach.

FIGURES

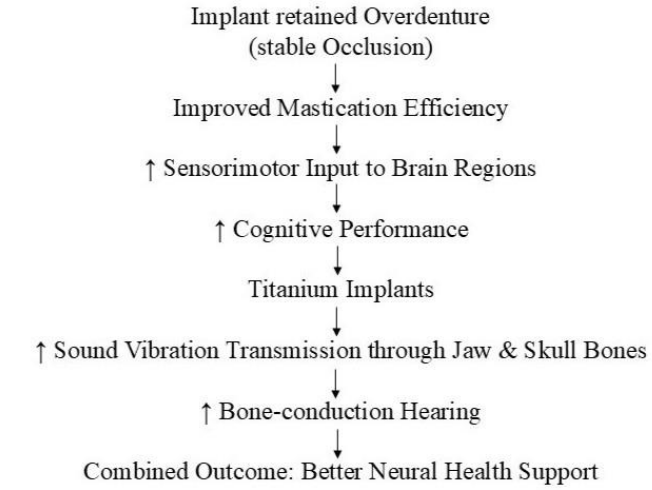

Figure 1. Integrated mechanism concept map showing dual pathways linking implant-retained overdentures with auditory and cognitive improvements.

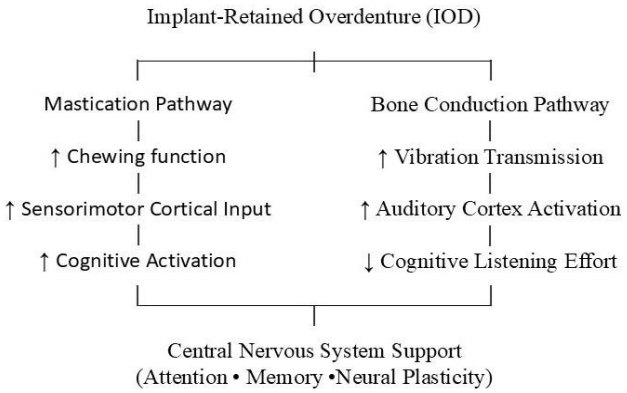

Figure 2. Dual-pathway model illustrating mastication-driven cognition enhancement and implant-mediated bone-conduction auditory benefits.

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The author acknowledges the contributions of the research community in advancing understanding of the multifaceted benefits of implant-retained overdentures. Collaborations across disciplines, including dentistry, audiology, and neurology, are essential for continued progress in this field.

Conflicts of Interest
The author declares no conflicts of interest related to this review.

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MeSH: Dental Implants; Hearing; Cognition; Edentulous Jaw; Prosthodontics

Highlights
• IODs enhance craniofacial bone-conduction of sound.
• Improved mastication promotes cortical sensory-motor activity.
• Oral rehabilitation plays a role in supporting cognitive resilience.
• Promising interdisciplinary opportunities exist across prosthodontics, neurology, and audiology.
• More robust, controlled studies are needed to confirm clinical significance.

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