



# The Need to Consider Vestibular Function in Cochlear Implantation

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Cochlear implantation (CI) is currently the only treatment method capable of restoring hearing in patients with severe to profound hearing loss. Although the safety and effectiveness of CI are widely accepted, there is a concern that insertion of electrodes into the perilymphatic space of the inner ear could affect vestibular sensory receptors. In particular, the recent increase in bilateral implantation could be associated with a higher risk of refractory vestibular dysfunction. However, during CI planning, such as selection of the side or method of implantation, vestibular function is still not considered important since achieving the best audiologic performance is crucial for implantees. However, the incidence of vestibular impairment after CI has been reported to be as high as 75%, indicating that its importance should be recognized [1-3].

Among patients who experience dizziness after CI, most (up to 63%) have been found to experience transient dizziness early after CI, which improves in several days, while persistent or recurrent dizziness has been reported in up to 32% of implantees [2,4]. The speculated reasons for early transient dizziness are mostly benign paroxysmal positional vertigo or reversible transient vestibular paresis, whereas significant vestibular dysfunction or associated auditory symptoms were more frequently observed in persistent or recurrent cases [2,4]. The suspected mechanisms are as follows: a direct injury or perilymphatic fistula [4-6], associated labyrinthitis [1], chronic foreign body reaction and fibrosis [2,5], and formation of endolymphatic hydrops [1,5]. Saccular injury was most frequently observed in vestibular organs, followed by injuries of the utricle and semicircular canals [5,7]. In this regard, previous studies reported that CI-associated vestibular impairment can be effectively assessed using vestibular myogenic potential or bithermal caloric tests [4,8,9].

The reported prevalence of underlying vestibular dysfunction in candidates for CI is as high as 71%; therefore, a preoperative assessment of vestibular function and careful consideration dur-

ing surgical planning are required [4,10]. In particular, meticulous attention is required in elderly patients or patients with preoperatively confirmed vestibular dysfunction, as these patients may have a diminished functional rehabilitative reservoir [6]. In addition, bilateral CI was reported to be associated with a higher risk of dizziness and vestibular impairment [11]. If possible, sequential bilateral implantation with a careful assessment for changes in vestibular function after the first surgery could be considered. The recently emphasized concept of “soft surgery” has shown positive results in terms of reducing CI-induced vestibular impairment through the selection of a round window approach rather than a cochleostomy [3,4], the insertion of precurved or soft electrodes [12], and steroid administration [6]. However, active research on this topic is ongoing, and a definitive conclusion can be drawn only with adequate data [3,4,8,13].

Evidence suggests that vestibular function can be affected by CI, and a considerable number of candidates for CI have underlying vestibular dysfunction. Therefore, vestibular function must be carefully assessed and considered during the planning and clinical procedures for CI, especially in patients undergoing bilateral CI or those with an elevated risk of vestibular dysfunction.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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