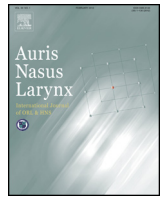




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## Evidence of surgical treatments for intractable Meniere's disease

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### ABSTRACT

Meniere's disease is an inner ear disease, characterized by recurrent rotatory vertigo, sensorineural hearing loss and tinnitus. There are some with frequent vertigo attacks, progressive hearing loss and persistent annoying tinnitus even through the continuous standard medical treatments. These cases are thought to account for 10%–20% of all cases of Meniere's disease. In this review article, we would like to demonstrate the evidences for surgical treatments according to the previous papers, and consider the next therapeutic strategies including surgical options according to the international guidelines.

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### 1. Background

Meniere's disease is an inner ear disease with an incidence of 15–50 per 100,000 population, and is characterized by recurrent attacks of episodic vertigo, fluctuating sensorineural hearing loss and persistent tinnitus [1]. Its pathology was first revealed to be inner ear hydrops through temporal bone studies by Yamakawa in Osaka [2] (Fig. 1) and Hallpike in London [3] simultaneously in 1938. Some patients with Meniere's disease are prevented from participating in activities of daily life and interaction with their social environment, such as work and schooling. This is because of frequent attacks of vertigo, especially with progressive profound hearing loss and unremitting tinnitus, in spite of various types of medication including diuretics. This type of Meniere's disease is called intractable Meniere's disease [1,4].

It is the fact that there are some with intractable vertigo attack, progressive hearing loss and persistent annoying tinnitus even through the continuous standard medical treatments as mentioned above [1,4]. On the other hand, it is also the fact that

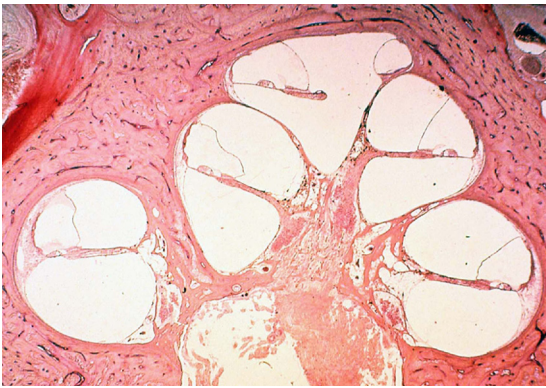
some of them achieve complete freedom from vertigo attacks in advance of the next therapeutic strategy. Therefore, the actual therapeutic efficacy of surgical treatments for Meniere's disease has been controversial until now and required to be evaluated strictly all the time [5]. However, it is not feasible to make planning a single or double blind study to evaluate surgical effects on this disease. It is also not so easy to prepare a non-surgical observation group as controls, because traditional surgeries for this disease are supposed to have some effects all over the world [1,4]. As far as pointed out by surgery for Meniere's disease in Cochrane Library [6] and endolymphatic sac surgery for Meniere's disease in a systemic review and meta-analysis [7], there have been only two papers of Bretlau et al. in 1989 [5] and Thomsen et al. in 1998 [8], which demonstrated randomized controlled trials of surgeries for Meniere's disease strictly. The lack of highly qualified EBM in surgeries for Meniere's disease usually makes it a rule to lead us to take less effective conservative non-surgical medical treatments, resulting in unremitting floating sensation and progressive sensorineural hearing loss [9] in bilaterally affected ears [10].

What we expect to surgery for intractable Meniere's disease is quite simple: effectiveness to reduce vertigo attack frequency

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**Fig. 1.** The first demonstration of histopathology of endolymphatic hydrops in Yamakawa's case in 1938.

and safety to accomplish hearing preservation at least. In this review article, we would like to discuss the present status of surgical treatments for Meniere's disease, such as endolymphatic sac surgery (inner ear conservative surgery), vestibular neurectomy and intratympanic gentamicin (inner ear ablative surgery), based on evidences raised by surgery for Meniere's disease in Cochrane Library [6] and endolymphatic sac surgery for Meniere's disease in a systemic review and meta-analysis [7]. Especially, we focused on the actual effects of each treatment on vertigo suppression and hearing improvement.

**2. Algorithm**

Among the surgical indication criteria for Meniere's disease presented at 2008 Lancet Seminar by Sajjadi and Paparella, there are examples of intractable cases that showed resistance to drugs and psychotherapy for at least 3–6 months, frequent vertigo, and hearing loss [1]. These cases are thought to account for 10%–20% of all cases of Meniere's disease [4]. The internationally accepted standards for judging the effectiveness of treatment for Meniere's disease were published by AAO-HNS in 1995 [11], and thereafter by International Classification of Vestibular Disease (ICVD) of Barany Society Meeting in

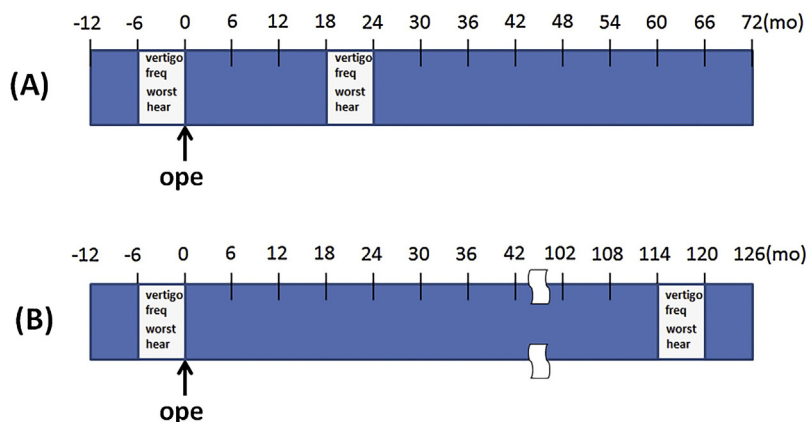
2015 [12]. Using these criteria, we compare the number of vertigo attacks and the worst hearing levels recorded at 6 months before surgery and at 18–24 months after surgery (Fig. 2A). To examine 10-year postoperative results, we must compare the number of vertigo attacks and the worst hearing levels recorded during the 6 months before surgery to those at 114–120 months after surgery (Fig. 2B). In this paper, we present a thesis based on international guidelines that evaluates therapy using effect judgment.

**3. Evidence**

*3.1. Endolymphatic sac surgery*

Endolymphatic sac surgery, which was created by Portmann in Bordeaux in 1927 [13], became known worldwide as the endolymphatic sac–mastoid shunt technique, in which an incision is made in the lateral wall of the sac lumen (Fig. 3A). The Portmann's surgery was modified as the endolymphatic sac–arachnoid shunt technique by Yamakawa-Naito in Osaka and House in Los Angeles [14] (Fig. 3B), but did not last so long because of risk-benefit matters. Endolymphatic sac surgery is a surgical procedure that aims to further improve the preservation of ear function. It is performed under general anesthesia, whereby simple mastoidectomy is performed to approach the endolymphatic sac, and the sac is incised to release endolymphatic hydrops.

In the 2-year results of endolymphatic sac surgery by Moffat [15], Huang [16], Gibson [17], and Gianoli [18], complete suppression of vertigo was achieved in 43.0%, 84.4%, 56.8%, and 60.0% patients, respectively, and hearing preservation with >–10 dB (or hearing improvement with ≥10 dB) occurred in 74.0% (19.0%), 83.4% (12.8%), 44.2% (4.7%), and 82.0% (66.0%) of patients, respectively. The 2-year results of Gianoli's surgery are eye-catching, but in a review of Gianoli's 5-year surgery results by Astrowski et al., complete suppression of vertigo was achieved in 47.0% patients and hearing preservation (or improvement) in 82.0% (18.0%) [19]. Although these results have been evaluated in



**Fig. 2.** AAOHNS-1995 guidelines for the judgement of treatment effects .

(A) To examine 2-year postoperative results, we must compare the number of vertigo attacks (vertigo freq) and the worst hearing levels (worst hear) recorded during the 6 months (mo) before surgery (ope) to those at 18–24 months after surgery.

(B) To examine 10-year postoperative results, we must compare the number of vertigo attacks (vertigo freq) and the worst hearing levels (worst hear) recorded during the 6 months (mo) before surgery (ope) to those at 114–120 months after surgery.

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