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Incidence of Developing Contralateral Ménière's Disease in Patients Undergoing Transmastoid Labyrinthectomy for Unilateral Ménière's Disease

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Abstract

Objectives: To analyze the incidence of developing contralateral Ménière's disease (MD) in patients who undergo labyrinthectomy for vestibular dysfunction in unilateral MD. **Study Design:** Retrospective chart review. **Participants and Methods:** Adult patients with a diagnosis of MD who underwent surgical labyrinthectomy with minimum follow-up of 12 months were included. Patients who experienced chemical labyrinthectomy, surgical labyrinthectomy for a diagnosis other than MD, contralateral ear surgery, or bilateral MD before the labyrinthectomy were excluded. The key outcome measure is whether symptoms of MD developed in the contralateral ear post-labyrinthectomy. Statistical analysis was performed using χ^2 (Fisher exact) test for discrete variables and the Student *t* test for continuous variables. A *P* value < .05 was considered significant. **Results:** Of the140 patients who underwent labyrinthectomy for intractable vertigo due to unilateral MD, 84 had at least 1 year follow-up appointments. Twelve percent (10/84) of these patients developed contralateral MD, which was diagnosed by a neuro-otologist based on symptoms consistent with MD, including low-frequency sensorineural hearing loss. Average age in years is 63.12 (10.83; mean [SD]) at time of surgery. Average follow-up was 35.57 (15.89) months (range: 12-69 months). **Conclusion:** The incidence of contralateral MD development in patients who underwent labyrinthectomy for unilateral MD is 12%. The current literature states that MD has a 30% bilateral involvement rate. Our incidence is significantly lower when compared to the current literature.

Keywords

labyrinthectomy, Ménière's, disease, contralateral, bilateral, endolymphatic hydrops

Introduction

Ménière's disease (MD) is an inner ear disorder characterized by fluctuating low-frequency sensorineural hearing loss, aural fullness, tinnitus, and vertigo. The disease was first described in 1861 by the Parisian physician Prosper Meniere.[1] This disease affects approximately 190 in 100 000 people in North America.[2] Although the pathophysiology of MD is not entirely understood, the most commonly attributed etiology is endolymphatic hydrops, an increase in endolymph in the inner ear spaces causing inner ear dysfunction and the characteristic symptoms.[3] However, not all patients with endolymphatic hydrops experience symptoms of MD.[4] There have been certain genetic studies attributing the vestibular dysfunction aspect of MD to certain exome sequencing such as variants in PRKCB, DPT, and SEMA3D genes.[5] Sugihara et al demonstrated on computed tomography that the longer and narrower vestibule anatomy could have an anatomical basis for the pathophysiology of Ménière's.[6]

Labyrinthectomy may be indicated in patients with unilateral MD that is refractory to medical management. In cases of minimal-serviceable hearing, this surgery has been successful in treating uncompensated, unilateral vestibular dysfunction causing disabling vertigo. With a labyrinthectomy, the input of the semicircular canals and vestibule is destroyed by removing the neuroepithelium of the semicircular canals, saccule, and utricle.[7] The major drawback to violating the inner ear is loss of all hearing on the operated ear. Thus, it is essential to test the hearing and vestibular function of both ears prior to labyrinthectomy.

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The incidence of MD affecting bilateral ears has been shown in the literature to be approximately 30%.[8,9] Greven and Oosterveld reported that as high as 73% of patients with MD experience tinnitus or hearing loss of the contralateral ear.[10] A study in Japan performed histological analysis of temporal bones and found the incidence of bilateral MD to be 30%.[11] This indicates the importance of taking into consideration both ears when addressing intractable vertigo in MD, especially for patients who elect to undergo a nonreversible procedure such as a labyrinthectomy. Rosenberg et al have shown that the incidence of developing bilateral MD is significantly higher in medically treated patients with unilateral MD than surgically treated patients; these surgical interventions include cochleovestibular neurectomy, cochleosacculotomy, and vestibular nerve section.[12] There have been no studies describing the incidence of developing bilateral MD in patients who receive labyrinthectomy for unilateral vestibular dysfunction. The objective of this study is to describe the incidence of contralateral MD in patients who undergo surgical labyrinthectomy and have no contralateral ear involvement prior to the surgery.

Materials and Methods

This study is a retrospective chart review. The study was approved by the institutional review board of Ascension St. John–Providence. Data for all patients who underwent the labyrinthectomy procedure through the Michigan Ear Institute from years 2008 to 2017. Chart review of 212 patients was conducted, and appropriate patients were included in the study using the following inclusion and exclusion criteria. Included were patients with a diagnosis of unilateral MD by a neurotologist using the 1995 AAO-HNS Guidelines for the Definition of MD. All patients had undergone transmastoid labyrinthectomy and were older than 18 years. Excluded were patients who underwent chemical labyrinthectomy, had a surgical labyrinthectomy for a diagnosis other than MD (ie, traumatic vestibular weakness), or patients with less than 1 year of follow-up.

All participants included in the study were diagnosed with unilateral MD by a neuro-otologist. Patient sex, age, date of surgery, laterality, and date of follow-up were collected and recorded. In all cases, the diagnosis of MD included unilateral, fluctuating, and low-frequency sensorineural hearing loss documented on audiogram. In end-stage MD with minimal serviceable hearing, a patient may elect to undergo labyrinthectomy. Minimal serviceable hearing in this study was defined as speech recognition threshold greater than 50 dB and speech discrimination less than 50%.

We ensured patient anonymity and confidentiality of records by excluding all key patient identifiers in the study, such as name, date of birth, medical record number, financial information number, or patient photos.

The key outcome variable was whether patients developed symptoms of MD in the contralateral ear on their follow-up visits. Patients were considered to have developed contralateral MD if it was documented during any of their postoperative office visits; symptoms include fluctuating low-frequency sensorineural hearing loss, vertigo, aural fullness, and tinnitus. Statistical analysis was performed using χ^2 (Fisher exact) test for discrete variables and the Student t test for continuous variables. A P value of less than .05 was considered significant.

Results

A total of 212 patients who underwent labyrinthectomy between 2008 and 2017 were reviewed. Eighteen patients had a transcanal labyrinthectomy approach, whereas 194 patients received the transmastoid approach for labyrinthectomy. Of these total patients, 128 were excluded from our study. Of these, 50 were excluded as they had labyrinthectomy for other reasons, 56 were excluded because they did not have at least a 1-year follow-up after the labyrinthectomy, and 21 patients had incomplete medical records and had no documentation of the surgery. One person was deceased. All patients had a follow-up period of at least 12 months. The range of follow-up period was between 12 months and 60 months. The mean follow-up time was 20.6 months (standard deviation [SD]: 19.3 months).

A total of 84 patients met inclusion criteria. All patients had intractable vertigo that was refractory to maximal medical therapy. The average age at the time of surgery was 63 years (standard deviation: 11 years). Surgery was performed in the right ear in 45% (n = 38) of patients and 55% (n = 46) in the left ear. Most patients had been diagnosed with MD for at least 5 years prior to receiving labyrinthectomy.

Of all patients receiving surgery for end-stage MD, 12% (10/84) developed MD in the contralateral ear greater than 12 months after surgery. In this subset of patients who developed contralateral MD, contralateral disease developed at a mean of 24.6 months (SD: 21.5 months) after receiving surgery. Comparatively, the patients who did not develop contralateral MD had a mean follow-up period of 20.4 months (SD: 19.6). t testing for equality measures did not show statistical significant difference in the follow-up periods between the 2 groups ($P < .005$).

Discussion

This study focuses on patients who had a diagnosis of unilateral MD and elected to undergo labyrinthectomy for intractable vertigo. These patients were then followed for a minimum of 12 months to assess their hearing and symptomatology of MD in the contralateral ear. The prevalence of contralateral MD in patients who undergo labyrinthectomy for unilateral MD has not been studied in the past.

The results of this study are contrasted with those presented by Yazawa and Kitahara, where histological analysis of 67 bilateral temporal bones delineated that there is a 30% incidence of bilateral MD.[11] The reason this study was chosen as a baseline for our comparisons is because Yazawa and Kitahara demonstrated histological MD changes in cadaveric temporal bones, which is the most definitive diagnosis for MD.

The demographics of the population in our study correlate with the age of onset and gender predilection found in the literature. The age of onset for MD is typically around 53 years with a range of 40 to 69 years.[13] The predilection of MD is about equal, with a slight female predominance.[14] The average age of patients in this study is 63 years. This falls within the latter range for age of onset in MD as stated in the current literature. Since this article is focusing on end-stage MD, the demographics correlate on par with the current literature. Our study indicated a predominance of female patients, which correlates with the current literature.

The typical treatment of MD consists of a low salt diet, a decrease in caffeine intake, in appropriate situations, and a diuretic. During episodes of fluctuating sensorineural hearing loss, patients may be prescribed oral steroids, intratympanic (IT) steroids, or a combination of both.[15] Certain patients may elect to undergo endolymphatic sac surgery as a hearing preservation procedure to release pressure in the endolymphatic sac to control intractable symptoms. All patients within this study received maximal medical therapy before considering surgical labyrinthectomy as an option. This included lifestyle modifications such as increased hydration and a low salt diet, as well as a diuretic if the patient could tolerate the medication without significant side effects. The average time frame in which patients underwent maximal medical therapy prior to surgical intervention was 5 years. Certain patients also failed IT steroid therapy and endolymphatic sac decompression and only had resolution of their symptoms with a labyrinthectomy. The success rate of labyrinthectomy for control of intractable vertigo in MD is reported to be around 90%.[16]

Patients typically report a significant improvement in their quality of life after a labyrinthectomy despite the definite loss of hearing.[17] The study by Diaz et al demonstrated that there is significant improvement in the Ménière's Disease Outcomes Questionnaire in the majority of patients who undergo labyrinthectomy for unilateral MD. Interestingly, the one patient in that study who reported a negative change in physical quality of life score developed contralateral MD 15 months after labyrinthectomy. Despite the definitive loss of hearing and the risk of developing contralateral MD, these patients typically experience great improvement in overall quality of life. Future studies should include quality of life surveys to confirm these findings.

The results of this study show that in patients who received labyrinthectomy for end-stage MD, 12% developed MD in the contralateral ear greater than 12 months after the surgery. The reported estimate for the incidence of bilateral MD ranges from 2% to 78% in the current literature.[17,18] However, the accepted prevalence rate is around 30%.[11,19] This study is significantly less than the currently stated literature for 30% bilateral MD. The 12% risk of developing bilateral MD is still substantial, and a patient with unilateral MD choosing to undergo labyrinthectomy should be fully aware of this possibility.

There are certain weaknesses in the study. First, due to the retrospective nature of this study, many patients had to be excluded due to inadequate records. Another challenge in any clinical study of MD is the certainty of the diagnosis; it is possible that symptoms of vertigo could have been multifactorial. To minimize the chance of this happening, we excluded all patients with additional diagnoses, such as traumatic vestibular weakness and benign paroxysmal positional vertigo, that could cause Ménière's symptoms documented on the operative report or clinic notes. Another weakness in this study is that our follow-up time status post-labyrinthectomy may be too short to fully assess the natural progression of MD and bilateral evolvement. Multiple studies have shown that the risk of bilateral MD decreases with time, and manifestation of bilaterality is typically within the first 5 years of the onset of symptoms.[16,20] This study focused on patients with end-stage MD, and the majority of patients have had symptoms of MD greater than 5 years before their labyrinthectomy surgery. Again, due to the respective nature of this study, not all patients had documented exact onset date for their MD.

Conclusion

In conclusion, the incidence of contralateral MD development in patients who underwent labyrinthectomy for unilateral MD is 12%. The current literature states that MD has a 30% bilateral involvement rate. Our incidence is significantly lower when compared to the current literature.

Declaration of Conflicting Interests

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