Original Article

Diuretic Agents in Treatment of Sudden Deafness

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Abstract  Objective To study the role of diuretic agents in treating sudden deafness (SD) and explore the possibility of endolymphatic hydrops as a potential cause of SD.  Methods Twenty-eight SD cases were reviewed. In 23 cases, treatment was initiated with routine agents. Diuretic agents were later added in 8 of these cases that failed to respond to routine treatment agents. Diuretic agents were included in the initial treatment in the rest 5 cases. In total, 13 cases received diuretics in addition to routine treatment agents and 15 cases received conventional treatment only.  Results In the 8 cases who received diuretics after failed conventional treatments, 4 showed hearing improvement, whereas all 5 cases in which diuretics were included in the initial treatment demonstrated hearing improvement.  Conclusion These results suggest a possible role of endolymphatic hydrops in the pathophysiologic course of SD. Diuretics should be considered when clear indications exist with no conflicts to other medical conditions.

Key words sudden deafness; Endolymphatic hydrops; Diuretics

Introduction

Sudden deafness (SD) is a symptomatic diagnosis, and its etiopathogenesis remains to be determined. Proposed causes include viral infection, microcirculation disorder and autoimmune disorders. Accordingly, routine treatments include vasodilation, reduction of blood viscosity and administration of neurotrophic supplements. Some reports have proposed that endolymphic homeostasis may be a potential cause of SD. In the current report, the effects of diuretic agents are reviewed in several SD cases with complaints of ear fullness:

Clinical data and results

Twenty-eight SD cases treated and followed between 1999 and 2003 were reviewed. The diagnostic criteria and therapeutic outcome assessment recommendations published in Chinese Journal of Otorhinolaryngology in 1997 were used. Hearing loss was graded using Goodman’s classification (1965). The patients included 14 man and 14 women, aged from 12 to 63 years. Of these patients, 66.3% were young or middle aged (21 to 50 years) adults. Tinnitus was present in 25 cases and vertigo in 12 cases.

In addition to auditory symptoms, hyperlipemia (n=3), combined hyperlipemia/hypertension (n=1) and combined hyperglycemia/adiposis hepatica (n=1) were also identified in some patients.

In 23 cases, treatment was started with only agents routinely used by the authors for SD, which included nimodipine, betahistine, vitamin B complex, ginkgo biloba, danshen root, Jingwu capsule (containing fleeceflower root, solomonseal rhizome, glossy privet fruit and yerbadetajo herb), and mecobalamine. Treatments were started within 1 day of onset of symptoms in 3 cases, within 1 week in 15 cases, between 8 and 15 days in 3 cases, and between 23 and 30 days in 2 cases. See table 1
for audiometric classification and final treatment outcomes in these 23 cases..

In 15 of these cases, hearing failed to improvement following initial conventional treatment. In 8 of the 15 cases, the patient reported significant sensation of fullness in the affected ear, which was considered an indication of endolymphatic hydrodrops. Other symptoms in the 8 cases included coexisting tinnitus and vertigo (n=3) and stand-alone tinnitus or vertigo (n=2). Furosemide test was conducted and positive in 2 cases. Glycerol test was performed and showed negative results in 3 cases, including 1 that showed positive furosemide test results. Diuretic agents were used in these 8 cases, which included dihydrochlorothiazide/triamterene (25/50 mg) b.i.d. (n=3), alismae rhizome q.d. (n=4), and Wuling (dried xylaria) powder q.d. (n=1). Hearing improvement was noticed in 4 cases on the 5th (n=2), 12th (n=1) and 14th (n=1) therapeutic days. Of these 4 cases, 1 was tested positive on furosemide test, 1 negative on glycerol test, and the rest 2 were not tested. During the 6–24 month follow-up period, their auditory threshold fluctuation was within 10 dB, with no recurrence of vertigo, although residual dizziness was reported in 1 case.

Encouraged by this experience, we decided to include diuretic agents in the initial treatment for the subsequent 5 SD cases, who complained of sensation of fullness or vertigo in addition to hearing loss. Complete hearing recovery was achieved in 4 of the 5 cases, and partial recovery in 1 case. These 5 cases are summarized below:

Case 1: A 61 years old male presented with SD in right ear of 7 days, with heavy fullness but no vertigo. Glycerol test was positive. Audiogram showed midrange hearing loss with a hump pattern in the right ear. Audiogram of left ear suggested presbycusis and lab work-up revealed adiposis hepatica. Treatment agents included nimodipine (40mg t.i.d.), danshen root and alismae rhizome. On the 8th therapeutic day, hearing in the right ear had improved to the level of the left ear level. Hearing remained stable at 2 year follow-up visit.

Case 2: A 40 years old female presented with SD in left ear of 6 days, with heavy fullness and vertigo. Audiogram showed severe loss affecting all frequencies. She was treated with nimodipine, danshen root, vitamin B complex, mecobalamin and Wuling powder. Audiometric thresholds at low frequencies (<1kHz) improved to within 20 dB HL in 15 days.

Case 3: This was a 27 years old female with SD in the left ear of 2 days and vertigo. There was severe loss with a hump pattern on the audiogram. She was treated with betahistine, Jingwu capsule, and alismae rhizome. Complete hearing recovery was achieved on Day 7 following treatment, with improved balance.

Case 4: A 26 years old young man presented with a history of SD in left ear of 20 days, with tinnitus and fullness but no vertigo. He was deaf in the

<table>
<thead>
<tr>
<th>Hearing Loss Pattern</th>
<th>Complete Recovery</th>
<th>Partial Recovery</th>
<th>Unchanged</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Frequency</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Moderate</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Profound</td>
<td>5</td>
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<td>7</td>
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<tr>
<td>Hump</td>
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<td>2</td>
<td>2</td>
</tr>
<tr>
<td>High Frequency</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>11</td>
<td>7</td>
<td>23</td>
</tr>
</tbody>
</table>

Table 1  Audiometric classification and final treatment outcomes (number of cases) in the 23 cases in whom initial treatment does not include diuretic agents.
right ear, as a result of trauma in childhood. Lab tests demonstrated hyperlipemia, hyperglycemia and high blood viscosity. He was treated with nimodipine, ginkgo, Jingwu capsule, mecobalamin and dihydrochlorothiazide/triamterene. A 35 dB audiometric threshold improvement was achieved within 10 days of treatment, and his diuretic agents were then changed to alismae rhizome decoctum.

Case 5: This was yet another young male (27 years old), with a history of SD in left ear of 7 days with vertigo. Audiogram showed midrange loss in the left ear and what appeared to be noise induced loss in the right ear, as evidenced by a 4 kHz notch and history of machine noise exposure. He was treated with nimodipine, Jingwu capsule, vitamin B complex, mecobalamin, and dihydrochlorothiazide/triamterene. Hearing improvement in the left ear was noticed after 2 days of treatment and complete hearing recovery was achieved on Day 8, although the patient still reports residual dizziness.

In these 5 cases, hearing improvement or recovery took place in 9.60±2.87 (x±SD) days following treatment. No hearing deterioration was noticed during the follow up period.

Discussion

SD continues to be a diagnostic and management challenge for otologists. It is a hearing disorder with various possible causes, including vascular disorders, rupture of the inner ear membrane, autoimmune diseases and viral infections which has received increasing attention in recent years. Because of its obscure etiology, little is known about its pathophysiological mechanisms.

SD and endolymphatic homeostasis: It has been suggested that some hearing loss is secondary to disturbed endolymphatic homeostasis. Endolymph is characterized by high potassium concentration (150–180 mM), a low sodium content (<1 mM) and a positive electric potential (80–100 mV). This intracellular-like fluid fills the endolymphatic compartment and is essential in the transduction process which takes place in the organ of Corti. In the progression of SD, secretory structures of the endolymph, including stria vascularis, spiral ligament and supporting cells, can be damaged by virus and/or inflammatory mediators. Subsequently, the electrochemical features of endolymph are altered and eventually lead to hearing loss. Also, the volume of endolymph can change as a result of electrochemical alteration. This may explain some of the endolymphatic hydrop symptoms such as fullness and vertigo seen in some SD cases. The authors have previously reported 20 cases with endolymphatic hydrop symptoms in 160 SD cases. Yoon et al. have reported endolymphatic hydrop changes in 4 of 11 SD cases on temple bone studies. Futake et al. have found positive furosemide test in 3 of 6 SD cases. In this series, diuretic agents were effective in 4 of 8 cases where conventional treatment with vasodilators, blood thinners and neurotrophic agents had failed to improve hearing. When used in initial treatment, diuretic agents resulted in improvement in hearing and other symptoms in all 5 cases. These results suggest that endolymphatic hydrps may play a role in the pathophysiology of SD in some cases.

Indications for diuretic treatment and agent selection: Diuretic agents were used in 8 cases with ear fullness complaints in this series. Furosemid and glycerin tests were less than informative in guiding diuretic treatment. Results of such tests have not been always consistent with clinical endolymphatic hydrop symptoms in other reports. The authors therefore feel that ear fullness is superior over these tests in predicting presence of endolymphatic hydrps.

In this study, both dihydrochlorothiazide and Chinese herbal agents were used and demonstrated certain levels of efficacy. The authors feel that dihydrochlorothiazide/triamterene is probably appropriate for young and...
healthy patients, whereas the herbal agents may be safe for the old and physically weak.

We conclude that endolymphatic hydrops may be involved in some SD cases and, when not contraindicated, treatment can be safely combined with diuretic agents.

Reference


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