

## Original Article

# Outcomes of treatment of sudden deafness using different Protocols: a retrospective analysis of 104 cases

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**Abstract Objective** To compare different treatment protocols for sudden deafness (SD), for the purpose of identifying an appropriate approach to SD. **Methods** A total of 104 patients with diagnosis of sudden hearing loss treated from Jan 2006 to December 2008 were included in this study, of which 31 received the typical pharmaceutical treatment (group I), 40 received the typical pharmaceutical treatment plus polarized liquid (Group II) and 33 received the hyperbaric oxygen in addition to the treatment included in Group II (Group III). **Results** The total improvement rate (67.74%, 62.50% and 75.76% for Groups I, II and III respectively) was not statistically different between the three groups ( $P > 0.05$ ). **Conclusion** The three treatment protocols are similar when judged by the treatment outcomes in SD, neither being superior to the others. The two important factors that appear to influence treatment outcomes are the audiogram pattern and duration of hearing loss before seeking treatment. Patients with upsloping or peak-type audiograms and treated within 7 days from the onset have better prognosis than others.

**Key words** Sudden deafness; Therapeutic Effect; Prognosis

### Introduction

Sudden deafness is a syndrome covering several heterogeneous entities resulting from different pathogenetic mechanisms, which is believed to affect 1:5 000 people yearly. The various therapeutic strategies currently recommended are highly empirical and should be questioned in terms of cost-effectiveness. The authors conducted a retrospective case review study to determine therapeutic effects of different treatment protocols on sudden hearing loss, in an attempt to identify an appropriate protocol to improve our approach to SD.

#### Subjects and methods

The diagnostic criteria for sudden hearing loss in this study was an acute onset of hearing loss of 30 dB at 3 contiguous frequencies that occurred either instantaneously or progressively over several days<sup>[1]</sup>.

Subjects were patients presenting with sudden hear-

ing loss who satisfied the following conditions: (1) idiopathic unilateral sensorineural hearing loss, (2) no positive central nervous system findings, (3) diagnosed within 60 days after the onset of hearing loss, (4) previously untreated, and (5) normal hearing in the opposite ear for age.

A total of 104 patients (53 males and 51 females, average age=44.9 years, ranging from 25 to 60 years) treated between Jan 2006 and December 2008 were included in this study. Thirty one cases (Group I) received the typical treatment including intravenous steroids, vasodilator, low-molecular-weight dextran and orally  $\text{Ca}^{2+}$  channel blocker. Polarized liquid was used in 40 cases in addition to the Group I protocol (Group II). The remaining 33 cases (Group III) received hyperbaric oxygen as well as the treatments employed in Groups I and II.

Evaluation of hearing recovery followed the criteria by Goodman, i.e., complete recovery: average threshold across 250, 500, 1 000, 2 000, and 4 000 Hz within 20

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**Table.1 Therapeutic effects of three groups (numbers of ears, %)**

Groups	recovery	Marked recovery	Patial recovery	Unchanged	Total effective rate
Group I	7 ( 22.58 )	7 ( 22.58 )	7 ( 22.58 )	10 ( 32.26 )	21 ( 67.74 )
Group II	8 ( 20.00 )	6 ( 15.00 )	11 ( 27.50 )	15 ( 37.50 )	25 ( 62.50 )
Group III	7 ( 21.21 )	9 ( 27.27 )	9 ( 27.27 )	8 ( 24.24 )	25 ( 75.76 )

dB HL or equal to that of the opposite ear; marked recovery: hearing gain of more than 30 dB in average threshold; partial recovery: hearing gain between 10 dB and 30 dB in average threshold; and unchanged: an average hearing gain within 10 dB.

Statistical analysis: The effect of treatment was analyzed using  $\chi^2$  test, with  $P < 0.05$  being considered significant.

## Results

The total effective rate in each group was 67.74%, 62.50% and 75.76% respectively and not statistically different between the three groups ( $P > 0.05$ ) (table 1).

Relationship between audiogram patterns and treatment outcomes:

Initial audiograms were divided into seven types in order to compare the relationship between therapeutic results and audiogram contours, including peak-type (4.4%), flat (24.3%), down-sloping (21.3%), and upward-sloping (17%) contours. All cases with peak-type audiograms and 84.6% of cases with upward-sloping (low-frequency loss) audiograms showed complete recovery. However, the extremely low number of patients with peak-type audiograms made statistical analysis difficult. Complete recovery was achieved in 78.3% of cases with flat-type audiograms and mild and moderate-severe deafness, and 61.0% if the deafness was extremely severe. For these cases, most threshold improvement took place at low to intermediate frequencies. Only 44.4% of patients with downward-sloping audiograms (high-frequency loss) showed complete recovery, significantly poorer than others audiogram patterns ( $\chi^2 = 9.58, P < 0.05$ ).

Effects of interval between onset and treatment on treatment outcomes:

The time from the onset to the initial visit was divided into 5 parts for comparison purposes, including 1–7

days, 8–15 days, 16–30 days and more than 60 days. Treatment outcomes were excellent when the patient sought treatment within 7 days from the onset of hearing loss, with 77.8% achieving complete recovery and 94.7% obtaining at least partial recovery. When combined with those treated within 15 days, the rates were 83.4% and 100% respectively. Whereas, after 31–60 days, patients were less likely to benefit from therapy, although there were 3 cases showing complete recovery and 2 cases showing marked recovery. In those who received treatment after 60 days from onset of hearing loss, only 1 case responded to treatment.

## Discussion

*Evaluation of treatment effects by the therapeutic protocols:*

The total effective rate is not statistically different when the three treatment protocols are compared. The result show that different combination of medicine and therapeutic methods do not influence treatment outcomes in SD. No particular treatment protocol appears superior to others.

Numerous causes have been speculated for sudden deafness, although rarely a specific underlying cause is reliably identified for any case. A cause can be determined in only 10 to 15% of patients with SD. A diagnosis of SD is generally based on the patient's medical history. Possible causes include infection, trauma (such as a head injury), abnormal tissue growth, immunologic diseases (such as Cogan's syndrome<sup>[2]</sup>), toxicity (such as snake bites), toxic drugs (ototoxic drugs); circulatory disorders<sup>[3, 4]</sup>, neurologic conditions (such as multiple sclerosis), and otologic conditions such as Ménière's disease. Immunologic disorders and microvascular events have been suggested to play an important role in SD. Therefore, before definite pathogenesis can be determined, treatment in SD is often focused on improving

microcirculation and protecting neural function<sup>[5]</sup>.

Hyperbaric oxygen (HBO) therapy has previously been suggested as an adjunctive treatment. In our study, however, HBO and polarized liquid failed to show any additional advantages, similar to some existing reports<sup>[6]</sup>. HBO therefore should only be considered for SD when there are contraindications to standard medical treatment. This opinion has been disputed in the literature<sup>[7]</sup>, as treatment with HBO and anti-oxygen-derived free radicals can improve oxygen supply to the cerebral tissue, which is beneficial to senile SD patients.

The course of treatment:

In the first 30 treatment days, improvement appears to increase along with treatment time, from 50.8% to 84.7%, although for most patients, auditory threshold improvement show little change beyond 15 days of treatment. Few cases continue to show recovery after 1 month. Treatment can continue for 1–2 months if there are no contraindications.

Prognosis can be predicted at approximately 2 weeks after start of treatment, as recovery appears to plateau after 2 weeks of treatment<sup>[8]</sup>. Hearing should be followed-up for 2–6 months after treatment in patients who show incomplete or delayed hearing improvement.

Factors influencing the therapeutic outcomes:

In our study, the two important factors that influenced hearing recovery were the pattern of audiogram and duration of hearing loss before seeking treatment<sup>[9]</sup>. Patients with low-frequency or peak-type audiograms, treated within 7 days from the onset showed better prognosis than others.

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