

Association of systemic diseases with sudden sensorineural hearing loss

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Background: To find out the association of systemic diseases with sudden sensorineural hearing loss and to observe the effect of high dose intravenous steroid in its management.

Methods: All patients admitted with sudden sensorineural hearing loss in the department of ENT & Head and Neck Surgery, T. U. Teaching hospital from January 2002 to January 2005 were studied prospectively. Association with any systemic illnesses were noted. High dose steroid intravenously was given for treatment and hearing improvement was assessed by pure tone audiometry.

Results: A total of 46 patients were enrolled in the study, 21 of whom had systemic diseases. Predominant systemic disease was diabetes mellitus which was present in 16 patients. After steroid therapy, 13 patient is hearing returned to normal, 13 had improvement in hearing, 16 had no improvement and 4 had their hearing deteriorated.

Conclusion: Approximately 45.7% of the patients with sudden sensorineural hearing loss had associated systemic diseases. Only 28.3% of the patient recovered to normal hearing though another 28.3% had improvement in hearing after the high dose steroid therapy.

Keywords: Sudden sensorineural hearing loss (SSNHL), pure tone audiometry (PTA), Diabetes mellitus

Introduction

Sudden sensorineural hearing loss is a medical emergency. As the exact etiology of it is still a controversial topic and its standard management is being tried in many centers with claims of differing results. Sudden sensorineural hearing loss was first described by De Klem in 1944 as 30dB or more sensorineural hearing loss over at least 3 continuous audiometric frequencies occurring within 3 days or less. In our study all our patients fulfilled these criteria. The worldwide incidence of SSNHL is 5-20 patients per 100,000 per year.⁽¹⁾ The highest incidence of sudden sensory neural hearing loss occurs of around in 50-60 years of age, lowest incidence between the age of 20-30 years. Around 2% of the patients present with bilateral hearing loss. There is equal male and female preponderance. Most of the causes are

unknown and only in 10% of the cases, the causes are established. Among the unknown causes, few potential causes are suggested which are viral infection, immunological causes, vascular compromise, intra-cochlear membrane breaks etc.

Severe and profound hearing loss have an expected recovery rate of only 30% and 10% respectively, whereas mild hearing loss has a recovery rate of up to 70%. Recovery rate without therapy ranges from 30%-60%. Patients greater than 50 year old or whose hearing loss is associated with vertigo have a poorer prognosis.⁽²⁻⁵⁾

Treatment of SSNHL is always a matter of controversies but the principle of it, focuses on decreasing cochlear inflammation, improving inner ear blood flow, oxygenation and re-establishing the endocochlear potential. In the past,

few studies showed association of systemic diseases like diabetes mellitus, hypertension, and autoimmune diseases with SSNHL. Among numerous drugs tested administration of high dose systemic steroid, either alone or in combination with other medication, was shown to affect significant improvement in patients with idiopathic sudden hearing loss, autoimmune inner ear disease and Meniere's disease and is currently the mainstay of treatment for immune-mediated inner ear disease.⁽⁶⁻⁸⁾ But regimen and the choice of steroid varies between different centres.

The present study tries to observe the association of SSNHL with systemic diseases and the effect of our prescribed regimen in its management.

Material and methods

All patients with SSNHL admitted in the department of ENT & HNS, TU Teaching hospital from January 2002 to January 2005 were included. At the time of admission, patient's particulars, association with systemic diseases were enquired and investigations as below were performed.

Blood – HB, TC, DC, ESR Urine-routine Chest X-ray

Random blood sugar/F/PP Liver function test VDRL

Coagulation profile Thyroid function test
Electrocardiogram

Anti nuclear antibody (ANA) Lipid profile MRI selected cases

In every case pure tone audiometry was done just before starting medication. Then the patients were started with intravenous steroid (hydrocortisone). The followed regimen of the dose of hydrocortisone was 500mg for 3 days, 400mg for 3 days, 200 mg for 3 days, 100mg for 3 days and the patients were discharged with oral prednisolone starting at 60 mg tapered in subsequent 18 days. But if the hearing improved to normal level during the course of treatment rapid tapering of the dose was performed.

During the period of treatment, on every third day pure tone audiometry was performed and hearing assessed. Decrease in air bone gap > 10 dB was taken as improvement and normal hearing as the hearing threshold < 25 dB air conduction threshold.

Statistical analysis was performed using spss 11.5.

Results

A total number of 46 patients were enrolled in the study, out of them 41 had unilateral and 5 had bilateral sudden sensorineural hearing loss. Among them 28 were male and

18 were female, 23 with right ear involvement and 18 with left ear involvement. Except one ear all other ears were associated with tinnitus. Among 46 patients, 3 were below 20 years, 17 were 20-40 years and 26 were above 40 years. 4 patients had the preceding history of upper respiratory tract infection.

Approximately half (21 out of 46) of the patient were having one or multiple systemic diseases with diabetes mellitus in the majority alone or with other diseases (16 out of 21 patients with systemic diseases).

Table 1: Presence of systemic diseases

Diabetes alone	7
Hypertension alone	3
Hyperlipidemia alone	2
Diabetes+ Hypertension	6
Diabetes+ Hyperlipidemia	2
Diabetes+ Hypertension+ Hyperlipidemia	1

Most of the patients who were having systemic diseases were above 40 years of age (19 out of 21). Among other systemic diseases, hypertension was present either alone or with other systemic diseases in total of 10 patients and 7 out of them were more than 40 years of age. Hyperlipidemia was present in 5 patients all of whom were more than 40 years of age.

At the time of presentation, most of the patients were having severe to profound hearing loss (29 out of 46 patients). On investigation, 30 patients were found to have elevated ESR, 14 with raised blood sugar though 16 patients were known diabetic, 5 with increased triglyceride level, 1 patient was having multiple infarct in cerebrum detected on MRI.

All patients were started with the high dose steroid therapy and 26 patients out of 46 (56%) ear responded with improved result with 13 patients to normal hearing (air conduction threshold < 25 dB), 13 with significant improvement on hearing (improvement in air bone gap threshold > 10 dB). Other 16 had no improvement at all and 4 patients deteriorated despite the treatment. Though the incidence was less in female, improvement was similar in both sexes (10 out of 18 versus 16 out of 28). Younger patients had less chance of recovery though incidence was low (3 cases of age <20 years where nobody improved; 18 cases of age 20 -40 years, 11 did improved and 25 cases of age > 40 years, 16 cases improved). Patients who presented early had good hearing recovery than who presented late as 38 cases who presented within 7 days, 23 cases improved in comparison to 3 out of 8 patients who presented after 7 days. And also the degree of

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hearing loss also has got no relationship with the improvement on outcome (P value ≤ 0.1).

Table 2: Association of pre- treatment PTA with improvement on hearing

P value ≤ 0.1 (not significant)

Pre-treatment PTA	Hearing improved	Hearing not improved
25-39dB (2)	2	0
40-59dB (4)	4	0
60-79dB(11)	4	7
>80dB (29)	16	13

Association between the systemic disease and hearing improvement was as shown in table no. 3

Table 3: Association between systemic disease and hearing improvement.

Systemic disease	Hearing improved	Hearing not improved
Present (21)	14	7
Absent (25)	12	13

P value ≤ 1 (not significant)

Discussion

Sudden sensorineural hearing loss though not very common has got serious implication to the patient as well as to the treating physician as the treatment of it is still a controversy. The most common cause for SSNHL is idiopathic, which may develop in 72 hours or less. Various mechanisms like vascular lesions, membrane break, and viral lesion have been mentioned in different literature but none with adequate acceptance.^(2,8) After the onset, most of the recovery occur within 2 weeks of the onset as seen in most of the literature and in our study also maximum improvement occurred within 10 days. It is a well established fact that it is the disease of elderly and may be associated with other systemic illnesses. We tried to find out its incidence in different age group and the result was similar to other studies as elderly age (40-50 years) most affected. Among the elderly age group with systemic illnesses, diabetes is the one which was seen in most of the patients suggesting some association but it needs a good randomized controlled trial study with good sample size to establish the significant association. We tried to see the prognostic value of age, severity, time of initiation of therapy which were proposed by Fettermann et al,^(1,9) Chandrasekhar,⁽⁴⁾ and Byl⁽²⁾ and in addition

presence of systemic diseases.

In 1984, Byl published a prospective study conducted over 8 years that evaluated 225 patients with sudden sensorineural hearing loss. Factors evaluated included age, tinnitus, vertigo, audiogram pattern; time elapsed from onset of hearing loss to initial visit, and ESR level with respect to recovery. His findings were as follows:

- 1) Time since onset - His study confirmed that the sooner the patient was seen and therapy initiated, the better the recovery. 56% of patients presenting within the first seven days of their hearing loss recovered compared to 27% who presented thirty days or later. He noted that there is some self-selection bias whereby those that recover rapidly do not seek medical aid.
- 2) Age - The average age for those recovering totally was 41.8 years. Those under 15 years and over 60 years had significantly poorer recovery rates.
- 3) Vertigo - Patients with severe vertigo had significantly worse outcomes than patients with no symptoms of vertigo. 29% of patients with vertigo recovered compared to 55% with no vertigo.
- 4) Audiogram - Patients with profound hearing loss has got significantly decreased recovery rates compared to all other groups (22% with complete recovery).

Other series have shown that patients with mid frequency hearing loss, particularly when hearing at 4000 kHz was worse than 8000 kHz, have an excellent prognosis.

In this study it was seen that extreme of age has got poor prognosis and also sooner the patients were started with therapy better the result. And regarding the presence of systemic diseases, it has got no prognostic value.

High dose systemic steroid therapy is a common treatment modality, with a reported success rate between 49% and 89%, whereas only 30% to 65% without treatment achieve partial or complete recovery.⁽⁶⁾ But in most of the studies, the administration of therapy was oral prednisolone for 10–15 days. And the improvement of hearing was seen within 7 days of the initiation of therapy. A significant improvement with high dose intravenous steroid versus placebo therapy could however be observed⁽⁹⁾. But none of the drug treatment has gain universal acceptance. We change the route of administration and also the type of steroid and the response was good in 56% overall. There are studies which showed dramatic response with the use of steroid with improvement in hearing⁽¹⁰⁻¹¹⁾ but few other studies showed no significant improvement than placebo therapy at all⁽¹²⁻¹³⁾ and in some studies only severe hearing loss responded to steroid therapy but not the mild hearing loss.⁽¹⁴⁾

In our study, patients with severe and profound hearing loss had recovery rate of 36% and 55% which was not concordance with the results reported by other authors.^{(14,}

²⁾ Age as a factor did not significantly affect the clinical outcome as in a study done by Ho Guan-Min et al⁽¹⁵⁾ but unlike study done by Fettermen et al.⁽³⁾

The use of systemic steroid is effective as shown by maximum studies, its side effects such as gastric ulcers, insomnia, mood change and deranged blood sugar level make the treating physician always cautious though in our study only 2 patients complained of burning epigastrium despite prescribing H2 blocker.

Conclusion

Chronic systemic illness is the major health problems in the old age group and the incidence of sudden sensory neural hearing loss is also high in those populations. It was seen that most of the patient with sudden sensorineural hearing loss who were elderly with chronic illnesses, diabetes is the one which is seen most commonly, suggesting there may be some association with it. And also contrary to the general belief, systemic disease has got no prognostic value.

In our study the use of systemic intravenous steroid showed no benefit over the conventional oral steroid therapy as shown by other similar studies. Thus before starting intravenous steroid therapy one should think twice as it has long hospital stay, economic burden and unnecessary potential risks. But it is likely that systemic intravenous therapy may have good response than oral steroid as it reaches early to the affected organ and patient need to stay in hospital with medication on time with complete course. So a study having good sample size comparing the outcome between intravenous and oral steroid is needed before any definite conclusion can be made.

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