

Steroid Use in Idiopathic Sudden Sensorineural Hearing Loss: What is the Evidence?

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Idiopathic sudden sensorineural hearing loss is a disease of unknown etiology. Controversy in the literature argues whether the condition should be treated by steroid therapy. In this case study, a Medline literature search was completed to find out if there is any evidence to support its use in this condition .

Case presentation

A 37 year old man was referred to our emergency department by his general practitioner with a three day history of muffled hearing and tinnitus of the right ear. Symptoms were sudden onset, with no associated pain, dizziness or otorrhea and no past history of hearing problems or medical illness. Family history was negative and physical examination was normal. Otologic examination revealed normal tympanic membranes bilaterally, with no evidence of cerumen or middle ear effusion. Tuning fork examination showed positive Rinne test bilaterally but with lateralization of Weber test to the left side, indicating right ear sensorineural hearing loss. Audiometric analysis confirmed sensorineural hearing loss across all frequencies of about 70-db in the right ear. Tympanometric analysis showed normal middle ear pressure and tympanic membrane compliance on both sides with no evidence of middle ear effusion. Ear canal volume was normal indicating intact tympanic membranes bilaterally. Routine lab work including complete blood count, erythrocyte sedimentation rate, random glucose, urea, and electrolytes were all within normal limits. Magnetic resonance imaging of brain and internal auditory canal were also normal.

Clinical diagnosis of idiopathic sudden sensorineural hearing loss of the right ear was made and the patient began a one week prednisone therapy of 60 mg daily to be tapered with a dose of 10 mg reduction every two days over the next ten days. The patient was followed for three months with repeat hearing assessment every two to four weeks. Unfortunately his hearing in the affected ear showed no significant improvement. He did not require a hearing aid since he had adequate hearing in the unaffected ear .

The clinical question is; "in patients with idiopathic sudden sensorineural hearing loss does the use of systemic corticosteroid therapy improve the chances of hearing recovery "?

To answer the question; Medline was searched using the following strategies :

Strategy 1: the literature was searched using the keywords "sudden hearing loss, sudden deafness, idiopathic sudden deafness, idiopathic sensorineural

deafness, sudden sensorineural or sudden nerve deafness, idiopathic sudden sensorineural hearing loss, or idiopathic sudden nerve deafness" .

Strategy 2: the literature was again searched using the words "corticosteroid(s), steroid, steroids, glucocorticoid, or glucocorticoids".

The combinations of strategy one and two identified 358 papers. We attempted to identify papers using a high level of evidence and large sample size, excluding papers using direct injection of steroid into the middle ear via the tympanic membrane, a practice not widely used. We found five key papers which directly answered the question 1-5. Only two of them were prospective trials [1,2].

The first compared the use of steroid or carbogen therapy against placebo in treating sudden sensorineural hearing loss [1] in a prospective double-blind study. The authors enrolled 41 patients with unexplained sudden sensorineural hearing loss who had no diabetes, previous ear conditions, or abnormal auditory physical findings. The outcome was measured through serial audiometric analysis of hearing levels at day six, with further follow-up assessment done at 90 days. The study showed no difference between early steroid or carbogen therapy.

The second prospective study compared steroids to placebo [2]. It showed that steroids had a statistically significant effect on the recovery of moderate degree hearing loss.

A Japanese retrospective, non-randomized, controlled study using chart review to assess the effectiveness of corticosteroids in treating sudden onset sensorineural hearing loss at lower frequencies reported improvement on audiogram in the corticosteroid treated group which was not statistically significant ($P = 0.84$) [3].

Another retrospective study of patients with sudden sensorineural hearing loss was reported 4. A group of 301 patients who received no treatment over a period of six years were compared with 302 patients who had intravenous blood thinning drugs and glucocorticoid therapy. Their objective criteria were hearing improvement evaluated by audiometric assessment. Results showed hearing recovery in both groups, however the group who received glucocorticoid treatment showed statistically significant hearing recovery at low and medium frequency range ($P < 0.05$).

Another non-randomized, retrospective review of patients who presented with sudden sensorineural hearing

loss of unknown cause over a ten year period was reported⁵. It compared hearing outcomes of patients who received steroid therapy to those who received no steroid therapy. The key findings were in patients with severe sensorineural hearing loss. It was found that steroid therapy significantly improved hearing recovery compared to those who received no steroid therapy ($P < 0.01$). The above effect was not found in patients with milder forms of hearing loss. Idiopathic sensorineural hearing loss mainly affects low frequencies, which is the normal speech frequency.

Discussion

The weakness of the first study was primarily small sample size [1]. The sample size required to achieve statistical significance was not calculated and the confidence interval was not done. The randomization was considered adequate because of the patient sequence numbering, and allocation of each patient in sequence to one of the four treatment groups.

The conclusion of the second study can not be considered valid due to heavy contamination as well as bias [2]. They treated 33 patients versus 34 controls from the two different centres. Each centre was using a different type and dosage steroid regime. The authors added 52 patients who opted for no treatment to the control group assuming this group was similar to the placebo control. Patients were removed from the treatment group and later included in the no-treatment group, affecting the validity of the results. So both the process of randomization and blinding were poorly conducted. This study did not account for all patients who decided to withdraw from the study, and intention to treat analysis was not completed.

The third retrospective study had no control group [3]. There was a high possibility of contamination of the treatment group with a significant potential for confounding bias: for example, using different medications for the treatment group.

The fourth paper used non-homogenous study groups, and included patients with different disease pathology, i.e. diabetics, and ruptured round window membrane (in the glucocorticoid group) [4]. These were serious flaws significantly jeopardizing the validity of results. It was also a retrospective study lacking a control group or randomization, which detracts from the generalizability of any results.

The fifth paper only reached the statistical significance level after excluding patients with low frequency hearing loss (speech frequency) and patients with milder forms of hearing loss in a second-pass analysis [5]. This has a high potential for exclusion bias. The control group was heterogeneous and included patients who did not want to receive treatment, were pregnant, or had medical contraindications to steroid therapy.

In summary, idiopathic sudden sensorineural hearing loss is a condition of unknown etiology, affecting all age groups regardless of sex. So far in the literature there is no compelling evidence whether or not steroid therapy should be used. Therefore further properly designed prospective, randomized, double blinded, controlled trials are required. Until then, we are of the opinion that

patients should be offered a steroid therapy provided there are no contraindications. Full explanation about possible side effect of steroid to the patients is essential.

References

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