PRACTICE UPDATE

# Sudden Sensorineural Hearing Loss: Primary Care Update

Marcia A. Leung BS; Anna Flaherty MD; Julia A. Zhang BS; Jared Hara BS; Wayne Barber MD; and Lawrence Burgess MD

## Abstract

*The primary care physician's role in recognizing sudden sensorineural hearing (SSNHL) loss and delivering initial treatment is critical in the management of the syndrome. This role involves recognizing its clinical symptoms, distinguishing it from conductive hearing loss with the Weber tuning fork or the Rauch hum test, and urgent administration of high dose oral corticosteroids. Diagnosis and treatment should not be delayed for audiometric testing or referral to otolaryngology. This paper provides an update on the initial evaluation and treatment of this syndrome based on the literature and clinical guideline recommendations.*

## Keywords:

*Sudden sensorineural hearing loss, Intratympanic steroid infiltration, Primary care, Prednisone, Dexamethasone, Glucocorticoid, Mineralocorticoid, Corticosteroid, Steroid*

## Abbreviations:

*SSNHL = sudden sensorineural hearing loss*
*IT = intratympanic*

## Introduction

Sudden sensorineural hearing loss (SSNHL) is a syndrome that develops rapidly with hearing loss progressing within 72 hours. It is considered to be an otologic emergency requiring immediate recognition and treatment,[1,2] and can occur at any age, but most commonly affects patients 65 years and older,[3] with an annual incidence of 5-27 per 100,000 or 4,000-66,000 new cases in the United States per year.[3,4] It presents a variety of diagnostic and therapeutic challenges due to the following: idiopathic etiology in 71% of cases with viral, vascular, tumorigenic, and autoimmune as known causes;[1,5] anatomic location in the inner ear limiting access for basic science study, and clinical evaluation and intervention; presentation with common and non-specific symptoms such as a stuffy ear resulting in delayed recognition and treatment;[1,2,4] high spontaneous recovery rates up to 65%;[6] and inconsistency in using objective data to define both SSNHL[7] and treatment success.[8]

The clinical practice guideline for SSNHL recommends that clinicians may offer systemic corticosteroids as initial therapy as an option, and intratympanic (IT) steroid infiltration for salvage therapy as a recommendation, based on reviews of randomized control trials with a balance between benefit and harm.[4] In clinical practice, oral steroid therapy is the mainstay of therapy, and IT steroid infiltration being utilized by an increasing number of otolaryngologists. Some are using IT for salvage therapy as recommended,[4,9] while others are using IT as combined treatment with oral therapy,[10,11] or as singular treatment when oral therapy is contraindicated or not preferred.[12,13]

## Recognizing & Diagnosing SSNHL

Clinical features of SSNHL include unilateral rapid hearing loss or hearing loss upon awakening, a normal ear examination, and associated clinical symptoms of a stuffy or full ear, tinnitus, and vertigo.[1,2] It is occasionally associated with otitis media. Evaluation of a patient includes taking a history of inciting events such as upper respiratory infection or trauma, degree of hearing loss, laterality, rapidity or chronicity, as well as associated symptoms. The sensation of a stuffy or full ear should not dissuade the examining physician that the underlying diagnosis could be SSNHL.

Diagnosis of SSNHL requires distinguishing it from conductive hearing loss. Tuning fork evaluations provide a reliable method to acutely assess the degree and type of hearing loss.[2] Air Conduction and the Weber test using the 512 Hz tuning fork can be used to help distinguish between sensorineural and conductive loss. The air conduction test involves alternating the 512 Hz tuning fork between the good and bad ears, and assessing hearing between 1-10. Ask the patient, "If the good ear is a 10, what is the bad ear?" Responses of 8 or higher generally indicate a conductive loss, and should be correlated with the clinical examination for the etiology of the acute conductive loss such as tympanic membrane rupture, hemotympanum, or otitis media. Responses of 7 and below are more likely to indicate SSNHL.

The type of loss is diagnosed with the Weber Test, that involves placing the tuning fork in the center of the patient's forehead, top of the head, bridge of the nose, or upper central incisors (with a rubber glove over the handle). In conductive hearing loss, the sound will be heard in the affected ear; in sensorineural loss the sound will be heard in the normal ear. If a tuning fork is not available, conduct the Rauch Test.[2] Have the patient hum in a low pitch. In conductive hearing loss the hum will be heard in the affected ear; in sensorineural loss the hum will be heard in the normal ear. Test this on yourself by humming and then occluding one ear, and the hum will be heard in the occluded ear with the conductive loss. The Rinne Test is used to assess the degree of conductive loss, and is not useful in assessing SSNHL.

After sensorineural hearing loss has been confirmed by tuning fork tests, an audiogram should be obtained as soon as possible, or will be obtained by the otolaryngologist. Treatment with steroids should not be delayed while waiting for an audiogram or referral.

## Initial Treatment of SSNHL

High dose oral steroids are recommended and should be given as soon as possible, with best improvement during the first two weeks, but treatment should be continued up to 6 weeks, with little chance for success beyond this time.[4] When faced with the option to undergo steroid therapy for SSNHL or risk the devastating consequences of permanent severe hearing loss, the vast majority of patients and clinicians opt to proceed with treatment, balancing benefit with the potential harm of steroids. Comparable 14-day courses of prednisone or dexamethasone (7-day high dose, 7-day taper) are provided in Table 1.[4] Commonly prescribed methylprednisolone dose packs are inadequate for therapy because of lower dosing and shorter length of treatment.

Side-effects of steroid therapy should be considered and monitored while under therapy. Some complications of short-term steroid therapy include exacerbation of glaucoma, increased coagulability and intravascular thrombosis, avascular hip necrosis, and insomnia.[14] Relative contraindications to systemic steroid use include breast feeding, Cushing's syndrome, diverticulitis, peptic ulcer disease and bleeding ulcers, diabetes, heart failure, myasthenia gravis, osteoporosis, psychosis, renal disease, and ulcerative colitis.[14,15] Use of proton-pump inhibitors or H2 antagonists should be considered in selected cases to reduce gastrointestinal upset; sleep medication may be used to treat insomnia.

Comparison of prednisone and dexamethasone shows that dexamethasone has a higher biological half-life and greater anti-inflammatory properties than prednisone at drug-equivalent doses (Table 2).[4,14,16]

The increased anti-inflammatory properties of dexamethasone may provide advantages for viral and autoimmune etiologies of sudden hearing loss. However, murine cochlear models indicate that both prednisone and dexamethasone upregulate both cytokine and ion hemostasis genes, while prednisone had a greater impact on ion hemostasis.[17] Therefore, the mineralocorticoid effect of prednisone might have benefits. Other studies indicate three fold up- or down-regulation by dexamethasone of certain genes, with some possible protective effects on the inner ear.[18] Underlying genetics of the patient may also impact treatment, with SSNHL carriers of macrophage migration inhibitory factor 173-C alleles having improved responses to steroid therapy, as opposed to non-carriers.[19]

IT steroid therapy is being increasingly utilized to treat SSNHL. Studies indicate equal efficacy compared to systemic steroids.[12] In support of clinical studies showing efficacy, one novel study evaluated non-SSNHL patients undergoing cochlear implantation. Steroids were given preoperatively via IT or intravenous routes, and perilymph of the inner ear was sampled at the time of implant insertion. There was a higher level of intracochlear dexamethasone with IT infiltration versus intravenous administration.[20] As expected, lower plasma levels were also detected in the IT group, implying reduced systemic side effects. National specialty guidelines recommend IT infiltration for salvage following failure of oral therapy,[4] but an increasing number of providers are maximizing therapy with combined therapy,[10] or using IT alone when systemic steroids are contraindicated. The clinic procedure is low risk and well-tolerated by the patient. Three infiltrations are provided over a 1-3 week period, and dexamethasone 24 mg/ml is emerging as the preferred unit dose.[21]

Table 1. Equivalent Dosage Regimen for Prednisone and Dexamethasone

| | |
|---|---|
| Prednisone | Disp: 20 mg tabs, # 30; sig: 60 mg (3 tabs) po once daily x 7 days; 40mg (2 tabs) x 3 days; 20 mg (1 tab) x 2 days; 10 mg (1/2 tab) x 2 days. |
| Dexamethasone | Disp: 2 mg tabs, #50; sig: 10 mg (5 tabs) po once daily x 7 days; 6 mg (3 tabs) x 3 days; 4 mg (2 tabs) x 2 days; 2 mg (1 tab) x 2 days |

Table 2. Comparison of Prednisone and Dexamethasone Pharmacokinetics[14,16]

| Drug - equivalent dosage | Prednisone - 5 mg | Dexamethasone - 0.75 mg |
|---|---|---|
| Plasma half life | 1 hour | 1.8-3.5 hours |
| Biological half life | 18-36 hours | 36-54 hours |
| Metabolism | Metabolized to liver by prednisolone (active compound) | Metabolized by liver to inactive metabolites |
| Glucocorticoid – Mineralocorticoid effects | Potency relative to Hydrocortisone (AI 1/MC 1): Anti-Inflammatory 4 Mineralocorticoid 0.8 | Potency relative to Hydrocortisone (AI 1/MC 1): Anti-Inflammatory 30 Mineralocorticoid 0 |
| Mechanism of action | Inhibits phospholipase A2, IL-2, histamine release | Inhibits phospholipase A2, IL-2, histamine release |

## Prognosis

About two-thirds of patients with SSNHL will experience full or partial recovery.[27] Recovery varies with severity at presentation, and those with mild hearing loss usually achieve full recovery. Spontaneous improvement or full recovery is rarely seen in those with severe to profound hearing loss.[4]

## Conclusion

Primary care physicians can play a significant role in timely diagnosis of SSNHL and treatment with oral steroid therapy followed by urgent referral to otolaryngology for potential IT infiltration. Prompt recognition of SSNHL with the Weber tuning fork test or the Rauch hum test will lead to early diagnosis and initiation of oral steroid therapy.

## Conflicts of Interest

None of the authors identify a conflict of interest.

Authors' Affiliation:
- John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI

Correspondence to:
Lawrence Burgess MD; 651 Ilalo St., Ste 212, Honolulu HI 96813;
Email: lburgess@hawaii.edu

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