The efficacy of intratympanic steroid injection for the treatment of idiopathic sudden sensorineural hearing loss

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ABSTRACT
Objective: A systemic steroid is known to have a potential to recover hearing after idiopathic sudden sensorineural hearing loss (ISSHL). However, lately many centres have introduced the use of intratympanic (IT) steroid therapy as an option. We reviewed our experience in the treatment of patients with ISSHL looking at the overall success of using systemic steroid, IT steroid injections as salvage therapy and primary IT steroid injection.

Methods: A retrospective study was conducted on 20 patients who had suffered from ISSHL from January 1, 2012, to December 31, 2017. ISSHL is defined as a rapid decline in hearing over three days or less affecting three or more frequencies by 30dB or greater. Comparison between the mode of steroid therapies and improvement in patients was done. At least 15dB improvement in pure tone audiogram (PTA) was considered as successful therapeutic intervention.

Results: Twenty male and female patients who fit the inclusion and exclusion criteria were included. The mean age of the patients was 41.4 years with a range from 13 to 72 years. Ninety percent patients presented with unilateral ISSHL involvement. Eight ears of patients who received systemic steroid therapy alone had improved hearings (75%). Out of seven ears from six patients who received salvage therapy, four ears (57.1%) had improvement in PTA. Seven ears showed improvement in PTA from a total of eight patients who primarily received IT injections.

Conclusions: IT steroid therapy promises a favourable outcome in the improvement of the hearing, as compared to systemic steroid administration. Its usage is recommended not only for salvage therapy but should be used as primary treatment especially in those with co-morbidities.

KEY WORDS:
Hearing loss, sudden, intratympanic injection, steroids

INTRODUCTION
Idiopathic sudden sensorineural hearing loss (ISSHL) was first reported nearly 60 years ago. However, the causative agents for this disorder, pathophysiology, the diagnostic approach as well as the treatment options are still highly debatable. The postulated causes of idiopathic ISSHL include viral infection followed by vascular occlusion, membrane breaks, immunological and activation of cochlear nuclear factor kappa B (NFkB).1

ISSHL presents as an acute unilateral deafness of more than 30dB hearing loss involving three contiguous frequencies, with a sudden onset, generally within three days or less. It occurs in 5-20 persons per 100,000 population.2 The management of this disorder poses a challenge. Normally, steroids are delivered systemically either orally or parenterally. Though the systemic delivery of medication leads to the development of techniques for local drug delivery.3,4

Systemic steroid therapy has been linked to deteriorating hyperglycaemic status, hypertension, hypokalaemia, peptic ulcer, osteoporosis, immune suppression, adrenal suppression, and serious organ damage.5-7 These side effects lead to the exploration of more effective alternative mode of administration of steroid to the inner ear. The recent discovery of glucocorticoid and mineralocorticoid receptors in the inner ear lead to the development of techniques for local drug delivery.4,5

It has been known that about 30-50% of patients did not respond to high-dosage of oral or intravenous steroid therapy. Therefore, IT steroid injections was proposed as rescue therapy for refractory cases.4,6 Certain centres used IT steroid injections as primary treatment without systemic steroids with the main indication in patients who are at greater risk for complications from systemic steroids.7,8,9 We review here our experience in the treatment of patients with ISSHL looking at the overall success of using systemic steroid, IT steroid injections as salvage therapy and primary intratympanic steroid injection.

MATERIALS AND METHODS
A retrospective record review of the patients who suffered from ISSHL from January 1, 2012, to December 31, 2017 was done. This study was approved by the Human Research and Ethical Committee of our institution. All patients with history of hearing loss of at least 30dB over three contiguous frequencies developing within 72 hours and received steroid therapy were included. Those without pre and post treatment pure tone audiogram (PTA) or received other than steroid therapy were excluded from the study. The average PTA was calculated as an average of the threshold measured at 0.5, 1.0, and 2.0kHz.
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Data is presented in numeric and percent form. Comparison between the mode of steroid therapies and improvement are represented by descriptive statistics. At least 15dB improvements in PTA were considered as a successful therapeutic intervention.

RESULTS

Table I shows demographic profile of the patients. A total of 20 patients were included with a range from 13 to 72 years of old. ISSHL predominantly affects the aged group above the third decade of life (65%). The gender predominance is almost equal in both females and males. The left and right ears were both equally affected and two (10%) patient presented with bilateral ears involvement.

Table II and Fig. 1 shows the mode of therapy and outcomes of the treatment. Eight ears had received systemic steroid therapy alone with six ears (75%) having improved hearings. Systemic steroids were given to patients without any co-morbidities. However, our success rate of 75% does not reflect the number of patients who had not responded well to systemic steroid therapy and proceeded with salvage IT injection. When those who proceeded with salvage IT injection is considered, the success rate was 40% (six out of 15 ears).

A total of six patients (seven ears) who failed systemic steroid therapy received salvage therapy. We observed four (57.1 %) ears with improvement in PTA including two ears with the hearing level normalised.

DISCUSSION

Studies have been conducted and proven that steroids have beneficial effects on cochlear function. Some studies have shown steroids are able to reduce inflammation from labyrinthitis, improve cochlear blood flow, protect against...
By introducing IT steroid injection; this mode of drug administration helps to overcome the complications or side effects associated with systemic drug delivery. However, we should consider several downsides of IT injection; for example, anatomic barriers to absorb at the round window membrane, loss of drug down to the Eustachian tube, and the varying pharmacokinetic profiles of medications currently used for IT delivery.4 The round window membrane is the primary transfer site for IT therapy. A study reported about one-third of the round window membrane were obstructed by a pseudo membrane, fibrous tissue, or a fat plug.39 Persistent tympanic perforation, short-duration vertigo, tinnitus, and otitis media may occur after perfusion of high concentrations of steroids, but the incidence was very low in clinical applications.

The fact that this study was conducted in only one tertiary centre and thus has limited data collections. Therefore, only descriptive statistics could be done due to small number of samples. It is recommended that a large scale and multicentre study be done in future thus enabling inferential statistics to be done for a better conclusion.

CONCLUSIONS

IT steroid therapy promises a favourable outcome in the improvement of the hearing as compared to systemic steroid administration. Its usage is recommended not only for salvage therapy but also used as primary treatment especially in those with co-morbidities.

REFERENCES

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