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Sudden sensorineural hearing loss in children: Etiology, management, and outcome

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ABSTRACT

Background and objectives: Pediatric sudden sensorineural hearing loss (SSNHL) is uncommon, and the current guidelines for its management refer to adults. Our objective was to review cases of SSNHL in children and examine their etiologies, management, and outcome.
Methods: We performed a retrospective chart review of all children under the age of 18 years treated for SSNHL between January 2003 and September 2014. Data recorded included age, gender, symptoms, onset of hearing loss, audiometric results, diagnostic studies, treatment, and outcome.
Results: Nineteen children were included. Mean age was 14 years (range 7–18 years). Male: female ratio was 9:10. Degree of hearing loss varied from mild to profound across the tested frequencies. Most common accompanying symptom was tinnitus. Serologic tests demonstrated recent Epstein–Barr virus infection in one patient and previous cytomegalovirus infection in six patients. Imaging studies included computed tomography scan ($n = 3$) and/or magnetic resonance imaging ($n = 12$). All imaging studies did not demonstrate any pathology. Treatment included systemic steroids in 19 (100%) children and intratympanic steroids in eight (42%). Hearing completely improved in three (16%) children, partially improved in nine (47%), and there was no improvement in six (32%). One child was lost to follow-up.
Conclusions: Viral infection was a common finding in children with SSNHL and no pathological changes were demonstrated on imaging studies. In most patients (63%), hearing improvement was observed. Intratympanic steroid injection can benefit these children. Further studies are required to investigate the etiologies and establish guidelines for the management of SSNHL in children.

1. Introduction

Although much has been published on sudden sensorineural hearing loss (SSNHL) in adults, data on the pediatric population is limited. Studies have shown that the incidence of SSNHL can range between 10.7 and 27 per 100,000 persons per year [1,2]. It has been shown that the incidence increases with age, with eight per 100,000 under the age of 18 years and 70 per 100,000 over 65 years [1]. SSNHL is considered to be an otologic emergency, and therefore early treatment is necessary in order to avoid permanent hearing loss. This is of special importance in children since hearing loss at an early age may affect speech and language development, as well as academic and social performance [3]. An additional major problem is that the youngest patients are not able to report on their hearing loss, which may go undetected during the acute stage when treatment is most effective. The degree of hearing loss can have an effect on the rate of recovery [4].

In adults, most cases of SSNHL are idiopathic [5]. In children, on the contrary, the percentage of idiopathic cases is unknown due to the small size of the available series. The current guidelines for the treatment of SSNHL are aimed at adult patients and include systemic steroids as primary treatment and intratympanic (IT) steroid administration when there is a contraindication or no improvement following systemic treatment [6]. There are reports on systemic treatment with steroids in children, but there is a lack of data on IT steroid administration in this age group. There is a need for more data in order to establish specific management pathways in children.

The objective of this study was to review cases of pediatric SSNHL treated at our department in order to examine their etiology, management, and outcome.

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2. Methods

The study was approved by the Institutional Review Board of Assaf Harofeh Medical Center. We performed a retrospective chart review of all patients under the age of 18 years who were treated for SSNHL at the Department of Otolaryngology-Head and Neck Surgery, Assaf Harofeh Medical Center between January 2003 and September 2014. SSNHL is defined as a unilateral or bilateral sensorineural hearing loss of ≥30 decibels (dB) affecting at least three consecutive frequencies, and occurring over a maximum period of 72 h [6]. Patients were admitted and a complete head and neck examination was done including an otoscopic examination using a microscope. Pure tone audiometry was performed at frequencies between 0.250 and 8 kHz. Normal hearing is defined at ≤20 dB. The treatment protocol for SSNHL included oral prednisone 1 mg/kg/day, or intravenous (IV) hydrocortisone 1 mg/kg/day divided into three doses. Both treatments were administered for a minimum of 7 days. Whenever there was no improvement following systemic therapy, or a contraindication for steroid treatment, IT treatment was offered. Intratympanic steroid injection of dexamethasone 1 mg every 12 h for 7 days was performed via a ventilation tube inserted into the tympanic membrane. Following IT injection, patients were positioned on the non-affected side for 30 min. Complete improvement of hearing was defined as a hearing level the same as the non-affected ear, partial hearing recovery as an improvement of more than 10 dB in at least one frequency, and no improvement when there was no change in the audiogram following treatment.

Data recorded included age, gender, symptoms other than hearing loss (ear fullness sensation, tinnitus, otalgia, and vertigo), onset of hearing loss, audiometric results, serologic tests, imaging studies, type and length of treatment, and outcome.

3. Results

A total of 19 children were included. Mean age was 14 years (range 7–18 years). The male to female ratio was 9:10. The right ear was affected in 9 (47%) children, the left ear in 9 (47%), and both ears in one (5%) child. All subjects were healthy and none had a family history of hearing loss. Physical examination was normal in all except one child, who had a previous history of bilateral serous otitis media (not the patient who presented with bilateral SSNHL). At least two pure-tone audiograms were performed. The first audiogram was done on hospital admission, before initiation of treatment, and another one, at the end of the systemic treatment prior to discharge. Children who were treated with IT injection had another audiogram at the end of the IT treatment. The degree of hearing loss varied between mild and profound across frequencies. Sixteen patients (84%) reported other symptoms in addition to hearing loss, most commonly tinnitus. One patient presented with diplopia and herpetic lip lesion, but serology for the herpes simplex virus was negative. All patients reported an abrupt onset of hearing loss. The mean timing between seeking medical help and initiation of treatment was 9 days (range 0–40 days) (median 6 days after the hearing loss was noticed by the patient). Table 1 summarizes the demographic data and clinical findings.

Initial treatment included oral steroids in 10 (53%) patients and IV steroids in 9 (47%). Systemic treatment lasted between 5 and 14 days (median = 7). In two cases, the caregivers decided to stop this treatment due to fear of side effects. Intratympanic steroids were administered in eight (42%) children and lasted between 5 and 9 days (mean = 7). One patient refused to continue IT treatment after 5 days. There were no adverse effects following either systemic or IT treatment. Oral antibiotics were given in two patients. Imaging studies of the temporal bones included non-contrast CT scan in three patients and MRI in 12 patients. None of the imaging studies demonstrate any pathology. CRP was obtained in 11/20 patients, and was significantly elevated in only one of them (10.52, normal range: <0.06 mg/L). Serologic tests results included cytomegalovirus (CMV) IgG in six (32%), Epstein–Barr virus (EBV) IgM in one, EBV EBNA IgG in seven (37%), and herpes simplex IgG in three (16%). Following treatment, tinnitus improved in seven (37%) children, vertigo was reported in one and otalgia and fullness sensation were not reported. Hearing completely improved in three (16%) patients, partially improved in nine (47%), and there was no improvement in six (32%). There was no worsening of hearing following treatment. One patient

Table 1
Clinical findings in 19 children with sudden sensorineural hearing loss.

No.	Sex	Age (years)	Side	Day of the treatment started	Other symptoms	Frequencies (kHz)	Steroids	CT	MRI	Viral titer	Outcome
1	F	16	R	0	Fullness Tinnitus	Pancochlear	IV, IT		N	EBV IgM	P
2	F	15	L	4		0.25, 0.5, 1, 6, 8	IV		N		I
3	M	11	L	4	Tinnitus Otalgia Vertigo	1, 2, 3, 4, 6, 8	Oral, IT		N		P
4	F	15	R	0	Tinnitus	Pancochlear	IV, IT		N	CMV IgG	NI
5	M	8	L	6	Otalgia	4, 6, 8	IV, IT		N	CMV IgG	P
6	F	15	L	30	Tinnitus Otalgia	Pancochlear	IV, IT		NA	CMV IgG	P
7	F	11	R	7	Tinnitus	Pancochlear	IV		N	CMV IgG	I
8	F	16	L	6	Tinnitus Vertigo	Pancochlear	Oral		N	CMV IgG	P
9	F	7	L	40	Fullness	0.5, 1, 2, 4, 6, 8	Oral		NA		NI
10	F	18	R	6	Fullness Tinnitus	4, 6, 8	Oral		N		P
11	M	17	R	7	Tinnitus Vertigo	2, 3, 4, 6, 8	Oral	N	N		P
12	M	18	R	6	Tinnitus	Pancochlear	IV		N		P
13	M	14	R, L	7	Tinnitus	1.5, 2, 3, 4, 6, 8	Oral		NA		NA
14	M	14	R	2	Tinnitus	2, 3, 4, 8	Oral	N	NA		NI

Clinical findings in 19 children with sudden sensorineural hearing loss.

No.	Sex	Age (years)	Side	Day of the treatment started	Other symptoms	Frequencies (kHz)	Steroids	CT	MRI	Viral titer	Outcome
15	M	11	L	8		0.25, 0.5, 0.75	Oral		NA		I
16	M	16	R	4	Fullness Tinnitus	Pancochlear	IV, IT		N		P
17	F	13	R	3	Tinnitus	0.25, 0.5, 4, 6, 8	Oral, IT		NA		NI
18	M	14	L	0		3, 2	Oral	N	NA		NI
19	F	10	L	30	Fullness Tinnitus Otalgia	Pancochlear	IV, IT		N	CMV IgG	NI

R, right; L, left; IV, intravenous, IT, intratympanic; EBV, Epstein–Barr virus; CMV, cytomegalovirus; N, normal; NI, no improvement; P, partial improvement; I, improvement.