Identifying hearing loss before it is too late

A pilot study on Late Onset Hearing Loss.

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Introduction

Undetected hearing loss (HL) can influence speech and language development which consequently impacts education (Durieux-Smith et al, 2008) and a child's social life. With this in mind it is important to improve intervention and early detection methods of HL in order to better a child's personal development.

In 2003, newborn hearing screening (NHS) was implemented across Ontario with the hopes of reducing the age of diagnoses for HL. This goal was achieved, through the practice of NHS, as children with risk factors were monitored more closely and those with abnormal screenings were addressed promptly.

Although NHS is beneficial, it is difficult to diagnose children with late onset HL as they often test normal at birth. Risk factors for late onset HL can include genetic factors, syndromes, head trauma and structural anomalies of the ear (JCIH 2000).

Objectives

The objectives of this medical chart review were to:

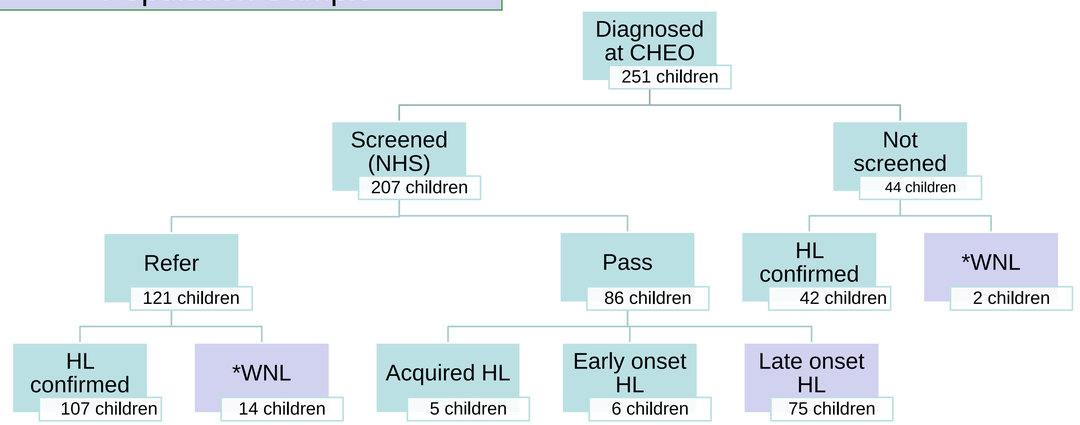
- Determine what percentage of children experience late onset HL
- Define characteristics of children who experience late onset HL
- Describe if specific causes of hearing loss are common in this cohort of children with late onset HL

Methods

- The diagnosis and audiology information for a cohort of 251 children, identified at CHEO through the NHS program from 2003-2012, were examined
- The screening status, onset and degree of HL were determined for this sample of children
- The children with late onset HL were reviewed to determine dominating causes of HL, specific to this group

Image source: http://www.123rf.com/search.php?word=listening_ears&alltext=1&imgtype=2&orderby=3

Population Sample



*WNL- Within Normal Limits for hearing at first diagnostic assessment at CHEO. Note, these children were later diagnosed with late onset HL.

Results

Table 1: Onset of Permanent Hearing Loss.

Type	Definition	n	Age of Diagnosis of HL*
Congenital	A permanent HL present at birth. Includes screened children and those with etiology known to be congenital.	80	2.8 (1.9, 4.7)
Early Onset	A permanent HL recognized in the neonatal period, defined as diagnosis before 6 months of age	36	6.6 (4.8, 11.0)
Late Onset	A permanent HL diagnosed, after 6 months, following a normal screening.	91	32.8 (21.7, 45.9)
Acquired	A permanent HL that manifests after 6 months of age and that can be attributed to an exogenous cause, e.g. meningitis.	10	19.8 (12.0, 44.3)
Unknown	No screening and no history to suggest onset of HL	33	23.7 (17.7, 52.5)

* IQR: Median (25th percentile, 75th percentile)

Figure 1: Etiology of Hearing Loss.

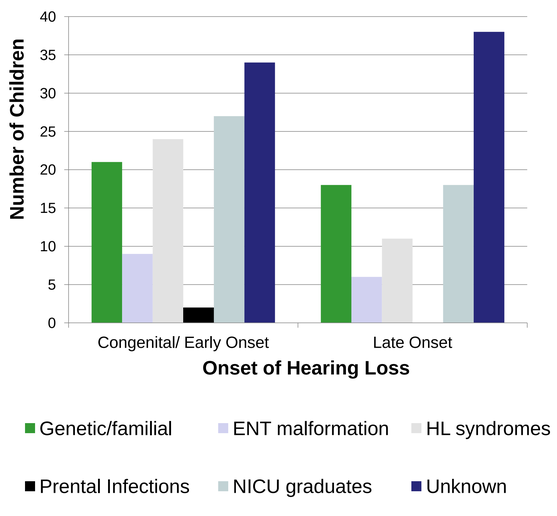


Table 2: Baseline characteristics of children with late onset hearing loss.

Number of Children	91
Age of confirmation (months) median (IQR)	
Refer	30.5 (23.9 to 41.6)
Pass with surveillance	17.4 (12.11 to 25.9)
Pass	37.8 (28.8 to 49.7)
Degree of HL (N, %)	
Unilateral	15 (16.5%)
High frequency	5 (5.5%)
Mild	29 (31.9%)
Moderate	25 (27.5%)
Moderate/severe	6 (6.6%)
Severe	2 (2.2%)
Profound	7 (7.7%)
Unknown	2 (2.2%)
***Progressive HL (N, %)**	39 (42.9%)
Current Amplification (N, %)	
Cochlear Implant	14 (15.4%)
Hearing aid	53 (58.2%)
FM system	10 (10.9%)
No amplification	14 (15.4%)

*3/7 children with late onset HL develop progressive HL. For the purposes of this study progressive HL is defined as a deterioration of hearing frequencies of difference greater than 20 dB, over time.

Case Example 1

History:

- Healthy baby with normal hearing at birth
- Long standing speech/language issues
- Minor head trauma caused sudden onset of hearing loss
- CT revealed Enlarged Vestibular Aqueducts (EVA)

Hearing Loss

- Diagnosed with late onset, progressive hearing loss triggered due to head trauma

Example of radiologic imaging demonstrating EVA

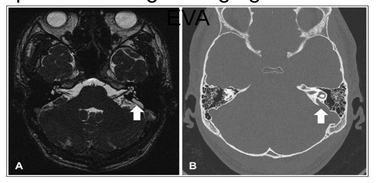


Fig. 5

Temporal bone images of a 38 year-old woman with left sensorineural hearing loss. Enlarged vestibular aqueduct syndrome (arrows) was identified by 3D fiesta screening (A) and confirmed by temporal bone computed tomography (B). 3D: three-dimensional.

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http://dx.doi.org/10.7874/kja.2013.17.3.111

Case Example 2

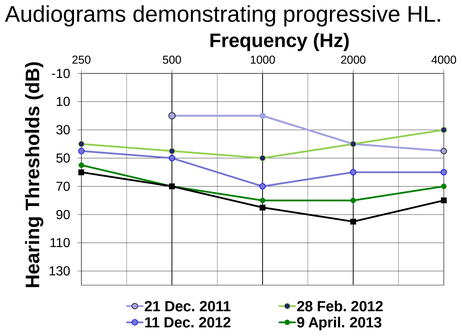
History:

- Healthy full term baby
- Family history of hearing loss - 2 siblings with HL

Hearing Loss

- Referred on screening at birth
- Monitored due to family history
- Hearing loss diagnosis at16 months of age
  - Progressive hearing loss
  - Fitted with Hearing Aids at 30 months of age

Audiograms demonstrating progressive HL.



Conclusion

Based on this study, 91 out of a total of 251patients were diagnosed with late onset HL. Within this cohort the average age of diagnosis for late onset HL is 32.8 months.

Interesting findings within this cohort are that the dominant etiology in this group were admissions to a NICU (20%). Additionally, 3 in 7 of the children with late onset HL went on to exhibit a deterioration in their hearing.

Based on these findings, it would be interesting to further determine why premature babies, in particular, are susceptible to late onset HL and similarly, why children who acquire late onset HL are so vulnerable to developing progressive HL.

Furthering knowledge within these areas is beneficial and crucial in order to ensure prompt detection and efficient care for children who develop late onset HL.

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