Audiometric Trends Among Children With Congenital Aural Atresia or External Auditory Canal Stenosis

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BACKGROUND

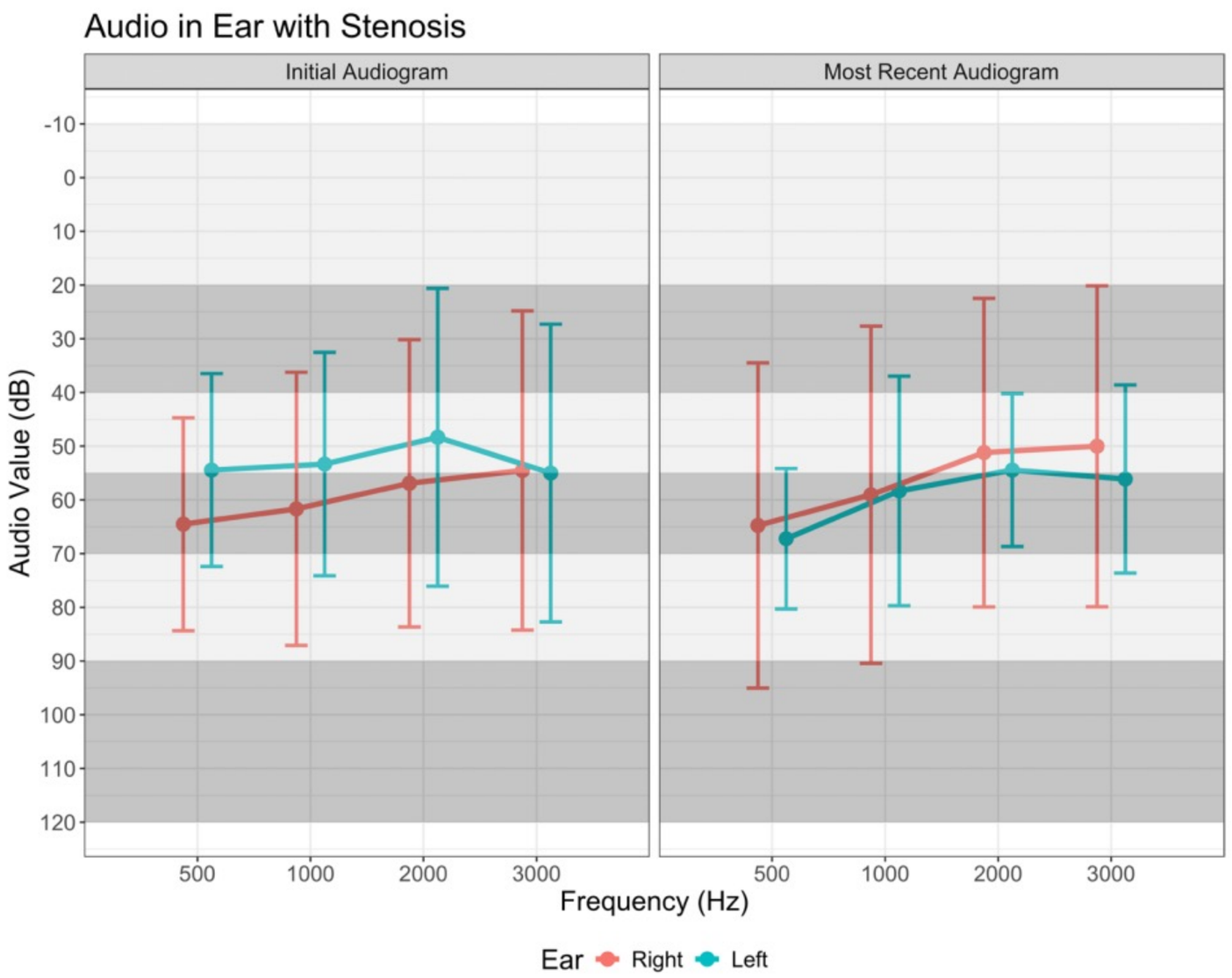
- The prevalence of microtia is estimated to be between 0.8-4.2 cases per 10,000 births, with increased prevalence among American Indian, Asian, and Hispanic populations.[1,2]
- The objectives of this study are to compare audiometric patterns between children with external auditory canal stenosis (EACS) and congenital aural atresia (CAA).
- We hypothesize that stenosis patients will experience hearing improvement over time and will have unique audiometric patterns on early hearing evaluations compared to aural atresia.

METHODS

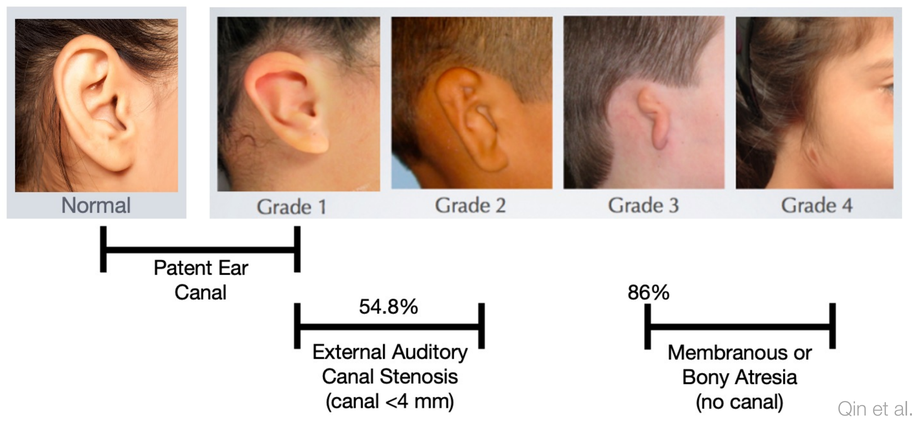
- Retrospective chart review was performed for 508 children with microtia treated at Children's Hospital Colorado.
- Patients were categorized as having CAA or EACS by documented physical exam, with confirmation by CT scan when available.
- Age-appropriate audiometric testing was performed by clinical pediatric audiologists, with hearing severity calculated as a pure-tone average.
- Hearing change was evaluated between first and last documented audiograms, prior to any canal or middle ear surgery.

RESULTS

- 186 children with microtia were included in analysis (n=156 CAA, n=30 EACS).
- There were no differences in sex, ethnicity, race, insurance type, or syndromic diagnoses between groups.
- Hearing levels were significantly more severe for CAA patients than EACS patients at the initial and final audiogram (p=0.004 and p<0.001, respectively).
- Hearing severity did not differ between initial and final audiograms for the EACS group (p=0.072).



Initial and final audiograms by ear for EACS patients. The red and blue lines represent the mean severity of CHL for the right and left ears at each frequency, respectively.



Qin et al. (2015)

Ages at initial and final audiograms.

	Atresia Patients (N = 156)	Stenosis Patients (N = 30)	P-Value
Age at Initial Audiogram (in years)			0.672
Mean (SD)	2.07 (3.19)	2.63 (3.69)	
Median (Q1, Q3)	0.68 (0.18, 2.8)	0.84 (0.142, 4.41)	
Age at Final Audiogram (in years)			0.44
Mean (SD)	8.09 (4.08)	7.50 (4.16)	
Median (Q1, Q3)	8.01 (4.87, 10.7)	7.31 (3.66, 9.51)	
Time Between Audiograms (in years)			**0.047***
Mean (SD)	6.03 (3.27)	4.87 (3.21)	
Median (Q1, Q3)	5.58 (3.24, 8.44)	3.6 (2.86, 6.86)	

*p < 0.05, **p < 0.01, ***p<0.001

Categorization of most severe hearing loss and pure-tone average.

	Atresia Patients (N = 156)	Stenosis Patients (N = 30)	P-Value
Severity of CHL on Initial Audiogram (% of patients)			**0.049***
Moderate CHL (40 - 54 dB)	6 (3.8%)	4 (13.3%)	
Moderate-Severe CHL (55 - 69 dB)	55 (35.3%)	13 (43.3%)	
Severe CHL (70 - 89 dB)	95 (60.9%)	13 (43.3%)	
Pure Tone Average on Initial Audiogram			
Median (IQR)	60 dB (55, 70)	60 dB (50, 65)	**0.004****
Mean ± SD	61.6 dB ± 9.8	57.4 dB ± 10.3	
Severity of CHL on Final Audiogram (% of patients)			**0.033***
Mild CHL (20 - 39 dB)	0 (0%)	1 (3.3%)	
Moderate CHL (40 - 54 dB)	2 (1.3%)	0 (0%)	
Moderate-Severe CHL (55 - 69 dB)	30 (19.2%)	10 (33.3%)	
Severe CHL (70 - 89 dB)	124 (79.5%)	19 (63.3%)	
Pure Tone Average on Final Audiogram			
Median (IQR)	60 dB (55, 70)	60 dB (50, 65)	**<0.001*****
Mean ± SD	63.6 dB ± 10.7	57.1 dB ± 11.6	

*p < 0.05, **p < 0.01, ***p<0.001

CONCLUSIONS

- In this study, it was rare for children with congenital EACS to have clinically significant improvement in hearing, indicating that the CHL is not exclusively a problem of the EAC.
- Hearing loss patterns did not differ between children with EACS and CAA.
- The extent of CHL is likely due to secondary middle ear deformities in this population, which is useful information when counseling families of infants with congenital EACS.

RESULTS IN PRACTICE

- Our recommendation is to counsel families on the low likelihood of natural improvement in conductive hearing loss in children with EACS and to use this information when discussing treatment options like surgical intervention and hearing amplification.

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