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Hearing loss and middle ear symptoms in aspirin-exacerbated respiratory disease.

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TO THE EDITOR

Aspirin-exacerbated respiratory disease (AERD) is an acquired, chronic inflammatory disease characterized by chronic rhinosinusitis with nasal polyposis (CRSwNP), asthma, and respiratory reactions to inhibitors of cyclooxygenase-1. Otologic complications of this disease are sparsely reported in the literature. Aural polyps have been reported twice[1,2] and a chart review identified hearing loss in 6 of 23 AERD patients[3]. Otologic symptoms have been described in association with CRS[4,5] and CRSwNP, [6,–7] and at least one study suggests endoscopic sinus surgery improves these symptoms[8]. In the latter study, 86% of CRSwNP patients reported ear fullness, dizziness, or ear pain prior to endoscopic sinus surgery. We sought to report the prevalence of otologic symptoms in patients with AERD and determine their association with clinical factors.

We developed a questionnaire to assess the presence and duration of otologic symptoms using single-choice response questions and free-text response fields (Figure E1). Patients enrolled in the Brigham and Women's Hospital (BWH) AERD patient registry, a longitudinally cohort of patients with a clinically confirmed diagnosis of AERD, were surveyed electronically; participation was voluntary. Corresponding demographic and

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clinical data were obtained from the BWH AERD patient registry. Statistical significance among associations was tested with logistic regression, Chi-square tests, and two-tailed t-tests.

Of the 1045 questionnaires distributed, 660 were completed (63.1%). Demographic characteristics and survey results are presented in Table 1. Among respondents, 260 reported a physician-confirmed diagnosis of hearing loss (39.3%). Historic congenital or traumatic hearing loss preceding the diagnosis of AERD occurred in 72; they were excluded from further analysis. At the time of survey, patients with hearing loss were older (51.0 ± 1.0 years vs 44.8 ± 6 years, $p < 0.0001$, table 2) and had a longer duration of nasal polyposis (17.2 ± 0.9 years vs 10.3 ± 0.4 years, $p<0.0001$) than those without hearing loss. Age at nasal polyp onset was equivalent between groups. Odds of hearing loss increased with each additional year of nasal polyposis (OR= 1.06 per year [95% CI 1.04-1.08] $p<0.0001$).

Middle ear symptoms (MES), defined as ear infections in adulthood requiring antibiotics, physician-confirmed middle ear effusion, or chronic ear drainage, were reported by 309 respondents (46.8%, Table 1). There was substantial overlap among MES with all patients reporting chronic ear drainage also reporting ear infection in adulthood, and all but 4 also reporting middle ear effusion (Figure E2).The presence of MES was a significant risk factor for hearing loss (OR=3.75 [95% CI 2.59-5.40] $p<.0001$) and was associated with female sex (OR=1.58 [95% CI 1.12-2.25] $p<0.001$). Compared to those without MES, patients reporting MES were younger at the time of asthma diagnosis (28.2 ± 0.8 years vs 30.6 ± 0.8 years, $p<0.05$, table 2). There was no difference in current age or age of nasal polyp onset between patients with and without MES.

To understand the severity of hearing loss and evaluate for eustachian tube dysfunction (ETD) all respondents endorsing hearing loss on the initial questionnaire were sent the Hearing Handicap Inventory for Adults (HHIA) and the Eustachian Tube Dysfunction 7 (ETDQ-7) questionnaire. Demographic characteristics and results are presented in Table E1. The mean ETDQ-7 score was 3.2 ± 0.2, consistent with ETD. The mean HHIA total score was 0.37 ± 0.02, suggestive of mild-moderate hearing handicap. Total, social, and emotional hearing handicap scores were significantly higher among respondents less than 40 years of age. Pearson correlation demonstrated a significant linear association between ETDQ-7 score and total HHIA score (Figure E3).

Our data suggest a significant and underrecognized burden of otologic disease in one of the largest cohorts of patients with AERD. These results demonstrate that duration of nasal polyps and presence of MES, independent of age, are risk factors for hearing loss in AERD. Moreover, the hearing loss reported by patients with AERD is associated with ETD and carries significant social and emotional handicap. This study highlights a need for regular audiologic screening for hearing loss and early intervention in this at-risk population. Our study is limited by the questionnaire methodology, as it relies primarily on patient reporting of outcomes, introducing the possibility of recall bias in disclosure of otologic symptoms. This study is also limited by the lack of a non-AERD comparison group and may reflect a burden of disease common in CRSwNP. Without audiogram data, our study cannot confirm the type of hearing loss. We hypothesize a mechanism by which the combination of

mechanical obstruction from nasal polyps and chronic sinonasal inflammation lead to ETD, resulting in a primarily conductive hearing loss pattern. Future studies should seek to compare hearing loss among patients across the CRS disease spectrum, to characterize the cause of hearing loss in AERD, and to identify the mechanisms linking hearing loss, MES, and chronic sinonasal inflammation.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Shen J, Peterson M, Mafee M, Nguyen Q. Aural Polyps in Samter's Triad. Otology & Neurotology. 2012;33(5):774–778. [PubMed: 22699987]
2. Brobst R, Suss N, Joe S, Saadia-Redleaf M. Bilateral Inflammatory Aural Polyps: A Manifestation of Samter's Triad. International Journal of Otolaryngology. 2009; 2009:1–3.
3. Caversaccio M, Hausler R, Helbling A. Otologic Manifestations in Samter's Syndrome. ORL. 2009;71(1):6–10. [PubMed: 18931527]
4. Tangbumrungtham N, Patel V, Thamboo A, Patel Z, Nayak J, Ma Y et al. The prevalence of Eustachian tube dysfunction symptoms in patients with chronic rhinosinusitis. International Forum of Allergy & Rhinology. 2017;8(5):620–623. [PubMed: 29227048]
5. Hung S, Lin H, Kao L, Wu C, Chung S. Sudden sensorineural hearing loss is associated with chronic rhinosinusitis: population-based study. The Journal of Laryngology & Otology. 2016;130(06):521–525. [PubMed: 27117586]
6. Parietti-Winkler C Otitis media with effusion as a marker of the inflammatory process associated to nasal polyposis. Rhinology Journal. 2009;47(4).
7. Hong S, Lee W, Lee S, Rhee C, Lee C, Kim J. Chronic rhinosinusitis with nasal polyps is associated with chronic otitis media in the elderly. European Archives of Oto-Rhino-Laryngology. 2016;274(3): 1463–1470. [PubMed: 27804083]
8. Teo N, Mace J, Smith T, Hwang P. Impact of endoscopic sinus surgery on otologic symptoms associated with chronic rhinosinusitis. World Journal of Otorhinolaryngology - Head and Neck Surgery. 2017;3(1):24–31. [PubMed: 28990012]

Clinical Implications:

Otologic complications in aspirin-exacerbated respiratory disease (AERD) are common and are associated with eustachian tube dysfunction and hearing loss. Regular audiologic evaluation and screening should be considered in this at-risk population.

Table 1:

Demographic characteristics, otologic symptoms, and major risk factors for hearing loss and MES in a cohort of subjects with aspirin-exacerbated respiratory disease.

Demographics			
	n=		% of total
Total Respondents	660		63.1%
Sex, Female	481		72.9%
Race			
Asian	9		1.4%
American Indian/Native Alaskan	3		0.5%
Black/African American	14		2.1%
White	610		92.4%
>1 race	17		2.5%
Other	4		0.6%
Age, years			
Mean	47.1 ± 0.5		
Range	19-69		
Age at Diagnosis of Asthma, years	29.5 ± 0.5		
Age at Diagnosis of Nasal Polyps, years	37.4 ± 3.1		
Number of Lifetime Polypectomies	2.5 ± 0.1		
Otologic Symptoms			
	n=		% of total
History of Hearing Loss	260		39.3%
Prior congenital/traumatic hearing loss or loud noise exposure	72		
History of Middle Ear Symptoms	309		46.8%
Middle Ear Effusion	198		30.0%
Chronic Ear Drainage	40		6.1%
Middle Ear Infection Requiring Antibiotics in Adulthood	274		41.5%
Vertigo	146		22.1%
Tympanostomy Tube Placement	59		8.9%
Myringotomy	52		7.9%
Tympanostomy Tube & Myringotomy	40		6.1%
Aural Polyps	9		1.4%
Risk Factors for Hearing Loss			
Risk factor	OR	95% CI	p-value
Female Sex	1.25	0.82-1.89	0.28
Presence of MES	3.76	2.59-5.40	<0.0001
Middle Ear Effusion	4.64	3.16-6.80	<0.0001
Chronic Ear Drainage	7.24	3.33-15.76	<0.0001
Ear Infections in Adulthood	3.08	2.15-4.41	<0.0001

Requiring Antibiotics			
Years of Nasal Polyposis	1.06	1.04-1.08	<0.0001
Risk Factors for MES			
Risk factor	OR	95% CI	p-value
Female Sex	1.58	1.12-2.25	<0.01
Years of Nasal Polyposis	1.02	0.998-1.04	0.071

Ages and polypectomies reported as mean ± standard error.

MES – middle ear symptoms.

Table 2:

Comparative Clinic Characteristics of patients with and without Hearing Loss and MES

	MES	No MES	p-value	Hearing Loss	No Hearing Loss	p-value Loss
Age	48.1 ± 0.7	46.2 ± 0.7	.06	51.0 ± 1.0	44.8 ± 0.6	<0.0001
Age at Onset of Asthma	28.2 ± 0.8	30.6 ± 0.8	<0.05	28.6 ± 1.1	28.9 ± 0.7	.74
Age at Onset of NP	40.2 ± 0.7	35.0 ± 0.7	.41	33.9 ± 1.0	34.3 ± 0.6	.73
Duration of NP	14.5 ± 0.6	11.17 ± 0.5	<0.0001	17.2 ± 0.9	10.3 ± 0.4	<0.0001

MES – middle ear symptoms. NP – nasal polyps. Ages and duration of NP are reported as mean years +/− standard error