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A Pilot Study of the Relationship between Autism Spectrum Disorder and Hearing Loss

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Abstract

Objective: To determine the occurrence of peripheral hearing loss and autism spectrum disorder in children enrolled in special education schools.

Methods: Twenty-two children diagnosed with ASD, confirmed by developmental medicine, were recruited from a special ASD school. Each participant underwent audiological testing: transient otoacoustic emission and impedance audiometry were used.

Results: The 22 participants were all boys, aged from 7 to 15 years, with mean ± 10.63 years and SD 2.4 years. TOAE was present in both ears in five ASD children, but it was absent in one or both ears in the remaining 17 participants. Seventeen of the 22 participants had type B and C tympanogram and an absence of TOAEs.

Conclusion: Children with ASD are at risk of peripheral hearing loss, due to middle ear problems. A complete audiological evaluation is recommended in all cases where ASD is suspected, so as not to delay diagnosis of hearing impairment in the event that hearing loss and ASD co-exist. Objective assessment measurements should be used to assess the auditory system in ASD children.

Keywords: Conductive hearing loss; Autism spectrum disorder; Middle ear; Tympanometry; Transient otoacoustic emission

Abbreviations

ASD: Autism Spectrum Disorder; TOAE: Transient Otoacoustic Emission

Introduction

Autism spectrum disorder (ASD) constitutes a group of developmental disorders characterized by impairments in social interaction and communication, and by restricted, repetitive, and stereotyped patterns of behaviors [1]. Typical signs of autism include, but are not limited to, speech and language delay, regression of developmental millstones at 18-24 months of age, avoidance of eye contact, tactile defensiveness, and engagement in repetitive and self-stimulating behaviors [2].

Approximately 4% of children who are hard of hearing have co-occurring ASD [3-6]. Audiologists may be among the earliest healthcare professionals encountered by a child with an ASD diagnosis and his or her family. Consequently, it is important that audiologists are aware of ASD and the symptoms that may be associated with the disorders. Increased awareness of the signs of ASD may help to facilitate earlier identification and intervention for children for better communication. Audiologists who work clinically with children may see a child with an ASD prior to a formal diagnosis of the disorder. It is common for a child with an ASD to have been suspected of having a hearing loss before the diagnosis of ASD was made.

Early identification of both disorders is extremely important to ease the effects of the dual diagnosis, since the co-morbidity of hearing loss and ASD may considerably complicate language development and communication skills. Because both hearing deficits alone and ASD alone could contribute to communication and social delays, identification of the true dual diagnosis is challenging [7,8].

Behavioral hearing assessments in ASD children are particularly challenging as a result of the difficulty in making contact with them. Using objective hearing methods, therefore, would seem to be the most suitable approach to assess hearing function in school-aged children with behavioral problems such as ASD [9].

One such method is transient otoacoustic emissions (TOAEs) testing. TOAEs can be easily recorded in children. They provide valuable information regarding the active process of the cochlea and outer hair cell integrity in individuals with clinically normal hearing and possible structural abnormalities that cannot be detected with behavioral testing.

Another objective method that can be used as an objective testing of auditory system is tympanometry, which evaluates the middle ear status. ASD children are less able to provide a reliable response when using a behavioral method. Therefore, it is vitally important that sensitive and specific physiologic measurement be available to provide information about functioning of the middle ear [10].

Method

Twenty-two children diagnosed with ASD, confirmed by developmental medicine, were recruited from a special school. The

gender and age of each child were recorded, and otoscopic examination ruled out pathology of the external auditory canal and middle ear, which can influence results. Each child underwent two types of audiological testing: TOAE test and tympanometric assessment. The data were analysed using basic statistical tests. TOAE responses were measured using OToRead system Interacoustics, Denmark, and middle ear status was evaluated using MADSEN OTOflex 100-tympanometer, Otometrics.

Results

The 22 children diagnosed with ASD enrolled in the special school were all boys. Their ages ranged from 7 to 15 years with mean ± 10.63 and SD 2.4. The tests consisted of TOAE bilaterally and impedance audiometry examination. TOAE was present in both ears in five ASD participants; in the remaining 17 participants it was present in just one ear or in neither ear. Tympanometric curves associated with a healthy middle ear on both sides (namely A) were described in seven ASD children. Tympanometric curves associated with dysfunctional middle ear (namely B and C curves) on both or one side were described in the remaining 15 children (Table 1).

Participants	Gender	Age	Tympanogram Right ear	Left ear	TOAE Right ear	TOAE Left ear
1	Male	15	B	B	Absent	Absent
2	Male	13	C	C	Absent	Present
3	Male	15	B	B	absent	absent
4	Male	12	A	A	Present	Present
5	Male	11	C	C	Present	Present
6	Male	13	B	B	absent	absent
7	Male	15	B	B	absent	absent
8	Male	9	A	A	Present	Present
9	Male	9	C	C	present	Present
10	Male	11	B	B	Absent	absent
11	Male	8	A	A	Present	Present
12	Male	9	C	B	Present	absent
13	Male	9	A	A	Absent	Absent
14	Male	8	B	B	absent	absent
15	Male	9	B	B	absent	absent
16	Male	9	A	A	Absent	Absent
17	Male	8	B	B	Absent	Absent
18	Male	9	A	A	Absent	Absent
19	Male	10	C	C	Present	Absent
20	Male	7	A	A	Absent	Absent
21	Male	10	C	B	Present	Absent
22	Male	11	B	B	Absent	Absent

Table 1: Characteristic of ASD children.

Discussion

We studied the occurrence of hearing loss in ASD children with different levels of intellectual functioning, using a combination of TOAEs and impedance audiometry testing. TOAE examination is widely used as a tool for screening in hearing loss. Seventeen out of the 22 ASD children tested had an absence TOAEs. The absence of otoacoustic emission is considered to be typical of conductive hearing loss in the course of otitis media with effusion [11,12]. The impedance audiometry examination is most commonly used as an objective examination allowing the assessment of middle ear functions.

The presence of types B and C tympanometric curves is most frequently observed in chronic otitis media with effusion, which is a common cause of conductive hearing loss in children [12].

Children with ASD have an increased prevalence of series otitis media and associated temporary conductive hearing loss [13]. Teachers and family are often unable to recognize the presence of middle ear problems such as otitis media and eustachian tube dysfunction.

Complete audiological assessment is recommended in all cases where ASD is suspected or confirmed, so as not to delay the diagnosis of hearing loss in the event that hearing loss and ASD co-exist.

Conclusions

Children with ASD are at risk of peripheral hearing loss due to middle ear problems. A complete audiological assessment is recommended, therefore, in all cases where ASD is suspected or confirmed, so as not to delay the diagnosis of hearing impairment in the event that hearing loss and ASD co-exist. Objective measurement such as TOAE and tympanometry should be used to assess the hearing condition in ASD children.

References

1. Lawson AK, Wright CV, Fitzgerald LF (2013) The evaluation of sexual harassment litigants: reducing discrepancies in the diagnosis of posttraumatic stress disorder. Law Hum Behav 37: 337-347.
2. Egelhoff K, Whilaw G, Radoux P (2005) What audiologists need to know about autism spectrum disorders. Semin Hear 26: 202-209.
3. Meinzen-Derr J, Wiley S, Bishop S3, Manning-Courtney P, Choo DI, et al. (2014) Autism spectrum disorders in 24 children who are deaf or hard of hearing. Int J Pediatr Otorhinolaryngol 78: 112-118.
4. Johnson CP (2008) Recognition of autism before age 2 years. Pediatr Rev 29: 86-96.
5. Gallaudet Research Institute (2011) Regional and national summary report of data from the 2009-2010 Annual Survey of deaf and hard of hearing children and youth. Gallaudet Research Institute, Gallaudet University, Washington DC.
6. Szymanski CA, Brice PJ, Lam KH, Hotto SA (2012) Deaf children with autism spectrum disorders. J Autism Dev Disord 42: 2027-2037.
7. Jure R, Rapin I, Tuchman RF (1991) Hearing-impaired autistic children. Dev Med Child Neurol 33: 1062-1072.
8. Guardino CA (2008) Identification and placement for deaf students with multiple disabilities: choosing the path less followed. Am Ann Deaf 153: 55-64.
9. Tas A, Yagiz R, Tas M, Esme M, Uzun C, et al. (2007) Evaluation of hearing in children with autism by using TEOAE and ABR. Autism 11: 73-79.
10. Takahashi H, Hayashi M, Sato H, Honjo I (1989) Primary deficits in eustachian tube function in patients with otitis media with effusion. Arch Otolaryngol Head Neck Surg 115: 581-584.

11. Dragicevic D, Vlaski L, Komazec Z, Jovic RM (2010) Transient evoked otoacoustic emissions in young children with otitis media with effusion before and after surgery. Auris Nasus Larynx 37: 281-285.

12. Zhao F, Wada H, Koike T, Ohyama K, Kawase T, et al. (2003) Transient evoked otoacoustic emissions in patients with middle ear disorders. Int J Audiol 42: 117-131.

13. Rosenhall U, Nordin V, Sandström M, Ahlsén G, Gillberg C (1999) Autism and hearing loss. J Autism Dev Disord 29: 349-357.