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(CASE REPORT)

Benign paroxysmal vertigo of childhood: A case report

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Abstract

Benign Paroxysmal Vertigo of Childhood (BPVC) is a disorder characterized by recurrent episodes of dizziness which are often sudden, occurring in the first decade of life, last a few seconds to one minute, recover completely after the episode and often would re-occur several times a month for several years. The present case study was to highlight the clinical features of BPVC in a 3 year old female child. Audiologists must be well aware of the typical features and clinical perspectives of BPVC.

Keywords: Vertigo; Benign Paroxysmal Vertigo of Childhood; Paediatric dizziness; Migraine Audiological investigation

1. Introduction

In contrast to adults, vertigo is a less common problem in childhood. However, as balance is connected to the three major sensory systems: visual system, vestibular system and proprioceptive system, an erroneous perception of movement can be due in the child as in the adult. The epidemiological studies report a prevalence rate of dizziness from 0.45% to 15% during childhood [1]. Vertigo in children was first reported by Basser in 1964 as 'Vestibular Neuronitis' in children under the age of four years [2]. The disorder and its characteristics are reputedly similar to Benign Paroxysmal Positional Vertigo (BPPV) in adults. Later, after the rise of sufficient amount of similar condition in children throughout the 1970s and 1980s, the syndrome was named as 'Benign Paroxysmal Vertigo of Childhood' (BPVC), considering as a relatively rare peripheral vestibular disorder that is commonly misdiagnosed or overlooked [3].

BPVC is now, the most frequent cause of paediatric dizziness and is probably a childhood manifestation of migraine. The disorder is characterized by recurrent episodes of dizziness which are often sudden, last a few seconds to one minute, recover completely after the episode and often would reoccur several times a month for several years. Symptoms also include loss of balance and staggering, without hearing loss or tinnitus, expressions of fear, diaphoresis, pallor, and occasional vomiting [3]. Typically, the age of onset of the disorder is 3-4 years but can occur late at the age of 7 or 8 years as well [4].

The exact pathogenesis of BPVC is not well understood but is thought to be a precursor of migraine at an older age [5]. Support for the migraine thesis underlying BPVC is the dearth of cellular debris in anatomical specimens of paediatric temporal bones [3].Some studies concur that it could be due to diffuse damage to the vestibular neuroepithelium, or due to 'canalolithiasis' or 'cupulolithiasis', a condition where the freely floating particles of cellular debris in the semicircular canals or particles of otoconia break off from the utricle, gets displaced and settle into the cupula [3].

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With current evidence, BPVC is regarded as migraine equivalent because of the presence of some features typical of migraine during adulthood. Other studies show that most of the children have a positive family history of migraine. [4]

The diagnosis of BPVC is based on thorough clinical history and the disorder should not be attributed to any other condition such as posterior fossa tumours, cervical spine abnormalities, vestibular otological pathology, epilepsy and metabolic disorders. [5]. It is necessary to have a multidisciplinary team approach including otolaryngologists, paediatric neurologists and audiologists to perform the comprehensive evaluation. The presence of episodic vertigo in a child without auditory symptoms in conjunction with associated historical features such as motion sickness sensitivity, an apparent relationship between vertiginous episodes and certain foods such as aged cheese and chocolate and a positive family history of migraine could lead to the diagnosis of BPVC. [6].

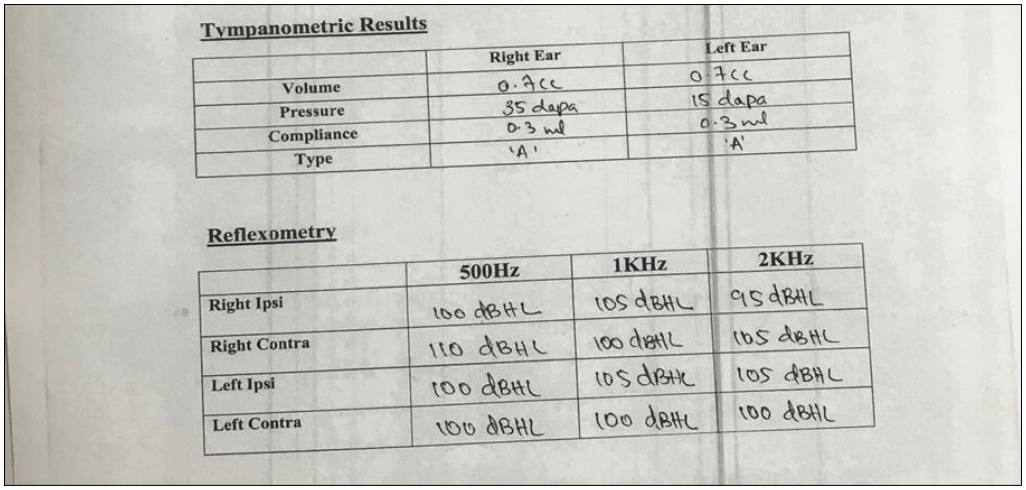
Audiological assessment is considered as a key point in the evaluation of a child with complaints of vertigo in order to differentially diagnose from other conditions associated with/without hearing loss. Objective vestibular assessment in children is more difficult to perform, requires modified approaches to reduce fear and to obtain reliable and reasonable recordings. Generally, majority of children with BPVC shows normal findings in audiometry, electroencephalograms, x-rays and scans of the brain and temporal bone. [3]. Vestibular test results usually include evidence of an ongoing vestibulo-ocular imbalance without evidence of peripheral vestibular involvement. Unilateral caloric reduction is sometimes found but is not an essential feature of the diagnosis. [7]. Directional preponderance on rotational testing is a common finding. [8-10].

It is very essential that audiologists and medical practitioners are well aware about this condition and when children present with such symptoms, clinicians should be able to accurately diagnose such conditions. Taking these aspects into consideration, we are presenting a case report on BPVC highlighting the clinical symptoms and audiological findings.

2. Case report

A 3 year old female child presented with imbalance episodes since one year. The child suddenly lose balance for 1-2 seconds while playing, then the child catches hold of anyone standing close by in an attempt to prevent fall. Some episodes are associated with child closing both ears and saying 'round'. The child was apparently normal till 2 years of age, then developed these paroxysmal events. Initially, she was taken to a local hospital and started on Cyproheptadine, used for two days, but stopped after she developed dystonic posturing of right leg. The child continued to get those events once in every two weeks with similar semiology. There is history of Migraine in child's mother from childhood.

Magnetic Resonance Imaging brain (MRI) done on 6-2-2020 revealed normal study. Electroencephalogram (EEG) (11-02-2020) was also normal in wakefulness. Following audiological evaluations were done: Immittance audiometric results showed Bilateral 'A' type tympanogram indicative of normal conductive pathway with acoustic reflexes present bilaterally (*Figure 1*).



Tympanometric Results

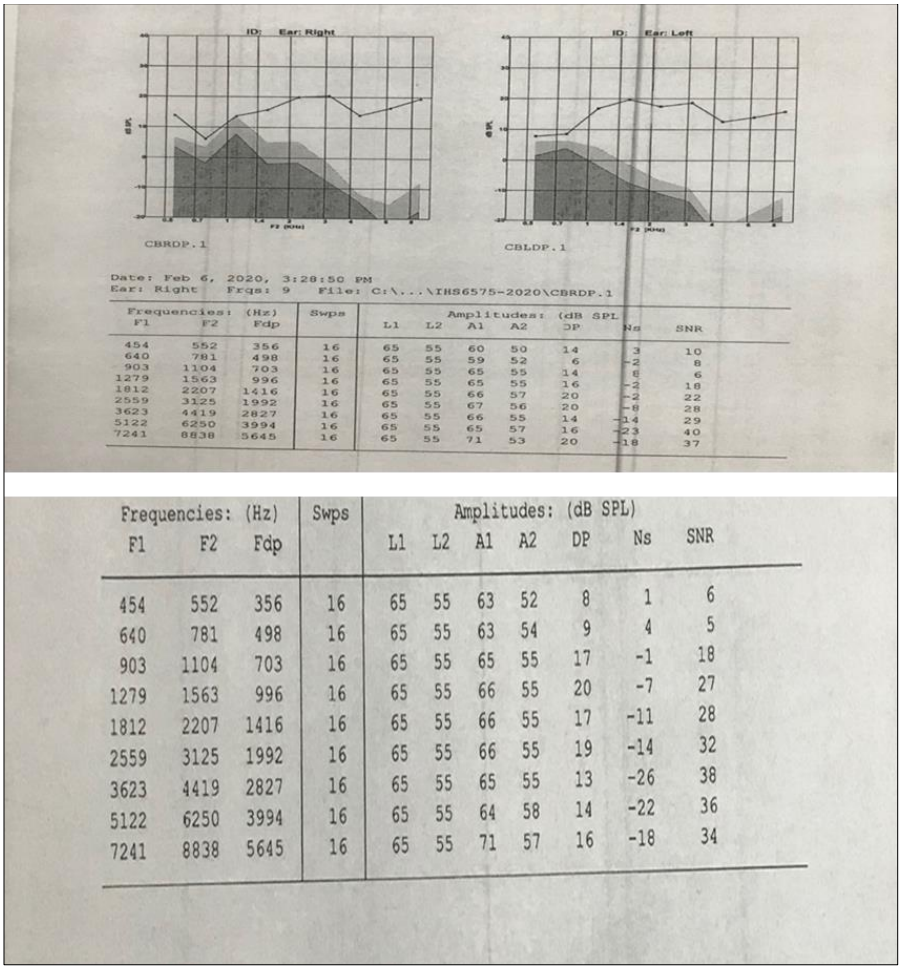
	Right Ear	Left Ear
Volume	0.7cc	0.7cc
Pressure	35 dapa	15 dapa
Compliance	0.3 ml	0.3 ml
Type	'A'	'A'

Reflexometry

	500Hz	1KHz	2KHz
Right Ipsi	100 dBHL	105 dBHL	95 dBHL
Right Contra	110 dBHL	100 dBHL	105 dBHL
Left Ipsi	100 dBHL	105 dBHL	105 dBHL
Left Contra	100 dBHL	100 dBHL	100 dBHL

Figure 1 Immittance audiometric results

Distortion Product Otoacoustic Emission (DPOAE) was present at majority of test frequencies indicative of normal cochlear Outer Hair Cell (OHC) functioning in both ears (*Figure 2*).



Frequencies: (Hz) F1	F2	Fdp	Swps	Amplitudes: (dB SPL) L1	L2	A1	A2	DP	Ns	SNR
454	552	356	16	65	55	63	52	8	1	6
640	781	498	16	65	55	63	54	9	4	5
903	1104	703	16	65	55	65	55	17	-1	18
1279	1563	996	16	65	55	66	55	20	-7	27
1812	2207	1416	16	65	55	66	55	17	-11	28
2559	3125	1992	16	65	55	66	55	19	-14	32
3623	4419	2827	16	65	55	65	55	13	-26	38
5122	6250	3994	16	65	55	64	58	14	-22	36
7241	8838	5645	16	65	55	71	57	16	-18	34

Figure 2 DPOAE results of right and left ear

Videonystagmography (VNG) was attempted; however the child did not allow keeping the goggles. Hence testing could not be done. Also, positional test could not be performed as the child was not cooperative. Considering the presence of Ipsilateral and Contralateral Acoustic Reflexes and DPOAEs, the child was considered to have normal hearing sensitivity bilaterally and intact auditory pathway till lower brainstem in both sides.

With the obtained audiological, radiological, neurological findings and the reported clinical symptoms and case history, we arrived at a diagnosis of Benign Paroxysmal Vertigo of Childhood (BPVC). Parents were counselled to do a regular follow up to monitor the condition. They were also recommended to consider starting Propranolol if complaints are persisting. After two weeks of follow up, parents reported no recurrence of events. The child was reviewed after eight months. She had one episode of dizziness lasting for few minutes and the child said to mother that she felt like rotating. They were recommended to start Folic acid and riboflavin tablets. During the follow up, VNG was attempted, but the child was not co-operative. Recent follow up was made in the department of Paediatric Neurology on 03/06/2021 and no events reported in last 4 months.

3. Discussion

Lack of literature resulted in less awareness among audiologists regarding balance issues in childhood. The present case study was to emphasize the role of audiologists in identifying and diagnosing BPVC by highlighting the clinical features and difficulties faced to evaluate a child with episodic vertigo.

Audiological evaluation was done to rule out other conditions. Immittance audiometry revealed bilateral A type tympanogram with presence of ipsilateral and contralateral acoustic reflexes. These test results indicated intactness of conductive pathway (external and middle ear), probable normalcy of acoustic reflex pathway from external auditory canal till lower brainstem (crossed as well as uncrossed reflex pathways), no obvious signs of extra axial or intra axial brainstem lesions. Correlation of test results with MRI brain reiterated these findings. Distortion Product Otoacoustic

Emission (DPOAE) revealed intactness of cochlear OHC function. Both these findings also indicated clues regarding probable normal hearing sensitivity in both ears. It would have been good if child cooperated for vestibular and balance evaluation such as Vestibular Evoked Myogenic Potential or VNG to gather more insights regarding pathophysiology.

There are lot of practical difficulties while evaluating children of such young age. Their description regarding dizziness or imbalance may not be accurate. Secondly, dizziness/imbalance in children creates profound sense of anxiety in parents and lack of knowledge in professionals may lead to excessive number of functional testing and imaging examinations, repeated number of visits to complete the detailed evaluation and may often lead to delay in therapeutic approach. Hence, adequate awareness in medical professionals and audiologists regarding conditions such as BPVC is critical in proper diagnosis and may play a critical role in alleviating undue tension among parents of children.

4. Conclusion

BPVC is an important childhood disorder that needs early recognition, characterized by recurrent brief episodic attacks of vertigo developing without warning in the first decade of life and resolves spontaneously and is a part of the "Childhood Periodic Syndromes', considered as a migraine precursor. Counselling parents regarding the benign nature of condition helps to relieve their anxiety.

The present study was to highlight the clinical features of BPVC. Audiologists and medical professionals must be well aware of the typical features and clinical perspectives of BPVC and should be an expert in selecting appropriate tests and should interpret findings properly in order to arrive at the diagnosis.

Compliance with ethical standards

Acknowledgments

The study was undertaken at Amrita Institute of Medical Sciences and Research Centre, super-specialty quaternary care health center and medical school in Kochi, India.

Disclosure of conflict of interest

The Authors declare that that they have no conflict of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from the participant included in the study. Informed consent was obtained from the legal guardians.

The participant has consented to the submission of the case report to the journal. Identifying information of the participant is not included in the article.

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