

VERTIGO IN CHILDHOOD: HOW TO EVALUATE VERTIGINOUS CHILDREN?

ÇOCUKLUK ÇAĞINDA VERTİGO: BAŞ DÖNMESİ OLAN ÇOCUKLARI NASIL DEĞERLENDİRELİM?

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Öz

Amaç

Çocukluk çağında vertigo, geniş ayırıcı tanısı olan bir yakındır. Bu çalışmanın amacı, vertigo şikayeti ile başvuran çocuk hastaların klinik özelliklerini belirlemek ve ayırıcı tanılarını değerlendirmektir.

Gereç ve Yöntem

Bu retrospektif çalışmada, Ocak 2018-Ocak 2021 tarihleri arasında Çocuk Nöroloji Polikliniğine, vertigo şikayeti ile başvuran yüz hastanın tıbbi kayıtları incelendi. Hastalar yaş, cinsiyet, aile öyküsü, semptomların süresi, atak sıklığı, provoke edici faktörler, eşlik eden semptomlar, fizik muayene, laboratuvar bulguları ve aldığı tanı açısından değerlendirildi.

Bulgular

Ortalama yaş 12.39 idi. Hastaların çoğunluğu (%64) erkekti. Vertigonun farklı nedenleri vardı, ancak en yaygın olan tanı, enfeksiyon (%34) ve psikojenik vertigo (%25) idi. Diğer sık nedenler arasında ortostatik hipotansiyon (%16) ve vitamin B12 eksikliği (%9) saptandı. Hastaların çoğunda semptom süresi bir aydan kısaydı ve ataklar genel olarak her gün görüldü. Hastalar ataklarını, çevrenin hareketi (%61), dönme (%27), dengesizlik (%20) ve diğerleri olarak tanımladı. En sık eşlik eden şikayetler, yorgunluk (%60) ve baş ağrısı (%54) olarak belirlendi. Laboratuvar verileri değerlendirildiğinde; dokuz hastada vitamin B12 eksikliği saptandı; diğer tüm testler normal aralıktaydı.

Otuz dokuz hastaya kraniyal manyetik rezonans görüntüleme yapılmıştı, 2 hastada anormal bulgu saptandı ve anormal bulgulardan sadece biri vertigodan sorumluydu.

Sonuç

Çocuklarda vertigo, hem ebeveynlerde hem de doktorlarda endişe duygusu yaratır ve çoğunlukla fazla laboratuvar ve görüntüleme incelemesine yol açar. Gereksiz araştırmalardan kaçınmak için değerlendirmeye ayrıntılı öykü ve kapsamlı fiziksel muayene ile başlanmalıdır. Vertigoya sebep olan ciddi durumlar nadirdir ve dikkatli klinik muayene ile tespit edilebilir.

Anahtar Kelimeler: Vertigo, Çocuk, Ayırıcı tanı, Değerlendirme.

Abstract

Objective

Vertigo is a complaint consisting of wide spectrum of diagnoses in childhood. The aim of this study was to evaluate clinical characteristics and differential diagnosis of pediatric patients with vertigo.

Material and Methods

In this retrospective study, the medical records of a hundred patients who presented to the Pediatric Neurology Outpatient clinic with the complaint of vertigo between January 2018-January 2021 were reviewed. Patients were evaluated for age, gender,

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family history, duration of symptoms, frequency of attacks, provoking factors, accompanying symptoms, physical examination, laboratory findings and final diagnosis.

Results

The mean age was 12.39 years. The majority of the patients were males (64%). There were different causes of vertigo, but the most common two were infection (34%) and psychogenic vertigo (25%). The other frequent reasons were orthostatic hypotension (16%) and vitamin B12 deficiency (9%). Most of the patients had symptom duration for less than one month (46%), and the attacks were primarily seen (65%) every day. Patients explained their attacks as the motion of the surrounding (61%), spinning (27%), imbalance (20%), and others. The most common accompanying symptoms were fatigue (60%) and

headache (54%). Laboratory data revealed vitamin B12 deficiency in nine patients; all other tests were in the normal range. Thirty-nine patients had cranial MRI, only 2 of them revealed abnormal findings, one of them was responsible for vertigo.

Conclusion

Vertigo in children creates a profound sense of anxiety both in parents and physicians leading to excessive number of functional testing and imaging examinations. Evaluation should begin with detailed history and comprehensive physical evaluation to avoid superfluous testing and diagnostics. Serious cases are fortunately rare and can be detected by careful clinical examination.

Keywords: Vertigo, Pediatric, Differential diagnosis, Evaluation.

Introduction

Vertigo occurs with considerable frequency in childhood (1-3). It is sometimes difficult to make the correct diagnosis because children are inadequate in describing their complaints, duration of episodes, provoking and accompanying factors. There may be symptoms of a wide spectrum of diagnoses and various peripheral and central causes may be implicated (1,2,4). Vertigo in children differs from that in adults and has been studied less extensively. Several etiologies are unique to the pediatric population while the others are rather different in children. The purpose of this study was to review the clinical characteristics and differential diagnosis of vertigo in children.

Material and Methods

In this retrospective study, the medical records of a hundred patients who presented to the Pediatric Neurology Outpatient clinic with the complaint of vertigo between January 2018-January 2021 were reviewed after approval of the Süleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee (Date: 28.04.2021, Number: 10/185). Patients with accompanying chronic conditions, patients with a history of long-term drug use, and missing data were excluded. Patients were anonymized and evaluated for age, gender, family history, duration of symptoms, frequency of attacks, provoking factors, the symptoms accompanying vertigo, physical examination findings, specialist consultations and final diagnosis.

We examined laboratory data, including complete blood count, biochemical tests (fasting blood glucose, electrolytes, liver, and kidney function tests), ferritin, B12 level, and thyroid function tests. The results from patients who underwent cranial magnetic resonance imaging (MRI) and electroencephalography (EEG) were evaluated.

Statistical Analysis

The statistical analyses of the study were performed using SPSS 20.0 (IBM Inc, Chicago, IL, USA). The descriptive statistics were presented as mean±SD for numerical variables and frequency (percentage) for categorical variables. Monte Carlo exact Chi-square test was used to see the relationships between the diagnosis and other clinical characteristics. A p-value of less than 0.05 was considered as a statistically significant result.

Results

The power analysis was performed using GPower 9.1.2 software, and the sample size was determined as 100. The power was considered 85% and the Type-I error 5% with the ratios of $p_1=0.65$ and $p_2=0.35$. Therefore, a total of 100 patients with vertigo were enrolled in the study. The majority of the patients were males (64%). The average age was 12.39 ± 3.29 years, and the range was 4 to 18 years. 34% of the patients had a family history of vertigo. Most of the patients had symptoms for a duration of less than one month (46%), and the attacks were primarily (65%) observed every day. Patients explained their attacks as the motion of the surrounding (51%), spinning

(27%), imbalance (20%), and others. The provocative factors of vertigo were standing up (40%), sudden move (36%), bending down (14%), turning over in bed (9%), and seasonal reasons (1%). We evaluated the severity of the disease in four classes with the highest rate belonging to the “moderate” class (48%). The attacks were lasting generally less than 60 minutes.

There were different causes of vertigo, but the most common two were infection (34%) and psychogenic vertigo (25%). The other frequent reasons were orthostatic hypotension (16%) and vitamin B12 deficiency (9%). Further details are provided in Table 1 and 2.

Table 1 Main characteristics of infants with vertigo

Characteristics	Categories	N (%)
Gender	Female	36 (36)
	Male	64 (64)
Duration of symptoms	< 1 Month	46 (46)
	1-2 Months	19 (19)
	3-6 Months	5 (5)
	6-12 Months	30 (30)
Frequency of attacks	Everyday	65 (65)
	Every week	23 (23)
	Monthly	10 (10)
	Annually	2 (2)
Description of attacks	The feeling of turning around	51 (51)
	Feeling of spinning	27 (27)
	Imbalance	20 (20)
	Other	2 (2)
Provocating factors	Bending down	14 (14)
	Standing up	40 (40)
	Turning over in bed	9 (9)
	Sudden move	36 (36)
	Seasonal changes	1 (1)
The severity of the attack	Mild	15 (15)
	Moderate	48 (48)
	Severe	27 (27)
	Very severe	10 (10)
Duration of attack	Seconds	17 (17)
	< 1 min	23 (23)
	1-60 mins	36 (36)
	> 60 mins	10 (10)
	Hours	11 (11)
	Days	3 (3)
Family history	Yes	34 (34)
	None	66 (66)

Table 2 Diagnosis of children with vertigo.

Diagnosis	n (%)
Infection	34 (34)
Psychogenic vertigo	25 (25)
Orthostatic hypotension	16 (16)
B12 deficiency	9 (9)
HT	4 (4)
BPVC	3 (3)
MS	1 (1)
BPPV	1 (1)
Epilepsy	1 (1)
Migraine associated vertigo	1 (1)
Trauma	1 (1)
Cardiac	1 (1)
Idiopathic	3 (3)
Total	100

HT: Hypertension, BPVC: Benign paroxysmal vertigo of childhood, MS: Multiple sclerosis, BPPV: Benign paroxysmal positional vertigo.

We evaluated the correlation between the etiology of vertigo and the duration of symptoms, the frequency of attacks, the explanation of the symptoms, the severity of the attack, and provoking factors. There was no significant relationship between the etiology and duration of symptoms ($p=0.418$). However, there was a strong correlation between the frequency of attacks and etiology ($p=0.040$). Diagnosis of the infection (70.6%), psychogenic vertigo (68%), orthostatic hypotension (56.3%), and vitamin B12 deficiency (66.7%) were the most common potential causes among attacks occurring on daily basis. The description of the attacks was not correlated with the etiology ($p=0.494$). The infection (64.7%), psychogenic vertigo (40%), orthostatic hypotension (31.3%), and vitamin B12 deficiency (44.4%) patients belonged to the group that described their symptoms as the motion of the surroundings. There was no significant relationship between the diagnosis and the provoking factors ($p=0.575$). The severity of the attack was not correlated with the diagnosis ($p=0.668$). It was seen that most of the patients diagnosed with infection (32.4%), psychogenic vertigo (48%), orthostatic hypotension (62.5%), B12 deficiency (66.7%), and hypertension (HT) (100%) were in the

group of moderate severity. It was also seen that the duration of the attack was not affected by the diagnosis ($p=0.602$). In most cases the duration of the attack was less than 1 minute or between 1 and 60 minutes.

The most common accompanying symptoms were fatigue (60%) and headache (54%). Nausea (32%), blurred vision (28%), anxiousness (23%), numbness (20%), fullness in the ear (18%), and vomiting (10%) were observed at lower rates. Other complaints were seen at rates below 10%. 10% of the patients did not have any associated symptoms (Table 3).

We examined the distribution between the age groups and the diagnosis of the patients. The distribution of etiology by age groups did not differ significantly. Benign paroxysmal vertigo of childhood (BPVC) diagnosis was seen only between the ages 4-6, but no BPVC diagnosis was found in older ages. While infection, psychogenic vertigo, and orthostatic hypotension were seen in all age groups, B12 deficiency and HT were observed in patients over ten years old (Table 4).

Table 3 Symptoms accompanying vertigo.

Complaints	n (%)
Fatigue	60
Headache	54
Nausea	32
Blurred vision	28
Anxiousness	23
Numbness	20
Fullness in ear	18
Vomiting	10
Diplopia	9
Dysarthria	8
Hearing Loss	4
Syncope	3

Table 4 Age-diagnosis

Tanı	Age Groups, n (%)				
	4-6 years	7-9 years	10-12 years	13-15 years	16-18 years
Infection	2 (28.6)	5 (38.5)	12 (52.2)	12 (30.8)	3 (16.7)
Psychogenic	0	3 (23.1)	4 (17.4)	12 (30.8)	6 (33.3)
Orthostatic	2 (28.6)	2 (15.4)	4 (17.4)	3 (7.7)	5 (27.8)
B12 deficiency	0	0	1 (4.3)	6 (15.4)	2 (11.1)
HT	0	0	2 (8.7)	2 (5.1)	0
MS	0	0	0	1 (2.6)	0
BPPV	0	0	0	1 (2.6)	0
Epilepsy	0	1 (7.7)	0	0	0
Other	0	2 (15.4)	0	1 (2.6)	0
Migraine	0	0	0	0	1 (5.6)
Trauma	0	0	0	0	1 (5.6)
Cardiac	0	0	0	1 (2.6)	0
BPVC	3 (42.9) _a	0 _{a,b}	0 _b	0 _b	0 _b
p			0.103		

a,b : superscript letter denotes the significant pairwise groups

HT: Hypertension, BPVC: Benign paroxysmal vertigo of childhood, MS: Multiple sclerosis,

BPPV: Benign paroxysmal positional vertigo.

Relationship between the complaint and the etiology was examined. The only complaint that varied significantly was determined to be blurred vision ($p=0.015$). It was observed that all complaints were generally concentrated in diagnoses of infection, psychogenic vertigo, orthostatic hypotension, and vitamin B12 deficiency. While complaints such as fatigue, headache, anxiousness, and nausea were observed at similar rates; blurred vision was less common in the infection group and more common among the psychogenic vertigo and orthostatic hypotension cases.

Laboratory data revealed vitamin B12 deficiency in nine patients; all other tests were in the normal range. The mean vitamin B12 serum level was 183.45 ± 18.16 (150.0-205.0) ng/mL.

We performed the audiological evaluation on 30 of the patients and all tests were normal. Ophthalmological examination was performed in 10 patients, none of them had pathological finding.

Thirty patients underwent cardiovascular evaluation, only one of them had the diagnosis of right bundle branch block, 4 had diagnosis of idiopathic HT, and 16 had orthostatic hypotension.

Thirty-nine patients had cranial MRI, only 2 of them revealed abnormal findings, one of them was responsible for vertigo; one patient had demyelinating plaques and the other one arachnoid cyst. EEG was performed in 55 patients, and only one had epileptic activity.

Discussion

Vertigo is a common complaint in childhood, consisting of a wide spectrum of etiologies. The diagnosis of vertigo in childhood is difficult, because ability to describe symptoms is limited, but still, history and physical examination remain the most valuable tools that allow diagnosis in most pediatric patients without further diagnostic tests (1-4).

The frequency of vertigo causes varies according to the examining centers. Differences in study design, inclusion and exclusion criteria may explain the differences between etiologies in different works. Several studies have reported that BPVC, migraine associated vertigo (MAV) and psychogenic vertigo are the most common causes of vertigo (3,5-7). Another study in childhood revealed that sinusitis and MAV were the most frequent causes of vertigo, followed by BPVC (4,8).

There were different etiologies that presented with vertigo in our study, but the most common two were infection (34%) and psychogenic vertigo (25%). The other identified reasons were orthostatic hypotension, vitamin B12 deficiency, HT, multiple sclerosis (MS), benign paroxysmal positional vertigo (BPPV), epilepsy, BPVC, MAV, trauma, and cardiac problems. No reason was found in 3 patients, their complaints were resolved spontaneously.

Vertigo can occur secondary to infections like otitis media and sinusitis in childhood. Pressure changes in the middle ear and labyrinthitis are responsible for the symptom. The frequency is reported to be 7-30% in different studies (4,7). Infection was the most common (34%) of the diagnoses in our study. The high rate of infection was thought to be due to accompanying headache, nausea, and vomiting symptoms which probably caused a pediatric neurology clinic admission. Clinical improvement was achieved with appropriate antibiotic therapy.

Psychogenic vertigo was reported in 5-22% of patients in different studies, while most of reports did not mention it among the etiologies for vertigo (1,4,9,10). Psychogenic vertigo was the second most common (25%) among the diagnoses in our study. Vertigo is often a subjective finding and can be accompanied by psychiatric disorders, such as anxiety disorders, depression and behavioral disorders. Psychosomatic effects in an anxious person can cause dizziness. Anxiety or hyperventilation may also reactivate a vestibular disorder by altering somatosensory input (11).

Orthostatic hypotension is frequently observed in childhood and represents a temporary weak adaptation of cardiovascular system to changes in body position. The most common accompanying symptoms are blackouts and loss of balance (12). The third most common cause in our study was orthostatic hypotension, and was detected in 10 patients. Only simple recommendations were made to the patients. Four children were diagnosed with HT. HT is a major circulatory disease that can affect the peripheral and/or central auditory and vestibular systems. The association between HT and vertigo is well known (13). Hypertensive crisis may be present with vertigo, thus the blood pressure should always be checked in such patients.

Vitamin B12 deficiency can cause neurological and psychiatric findings. Vertigo is one of the most common findings in deficiency (14).

BPVC was found only in three (3%) patients in our study, but was a common etiology in most other studies (3-6). The diagnosis of BPVC was made according to age onset, characteristics of attacks and normal physical and neurological findings between attacks. It usually occurs in early childhood and attacks disappear spontaneously (15).

BPPV consist of short-duration vertigo attacks in a definite head position. The disease is rare in childhood. It is a condition caused by dislodged otoconia into the semicircular canals (16). Only one patient had this diagnosis and was treated with repositioning maneuvers.

MAV is one of the most often reported diagnosis (3-6), but only one of our patients had this diagnosis. Vertigo may occur without, before or during migraine headaches. It can be seen together with phonophobia, photophobia, smell disorders, nausea and vomiting (15).

One of our patients had history of blunt head trauma. Computed tomography scan was negative and vertigo was due to labyrinthine concussion.

Only one of our patients had epileptic attack. Abnormal EEG findings, loss of consciousness accompany vertigo seen in epilepsy.

15-year-old girl had the diagnosis of MS which is a rarely reported condition and also cardiac arrhythmias may be present as a symptom of vertigo.

3 patients remained unclassified in our study. The incidence of unclassified vertigo in children differs in many studies.

Tumor, metabolic disease, refractive errors, vestibular neuritis are among the causes of vertigo (17) we did not detect in our study.

The most common symptoms accompanying vertigo were fatigue, headache and nausea followed by blurred vision, anxiousness and numbness. No associated symptoms were found in 10% of the patients. There are studies that reported headache, blurred vision and loss of balance among the most common symptoms (4), while others reported headache, syncope, nausea and vomiting as the most frequent ones (1,6,8,17).

Inadequacy of the children suffering from vertigo to explain the characteristics of symptoms, duration of episodes, and the provoking or accompanying factors

may cause problems in reaching the diagnosis. There was no strong correlation between diagnosis and duration of symptoms, explanation of situation, duration of attack, and the provoking factors in our study. The clinician should be aware of it and should try to make a diagnosis with the help of the caregiver. Neuroimaging studies contribute little to the diagnosis in patients if vertigo is the only symptom (18,19). Raucci et al, performed neuroimaging studies in 20.8% of 616 children and detected serious neurological problems only in 2.5% and noted neurological symptoms in these patients (5).

Similarly, a study of 171 pediatric patients with vertigo reported normal findings in 85% of MRI, 10% had non-specific findings, and they declare that neuroimaging findings have limited role in the children assessment with vertigo (1).

Consistent with literature, our results suggest that neuroimaging studies have a very limited role in the assessment of children with vertigo and should only be applied to selected patients.

Most patients presenting with vertigo do not require laboratory testing, it should only be considered in suspicion of special etiology.

Our observations suggested that vertigo in children does not commonly represent a life-threatening or serious illness and close cooperation between different specialties is essential in establishing a diagnosis.

Conclusions

Although the etiologies of vertigo are myriad, the most commonly identified reasons are benign entities. Vertigo in children creates a profound sense of anxiety both in parents and physicians leading to an excessive number of functional testing and imaging examinations that are often unnecessary. Evaluation should begin with detailed history and comprehensive physical evaluation to avoid superfluous testing and diagnostics. Serious cases are fortunately rare and can be detected by careful clinical examination.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Ethical Approval

Ethical approval was obtained from Süleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee (Date: 28.04.2021, Number: 10/185).

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