



A STUDY OF INCIDENCE OF VERTIGO IN CHILDREN IN RIMS RAIPUR C.G.

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ABSTRACT

Vertigo is a frequent symptom in the general population with a 12-month prevalence of 5% and an incidence of 1.4% in adults. Its prevalence rises with age and is about two to three times higher in women than in men. The epidemiology of vertigo and underlying specific vestibular disorders is still an underdeveloped field despite its usefulness for clinical decision making and its potential for improving patient care. We studied vertigo as a symptom and other four specific vestibular disorders: benign paroxysmal positional vertigo (BPPV), vestibular migraine, Ménière's disease, and vestibular neuritis. Data on the epidemiology of vertigo, however, are scarce; one of the underlying reasons is that vertigo is a subjective symptom and difficult to define. The Hearing and Equilibrium Committee of the American Academy of Otolaryngology-Head and Neck Surgery has defined vertigo as "the sensation of motion when no motion is occurring relative to earth's gravity." Although patients and many physicians tend to use the terms vertigo and dizziness interchangeably, dizziness experts seek to differentiate vertigo—as a symptom that arises from the vestibular system—from nonvestibular dizziness, which can comprise a sensation of light-headedness, giddiness, unsteadiness, drowsiness, or impeding faint, we use the term vertigo as a vestibular symptom. As measures of disease frequency in the population we use incidence (proportion of newly developed—incident—disease over a specific period) and prevalence (proportion of an existing disease at one time point, point prevalence, or during a given period, period prevalence, e.g., one-year prevalence). Lifetime prevalence denotes the cumulative lifetime frequency of a disease to the present time, i.e., the proportion of people who have had the event at any time in the past.

KEYWORDS : Vertigo, BPPV, Vestibular migraine, Meniere's disease, Vestibular neuritis

INTRODUCTION

Vertigo is a frequent symptom in the general population with a 12-month prevalence of 5% and an incidence of 1.4% in adults. Its prevalence rises with age and is about two to three times higher in women than in men. The epidemiology of vertigo and underlying specific vestibular disorders is still an underdeveloped field despite its usefulness for clinical decision making and its potential for improving patient care. We studied vertigo as a symptom and other four specific vestibular disorders: benign paroxysmal positional vertigo (BPPV), vestibular migraine, Ménière's disease, and vestibular neuritis.

MATERIALS AND METHODS:

The aim of this project was to evaluate the prevalence and clinical characteristics of childhood vertigo. Specific aims were as follows: 1. To determine the prevalence and characteristics of vertigo and balance problems in Finnish children aged 1-15 years. (I) 2. To evaluate—using a structured approach—the history and findings in vertiginous children as compared with a control group of healthy children. (II) 3. To assess the prevalence and characteristics of symptoms in vertiginous children visiting an ENT clinic. (III) 4. To determine the value of and indications for imaging of the head in vertiginous children. (IV) In the prospective epidemiological study from the general population (I), altogether 1050 children in the RAIPUR area received a screening questionnaire and 938 (473 girls, 465 boys) returned it; thus, the response rate was 89%. The children were aged 1-15 years (mean 9.3 years). From the same child population, 30 vertiginous children with true episodes of vertigo of unknown etiology were invited to further examinations at the ENT clinic (II). True vertigo was defined as rotational or veering vertigo. Children with orthostatic hypotension and vertigo due to misuse of alcohol were excluded from the true vertigo study group. Of those invited, 24 subjects (15 girls, 9 boys) aged 2-16 years participated. In all, we studied 24 vertiginous children and 12 healthy age- and gendermatched controls. Their mean ages were 10.4 years and 10.3 years, respectively. Girls made up 62% of the study group and 58% of the control group. In Study III, we reviewed the medical records of all subjects with vertigo, altogether 119 children (63 girls, 56 boys) aged from 7 months to 17 years (mean age 10.9 years at ENT clinic examination), who visited the ENT clinic between 2010 and 2014 with a primary complaint of dizziness or vertigo. In

Study IV, we reviewed the medical records of 978 children who had an MRI or CT of the head or a CT of the ears in 2014. Of these, 87 (40 boys, 47 girls) had imaging of the head because of vertigo, and we studied them more carefully. We also more closely examined 23 vertiginous children (13 girls, 10 boys) with a new abnormal finding in images that was thought to be the underlying cause of vertigo. The Ethics Committee of the Department of Otorhinolaryngology, RIMS, approved the study protocols. In Study I, we collected data on balance problems and vertigo from children in three different schools and one child welfare clinic in the RAIPUR area. The simple screening questionnaire with mostly yes/no types of questions also focused on recurrent falls, difficulties in walking, clumsiness, peculiar behavior, and experienced fear or panic. At the welfare clinic, the questionnaire with an information letter was given to 300 consecutive children visiting the clinic. At the three schools, we gave a questionnaire to every child in selected classes. The younger children filled in the questionnaires with their parents and the older children by themselves. The information on prevalence of vertigo and balance problems and other conditions was stored in a database for analysis. In Study II, we examined 24 children with true vertigo from the subject pool of Study I at the ENT clinic. These children provided a detailed history, underwent otoneurologic and general examinations, and had Ag, ENG, and tympanometry done if the cooperation was sufficient. A group of 12 healthy controls underwent the same protocol. All data were Materials and methods

RESULTS

An epidemiological study on childhood vertigo (I) The objective was to determine the prevalence and characteristics of vertigo and balance problems in children aged 1-15 years. Seventy-five children (8%) had experienced vertigo, with prevalence being cumulative such that older children had experienced more vertigo in their lives than younger children. The majority of the children (48%, n=36) had 1-2 attacks a year. Of the vertiginous children, six (8%) had frequent attacks, at least once a week. The vertigo attacks varied in duration from 1-15 s (35%, n=26) to more than 4 hours (3%, n=2). Vertigo attacks interfered with normal activities in 23% (n=17) of vertiginous children. Recurrent falls were experienced by 1% of the children and difficulties in walking by 2%. Clumsiness was most common in children

aged 1-5 years; altogether 3% of the children had been exceptionally clumsy. Peculiar behavior was reported by 2% and occasional fear or panic by 3%. A possible provoking factor or reason for vertigo was mentioned in 69% of vertiginous children's questionnaires. In Study II, we aimed to evaluate history and findings in vertiginous children as compared with a control group of healthy children. In the vertiginous group, there were significantly more head traumas than in controls (p<0.05). Diagnostic evaluation of vertiginous children (II) In Study II, we aimed to evaluate history and findings in vertiginous children as compared with a control group of healthy children. In the vertiginous group, there were significantly more head traumas than in controls. We also calculated the prevalence of vertigo and dizziness in all children based on questionnaires and examinations at the clinic. The most common cause of vertigo and dizziness was orthostatic hypotension, followed by hypoglycemia, BPVoC, OM-related dizziness, tiredness, and MAD. Based on our results, the otoneurological examinations did not differ between the study group and the control group. Head traumas and headaches were more common in vertiginous children than in controls. In Study III, the objective was to evaluate the prevalence and characteristics of symptoms in vertiginous children visiting an ENT clinic. Most children (n=92, 77%) had normal hearing in Ag, with no asymmetry and hearing thresholds equal or better than 20 dB hearing level, 22 (18%) had abnormal Ag, and Ag was unavailable for 5 children (4%). Two girls with a final diagnosis of MD had sensorineural and unilateral hearing loss as well as hearing fluctuation documented in Ag. DIAGNOSIS Number of children Benign paroxysmal vertigo 23 Migraine-associated dizziness 17 Vestibular neuritis 14 Otitis media-related dizziness 12 Psychogenic vertigo 6 Vestibulopathy (unknown) 6 Posttraumatic vertigo 6 Inner ear irritation, sudden deafness 4 Labyrinthine hydrops 4 Tension neck 4 Orthostatic hypotension 4 Epilepsy-related vertigo 3 Meniere's disease 2 Chronic cholesteatoma and surgery 2 Mal de barquement 1 Benign paroxysmal positional vertigo 1 Autoimmune thyroiditis, with hypothyreosis 1 Insulin shock-related vertigo 1 Sinusitis-related vertigo 1 Chiari I malformation 1 Ataxia (genetic) 1 Postoperative vertigo (after astrocytoma operation) 1 CATCH 22 syndrome 1 Ophthalmic vertigo 1 Otitis media-related vertigo and migraine-associated dizziness 1 Mononucleosis 1 TOTAL 119 CATCH 22, cardiac defects, abnormal facies, thymic hypoplasia, cleft palate, and hypocalcemia.

ENG was performed or attempted in 79 children. Six children did not complete the test because of insufficient cooperation. There were unilaterally reduced vestibular responses (side difference greater than 25%) in 12 patients with a diagnosis of sudden deafness, MD, posttraumatic vertigo, cholesteatoma, or VN. None had bilateral vestibular function loss. Ninety of the 119 children (76%) were examined at the Department of Child Neurology, Hospital for Children and Adolescents, RIMS; 14 (16%) had deviant neurological findings. Imaging of the head was done for 71 children (60%). It was normal in 64 children (90%) and abnormal in 7 (10%). Two of these abnormalities were posttraumatic fractures, one postoperative condition after brain tumor operation, one anomaly in the semicircular canals, one Chiari I malformation, one unilateral labyrinthitis, and one nonspecific post-bleeding sign. An ophthalmologic examination was carried out in 23 children who, based on history, were thought to have eye-related dizziness, but only one child's vertigo was purely ophthalmologic in origin. The aim of this study was to determine indications for imaging of the head in vertiginous children. Their ages ranged from 6 months to 16 years (mean 8.1 years). Of these vertiginous children, 53 (61%) underwent MRI, 24 (28%) CT, and 10 (11%) had both examinations done. Abnormal findings were present in 37 children's images; 14 had previously confirmed pathological findings that were unchanged and did not explain their new onset of vertigo, and 23 had a new abnormal finding explaining the vertigo symptoms. Of the 23 children with vertigo and a new finding in images, 19 (83%) had other neurological signs as well. Four children with a new finding in images had no neurological deficits, but 3 of them had intense headaches and 1 a temporal bone fracture after head trauma. Of the 23 vertiginous children with a new finding in images, 17 had MRI, 1 with a cerebrospinal fluid shunt problem had CT, and 5 had both examinations done. There were 33 vertiginous children (38%) with deviant neurological signs; 19 (58%) had an abnormal image, 2 (6%) had no changes from previous images, and 12 (36%) had a normal imaging study. All children with an obvious pathological finding in images (e.g. brain tumors, multiple sclerosis) had cranial nerve deficits or intense headaches. Multiple sclerosis lesions and acute disseminated encephalomyelitis

(ADEM) signals can be difficult to distinguish in head MRI; however, the final diagnosis is always made based on clinical findings.

DISCUSSION

Studies I and II focused on gathering information on vertigo from a general child population. We found that 8% of the children had experienced vertigo or dizziness. Due to severe vertigo, 23% of these children had had to stop their activity. A thorough history should be obtained from vertiginous children; especially previous head traumas and occurrence of headache gave valuable information and were more frequent in vertiginous children than in controls. The predominant types of vertigo were OM-related vertigo, MAD, and BPVoC. We reviewed patient data of vertiginous children who visited an ENT clinic during 2010-2014. The most common diagnoses were BPVoC, MAD, VN, and OM-related vertigo. Valuable diagnostic tools in achieving a diagnosis were medical and family histories, otoneurological examination, ENG, and Ag. We reviewed the medical papers of children who had imaging done due to vertigo. Head imaging in vertiginous children appears to be helpful only when the child has neurological deficits, or sustained head trauma along with vertigo. If vertigo is the only symptom, imaging studies of the head are unlikely to aid in diagnostic work-up. As in adults, the history and otoneurologic examination are the basis for the majority of diagnoses. In children a proper history and a description of symptoms may be incomplete, due to the lack of vocabulary. In younger children and infants, parental observation constitutes the history. Balance problems are not uncommon in children and can limit daily activities. In Study I, we attempted to differentiate between normal and abnormal clumsiness in very young children. We did not aim to diagnose the children, but requested their opinion on provoking factors or the cause of vertigo in the questionnaire. This information was identified by 69% of the children or their parents. None of the children reported trauma-related vertigo, perhaps due to the long lag time between the trauma and vertigo onset, making the correlation difficult to recognize. Post-traumatic vertigo has been cited as a frequent cause of vertigo in some studies (Eviatar and Eviatar 1977; Bower and Cotton 1995; D'Agostino et al. 1997; Choung et al. 2003). The response rate was 89%. The rate would have been somewhat higher had some children, especially teenage boys, not responded jokingly to their screening questionnaires. We excluded any answers that were unclear or frivolous. It is noteworthy that the study focused on the population located in southern Finland. Hazards, accidents, and disease profiles may be different in non urban areas or in populations of other genetic backgrounds. As far as we know, there are no earlier studies on prevalence of vertigo in children from the general population. Previous studies have concentrated either on school-aged children only (Abu-Arafah and Russell 1995) or on children who were patients in ENT or neurological clinics, thus not revealing the true prevalence of vertigo in children (Blayney and Colman 1984; Bower and Cotton 1995; Choung et al. 2002; Ravid et al. 2003). When children with vertigo are referred to an ENT clinic, the reason for vertigo is considered to be peripheral, while children with suspected central problems, MAD, and other paroxysmal vertigo attacks are referred to a neurological clinic. Discussion Vertigo in Children 39 In Study II, we aimed to diagnose the children with vertigo of unknown etiology. In conjunction with the detailed history-taking, Ag and ENG yielded the most information. The number of children in both groups was small, and thus, definitive conclusions could not be drawn. We had problems in motivating the children to participate in studies at the clinic, as many of them no longer had vertigo symptoms and the examinations at the ENT clinic were time-consuming. The controls were also difficult to recruit. Most of the children cooperated well. Children with true vertigo were selected to undergo further examinations. Based on the screening questionnaires, it was sometimes difficult to identify the children with true vertigo and therefore suitable for the study and in need of further examinations. Children reporting, for example, orthostatic hypotension or dizziness after alcohol drinking were, however, quite easy to exclude from the study group. In Study III, we reviewed medical records and determined medical characteristics of all children who had visited the RIMS ENT clinic because of vertigo. The major challenge here was to obtain a proper patient history from often poorly documented medical records. Children with vertigo made up 0.7% of the child population visiting the ENT clinic during this 5-year period. According to an epidemiological study, there should have been many more children with vertigo (Russell and Abu-Arafah 1999). Our diagnosis results were in line with earlier studies done in ENT and neurology clinics (Blayney and Colman 1984; Eviatar 1994; Bower and Cotton 1995; Weisleder and Fife 2001; Ravid et al. 2003). The most common forms of vertigo were

OM-related vertigo, BPVoC, MAD, and VN. We had two children with MD (1.7%). In the literature, MD prevalence in studies of vertiginous children has varied from 1.5% to 2.9% (Hausler et al. 1987; Akagi et al. 2001). The most common forms of vertigo were peripheral. This is as expected since the children were seen in an ENT clinic. Close cooperation between specialists is essential in establishing a diagnosis. Most of children (76%) had first visited a pediatrician or a child neurologist and had already undergone neurologic evaluations. When the underlying reason for vertigo was thought to be ear-related or unclear, the child was referred to an ENT clinic for further evaluation. In Study IV, we reviewed all medical papers of children who had undergone head imaging or CT of the ears during the study year. Abnormal radiological findings were found in 37 out of 87 children who had imaging done due to vertigo or dizziness. There were 23 children with a new abnormal finding. In their history and at examination, 19 patients had concomitant neurological signs or deficits, 3 intense headaches, and 1 a previous head trauma. Children in this study had more central causes of vertigo, reflected in their first being referred to the Hospital for Children and Adolescents, not to an ENT clinic. The most common abnormalities in images were brain tumors, CNS infections, and multiple sclerosis lesions. As far as we know, there are no earlier studies concerning the value of head imaging in vertiginous children. This study was important to define the signs and symptoms of children who need imaging of the head. This information will help to diminish unnecessary and expensive examinations, and young children can avoid unnecessary general anesthesia. Of the 23 children with a deviant image, 17 had undergone MRI, 1 with shunt problems had CT, and 5 had both MRI and CT. Radiation doses of CT scans may be harmful to children, and therefore, unnecessary head CT should be avoided (Khursheed et al. 2002). The first choice of imaging should always be MRI when available. Nevertheless, Discussion 40 CT of the head is preferred after head trauma or in children with shunt problems. With recent developments, MRI has become a very sensitive method of neuroimaging but can also reveal clinically insignificant findings. To counteract the high sensitivity of MRI, clinical findings should always be related to imaging results. In Study III, the prevalence of psychogenic vertigo was 5%, which is relatively high. We are planning a further study on psychogenic comorbidity in vertiginous children. We also intend to establish a structured questionnaire for pediatric vertigo patients that can be stored electronically. This is anticipated to improve the quality of patient medical records, particularly as they pertain to patient histories. Although vertigo in children is not common, it is seen frequently enough to warrant an adequate understanding by all otologists and child neurologists.

Conclusion: -

Epidemiologic findings on the distribution, determinants, and outcome of vertigo can contribute both to better patient care and to a better understanding of the underlying causes of vestibular disorders. Epidemiologic observations of the association between migraine and vertigo are a good example. However, the epidemiology of vertigo and vestibular disorders is still an underdeveloped field. In particular, prevalence and outcome studies are frequently hampered by selection bias due to patient identification in specialized care settings. Recent studies have underscored the high frequency and impact of the symptom vertigo and of vestibular disorders at the population level, in particular BPPV and vestibular migraine, but the determinants and outcome of these frequent conditions are not well known yet. Based on Studies I-IV, the following conclusions were drawn: 1. Balance problems or vertigo are not rare in children. Of the Finnish capital area population, 8% of children had at some point experienced vertigo, dizziness, or balance problems. Of these, 23% had sufficiently severe vertigo to prevent continuation of their activity. 2. The structured data collection approach eased the evaluation of vertiginous children. Otolaryngological examinations did not differ between the study group and the controls. More head traumas and headaches were observed in vertiginous children than in healthy controls. 3. Vertiginous children comprised 0.7% of children visiting an ENT clinic during the 5-year period. The most common diagnoses were BPVoC, MAD, VN and OM-related vertigo. In the diagnostic process, the most valuable tools were patient history, otoneurological examination, ENG, and Ag. 4. Imaging of the head with MRI or CT is indicated for those vertiginous children with either neurological deficits or persistent headache, or after head trauma. If vertigo is the only symptom, imaging studies are not likely to be helpful in setting a diagnosis.

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