Alder Hey Children's NHS Foundation Trust

Vestibular migraine in children

Prof Soumit Dasgupta

MBBS DLO MS FRCS MSc FIAOHNS FRCP

Consultant Audiovestibular Physician and Clinical Lead

Alder Hey Children's NHS Foundation Trust, Liverpool, UK

Honorary Visiting Professor, Otology and Skull Base Surgery, University of Siena, Italy

Honorary Senior Clinical Lecturer, University of Liverpool, UK

Honorary Lecturer, University of Manchester, UK

Secretary, International Vestibular Society and Vertigo Academy International

Vice President, British Association of Audiovestibular Physicians

Founder-member, International Paediatric Balance Network

Inspired by Children

Introduction

Definition

- Migraine is a neurological disorder that is traditionally characterised by a throbbing or pulsatile headache, episodic in nature and occasionally self-limiting

- The International Classification of Headache Disorders 3 (ICHD 3) lists different variants:
    - migraine with aura,
    - migraine without aura (including hemiplegic migraine, chronic migraine),
    - complications of migraine (including status migrainous, migrainous infarction, persistent aura triggered seizure and persistent aura without infarction),
    - probable migraine,
    - episodic syndromes associated with migraine (including cyclical vomiting, abdominal
    - migraine, benign paroxysmal vertigo and benign spasmodic torticollis)

Vestibular migraine is listed in ICHD where the predominant symptom is dizziness rather than headache

- Vestibular migraine is a distressing condition especially in children
- Diagnosis and clinical judgement is complex and crucial
- Management leads to a very rewarding outcome

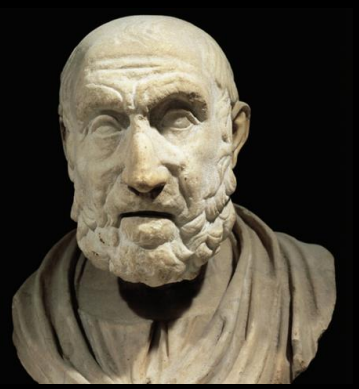
History of the evolution of vestibular migraine

A syndrome with headache, dizziness and intolerance to light was known since ancient times and the middle ages



Ebers papyrus

3000 BC



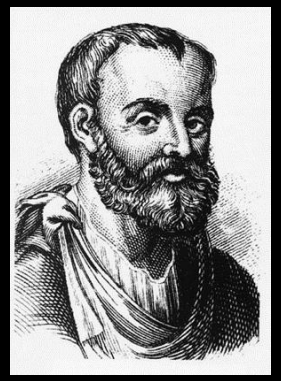
Hippocrates

460-370BC



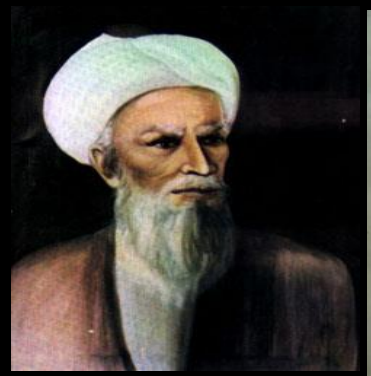
Aretaeus

2nd Century AD



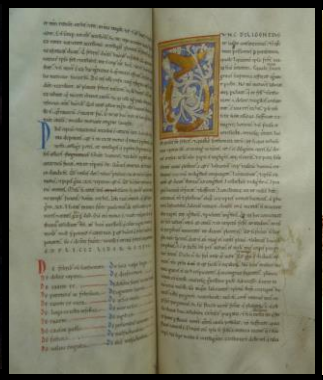
Galenus

129–200 AD



Rhases

10th Century AD



Gariopontus

11th Century AD



Ibn Sina

11th Century AD

- Shelby and Lance (1960) first reported the association between vascular headache and vertigo
- Bickerstaff (1961) described basilar artery migraine
- Kayan an Hood (1984) first proposed VM as a predominantly vestibular affliction as opposed to classical migraine
- Dietrich and Brandt (1999) coined the term vestibular migraine
- Neuhauser and Lempert (2004) laid the first diagnostic criteria for migrainous vertigo
- Barany Society (2012) published the diagnostic criteria for VM in adults followed by ICHD inclusion in 2018

- Basser (1964) identified benign paroxysmal vertigo of childhood (BPVC) as a clinical entity
- BPVC confirmed to be a migraine variety following a review by Batson (2004)
- Barany Society (2021) published the diagnostic criteria for VM in children merging the above

Epidemiology and pathogenesis of VM in children

Epidemiology

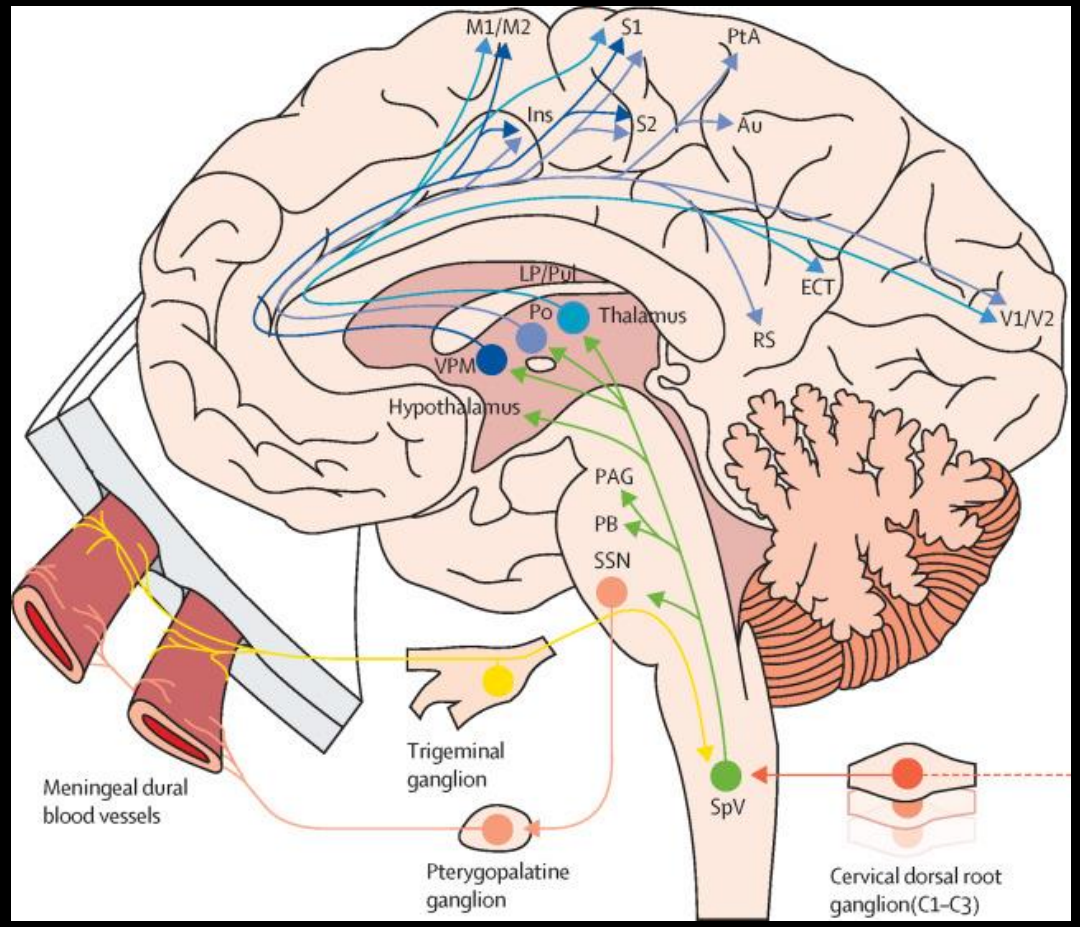
- Reported prevalence in children presenting with dizziness is 17% - 58%
- On an average, VM accounts for at least 25% of children with dizziness
- More common than in adults (4% - 10% prevalence) due to differences in cerebral plasticity, neurotransmitter and synaptic development and a developing vestibular system
- BPVC common in children under 4 years; VMC average age 10 years
- Females especially adolescents account for about two thirds; less common in Asians
- ***Absolutely essential to diagnose as VM generates significant morbidity in children affecting their childhood with psychological consequences***

Differences in adult and child brain function

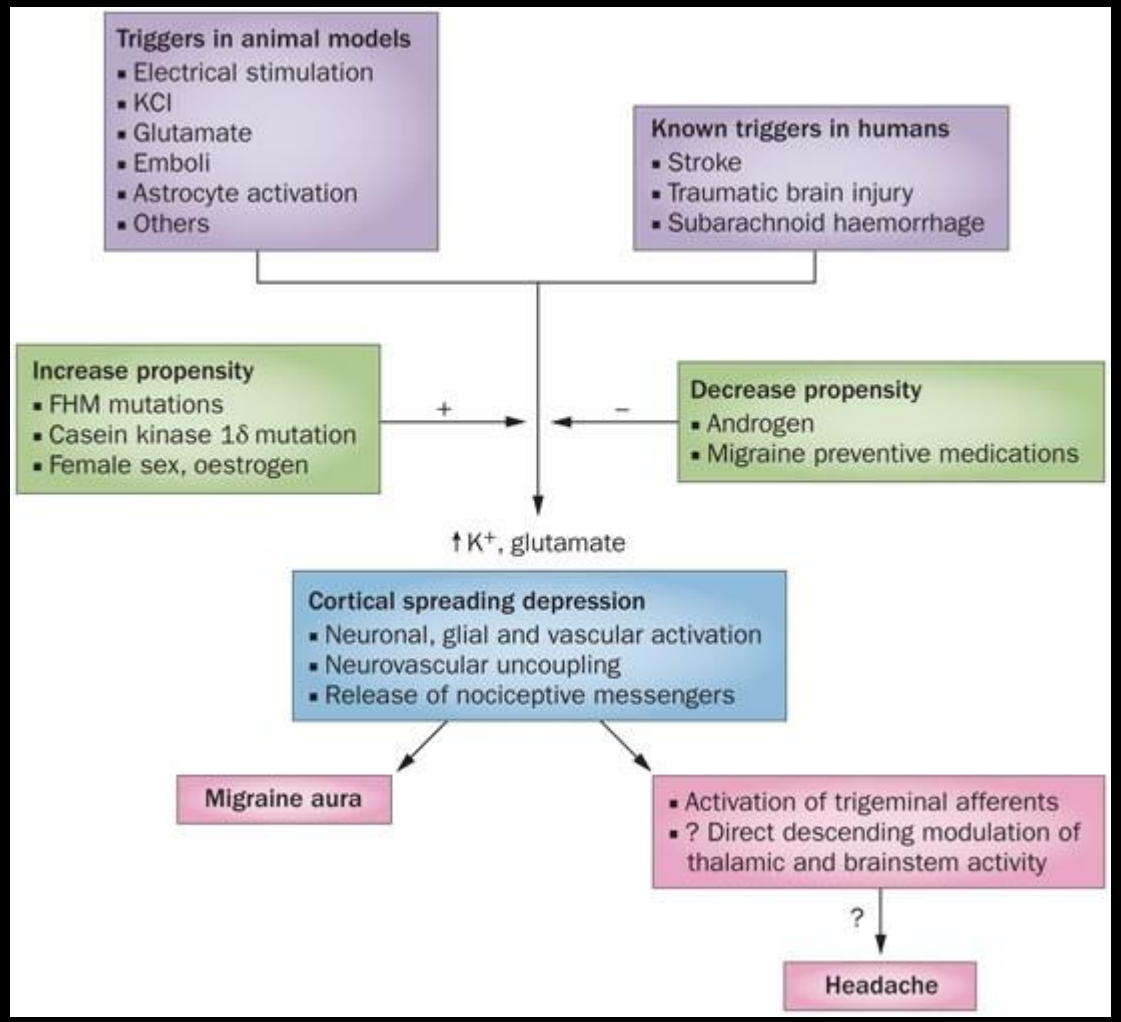
Child	Adult	Manifestation
Evolving neurotransmitters implicated in migraine – NAA, choline and glutamate	Neurotransmitters well established	Affects phenotype in terms of distress and duration
Taurine levels low	Full expression in adults	Removal of inhibitory neurotransmitter balance with more intense spells
Evolving cerebral blood flow with more O2 demand	Cerebral blood flow established	Affects vascular influence and is a more global central phenotype in children
Maturing cerebral plasticity	Established cerebral plasticity	Excitatory and inhibitory neurotransmitter flux modifications explaining frequency

Theories of pathogenesis of VM

- Vascular
- Trigeminovascular system activation
- Cortical spreading depression
- Inherent hyperexcitability probably genetic

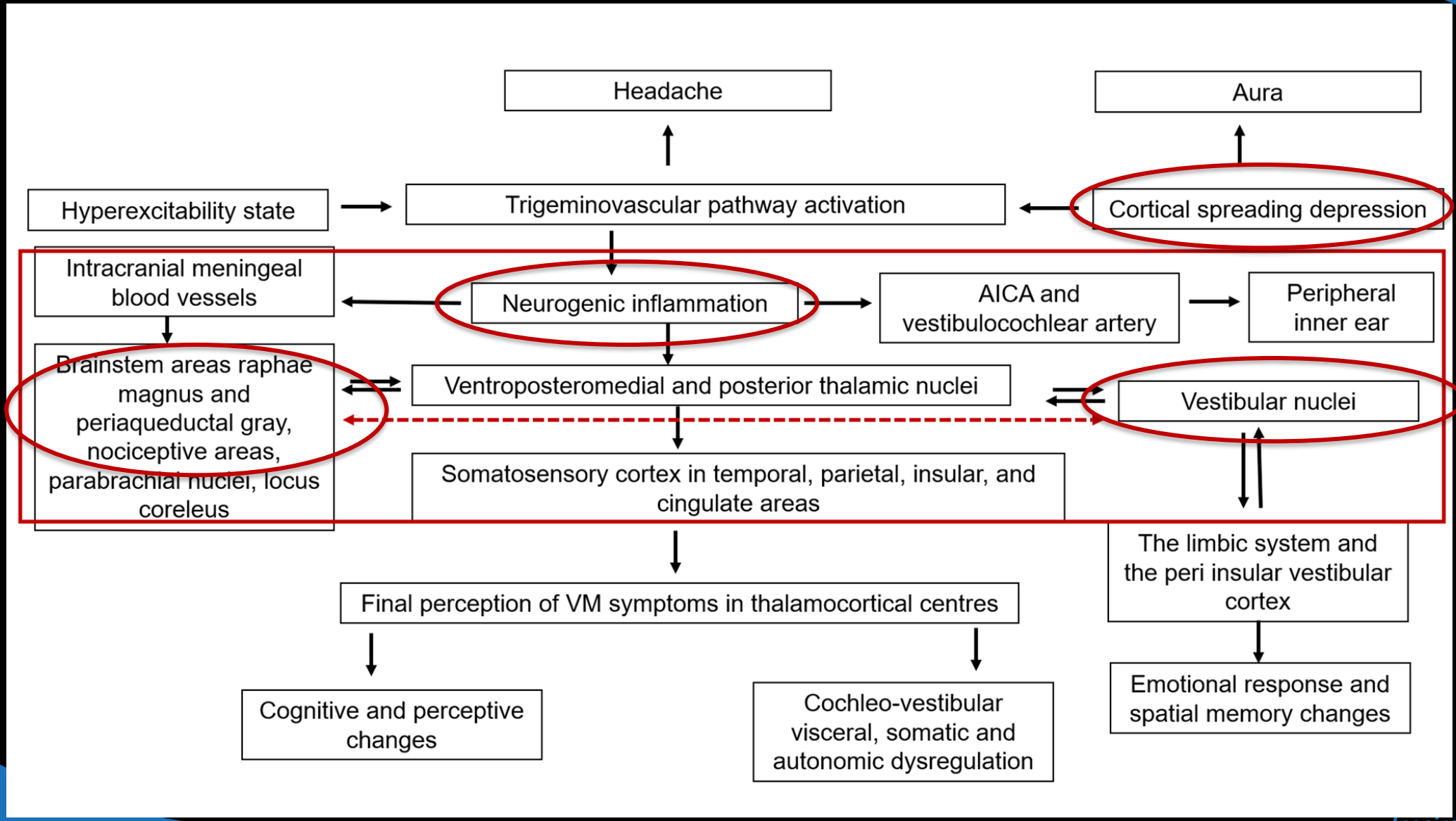


Migraine and the trigeminovascular system—40 years and counting
Ashina, Messoud et al. The Lancet Neurology, Volume 18, Issue 8, 795 - 804



Charles, A., Baca, S. Cortical spreading depression and migraine. Nat Rev Neurol 9, 637–644 (2013). https://doi.org/10.1038/nrneurol.2013.192

Pathogenesis



Vestibular areas participating in VM

Area	Location
Peripheral labyrinth supplied by vestibulocochlear artery	Inner ear
Uvula-nodulus, flocculus and the paraflocculus	Cerebellum
Vestibular nuclei	Brainstem
Raphae nucleus	Brainstem
Parabrachial nucleus	Brainstem
Locus coeruleus	Brainstem
Red nucleus	Midbrain
Thalamus	Diencephalon
Hypothalamus	Diencephalon
Amygdala	Temporal lobe
Hippocampus	Temporal lobe
Caudate nucleus	Basal ganglia in forebrain
Insula	Temporoparietal junction
Parietoinsular vestibular cortex	Parietal lobe
Periaqueductal grey	Midbrain

Biomolecules in VM

Neuropeptides

- Calcitonin gene related peptide (CGRP)
- Substance P
- Neurokinin
- Pituitary adenylate cyclase-activating polypeptide (PACAP)

Biomolecules

- Nerve growth factor (NGF)
- Nitric oxide
- Prostaglandins
- Capsaicin
- Riboflavin

Neurotransmitters

- Glutamate (excitatory)
- Gamma-amino butyric acid (GABA - inhibitory)
- Serotonin (low level increases susceptibility, high level exacerbates symptoms)
- Dopamine (excitatory)

Hormones

- Oestrogen
- Progesterone

Cochlear substrates in VM

- 12.2% of VM with cochlear symptoms
- Therefore, this is relatively rare than vestibular symptoms
- The TVS has limited connections in the cochlear circuitry except the dorsal cochlear nucleus and superior colliculus in addition of cochlear vessels intra cranium
- Upstream modulation is much less than vestibular connections from the level of the olivary complex and further higher up

Aetiology and comorbidity of VM in children

1.Classical migraine
2. Genetic factors
3. Head injury
4. Epilepsy
5. Meniere's disease
6. Neurodevelopmental disorders
7. Migraine variants

Genetic and familial

- 75% of children with VM have a positive family history
- Polygenic inheritance - 12 definite and 134 probable loci identified
- Definite association with CACNA1 1A, ATP1A2, HTR6, PRG and TRPM7, chromosome 11q and 5q.35

Head injury

- Meagre studies in children, in adults HI can cause VM in 0.36%
- Poorly correlated to severity of injury
- Injury induced elaboration of extracellular K+ leading to neurotransmitter excitation and depolarisation
- Injury induced activation of neuroinflammation through TVS
- CSD facilitated by developing CSF dynamics in a growing brain

Epilepsy

- Overlapping phenotypes – vacant stares, drop attacks, dizziness, headache
- Both migraine and epilepsy due to random firing and altered balance between excitatory and inhibitory neurotransmitters that could be genetic (for example CACNA1) or a channelopathy
- The main excitatory substrate in epilepsy is glutamate-driven AMPTA receptor whilst in migraine, the main excitatory substrate is the glutamate and CGRP-driven NMDA receptor in CSD
- CSD is less widespread in epilepsy but merges with migraine circuitry at the thalamocortical level
- Children with migraine with a 3.2 to 4.5% risk of developing epilepsy
- Distinguished by EEG and imaging

Meniere's disease

- In adults 25% - 50% of VM also have MD
- VM subjects have a two fold risk of developing MD
- Not defined in children and MD is rare in children that is usually secondary
- Pathogenesis of MD is ELH whilst that of VM is hyperexcitability
- The common pathway is peripheral and central vasospasm mediated by the vestibulocochlear and AICA territory
- The Barany criteria distinguishes between the two depending on the cochlear versus vestibular autonomic symptoms and duration
- The peripheral vestibular system might show weakness in chronic MD and rarely in VM

Classical migraine

- VM and migrainous headache with vertigo belong to the same group of hyperexcitable episodic central disorders and treated similarly
- Barany criteria stipulates that 50% of VM in children need to be accompanied with a headache
- The important distinguishing point is that in classical migraine vertigo is often described as an aura and ceases when the migraine starts
- In VM, the dizziness is more debilitating than the headache
- Even then, the natural history is tenuous and strict diagnostic criteria may lead to diagnostic bias

Neurodivergent conditions (NDC) in children

- Both NDC and VM are due to an hyperexcitable state mediated by a tipping of the balance between neuroexcitatory neurotransmitters and inhibitory neurotransmitters in addition to low serotonin
- Children with autism with a 2.5% risk of developing migraine
- Children with ADHD have a 1.75% risk of developing migraine
- Sensory dysregulation is more pronounced in NDC and teasing out a migraine history is complex

Migraine variants (ICHD 2018)

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Benign paroxysmal vertigo	Cyclical vomiting	Abdominal migraine	Benign torticollis of childhood
A. At least 5 attacks fulfilling criteria B and C	A. At least 5 attacks of intense nausea and vomiting, fulfilling criteria B and C	A. At least 5 attacks of abdominal pain, fulfilling criteria B to D	A. Recurrent attacks in a young child, fulfilling criteria Band C
B. Vertigo occurring without warning, maximal at onset and resolves spontaneously after minutes to hours without loss of consciousness	B. Stereotypical in the individual patient and recurring with predictable periodicity	B. Pain has at least 2 of the following 3 characteristics 1. midline location, periumbilical or poorly localized 2. dull or 'just sore' quality. 3. moderate or severe intensity.	B. Tilt of the head to either side, with or without slight rotation, remitting spontaneously after minutes to days.
C. At least one of the following 5 associated symptoms or signs: **1. nystagmus** **2. ataxia** **3. vomiting** **4. pallor** **5. fearfulness**	C. All of the following: 1. nausea and vomiting occur at least 4 times per hour. 2. attacks last for >1 hour, up to 10 days. 3. attacks occur >1 week apart	C. At least 2 of the following 4 associated symptoms and signs: 1. anorexia 2. nausea 3. vomiting 4. pallor	C. At least one of the following 5 associated symptoms or signs: 1. pallor 2. irritability 3. malaise 4. vomiting 5. ataxia
D. Normal neurological examination, audiometry and vestibular function between attacks.	D. Complete freedom from symptoms between attacks.	D. Attacks last 2-72 hours when untreated or unsuccessfully treated E. Complete freedom from symptoms between attacks.	D. Normal neurological examination between attacks.
E. Not better explained by another disorder	E. Not better explained by another disorder	F. Not better explained by another disorder	E. Not better explained by another disorder

Recurrent vertigo of childhood RVC(Barany 2021)

- Previously BPVC redubbed RVC as typically VM does not generate paroxysmal attacks that by definition are spells less than a minute
- However, in a developing brain and vestibular system, defining inflexible duration of symptoms may be over simplistic and fraught with difficulties, ambiguity and conundrum – many VM children may perceive spells for less than a minute
- Furthermore, many children cannot describe vertigo or spinning or dizziness and parental observation cannot pin point the duration in many cases
- BPVC was classically ascribed to children up to the age of 4 years when the symptoms merge with VM – from age of 4 years the vestibular system in children start attaining adult maturity – 20-69% of children with BPVC develop VM

Diagnosis

Special considerations

- There are no objective biomarkers to diagnose vestibular migraine
- Diagnosis is therefore based on defined criteria that is governed by anamnesis
- However, a child is not a miniature adult and extrapolating adult criteria for VM in children may miss diagnosis of the condition especially in young children as they are unable to describe their symptoms
- Perception of vestibular symptoms are different in children than in adults due to their illness cognitions contributed by developing and maturing vestibular-central connections, this must be factored in during diagnosis
- Surrogate history from carers/parents describing vestibular behaviour and its elicitation requires a skill set that can come from a trained paediatrician

- Since VM is a symptom-based diagnosis without any well-defined biomarker, the diagnosis has to be backed up by exclusion of other conditions (Barany criteria 2021) that remains an important part of the diagnostic process
- Therefore, full cochleovestibular quantification and imaging are recommended
- Neurological, metabolic causes of dizziness in children and cardiovascular causes of dizziness need to be excluded
- To note that imaging is crucial as intracranial pathologies may be unearthed that may explain phenotype – *the psychological and emotional reaction to VM is often heightened in the presence of a lesion in the emotional regulating centres for example the caudate nucleus or the third ventricle areas*

Criteria

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Barany adult 2012	ICHD 3 BETA 2018	Barany child 2021
A. At least 5 episodes with vestibular symptoms of moderate or severe intensity, lasting 5 minutes to 72 hours.	A. At least 5 episodes fulfilling criteria C and D.	A. At least 5 episodes with vestibular symptoms of moderate or severe intensity, lasting 5 minutes to 72 hours.
B. Current or past history of migraine with or without aura according to ICHD.	B. A current or past history of migraine with or without aura	B. Current or past history of migraine with or without aura according to ICHD.
C. One or more migraine features with at least 50% of the vestibular episodes - headaches with at least two of the following characteristics: a) one-sided location b) pulsating quality c) moderate or severe pain intensity d) aggravated by routine physical activity - photophobia and phonophobia - visual aura ***Probable VM requires criteria B or C***	C. Vestibular symptoms of moderate or severe intensity, lasting between 5 minutes and 72 hours. D. At least 50% of episodes are associated with at least one of the 3 migrainous features: 1. headaches with at least 2 of the following 4 characteristics: a) unilateral location b) pulsating quality c) moderate or severe intensity d) aggravation by routine physical activity 2. photophobia and phonophobia 3. visual aura	C. One or more migraine features with at least 50% of the vestibular episodes - headaches with at least two of the following characteristics: a) one-sided location b) pulsating quality c) moderate or severe pain intensity d) aggravated by routine physical activity - photophobia and phonophobia - visual aura D. Age less than 18 years ***Probable VM requires criteria B or C*** ***RVC does not require B or C and duration is 1 minute to 72 hours***
D. Not better accounted for by another vestibular or ICHD diagnosis	E. Not better accounted for by another vestibular or ICHD diagnosis	E. Not better accounted for by another vestibular or ICHD diagnosis

- Note that the variants with their typical symptomatology may mimic a vestibular migraine especially the BTC
- Often these are small children who are pre lingual or early lingual where diagnosis is made clinically with surrogate history describing ‘vestibular behaviour’
- The BPVC variety not infrequently may get treated for epilepsy and is a useful definition for counselling and for diagnosis using some ‘non migraine’ like symptoms
- The cyclical vomiting variant often ends up with gastroenterology

Symptoms encountered during spells

- Vacant stares and/or fright
- Pallor
- Ataxia
- Complete loss of mobility and drop attacks
- 'Fainting spells'
- Clutching of head
- Requiring silence and darkness to rest the spell off
- Struggling in school playground and missing school
- Travel sickness of recent onset
- Occasional identification of triggers for example stress and dehydration
- Visual sensitivity or vision induced vertigo
- Head motion induced dizziness
- Nausea and vomiting

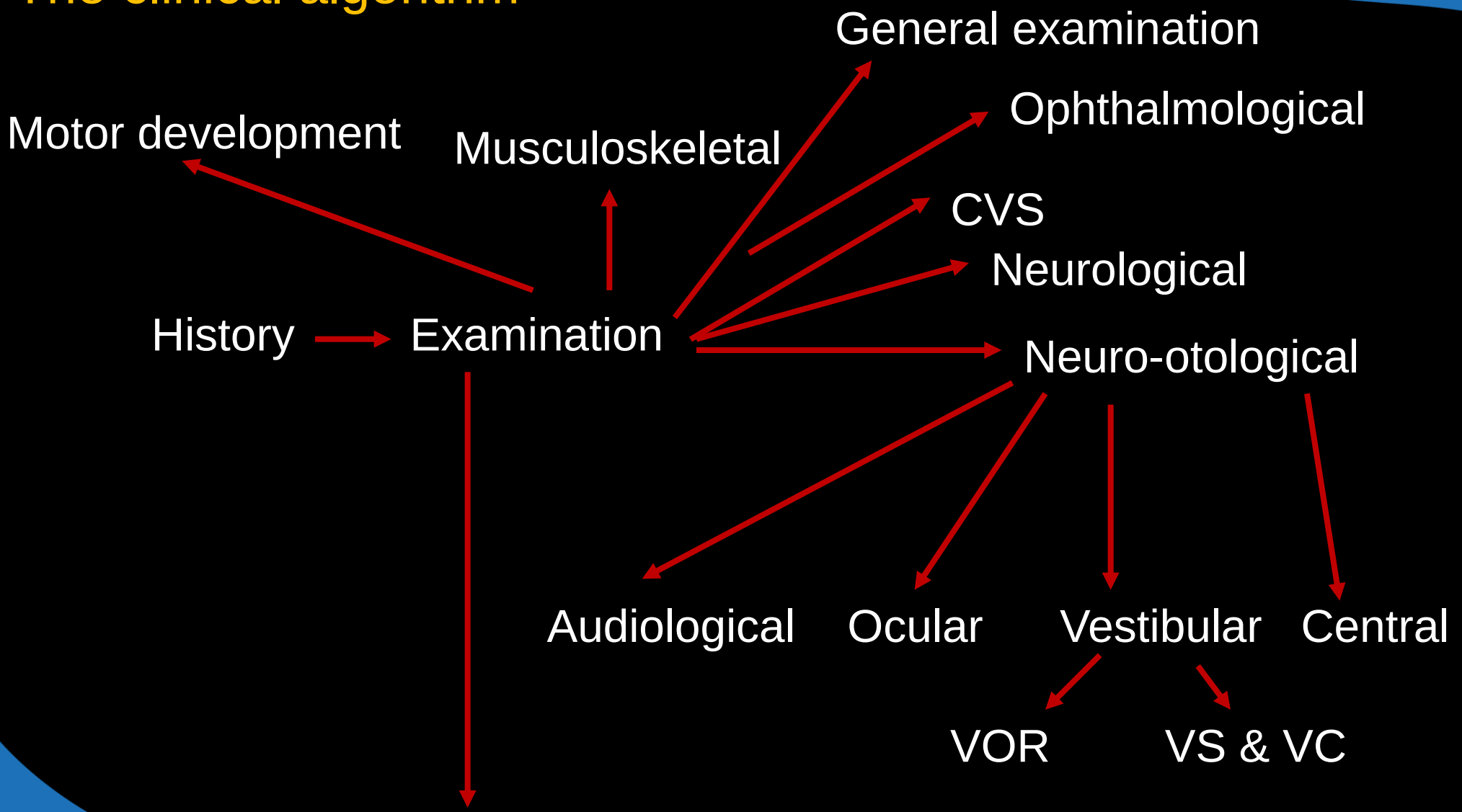
To note that a child may be unable to distinguish between a headache and a dizziness as both are distressing symptoms

Other history

- Birth history
- Family history
- Ear symptoms
- Development history especially motor development
- Other medical illness
- Head injury in the past
- Ototoxic history
- Musculoskeletal pain
- Gluten sensitivity and history of autoimmune disorders
- Past history of sepsis

Performance in school and social circles – remember, VM affects daily activities and overall emotional well-being in a child and this history is pivotal

The clinical algorithm



Imaging studies in all cases and blood tests when indicated

Recommended

- Baseline blood tests
- Imaging
- Peripheral hearing assessment if history suggests auditory symptoms
- Vestibular function tests required in all instances to make a diagnosis
    - Highly variable but generally unremarkable (up to 90%) and if present much milder than vestibulopathies
    - Mild unilateral caloric paresis and DP abnormalities
    - Low VOR gain
    - Absent VEMP
    - SVV tilt
    - Rotatory chair deficits
    - Central eye movement abnormalities not infrequent
- ***However, it is important to appreciate that VFT may also show hyperexcitability***

Differential diagnosis

- Posterior fossa tumours or space occupying lesions includes vestibular paroxysmia
- Peripheral vestibular disorders such as decompensating vestibular weakness and third window disorders
- Neurological conditions including seizure disorders, demyelinating disorders and ataxic syndromes
- Idiopathic intracranial hypertension
- A variety of gastrointestinal disorders including gastro-oesophageal reflux
- Congenital or acquired causes of torticollis
- Psychogenic dizziness
- Orthostatic hypotension, dysautonomia and POTS
- TMJ syndromes

Management

The management algorithm

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Phenotype determination

↓

Vestibular and central quantification

↓

ACCURATE DIAGNOSIS

Idiopathic

↓

Symptomatic treatment

- **Cognitive approach**
- Life style changes
- Involvement of significant others and MDT
- Pharmacological intervention
- **Vestibular rehabilitation**

Investigate decompensation

Cause found

↓

Symptomatic treatment

- **Cognitive approach**
- Treatment of cause
- Life style changes
- **Involvement of significant others and MDT**
- Pharmacological intervention
- **Vestibular rehabilitation**

Inspired by Children

Summary

- Life style changes – identification of triggers, keeping diary
- Counselling, information dissemination, reassurance and psychological support may be required
- Dietary modifications and adequate hydration
- Involving significant others and school in management with environmental modification linked to triggers
- Pharmacological management
- May need vestibular rehabilitation if vestibular weakness present
- *The condition is self limiting but the distress it generates is not and symptomatic relief is highly effective and rewarding*

The cognitive approach

- A key element to manage the paediatric population with vestibular disorders is to understand illness cognition models
- And this is applicable to both children and their carers
- They often come to you after multiple visits to specialists and are looking for an answer to address the most distressing question on illness cognition *uncertainty*
- A concrete diagnosis achieves cognitive closure and leads to a sense of well being and more importantly reconciliation and self directed coping strategies built around life style
- This leads to a significant improvement in quality of life
- Occasionally CBT is required

Lifestyle changes

- Life style changes for specific conditions like vestibular migraine and endolymphatic hydrops with diet and hydration

- Situational counselling
  - Coping with stress
  - Coping with tiredness
  - Coping with busy and crowded environment
  - Choosing right transport to travel
  - Avoiding challenging visual surroundings
  - Clutter free spaces for mobile navigation
  - Regulated head movements
  - Motion sickness counselling

- Adequate physical exercises

It is important to consider lifestyle changes as these changes prevent spells by eliminating triggers; but these must be counselled bearing in mind *that the child's enjoyment in certain activities are not curtailed by avoidance behaviour*

Pharmacological management

- This is an important cornerstone in managing VM in children and its variants and is complex
- There are 2 types of medications – a breakthrough drug to provide relief during spells and a prophylactic drug to prevent spells
- Indications for prophylaxis include more than 3 attacks in a month, severe distress during spells curtailing daily activities including absence from school and social withdrawal and/or female sex pubertal status assessed on a case-to-case basis
- Side effects and contraindications considered
- Regular updates and dose and drug titration with tapering period – a 3 month spell freedom without medication is deemed a discharge
- More research needed

Agent	Mechanism of action	Type
Prochloperazine	Dopamine antagonist D2 blocker	Breakthrough
Triptans	Serotonin agonist	Breakthrough
Dihydroergotamine	Serotonin agonist	Breakthrough
NSAID	Anti-inflammatory at neurogenic inflammation level	Breakthrough
Propranolol	Beta adrenergic receptor blocker – central vasodilation	Prophylaxis, also anxiolytic
Pizotifen	Serotonin antagonist	Prophylaxis, also anti-depressant
Topiramate	Increases GABA and inhibits glutamate	Prophylaxis
Cinnarizine	Antihistamine and Ca channel blocker	Prophylaxis
Flunarizine	Antihistamine, Ca channel blocker, serotonin antagonist, dopamine antagonist	Prophylaxis
Tricyclic antidepressants	Anticholinergic and serotonin antagonist	Prophylaxis
Sodium valproate	Enhancement of inhibitory neurotransmission specially GABA	Prophylaxis
Gabapentin	Ca channel blocker and enhances GABA synthesis	Prophylaxis
Riboflavin, Zn, Mg	Reduction of neurogenic inflammation and oxidative stress	Prophylaxis

Monitoring outcome of pharmacological treatment

- Improvement of distress, frequency and duration of migraine spells
- Changes in migraine diary
- Resumption of daily activities and coming out of withdrawal
- School report with increased attendances
- Social life restored
- VFT might show restoration of VOR gain in vHIT and SHIMP and recovery of VEMP amplitude and normalisation of thresholds

Vestibular rehabilitation

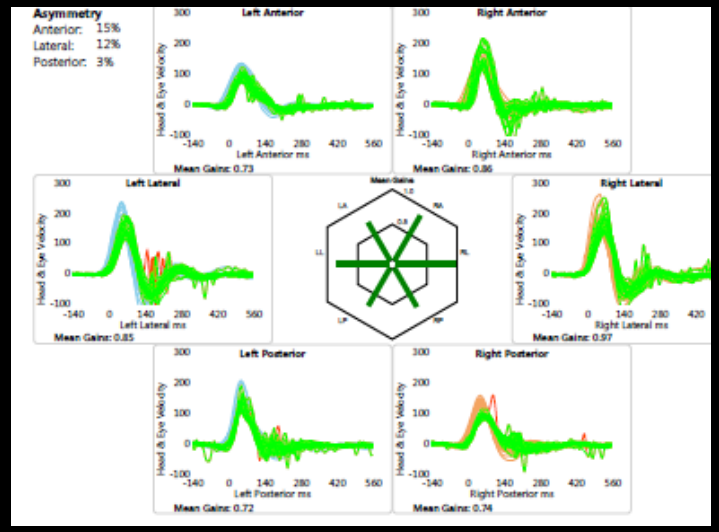
- Vestibular rehabilitation **should not be a blanket treatment option** for all children presenting with VM
- The decision depends on the quality of lives of children and the proper quantification of a vestibular weakness, evidence of decompensation; if weakness is quantified, then it depends on the presence of a vestibular history (central or peripheral) and vestibular behaviour affecting QOL
- Therefore, only indicated if there is objective vestibular weakness

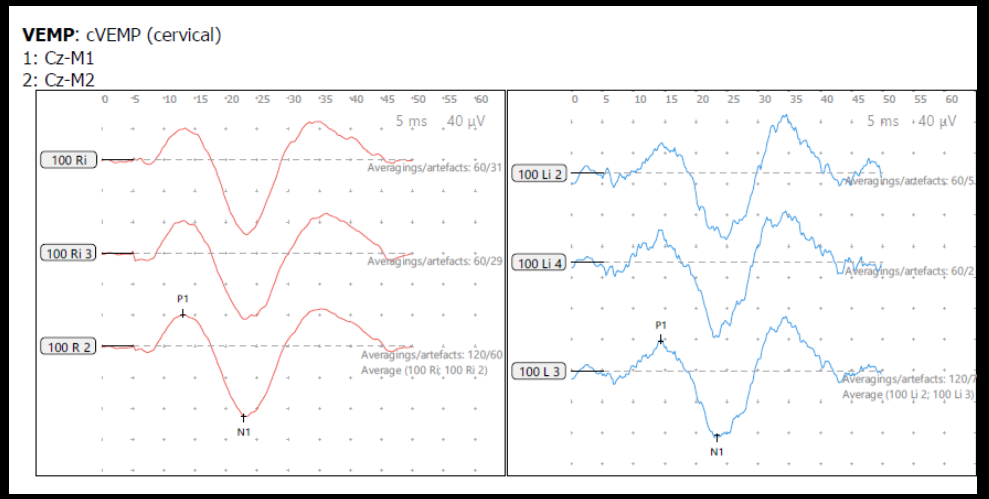
Prognosis and legacies of VM in children

- In the majority of children, VM is a self limiting condition especially BPVC
- Pharmacological management with life style and cognitive counselling lead to a favourable outcome with disappearance of symptoms and restoration of good lifestyle
- Chances of recurrence are present especially triggered by stress and puberty/adolescence
- VM carries an increased risk of developing BPPV – in Alder Hey, we have identified several children with BPPV and vestibular migraine (studies lacking except one in adult)
- 3PD is rare in children (overall prevalence 7%, Alder Hey <5%) and in VM it can be observed but rare (although a very limited study observed a prevalence of 56%); mitigated by meticulous follow up and getting the medicine right
- Reportedly up to 40% of children with VM go on to develop migraine in adult life but more studies are needed

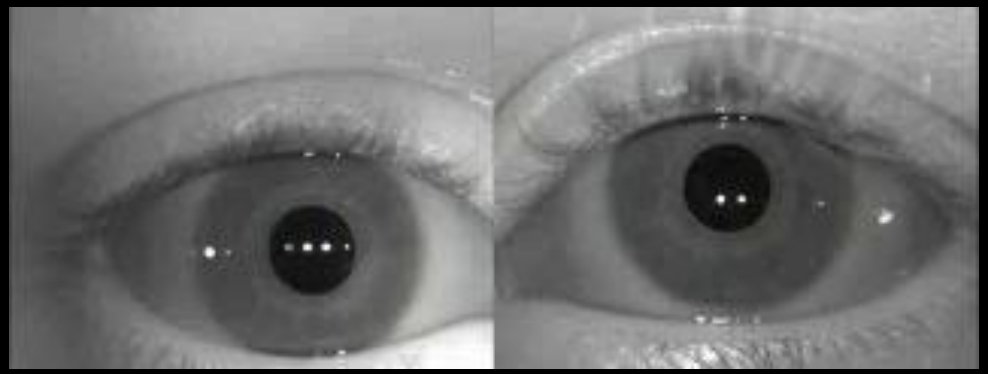
Examples

- Child with an acute dizzy spell followed by recovery but persistence of episodic spells lasting for hours with photophobia and phonophobia; difficulties in quick head movements
- Low confidence and some avoidance of school



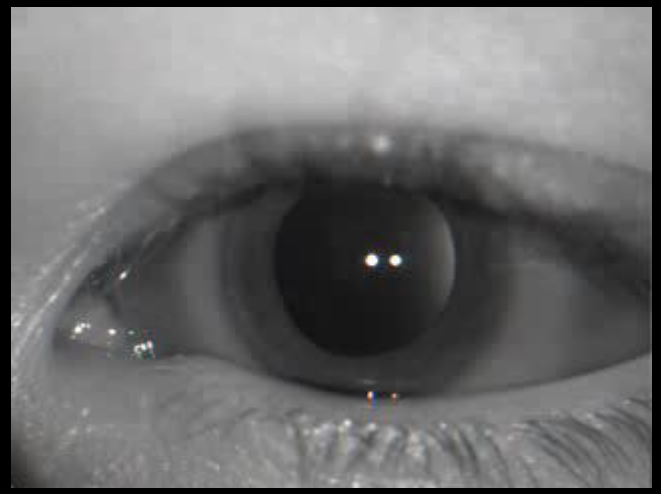


- High VOR gain in some canals
- All other tests normal
- Scan normal
- Abnormal central sign
- Treated with propranolol with excellent results, normal life style



Vestibular migraine

- Child with undiagnosed proximal myopathy; severe ataxia; positional dizziness with every change of posture; feels better in the dark; frequent falls; tinnitus and auditory processing problems; chronic symptoms and developmental delay with learning deficits
- Migraine features with headache and autonomic symptoms
- Obesity and some endocrine abnormalities; normal hearing
- Simultaneous vestibular migraine



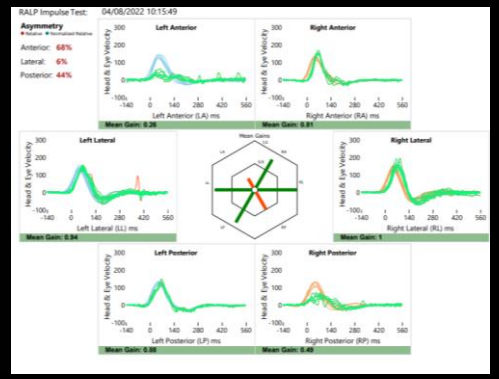
- Vestibular battery completely normal
- Macrosaccadic oscillations, perverted HSN, GEN
- Central scans normal
- Partial response to vestibular rehabilitation but more confident of balance; resolution of VM with pizotifen

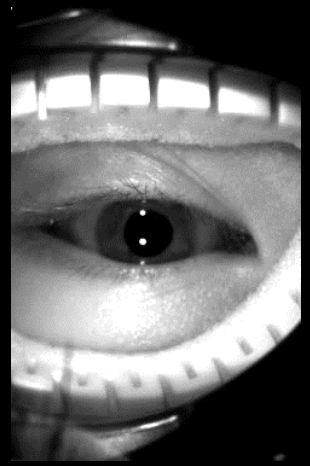
A variant of cerebellar ataxia EA2 CACNA1 mutation

3

- Child with an acute headache and diagnosed with third ventricle aqueduct of Sylvius stenosis effectively treated with endoscopic third ventriculostomy
- Presented with episodic dizziness, photophobia, phonophobia and visual symptoms fulfilling Barany's criteria for VM
- Significant psychological reaction and emotional lability way out of proportion to his treated condition with severe reduction on confidence and avoidance of school







- VFT normal but low VOR gain LARP
- Parinaud's nystagmus detected
- Stenosis of Sylvian aqueduct involving the PAG, a crucial emotional centre and migraine focus
- Resolution of VM with cinnarizine and betahistine
- CBT and counselling of pathology for cognitive closure
- Attendance in school and socialising with friends

Vestibular migraine with disproportionate cognitive response

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Alder Hey Series

Crunkhorn R, Ratnayake S, Dasgupta S
1747 Vestibular Migraine in Children
*Archives of Disease in Childhood 2021;**106:**A475.*

Inspired by Children

Period of study : 12 months

Total cohort: 81 children

Mean age at presentation: 10.3 ± 3.8 years (range 2-17)

Distribution: 38 boys and 43 girls

Prevalence of VM and variants : 20.8% of total referrals

Mean follow up : 28 months (Range 16- 70 months)

VM: n=31; 38.3%

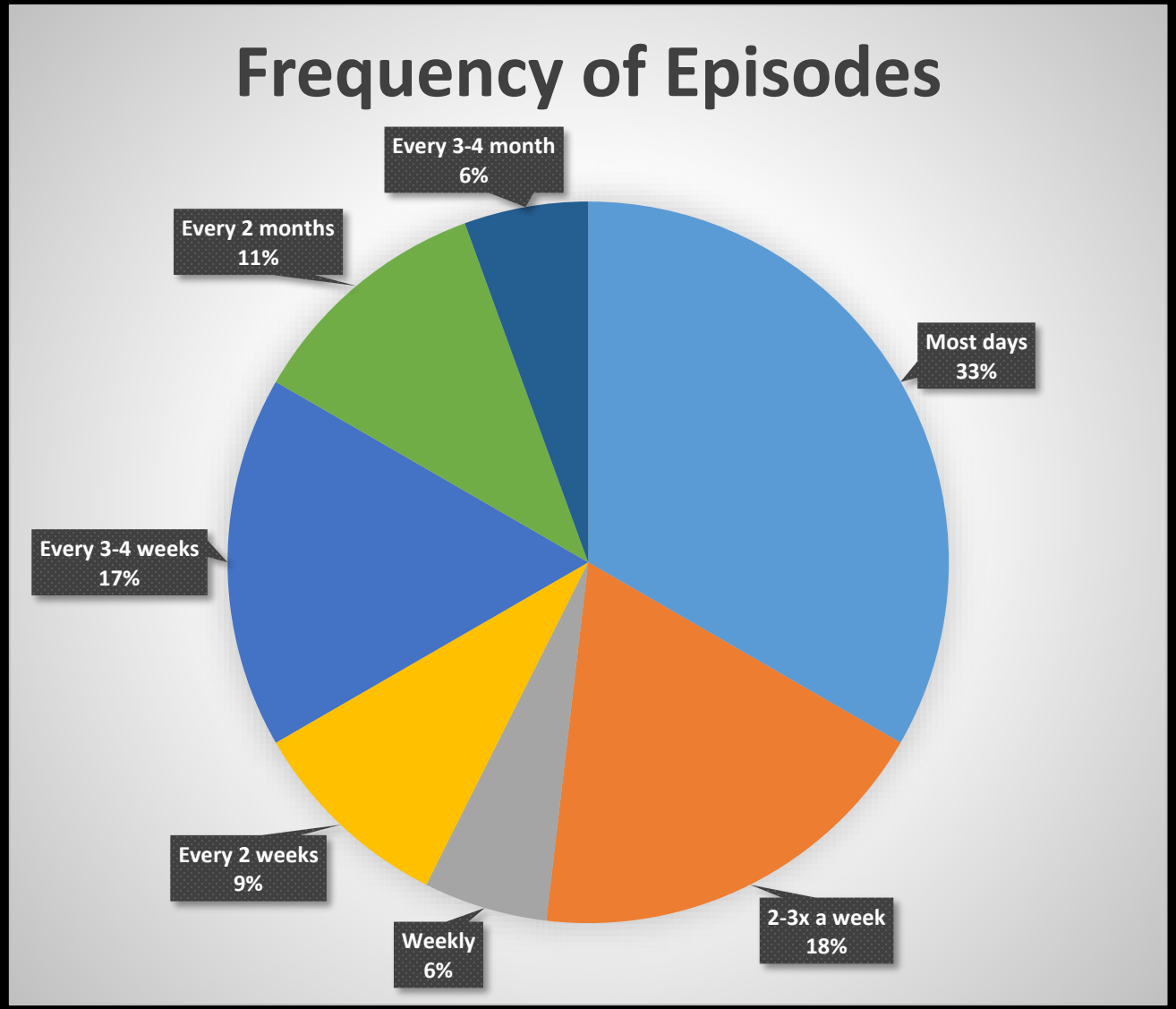
Probable VM: n=31; 38.3%

BPVC : n=12; 14.8%

Other:
Cyclical vomiting: n=4; 5%
Migraine + aura: n=1; 1.2%
Multifactorial (with migraine): n=2; 2.4%

Probable VM was based on fulfilment of some criteria and other symptoms

Frequency of Episodes



Vestibular function tests and oculomotor findings

Findings	Number of Abnormal Clinical Examination Findings	Number of Abnormal Vestibular Diagnostic Findings
OM Peripheral	3	8
OM Central	2	9
Neuro-vestibular	18	28
Head Thrust/vHIT	5	21

VOR gain significantly more than control group in all canals and cVEMP P1N1 latencies shortened in the majority; 30 (37%) children had normal examination and diagnostic findings

Outcome

- Discharged 11
- FU neurology 6
- Overall outcome:
  - 38 (66%) symptoms improved
  - 12 (20%) completely resolved
  - 8 (14%) ongoing symptoms
- Awaiting follow up 13
- DNA follow up 5

- Prophylactic medication trialled in 65 (80%)
  - Pizotifen or Propranolol 1st line
  - 84% improved / resolved with meds in those followed up
    - Small group: multiple medications poor response
- No medication in 16
  - 100% improved / resolved in those followed up

Holistic approach with cognitive counselling and involving others

Conclusions

- VM in children is a complex condition to diagnose and manage
- Diagnosis of vestibular migraine and its variants in children demand a high clinical skill set from a physician/surgeon trained in paediatrics
- Children except older teenagers might not describe or qualify their symptoms adequately to fit them into a diagnostic criteria
- Surrogate history observing vestibular behaviour is essential
- The diagnostic process must be flexible, practical and open, so that even in the absence of definite criteria, a clinical suspicion may be formulated
- Vestibular function tests show variable results but are required in all cases as is imaging
- Treatment is effective when holistic and restores quality of life of children and carers

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October 2025





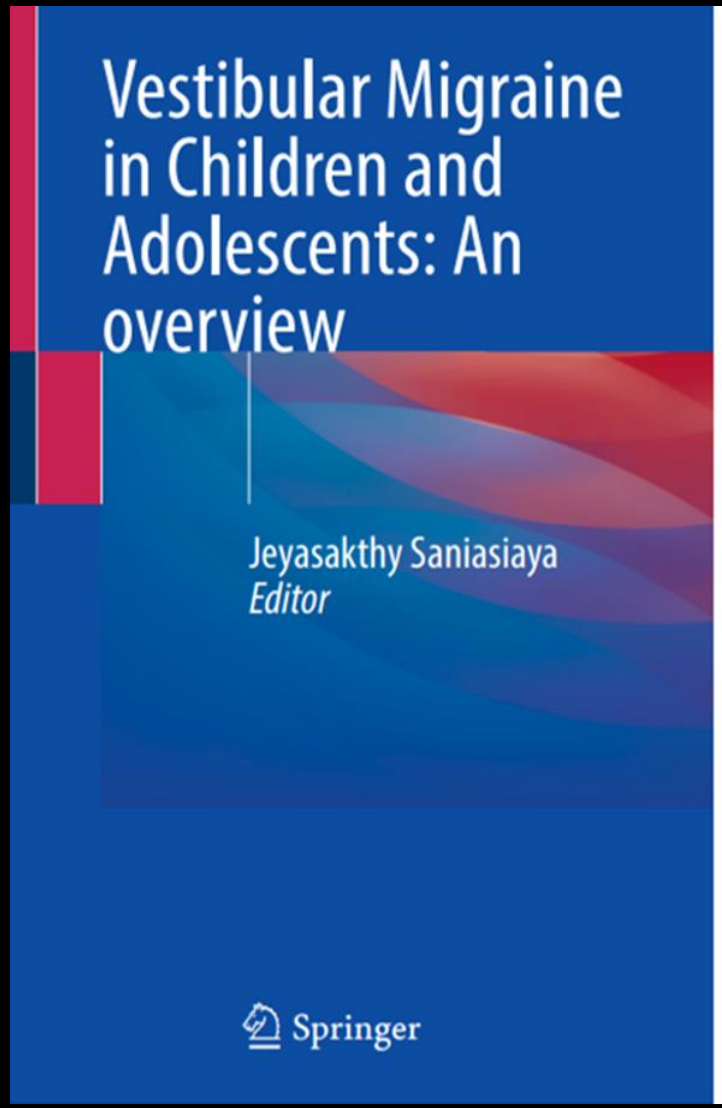




Inspired by Children

International Pediatric Vestibular Network
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- Membership open
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- Founding members
  - Sylvette Vacher Wiener – Paris, France
  - Leen Maes – Ghent, Belgium
  - Soumit Dasgupta – Liverpool, UK
  - Jacob Brodsky – Boston, USA
  - Sharon Cushing – Toronto, Canada
  - Ruth van Haecke – Ghent, Belgium
  - Josine Widdershoven – Maastricht, Netherlands
  - Kristen Janky – Boys Town, USA



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Medical Hypotheses
Volume 159, February 2022, 110747



Vincent Van Gogh and the elusive diagnosis of vestibular migraine

Soumit Dasgupta [a b], Robby Vanspauwen [c], Enis Alpin Guneri [d], Marco Mandala [e]

Thank you

soumit.dasgupta@alderhey.nhs.uk