Vertigo Academy International

A Trademark of International Vestibular Society

VI. VERTIGO ACADEMY INTERNATIONAL

3rd VIRTM Vestibular Implant Related Technologies Sessions

April 03-05, 2025 • Novotel Budapest, Hungary

Delivered by UEMS: 18 CME Credits

PROGRAM AND ABSTRACT BOOK

www.vai2025.org

SERENAS GROUP

Vertigo Academy International

A Trademark of International Vestibular Society

VI. VERTIGO ACADEMY INTERNATIONAL

in your pocket!

All the scientific and social content of the meeting is at your fingertips with the mobile app. Mobile app is right with you with its extensive media content from abstract book to meeting photographs!

HOW CAN I USE THE MOBILE APPLICATION?

For handhelds using iOS (iPhone, iPad); go to the App Store and search for "VAI2025" on the search bar. You can download and install the free application.

For handhelds using Android; first select Google Play. Click on the "Search" button at the right top corner and search for "VAI2025". You can download and install the free application.

Download on the App Store

ANDROID APP ON Google play

Contents

WELCOME MESSAGES

Dear Colleagues, Friends,

I am having the great pleasure of physically meeting in Budapest for the 6th meeting. Budapest is the second largest city on the Danube River. The Hungarians arrived in the territory in the late 9th century. Buda became one of the centers of Renaissance humanist culture by the 15th century. The city was the focal point of the Hungarian Revolution of 1848. Budapest is a global city with strengths in commerce, finance, media, art, fashion, research, technology, education, and entertainment.

As well known the previous meetings of VAI have been held in Antalya, Moscow, Mumbai, Minsk and Belgrade.

During this 2,5-day meeting 170 distinguished Faculty Members from all over the World will contribute with 40 remarkable study presentations, 38 instructional courses, 25 invited lectures, 20 keynote lectures, 4 plenary sessions, 4 debate sessions, 4 round Tables, 2 plenary lectures, 2 workshops.

Within this instance also the Vestibular Implant Related Technologies Sessions will take place as previous two meetings.

The meeting has been accredited by UEMS by 18 CME credits.

I wish you all to inspire the nice atmosphere of Budapest while being harmonized with the vestibular science that is presented by the masters of the topic.

Prof. Dr. O. Nuri Ozgirgin
Chairman

VI. Vertigo Academy International

ORGANIZING INSTITUTION

International Vestibular Society

http://www.intvest.org/

THE BOARD and COMMITTEES

President

Osman Nuri OZGIRGIN, M.D.

Scientific Secretary

Enis Alpin GUNERI M.D.

Scientific Consultant

Herman KINGMA M.D.

Local Committee

Imre GERLINGER M.D.

Organizing Secretary

Tuncay OZCELİK, M.D.

International Executive Committee

Honorary President
Jacques MAGNAN

President
Nuri OZGIRGIN

Vice President
Angel RAMOS

Secretary
Soumit DASGUPTA

Treasurer
Avi SHUPAK

Members

Robert GURKOV

Michel LACOUR

Jose Antonio LOPEZ-ESCAMEZ

Badr El Din MOSTAFA

Maurizio BARBARA

Anirban BİSWAS

Arun GADRE

Herman KINGMA

Local Registered Committee

President
Osman Nuri OZGIRGIN

Vice President
Pınar YALINAY DIKMEN

Secretary
Fazıl Necdet ARDIC

Treasurer
Bülent SATAR

Members

Neşe CELEBISOY

Levent N. OZLUOĞLU

Enis Alpin GUNERI

Tayfun KIRAZLI

Nazım KORKUT

VI. VAI MEETING INFORMATION

Vertigo Academy International Meetings is a Scientific Organization of International Vestibular Society. It is Academic Program and learning objectives offer substantial opportunities to the fellows interested with the topic. Following four successive previous meetings in Turkey, Russia, India and Belarus, Serbia the VI. Vertigo Academy International Meeting will be held in Budapest.

I. Vertigo Academy International	16-17 November 2013 – Antalya, Turkey.
II. Vertigo Academy International	22-23 May 2015 – Moscow, Russia.
III. Vertigo Academy International	02-04 March 2017 – Mumbai, India.
IV. Vertigo Academy International	25-28 April 2019 – Minsk, Belarus.
V. Vertigo Academy International	09-11 March 2023 – Belgrade, Serbia.

Meeting Dates: April 03-05, 2025.

Official Web Site: Please bookmark this website: www.vai2025.org
Please bookmark this website. Primary importance will be given to the website, on every stage of preparation and operation of the meeting, including the scientific program, registration and accommodation.

Official Language: Official language of the meeting and of correspondence is English.

Certificate of Attendance: Certificate of attendance will be available at the Meeting Registration and Information Desk.

Important Dates

Deadline for Online Abstract Submission	**January 17, 2025**
Notification of Abstract Acceptance	**January 31, 2025**
Deadline for Early Meeting Registration	**January 17, 2025**
Deadline for Cancellation of Hotel Booking	**January 26, 2025**
Deadline for Cancellation of Meeting Registration	**January 26, 2025**

Sponsorship and Exhibition: An area for exhibition booths will be provided for the industry and publishers. For exhibition and industry related inquiries, please contact Serenas Tourism at info@vai2025.org

CME ACCREDITATION

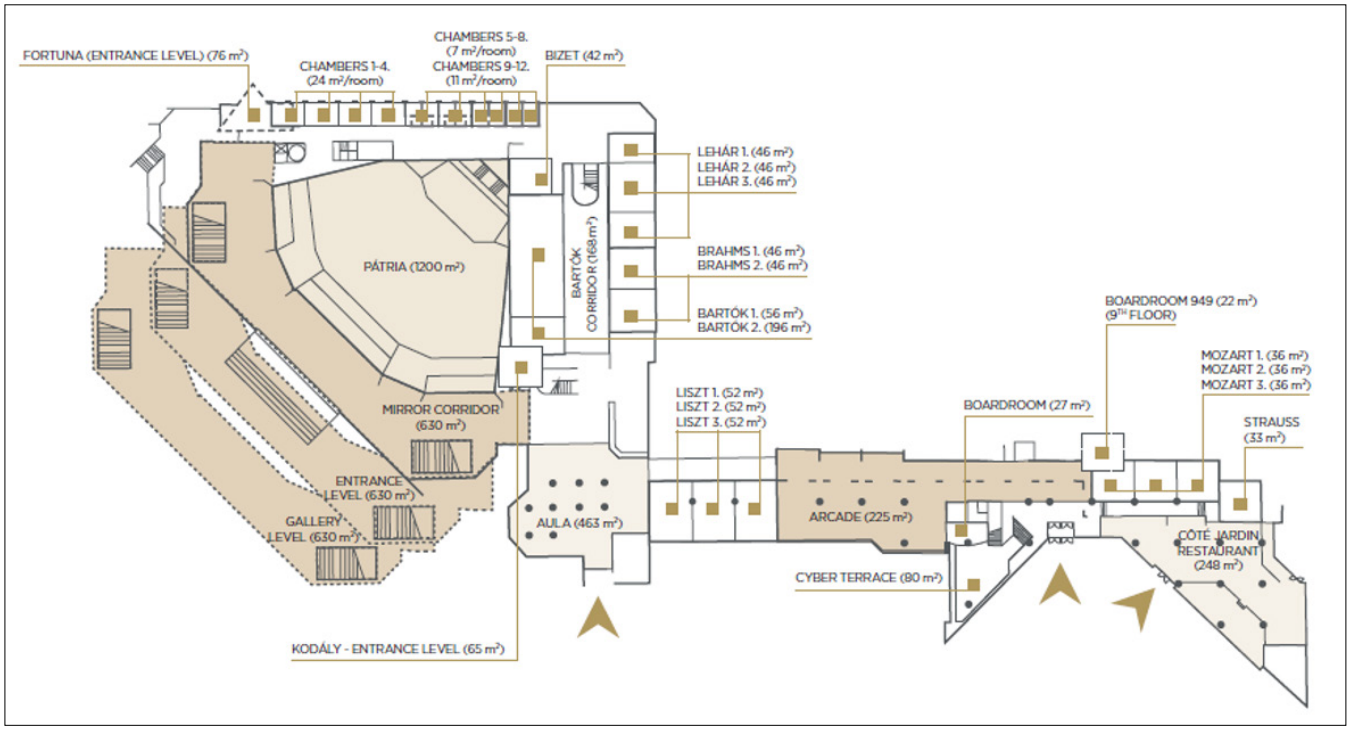
The VI. Vertigo Academy International Meeting, Budapest, Hungary 03/04/2025 - 06/04/2025, has been accredited by the European Accreditation Council for Continuing Medical Education (EACCME®) with 18.0 European CME credits (ECMEC®s).
Each medical specialist should claim only those hours of credit that he/she actually spent in the educational activity.

Through an agreement between the Union Européenne des Médecins Spécialistes and the American Medical Association, physicians may convert EACCME® credits to an equivalent number of AMA PRA Category 1 CreditsTM. Information on the process to convert EACCME® credit to AMA credit can be found at https://edhub.ama-assn.org/pages/applications .

Live educational activities, occurring outside of Canada, recognised by the UEMS-EACCME® for ECMEC®s are deemed to be Accredited Group Learning Activities (Section 1) as defined by the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada.

LOCATION OF ACTIVITIES

Novotel Budapest City & Budapest Congress Center (Meeting Venue)



Registration and Information Desk	: Hotel Lobby Area
Speaker Ready Room	: Lehar I
Mail Hall	: Patria
Parallel Room I	: Bartok I-II
Parallel Room II	: Liszt I-II-III
Instructional Course / Remarkable Studies Room	: Brahms I-II
General Assambly	: Mozart I-II-III
Opening Ceremony (Cocktail Prolonge)	: Foyer of the Main Hall
Exhibition and Poster Area	: Aula
Coffee Break Area	: Aula
Lunch Area	: Aula
IVS International Committee Meeting Room	: Lehar II-III
Organizing Secretariat & Storage	: Bizet

FACULTY LIST

Surname	Name
Abubacker	Rahina
Acar	Melda
Arbel	Yael
Ardıç	Fazıl Necdet
Armato	Enrico
Assaban	Franck
Avivi	Itay
Barin	Kamran
Battelino	Saba
Bayraklı	Bilal Burak
Belyakova-Bodina	Alexandra
Beyaz	Mahmut Furkan
Ben-Rubi Shimron	Hadas
Beynon	Andy
Berge	Jan Erik
Bhandari	Anita
Bhandari	Rajneesh
Bisdorff	Alexandre
Bouazzaaoui	Anis
Borysenko	Oleg
Bozanic Urbancic	Nina
Casani	Augusto
Castillo Bustamente	Melissa
Celebisoy	Neşe
Chiarella	Giuseppe
Cisneros	Juan Carlos
C.J. van Boxel	Stan
Corbo	Daniele
Çelik	Onur
Darrouzet	Vincent
Dasgupta	Soumit

Surname	Name
Deblieck	Choi
de Miguel	Angel Ramos
De Smet	Dario
della Volpe	Antonio
Durakovic	Nedim
Dorasala	Srinivas
E. Mostafa	Badr
Erbek	Seyra
Ercan	Mehmet Kadir
Elsherif	Mayada
Faralli	Mario
Felipe	Lilian
Fujimoto	Chisato
Gary Spring	Stephen
Garaycochea	Octavio
Gerlinger	Imre
Georgescu	Mădălina Gabriela
Giannuzzi	Anna Lisa
Gouider	Henda
Goto	Fumiyuki
Görür	Kemal
Grace Yap Cruz	Melanie
Guerkov	Robert
Guerra Jimenez	Gloria
Guinand	Nils
Güneri	Enis Alpin
Haijoub	Souad
Hamid	Ossama
Horii	Arata
Hougaard	Dan Dupont
Hong	Sung Kwang

FACULTY LIST

Surname	Name
Ikezono	Tetsuo
Imai	Takao
Jeon	Eun-Ju
Jozefowicz-Korczyńska	Magdalena
Judd	Owen
Kalderon	Liran
Kameswaran	Mohan
Kaplan	Daniel
Karabulut	Mustafa
Karaçaylı	Ceren
Kaya Çelik	Elif
Kıroğlu	Mete
Kingma	Herman
Kirazlı	Tayfun
Kirazli	Gulce
Kitahara	Tomoyasu
Koç	Ahmet
Kocdor	Pelin
Korkut	Nazım
Koo	Ja-won
Kothari	Shenal
Lacour	Michel
Lee	Ambrose
Lennox	Amy
Li	Wenyan
Lopez Escamez	Antonio
Macias	Angel Ramos
Madrigal	Jorge
Maes	Leen
Mandala	Marco
Manrique Huarte	Raquel

Surname	Name
Mansor	Wan Nabila Wan
Manzari	Leonardo
Martellucci	Salvatore
Martinez	Norberto
Melliti	Ali
Milkov	Mario
Moustafa	Fawzi
Nargiza	Karimova
Nouini	Adraa
Ocak	Emre
Orhan	Kadir Serkan
Orzan	Eva
Özdek	Ali
Özlüoğlu	Levent
Pajaniappane	Arun
Perez Fernandez	Nicolas
Perez	Ronen
Perez Fornos	Angelica
Porwal	Prateek
Quaranta	Nicola
Qureshi	Sameer
Ratnayake	Sudhira
Ricci	Giampietro
Rutka	John
Rodríguez-Villalba	Rosana
Saeed	Shakeel
Satar	Bülent
Sanna	Mario
Salman	Nour
Santopietro	Giuseppe
Sharma	Sandeep

FACULTY LIST

Surname	Name
Shupak	Avi
Sluydts	Morgana
Staab	Jeffrey
Staffa	Paola
Szirmai	Agnes
Tahir	Emel
T. Tamás	László
Teggi	Roberto
Trabalzini	Franco
Trayner	Penny
Türkyılmaz	M. Didem
Van de Berg	Raymond
Vermorken	Bernd
Vijayendra	Honnurappa
Vundavalli	Pradeep
Wang	Hui
Widdershoven	Josine
Wiener Vacher	Sylvette
Wuyts	Floris L
Yalınay Dikmen	Pınar
Yamanaka	Toshiaki
Yin	Shankai
Yiğit	Özgür
Yorgancılar	Ediz
Young	Yi-Ho
Yuvaraj	Pradeep
Yüksel Aslıer	Nesibe Gül
Zarowski	Andrzej
Zaytoun	George
Zhu	Meichan
Zou	Jing

Surname	Name
Zuma e Maia	Francisco Carlos
Yamanaka	Toshiaki
Yin	Shankai
Yiğit	Özgür
Yorgancılar	Ediz
Young	Yi-Ho
Yuvaraj	Pradeep
Yüksel Aslıer	Nesibe Gül
Zarowski	Andrzej
Zaytoun	George
Zhu	Meichan
Zou	Jing
Zuma e Maia	Francisco Carlos

PROGRAM AT A GLANCE

	DAY 1 (APRIL 03, 2025-Thursday)				
	PATRIA	**BARTOK I-II**	**LISZT I-II-III**	**BRAHMS I-II**	**MOZART I-II-III**
13:30-14:00	Instructional Course 1	Instructional Course 2	Instructional Course 3	Instructional Course 4	
14:00-14:30	Instructional Course 5	Instructional Course 6	Instructional Course 7	Instructional Course 8	
14:30-15:00	Instructional Course 9	Instructional Course 10	Instructional Course 11		
15:00-15:30	*Coffee Break*				
15:30-16:00	Instructional Course 12	Instructional Course 13	Instructional Course 14	Instructional Course 15	
16:00-16:30	Instructional Course 16	Instructional Course 17	Instructional Course 18	Instructional Course 19	
16:30-17:00	Instructional Course 20	Instructional Course 21			
18:30-20:00	Opening Ceremony				
	DAY 2 (April 04, 2025-Friday)				
	PATRIA	**BARTOK I-II**	**LISZT I-II-III**	**BRAHMS I-II**	
08:00-08:30	Instructional Course 22	Instructional Course 23	Instructional Course 24	Instructional Course 25	
08:30-09:00	Instructional Course 26	Instructional Course 27			
09:00-09:30	VIRTM Session / Plenary Lecture 1				
09:30-10:45	VIRTM Session / Plenary Panel 1				
10:45-11:15	*Coffee Break*				
11:15-12:30	VIRTM Session / Round Table 1	Workshop 1	Debate Session 1	Keynote Lectures 1-5	
12:30-13:30	*Lunch / IVS International Executive Committee Meeting*				
13:30-14:45	Plenary Panel 2				
14:45-15:15	*Coffee Break*				
15:15-16:30	Round Table 2	Debate Session 2	Keynote Lectures 6-10	Remarkable Paper Presentations 1-8	
16:45-18:00	Invited Lecture 1	Workshop 2	Invited Lecture 5-9	Remarkable Paper Presentations 9-16	
	DAY 3 (April 05, 2025-Saturday)				
	PATRIA	**BARTOK I-II**	**LISZT I-II-III**	**BRAHMS I-II**	
08:00-08:30	Instructional Course 28	Instructional Course 29	Prize Session for Posters		
08:30-09:00	Instructional Course 30	Instructional Course 31			
09:00-09:30	Plenary Lecture 2				
09:30-10:45	Plenary Panel 3				
10:45-11:15	*Coffee Break*				
11:15-12:30	Round Table 3	Debate Session 3	Invited Lecture 10-14	Remarkable Paper Presentations 17-24	IVS General Assembly
12:30-13:30	*Lunch*				
13:30-14:45	Plenary Panel 4 Satellite Session (ABBOTT)				
14:45-15:15	*Coffee Break*				
15:15-16:30	Round Table 4	Debate Session 4	Keynote Lecture 11-14	Remarkable Paper Presentations 25-33	
16:45-18:00	Invited Lecture 15-19	Keynote Lecture 15-18	Invited Lecture 20-22	Remarkable Paper Presentations 33-41	

SCIENTIFIC PROGRAM

DAY 1 / APRIL 03, 2025 – THURSDAY (Afternoon Sessions)

PATRIA

13:30-14:00	**Instructional Course 1** **Unusual presentations of BPPV** *Pradeep Vundavalli*
14:00-14:30	**Instructional Course 5** **Impact of a vestibular dysfunction on the development of children: the importance of early detection** *Leen Maes*
14:30-15:00	**Instructional Course 9** **How to test vestibular function in children, what diagnoses to look for** *Josine Widdershoven*
15:00-15:30	**Coffee Break**
15:30-16:00	**Instructional Course 12** **Motion and Sea Sickness** *Avi Shupak*
16:00-16:30	**Instructional Course 16** **Mal de debarquement syndrome** *Choi Deblieck*
16:30-17:00	**Instructional Course 20** **Artificial ıntelligence in vestibular disorders** *Sung Kwang Hong*
18:30-20:00	**Opening Ceremony** **Welcome Address by** *Nuri Ozgirgin & Imre Gerlinger* **IFOS Istanbul 2026 Presentation** *Özgür Yiğit* **Opening Lecture** **History of Vestibular Medicine** *Soumit Dasgupta*

BARTOK I-II

13:30-14:00	**Instructional Course 2** **Bedside examination in patients with Vestibular symptoms** *Onur Çelik*
14:00-14:30	**Instructional Course 6** **What is still needed in vestibular diagnosis and Management** *Daniel Kaplan*
14:30-15:00	**Instructional Course 10** **Labyrinthine fistulas due to chronic otitis media** *Vijayendra Honnurappa*
15:00-15:30	**Coffee Break**

SCIENTIFIC PROGRAM

15:30-16:00 **Instructional Course 13**
Vertigo and dizziness in the elderly
Augusto Casani

16:00-16:30 **Instructional Course 17**
Acute Unilateral Vestibulopathy: clinical presentation, instrumental patterns, evolution and management
Salvatore Martellucci

16:30-17:00 **Instructional Course 21**
Power of vibration
Leonardo Manzari

LIZST I-II-III

13:30-14:00 **Instructional Course 3**
Acute vestibular loss
Levent Özlüoğlu

14:00-14:30 **Instructional Course 7**
Vestibular neuritis
Enrico Armato

14:30-15:00 **Instructional Course 11**
Vestibular Paroxysmia
Floris Wuyts

15:00-15:30 **Coffee Break**

15:30-16:00 **Instructional Course 14**
Meniere Disease – Surgical treatment
Ambrose Lee

16:00-16:30 **Instructional Course 18**
Autoimmune vestibular disease
Antonio Lopez Escamez

SCIENTIFIC PROGRAM

BRAHMS I-II

13:30-14:00	**Instructional Course 4** **VEMP's and their expectation in diagnosis of vestibular diseases** *Gloria Guerra Jimenez*
14:00-14:30	**Instructional Course 8** **Multidisciplinary approach to Usher syndrome: how to integrate genetic, and vestibular data** *Eva Orzan*
15:00-15:30	**Coffee Break**
15:30-16:00	**Instructional Course 15** **How to perform the HIT and VHIT** *Dan Dupont Hougaard*
16:00-16:30	**Instructional Course 19** **Overview of persistent postural- perceptual dizziness** *Arata Horii*

SCIENTIFIC PROGRAM

DAY 2 / APRIL 04, 2025 – FRIDAY (Morning Sessions)

PATRIA

08:00-08:30	**Instructional Course 22** **Interpretation of vHIT in your clinical practice** *Jawon Koo*
08:30-09:00	**Instructional Course 26** **Objective Measurement of HINTS (Head Impulse, Nystagmus, Test of Skew) in Peripheral Vestibulopathy** *Jawon Koo*
09:00-12:30	**Vestibular Implant and Related Technologies Sessions**
09:00-09:30	**Plenary Lectures 1**
	09:00-09:15 **Otolithic system** *Angel Ramos de Miguel*
	09:15-09:30 **Utricular dysfunction** *Raquel Manrique Huarte*
09:30-10:45	**Plenary Panel 1**
	Bilateral vestibular disease **Moderator:** *Nuri Özgirgin*
	Improving diagnosis of BVD *Leonardo Manzari*
	Etiology analysis and impact in treatment in patients with BVD *John Rutka*
	Rehabilitation techniques in BVD *Toshiaki Yamanaka*
	New aspects in neurophysiology of BVD *Herman Kingma*
10:45-11:15	**Coffee Break**
11:15-12:30	**Round Table 1**
	Electrical stimulation of the vestibular system **Moderator:** *Angel Ramos Macias*
	The vestibular implant: results of the 2nd generation device *Raymond Van de Berg*
	Recruiting for vestibular implantation: Hurdles in research *Morgana Sluydts*

SCIENTIFIC PROGRAM

Electrical stimulation of the vestibular system
Angelica Perez Fornos

New aspects in VI technology
Angel Ramos de Miguel

BARTOK I-II

08:00-08:30 **Instructional Course 23**
Gentamicin's effect over the peripheral Vestibular endorgan
Nicolas Perez Fernandez

08:30-09:00 **Instructional Course 27**
Downbeating nystagmus in the context of BPPV
Octavio Garaycochea & Nicolas Perez Fernandez

10:45-11:15 **Coffee Break**

Gruppo Otologico Session

11:15-12:30 **Workshop 1**
Session Chair: *Shak Saeed*

Vestibular schwannoma treatment
Mario Sanna

Labyrintectomy and CI for end stage Meniere disease
Anna Lisa Giannuzzi

Vestibular rehab after vestibular schwannoma removal
Anna Lisa Giannuzzi

LIZST I-II-III

08:00-09:00 **Instructional Course 24**
Perilymph fistula
Tetsuo Ikezono

10:45-11:15 **Coffee Break**

11:15-12:30 **Debate Session 1**

Third Window
Session Chair: *Augusto Casani*
Moderator: *Vincent Darrouzet*

Oleg Borysenko, Kemal Görür, Jawon Koo, Enrico Armato, Octavio Garaycochea

SCIENTIFIC PROGRAM

BRAHMS I-II

08:00-09:00

Instructional Course 25
Virtual reality in vestibular rehabilitation
Franck Assaban

10:45-11:15 **Coffee Break**

11:15-12:30

Keynote Lectures 1-5
Session Chair: *Giampietro Ricci*

KL1 - Classification of Vestibular disorders
Alexandre Bisdorff

KL2 - Acute cerebellar disease and its vestibular manifestations
Shenal Kothari

KL3 - Latest advances in pediatric vestibular medicine
Soumit Dasgupta

KL4 - Spinning into the future: Telehealth solutions for effective vertigo and dizziness management
Anita Bhandari

KL5 - Vestibular effects of diving
Mario Milkov

12:30-13:30 **Lunch / IVS International Executive Committee Meeting**

DAY 2 / APRIL 04, 2025 – FRIDAY (Afternoon Sessions)

PATRIA

13:30-14:45

Plenary Panel 2

BPPV
Session Chair: *Bulent Satar*
Moderator: *Anita Bhandari*

Francisco Carlos Zuma e Maia, Eun-Ju Jeon, Enis Alpin Güneri, Marco Mandala

14:45-15:15 **Coffee Break**

15:15-16:30

Round Table 2
Vestibular disorders in children

Session Chair: *Pelin Koçdor*

Moderator: *Soumit Dasgupta*

Sylvette Wiener Vacher, Nina Bozancic, Sudhira Ratnayake, Antonio della Volpe, Giuseppe Chiarella, Yi-Ho Young, Penny Trayner

SCIENTIFIC PROGRAM

16:45-18:00 **Invited Lectures 1-4**

Controversial issues in BPPV
Moderator: *Tayfun Kirazlı*

Eye torsion measurement in BPPV: State of art
Kamran Barin

SVV in BPPV
Mario Faralli

Atypical BPPV
Bülent Satar

A mechanical rotation chair provides superior diagnostics of benign paroxysmal positional vertigo
Dan Dupont Hougaard

BARTOK I-II

15:15-16:30 **Debate Session 2**

Surgical treatment for Vestibular disorders
Moderator: *Andrzej Zarowski*

Juan Carlos Cisneros, Shakeel Saeed, Franco Trabalzini, Mohan Kameswaran,

16:45-18:00 **Workshop 2**

Vestibular Rehabilitation
Session Chair: *Neşe Çelebisoy*
Moderator: *Lilian Felipe*

Didem Turkyılmaz, Nour Salman, Mădălina Gabriela Georgescu,

LIZST I-II-III

15:15-16:30 **Keynote Lectures 6-10**

Session Chair: *Nazım Korkut*

KL6 - The diagnosis of central vestibular disorders based on the complementary examination of the vestibulospinal reflex
Agnes Szirmai

KL7 - Conditions to Recover rather than Compensate vestibular deficits
Michel Lacour

KL8 - Home use of the Geneva-Maastricht Vestibulo-Cochlear Implant
Nils Guinand

KL9 - Central impact of vestibular stimulation
Angel Ramos Macias

KL10 - Combining multi-canal vestibular implant stimulation to restore the vestibulo-ocular reflex in 3D
Stan C.J. van Boxel

SCIENTIFIC PROGRAM

16:45-18:00

Invited Lectures 5-9

Moderator: *Imre Gerlinger*

High frequency versus low frequency patterns of Vestibular system
Mayada Elsherif

SSC occlusion in Meniere's Disease
Shankai Yin

The effect of ipsilateral ocular fixation on the control of vertigo attacks in Ménière's patients
Mete Kıroğlu

Therapeutic strategies in the treatment of Menière's disease: the Italian experience
Nicola Quaranta

Hintpoints of Labyrintectomy for Meniere Disease
Ediz Yorgancılar

BRAHMS I-II

15:15-16:30

Remarkable Paper Presentations 1-8

I: Evaluation & Assessment

Session Chair: *Nesibe Gül Yüksel Aslıer*

1. DVA assessment: a comparison between people with bilateral vestibulopathy and healthy age- and sex-matched participants
Meichan Zhu, Lisa van Stiphout, Benjamin Volpe, Miranda Janssen, Mustafa Karabulut, Angélica Pérez Fornos, Nils Guinand, Kenneth Meijer, Raymond van de Berg, Christopher McCrum

2. Proposal of a standardized testing protocol for BPPV using 3d simulations of positional tests
Rajneesh Bhandari, Anita Bhandari, David Samuel Zee, Daniele Nuti, Herman Kingma, Raymond Van De Berg

3. The impact of dual tasking on the vestibular ocular reflex
Itay Avivi, Noa Rozendorn, Amit Wolfowitz, Yoav Gimmon

4. Combining battery of auditory and vestibular tests for severity evaluation of Menière's disease
Hui Wang

5. Subjective visual vertical (SVV) alterations in Parkinson's disease
Alexandra Belyakova-Bodina, Maria Tsvetkova, Anastasia Mezenchuk, Ekaterina Fedotova

6. Videonystagmography (VNG) findings in vestibular migraine
Prateek Porwal, Srinivas Dorasala, Pradeep Vundavalli

7. Gain values of vestibulo-ocular reflex (VOR) in video head impulse test in children without otoneurologic symptoms
Rosana Rodríguez-Villalba, Miguel Caballero-Borrego

8. Influence of cognitive load on cervical vestibular evoked myogenic potentials (VEMP) in normal subjects
Rahina Abubacker, Pradeep Yuvaraj, Anannya Adhikari, Aravind Kumar Rajasekaran

16:45-18:00 **Remarkable Paper Presentations 9-16**

II: Vestibular Rehabilitation

Session Chair: *Ceren Karaçaylı*

9. Vestibular rehabilitation with virtual reality in patients with long-term dizziness
Daniele Corbo, Valentina Santomauro, Alessandro Maroli, Federica Simoni, Eolo Castello

11. Results of a vestibular rehabilitation program combined with virtual reality in bilateral vestibular hypofunction
Bilal Burak Bayraklı, Ömer Kuzu, Canan Çelik

12. Digital advancements in vestibular rehabilitations: evaluating the effectiveness of an online therapy program
Rajneesh Bhandari, Anita Bhandari

13. Effectiveness and adoption of an online vestibular tutorial for physiotherapists: insights from the UTAUT model
Yael Arbel, Liora Shmueli

14. Neural correlates of vestibular adaptation in cosmonauts after long-duration spaceflight
Catho Schoenmaekers, Steven Jillings, Dmitrii Glukhikh, Elena Tomilovskaya, Ilya Rukavishnikov, Peter zu Eulenburg, Floris L Wuyts

15. Investigation of vestibular rehabilitation effectiveness in children with specific learning disorders
Melda Acar, Eyyup Kara, Zehra Koyuncu, Mesut Yavuz, Hasan Ahmet Özdoğan

16. New liberatory maneuver for the treatment of anterior canal benign paroxysmal positional vertigo
Prateek Porwal, Srinivas Dorasala, Pradeep Vundavalli

SCIENTIFIC PROGRAM

DAY 3 / APRIL 05, 2025 SATURDAY – (Morning Sessions)

PATRIA

08:00-08:30	**Instructional Course 28** **Changes in symptom pattern in Meniere's disease by duration: The need for comprehensive Management** *Jing Zou*
08:30-09:00	**Instructional Course 30** **Capturing nystagmus during vertigo attacks using a smartphone: adherence, characteristics, pearls and pitfalls** *Ali Melliti*
09:00-09:30	**Plenary Lectures 2** **Contemporary radiologic evluation in Vestibular disorders** *Robert Guerkov*
09:30-10:45	**Plenary Panel 3** **Vestibular Migraine** **Session Chair:** *Soumit Dasgupta* **Moderator:** *Neşe Çelebisoy* *Pınar Yalınay Dikmen, Fumiyuki Goto, Roberto Teggi, Melissa Castillo Bustamente*
10:45-11:15	**Coffee Break**
11:15-12:30	**Round Table 3** **Persistent Postural Perceptual Dizziness** **Session Chair:** *Marco Mandala* **Moderator:** *Jeffrey Staab* *Arata Horii, Chisato Fujimoto, Owen Judd, Jan Erik Berge, Jorge Madrigal*

BARTOK I-II

08:00-08:30	**Instructional Course 29** **Utility of the hyperventilation test in the evaluation of the dizzy patient** *Giuseppe Santopietro*
08:30-09:00	**Instructional Course 31** **Eye movements for Vestibular Physicians** *Pradeep Vundavalli*
10:45-11:15	**Coffee Break**
11:15-12:30	**Debate Session 3** **Vestibulo-Ocular Reflex** **Session Chair:** *Badr Eldin Mostafa* **Moderator:** *Herman Kingma* *Li Wenyan, Takao Imai, Marco Mandala, Ali Özdek*

SCIENTIFIC PROGRAM

LIZST I-II-III

08:00-09:00

Prize Session for Posters
Session Chairs: *Badr Eldin Mostafa, Leonardo Manzari, Soumit Dasgupta*

10:45-11:15 **Coffee Break**

11:15-12:30

Invited Lecture 10-14
Moderator: *Ahmet Koç*

Vestibular findings during pregnancy and puerperium
Melissa Castillo Bustamante

Sleep apnea and vertigo: a correlation or a coincidence?
Ossama Hamid

Diagnostic Value of Computerized Dynamic Posturography in the Assessment of Peripheral Vestibular Disorders
Norberto Martinez

MRG findings in hydropic ear and Meniere's disease
Kadir Serkan Orhan

Vestibular disorders in adolescants
Saba Battelino

BRAHMS I-II

10:45-11:15 **Coffee Break**

11:15-12:30

Remarkable Paper Presentations 17-24

III: Research

Session Chair: *F. Necdet Ardıç*

17. Endolymphatic hydrops impair inner ear uptake and distribution of it injected agents in patients with Meniere's disease
Jing Zou, Hongbin Li, Minhui Zhu, Luguang Chen, Zhen Wang, Tianhao Lu, Yukun Chen, Jianping Lu, Ilmari Pyykkö

19. Vestibular responses to virtual reality in individuals with and without motion sensitivity
Hadas Ben-Rubi Shimron, Mor Bitterman Peri, Amit Wolfovitz, Yoav Gimmon

SCIENTIFIC PROGRAM

20. Beyond environmental factors: migraine as a key contributor to benign paroxysmal positional vertigo recurrence
Pelin Kocdor, Emel Işık, Oğuzhan Çetin, Rüya Somer, Suat Avcı, Levent Naci Özlüoğlu

21. The basic mechanism of vertigo attacks in Meniere's disease with explanatory animation
Stephen Gary Spring

22. Postural dysfunction in auditory neuropathy spectrum disorder: a computerized dynamic posturography
Pradeep Yuvaraj, Rahina Abubacker, Chethan K, Aravind Kumar Rajasekaran, Muralidharan Kesavan

23. Bilateral neural connectivity between vestibular end organs in patients with unilateral vestibular schwannoma
Andy Beynon, Mehmet Ercan, Anne Voncken

24. Investigation of behavioral vestibular function after intratympanic injection of potassium chloride in epileptic rats
Yavuz Gündoğdu, Mahmut Furkan Beyaz, Fatma Nur Kömür, Orhan Asya, Ali Cemal Yumuşakhuylu

MOZART I-II-III

11:15-12:30	**IVS General Assembly**
12:30-13:30	**Lunch**

SCIENTIFIC PROGRAM

DAY 3 / APRIL 05, 2025 SATURDAY– (Afternoon Sessions)

PATRIA

13:30-14:45 — **Plenary Panel 4**
Satellite Session

Abbott

BPPV-Related Residual Dizziness: New Insights and Contemporary Approaches
Moderator: *Nuri Özgirgin*

Herman Kingma, Leonardo Manzari

14:45-15:15 — **Coffee Break**

15:15-16:30 — **Round Table 4**

Abbott

Vestibular Compensation
Moderator: *Badr Eldin Mostafa*

Anis Bouazzaaoui, Sameer Qureshi, Henda Gouider, George Zaytoun, Karimova Nargiza Abdullayevna, Fawzi Moustafa

16:45-18:00 — **Invited Lecture 15-19**
Session Chair: *Kemal Görür*

Galvanic vestibular stimulation for the treatment of MDDS: An open, randomized, personalized feasibility treatment trial
Dario De Smet

Boosting mid and high frequency vestibulo-ocular reflexes with a vestibular implant in bilateral vestibulopathy
Bernd Vermorken

Motorist's vestibular disorientation syndrome
Srinivas Dorasala

Intratympanic applications for vestibular disorders
Emre Ocak

Acute vestibular deficit in children
Paola Staffa

BARTOK I-II

15:15-16:30 — **Debate Session 4**

Post Traumatic Vestibular Disorders
Session Chair: *Kadir Serkan Orhan*
Moderator: *John Rutka*

Amy Lennox, Oleg Borysenko, Seyra Erbek, Arun Pajaniappane, Magdalena Jozefowicz-Korczyńska

SCIENTIFIC PROGRAM

16:45-18:00

Keynote Lecture 15-18
Session Chair: *Enis Alpin Güneri*

KL15 - The quality of life in patients with unilateral vestibular hypofunction
Mustafa Karabulut

KL16 - Clinical examination of balance and gait Vibrotactile feedback im proves balance and mobility in patients with severe bilateral vestibular loss
Souad Haijoub

KL17 - The effect of topically applied antimycotic agents on inner ear vestibular function
Ronen Perez

KL18 - Barriers and facilitators of vestibular rehabilitation: Patients and physiotherapists' perspectives
Liran Kalderon

LIZST I-II-III

15:15-16:30

Keynote Lecture 11-14

Moderator: *Özgür Yiğit*

KL11 - Understanding the immune response in vestibular migraine and Meniere disease
Antonio Lopez Escamez

KL12 - Endotype does not influence therapeutic outcome of double approach delivery of corticosteoids in refractory Meniere's disease
Jing Zou

KL13 - International consensus (ICON) on treatment of Ménière's disease
Vincent Darrouzet

KL14 - Galvanic vestibular stimulation
Fazıl Necdet Ardıç

16:45-18:00

Invited Lecture 20-22
Session Chair: *Mete Kıroğlu*

Bilateral Lateral Canal BPPV
Sandeep Sharma

The vestibular time constant and response to anti-motion sickness medications
Avi Shupak

Vestibular complications and the law after head injuries
Soumit Dasgupta

SCIENTIFIC PROGRAM

BRAHMS I-II

15:15-16:30

Remarkable Paper Presentations 25-33

IV: General Approach

Session Chair: *Mustafa Karabulut*

25. Two centuries of vertigo research: trends, gaps, and global contributions

Melanie Grace Yap Cruz, Deborah Manandi, Ma. Natividad Almazan

26. Turkish validity and reliability study of the vestibular activities avoidance instrument-9

Merve Gundas, Gulce Kirazli, Feyza Inceoglu, Nese Celebisoy, Tayfun Kirazli

27. Mapping the scientific trends and collaboration networks in vestibular migraine: a bibliometric analysis

Emel Tahir, Nurullah Türe

28. Endre hőgyes (1847-1906), forgotten father of the vestibulo-ocular reflex

László T. Tamás, Albert Mudry

29. Vestibular system in patients after mild traumatic brain injury

Magdalena Jozefowicz-Korczynska, Wojciech Skora, Bogna Zielinska-Kazmierska, Anna Puzio-Suwart

30. Central causes of vertigo: A case series of VNG findings in patients from 2023 to 2025

Ceren Karaçaylı, Abdullah Sunar, Bülent Satar, Uğur Burak Şimşek

31. Risk factors associated with benign paroxysmal positional vertigo: a national database study

Nedim Durakovic, Prithwijit Roychowdhury

32. Revealing the underlying pathophysiological mechanisms of MDDS with the use of functional magnetic resonance imaging

Catho Schoenmaekers, Steven Jillings, Megan Van Deun, Andrzej Zarowski, Floris Wuyts, Choi Deblieck

33. New Insights into the Management of PLF: Advanced Treatment Approaches Addressing Sudden, Fluctuating, and Progressive Sensorineural Hearing Loss with Concurrent Vestibular Symptoms

Tomoyasu Kitahara

SCIENTIFIC PROGRAM

16:45-18:00 **Remarkable Paper Presentations 34-41**

V: Treatment – Interventions

Session Chair: *Emel Tahir*

34. The association between vestibular, hearing and cognitive abilities among older population
Wan Nabila Wan Mansor, Afiq Ikmal Sahak, Nor Haniza Abdul Wahat, Asma Abdullah, Noorlaili Mohd Tohit

35. The legs of the tripod in balance ears and eyes; results of VEMP in amblyopia
Elif Kaya Çelik, Şerife Gülhan Konuk, Meriç Yıldız

36. Dizzy patient in the emergency, should we call the neurologist?
Adraa Nouini

37. Triple semicircular canal occlusion for the treatment of Ménière's disease
Shankai Yin

38. Effects of the vestibulocochlear implant on balance and gait in bilateral vestibulopathy
Meichan Zhu, Rik Marcellis, Paul Willems, Jona Beckers, Bernd Vermorken, Benjamin Volpe, Stan van Boxel, Joost Stultiens, Elke Devocht, Angélica Pérez Fornos, Nils Guinand, Kenneth Meijer, Raymond van de Berg, Christopher McCrum

40. Practical quality of life assessment for vestibular implant candidates
Mehmet Kadir Ercan, Andy J Beynon

41. Virtual reality application matches the standard treatment for MDDS: A non-inferiority, randomized, open clinical trial
Catho Schoenmaekers, Dario De Smet, Jan Van Riel, Andrzej Zarowski, Choi Deblieck, Floris L Wuyts

INDUSTRY RECOGNITION and SESSION

Industry Sponsored - Abbott Satellite Meeting

Abbott

Date : April 5, 2025
Time : 13:30 – 14:45
Hall : Main Hall (Petria)

Title : BPPV-Related Residual Dizziness: New Insights and Contemporary Approaches

Moderator: Nuri Özgirgin

Speakers: Herman Kingma, Leonardo Manzari

ACCEPTED ORAL PRESENTATIONS LIST

I: Evaluation & Assessment

RP-01. **DVA assessment: a comparison between people with bilateral vestibulopathy and healthy age- and sex-matched participants**
Meichan Zhu, Lisa van Stiphout, Benjamin Volpe, Miranda Janssen, Mustafa Karabulut, Angélica Pérez Fornos, Nils Guinand, Kenneth Meijer, Raymond van de Berg, Christopher Mc Crum

RP-02. **Proposal of a standardized testing protocol for BPPV using 3d simulations of positional tests**
Rajneesh Bhandari, Anita Bhandari, David Samuel Zee, Daniele Nuti, Herman Kingma, Raymond Van De Berg

RP-03. **The impact of dual tasking on the vestibular ocular reflex**
Itay Avivi, Noa Rozendorn, Amit Wolfowitz, Yoav Gimmon

RP-04. **Combining battery of auditory and vestibular tests for severity evaluation of Menière's disease**
Hui Wang

RP-05. **Subjective visual vertical (SVV) alterations in Parkinson's disease**
Alexandra Belyakova-Bodina, Maria Tsvetkova, Anastasia Mezenchuk, Ekaterina Fedotova

RP-06. **Videonystagmography (VNG) findings in vestibular migraine**
Prateek Porwal, Srinivas Dorasala, Pradeep Vundavalli

RP-07. **Gain values of vestibulo-ocular reflex (VOR) in video head impulse test in children without otoneurologic symptoms**
Rosana Rodríguez-Villalba, Miguel Caballero-Borrego

RP-08. **Influence of cognitive load on cervical vestibular evoked myogenic potentials (VEMP) in normal subjects**
Rahina Abubacker, Pradeep Yuvaraj, Anannya Adhikari, Aravind Kumar Rajasekaran

II: Vestibular Rehabilitation

RP-09. **Vestibular rehabilitation with virtual reality in patients with long-term dizziness**
Daniele Corbo, Valentina Santomauro, Alessandro Maroli, Federica Simoni, Eolo Castello

RP-11. **Results of a vestibular rehabilitation program combined with virtual reality in bilateral vestibular hypofunction**
Bilal Burak Bayraklı, Ömer Kuzu, Canan Çelik

RP-12. **Digital advancements in vestibular rehabilitations: evaluating the effectiveness of an online therapy program**
Rajneesh Bhandari, Anita Bhandari

RP-13. **Effectiveness and adoption of an online vestibular tutorial for physiotherapists: insights from the UTAUT model**
Yael Arbel, Liora Shmueli

RP-14. **Neural correlates of vestibular adaptation in cosmonauts after long-duration spaceflight**
Catho Schoenmaekers, Steven Jillings, Dmitrii Glukhikh, Elena Tomilovskaya, Ilya Rukavishnikov, Peter zu Eulenburg, Floris Wuyts

RP-15. **Investigation of vestibular rehabilitation effectiveness in children with specific learning disorders**
Melda Acar, Eyyup Kara, Zehra Koyuncu, Mesut Yavuz, Hasan Ahmet Özdoğan

RP-16. **New liberatory maneuver for the treatment of anterior canal benign paroxysmal positional vertigo**
Prateek Porwal, Srinivas Dorasala, Pradeep Vundavalli

ACCEPTED ORAL PRESENTATIONS LIST

III: Research

RP-17. **Endolymphatic hydrops impair inner ear uptake and distribution of it injected agents in patients with Meniere's disease**
Jing Zou, Hongbin Li, Minhui Zhu, Luguang Chen, Zhen Wang, Tianhao Lu, Yukun Chen, Jianping Lu, Ilmari Pyykkö

RP-19. **Vestibular responses to virtual reality in individuals with and without motion sensitivity**
Hadas Ben-Rubi Shimron, Mor Bitterman Peri, Amit Wolfovitz, Yoav Gimmon

RP-20. **Beyond environmental factors: migraine as a key contributor to benign paroxysmal positional vertigo recurrence**
Pelin Kocdor, Emel Işık, Oğuzhan Çetin, Rüya Somer, Suat Avcı, Levent Naci Özlüoğlu

RP-21. **The basic mechanism of vertigo attacks in Meniere's disease with explanatory animation**
Stephen Gary Spring

RP-22. **Postural dysfunction in auditory neuropathy spectrum disorder: a computerized dynamic posturography**
Pradeep Yuvaraj, Rahina Abubacker, Chethan K, Aravind Kumar Rajasekaran, Muralidharan Kesavan

RP-23. **Bilateral neural connectivity between vestibular end organs in patients with unilateral vestibular schwannoma**
Andy Beynon, Mehmet Ercan, Anne Voncken

RP-24. **Investigation of behavioral vestibular function after intratympanic injection of potassium chloride in epileptic rats**
Yavuz Gündoğdu, Mahmut Furkan Beyaz, Fatma Nur Kömür, Orhan Asya, Ali Cemal Yumuşakhuylu

IV: General Approach

RP-25. **Two centuries of vertigo research: trends, gaps, and global contributions**
Melanie Grace Yap Cruz, Deborah Manandi, Ma. Natividad Almazan

RP-26. **Turkish validity and reliability study of the vestibular activities avoidance instrument-9**
Merve Gundas, Gulce Kirazli, Feyza Inceoglu, Nese Celebisoy, Tayfun Kirazli

RP-27. **Mapping the scientific trends and collaboration networks in vestibular migraine: a bibliometric analysis**
Emel Tahir, Nurullah Türe

RP-28. **Endre hőgyes (1847-1906), forgotten father of the vestibulo-ocular reflex**
László T. Tamás, Albert Mudry

RP-29. **Vestibular system in patients after mild traumatic brain injury**
Magdalena Jozefowicz-Korczynska, Wojciech Skora, Bogna Zielinska-Kazmierska, Anna Puzio-Suwart

RP-30. **Central causes of vertigo: A case series of VNG findings in patients from 2023 to 2025**
Ceren Karaçayli, Abdullah Sunar, Bülent Satar, Uğur Burak Şimşek

RP-31. **Risk factors associated with benign paroxysmal positional vertigo: a national database study**
Nedim Durakovic, Prithwijit Roychowdhury

RP-32. **Revealing the underlying pathophysiological mechanisms of MDDS with the use of functional magnetic resonance imaging**
Catho Schoenmaekers, Steven Jillings, Megan Van Deun, Andrzej Zarowski, Floris Wuyts, Choi Deblieck

RP-33. **New Insights into the Management of PLF: Advanced Treatment Approaches Addressing Sudden, Fluctuating, and Progressive Sensorineural Hearing Loss with Concurrent Vestibular Symptoms**
Tomoyasu Kitahara

ACCEPTED ORAL PRESENTATIONS LIST

V: Treatment – Interventions

RP-34. **The association between vestibular, hearing and cognitive abilities among older population**
Wan Nabila Wan Mansor, Afiq Ikmal Sahak, Nor Haniza Abdul Wahat, Asma Abdullah, Noorlaili Mohd Tohit

RP-35. **The legs of the tripod in balance ears and eyes; results of VEMP in amblyopia**
Elif Kaya Çelik, Şerife Gülhan Konuk, Meriç Yıldız

RP-36. **Dizzy patient in the emergency, should we call the neurologist?**
Adraa Nouini

RP-37. **Triple semicircular canal occlusion for the treatment of Ménière's disease**
Shankai Yin

RP-38. **Effects of the vestibulocochlear implant on balance and gait in bilateral vestibulopathy**
Meichan Zhu, Rik Marcellis, Paul Willems, Jona Beckers, Bernd Vermorken, Benjamin Volpe, Stan van Boxel, Joost Stultiens, Elke Devocht, Angélica Pérez Fornos, Nils Guinand, Kenneth Meijer, Raymond van de Berg, Christopher McCrum

RP-40. **Practical quality of life assessment for vestibular implant candidates**
Mehmet Kadir Ercan, Andy J Beynon

RP-41. **Virtual reality application matches the standard treatment for MDDS: A non-inferiority, randomized, open clinical trial**
Catho Schoenmaekers, Dario De Smet, Jan Van Riel, Andrzej Zarowski, Choi Deblieck, Floris Wuyts

RP-01

DVA ASSESSMENT: A COMPARISON BETWEEN PEOPLE WITH BILATERAL VESTIBULOPATHY AND HEALTHY AGE- AND SEX-MATCHED PARTICIPANTS

Meichan Zhu[1--2], Lisa van Stiphout[1], Benjamin Volpe[1], Miranda Janssen[4--1], Mustafa Karabulut[1], Angélica Pérez Fornos[3], Nils Guinand[3], Kenneth Meijer[2], Raymond van de Berg[1], Christopher McCrum[2]

[1]*Department of Otorhinolaryngology and Head and Neck Surgery, Division of Balance Disorders, Maastricht University Medical Center, School for Mental Health and Neuroscience, Maastricht, The Netherlands*

[2]*Department of Nutrition and Movement Sciences, Nutrım School of Nutrition and Translational Research İn Metabolism, Maastricht University, Maastricht, The Netherlands*

[3]*Service of Otorhinolaryngology and Head and Neck Surgery, Department of Clinical Neurosciences, Geneva University Hospitals, Geneva, Switzerland*

[4]*Department of Methodology and Statistics, Care and Public Health Research Institute (caphrı), Maastricht University, Maastricht, The Netherlands*

Aim: Walking and other dynamic conditions impair visual acuity in individuals with bilateral vestibulopathy (BVP). Dynamic Visual Acuity (DVA) can be assessed on a treadmill while participants walk at different speeds. This study aimed to determine whether age significantly affected the drop-out rate and DVA test outcomes in both BVP and healthy age-matched participants.

Material and Method: Fifty-two BVP and 52 age- and gender-matched healthy subjects completed the DVA test, which included a static condition at 0 km/h and dynamic walking conditions at 2, 4, and 6 km/h. The dynamic visual acuity loss (DVAL) was measured as the difference between visual acuity in the static and walking conditions. At all speeds, the drop-out rate, handrail use and DVAL were examined in relation to BVP, age, and the relationship between DVAL and speed in BVP and healthy controls.

Results: Age significantly increased the odds of dropping-out (odds ratio = 1.176, p<0.001, 95%CI (1.077-1.284). However, BVP does not increase the odds of dropping-out (BVP: odds ratio = 0.984, p = 0.979, 95%CI (0.287-3.375). Group*speed (p=0.004) has a significant effect on the DVAL. Age (F=3.643, p=0.06) have not significant effect on the DVAL in different groups and speeds. Post hoc analyses revealed that DVAL was significantly lower in BVP-patients at all walking speeds (p<0.001) In the group of BVP-patients speed (p<0.001) significantly influenced DVAL, it decreased with an increase of speed. However, speed had not significant effect on DVAL in healthy control (p>0.05). There were significant differences in the DVAL across speeds in patients who did (one hand or two hands) and did not hold the treadmill handrails (p =0.008). There were significant differences in the DVAL of patients who use the handrail or not at speed 4km/h(p=0.003) and 6km/h(p=0.017), but not in 2km/h(p=0.136).

Discussion: The results suggest that age significantly increased drop-out rates, while BVP did not, with significant differences in dynamic variability (DVAL) observed across walking speeds, particularly in BVP patients, who showed lower DVAL at faster speeds, and the use of handrails influenced gait variability at faster walking speeds.

Conclusion: It can show loss of DVA in patients with bilateral vestibulopathy. Age considerably enhances the drop-out rate at faster walking speeds. And the handrail use effect on the faster speed of DVAL.

Keywords: Dynamic visual acuity, bilateral vestibulopathy, oscillopsia

References

1. Purves D AG, Fitzpatrick D, et al. Neuroscience. 2nd edition. The Vestibular System Chapter 14. 2001.
2. Cullen KE. The vestibular system: multimodal integration and encoding of self-motion for motor control. Trends Neurosci. Mar 2012;35(3):185-96. doi:10.1016/j.tins.2011.12.001
3. Strupp M, Kim JS, Murofushi T, et al. Bilateral vestibulopathy: Diagnostic criteria Consensus document of the Classification Committee of the Barany Society. J Vestib Res. 2017;27(4):177-189. doi:10.3233/VES-170619
4. Strupp M, Kim JS, Murofushi T, et al. Erratum to: Bilateral vestibulopathy: Diagnostic criteria Consensus document of the Classification Committee of the Barany Society. J Vestib Res. 2023;33(1):87. doi:10.3233/VES-229002
5. Clement G, Kuldavletova O, Macaulay TR, et al. Cognitive and balance functions of astronauts after spaceflight are comparable to those of individuals with bilateral vestibulopathy. Front Neurol. 2023;14:1284029. doi:10.3389/fneur.2023.1284029

Figure: DVAL versus speed in BVP-patients (green) and healthy controls (blue).

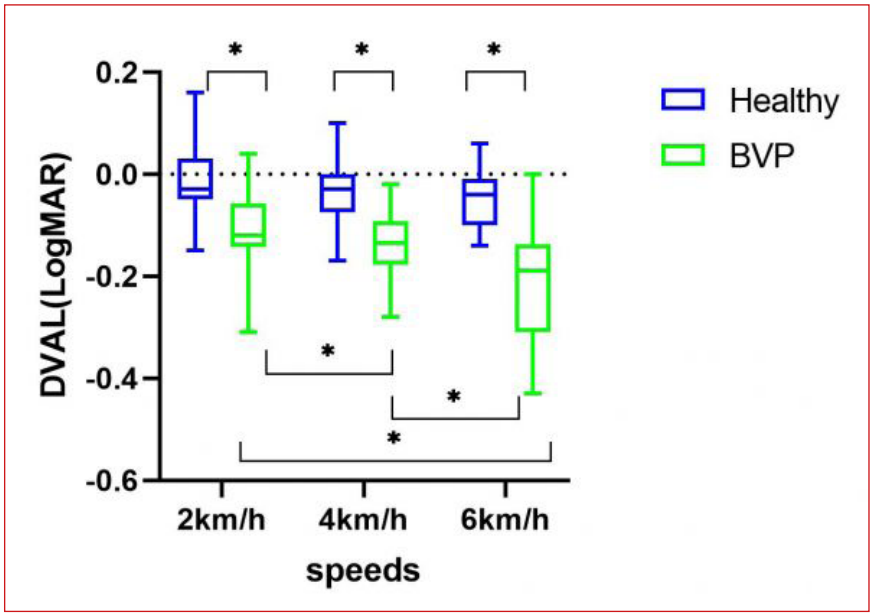
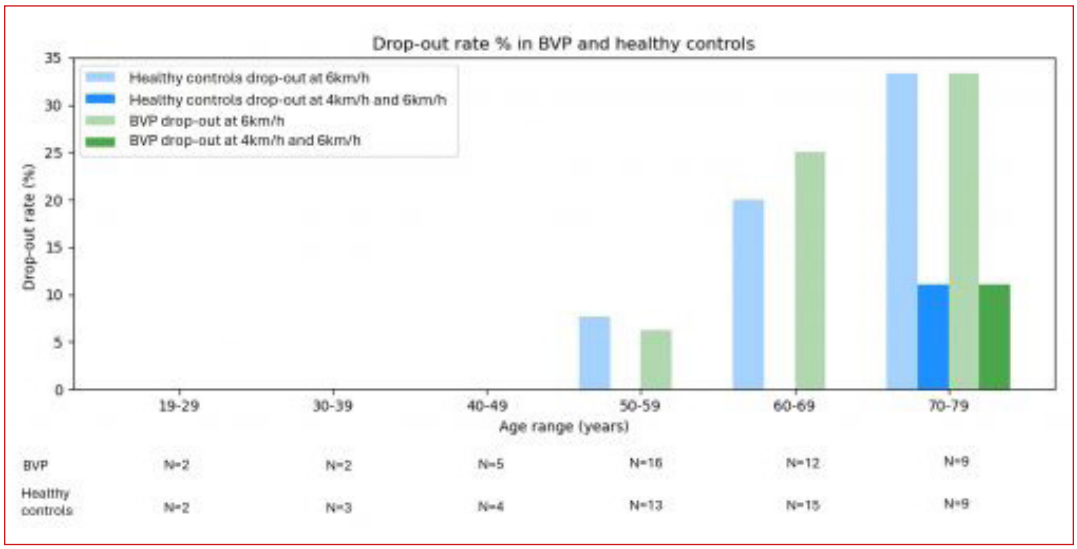


Figure: Drop-out rate (%) in different age range and pattern in BVP and healthy control (blue: heathy control, light blue: pattern 2: drop-out at 6 km/h , dark blue: pattern 3: drop-out at 4 and 6 km/h; green: BVP, light green: pattern 2: drop-out at 6 km/h, dark green: pattern 3: drop-out at 4 and 6 km/h)



RP-02

PROPOSAL OF A STANDARDIZED TESTING PROTOCOL FOR BPPV USING 3D SIMULATIONS OF POSITIONAL TESTS

Rajneesh Bhandari[1], Anita Bhandari[1], David Samuel Zee[2], Daniele Nuti[3], Herman Kingma[4--5], Raymond Van De Berg[5]

[1]*Neuroequilibrium, India*

[2]*Johns Hopkins University, Baltimore, Usa*

[3]*University of Siena, Italy*

[4]*Aalborg University, Denmark*

[5]*Maastricht University Medical Centre, Netherlands*

Background: Benign Paroxysmal Positional Vertigo (BPPV) is a common vestibular disorder caused by displaced otolith debris in the inner ear. This study explored the order effect related to the sequence of performing different diagnostic positional maneuvers.

Methods: 3D simulations of the Supine Roll Test (SRT), Dix-Hallpike maneuver (DHM), and Deep head hanging tests, performed in the standardized prescribed way, were used to study various types of horizontal, posterior, and anterior canal BPPV. The simulations allowed visualization of the movement of the otolith debris and the resulting nystagmus patterns. The results of the sequence of tests and the starting side of the tests (from left or right) were observed.

Results: Simulations of the SRT on horizontal canal BPPV (hc-BPPV) showed different patterns of nystagmus: direction changing, direction fixed, and unilateral (only elicited in one position) nystagmus. These patterns depended on the position of the debris within the horizontal canal and the side from which the SRT began. Simulations of the DHM showed that the test procedure could displace debris in the horizontal canal. The SRT, however, caused no movement of debris in the vertical canals. The deep head hanging test could displace debris in all canals.

Conclusion: An order effect can occur when performing diagnostic maneuvers for BPPV. The maneuvers can displace debris in the semicircular canals into new positions that may influence the findings in subsequent maneuvers and confound interpretation. A standardized testing protocol, starting with the SRT first, can decrease the order effect and simplify the interpretation of test results and in turn improve diagnostic accuracy and outcomes in the management of BPPV.

Keywords: BPPV, simulations, positional tests

RP-03

THE IMPACT OF DUAL TASKING ON THE VESTIBULAR OCULAR REFLEX

Itay Avivi[1], Noa Rozendorn[2], Amit Wolfowitz[2], Yoav Gimmon[1--2]
[1]Department of Physical Therapy, Faculty of Social Welfare & Health Studies, University of Haifa, Haifa, Israel
[2]Department of Otolaryngology-head and Neck Surgery, Sheba Medical Center, Tel-hashomer, Israel

Aim: Our daily lives often involve dual-task activities that require both gait and postural control. The vestibular system plays a crucial role in maintaining balance through its various reflexes and in stabilizing gaze via the Vestibulo-Ocular Reflex (VOR). The VOR helps stabilize gaze during head movements and continuously adapts to environmental changes in healthy individuals. Previous studies have shown that either cognitive or motor tasks can negatively impact balance, and vice versa. However, the effect of dual-tasking on VOR function and adaptability has yet to be explored. This study aims to assess the impact of cognitive and motor dual-tasking on VOR function, and to evaluate VOR adaptability to changes in target distance, considering the vergence modulation concurrent with these tasks, using the video head impulse test (vHIT).

Materials and Methods: Sixteen healthy young adults performed fourteen tasks in random order: single-task vHIT with far and near targets, single-task cognitive tasks, single-task motor tasks, and dual-task cognitive/motor tasks with vHIT for both near and far targets. Cognitive and motor tasks were selected based on common task types. vHIT testing was conducted with near (15 cm) and far (1.5 m) targets. A paired t-test was used to evaluate differences in VOR gains between single-task and dual-task conditions, as well as between the far and near testing conditions.

Results: No significant differences in VOR gains or VOR gain ratios (near VOR gain / far VOR gain × 100) were observed between single-task vHIT and either dual-task condition (cognitive or motor). VOR gains were similar across both dual-task conditions, whether using far or near targets. No significant difference was found between the effects of cognitive and motor dual-tasking.

Discussion: Our findings suggest that dual-tasking does not affect VOR gains or VOR adaptation. This implies that other mechanisms involved in balance control may be more susceptible to cognitive or motor load. This could explain the impaired performance observed in various static and dynamic balance tasks during dual-tasking, as reported in other studies.

Conclusion: Our results suggest that gaze stability is more robust and less sensitive to external cognitive and motor loads. Based on these findings, we propose that dual-tasking exercises may not be necessary for gaze stability rehabilitation.

Keywords: VOR, dual task condition, vergence modulation, adaptation

Figure: VOR Gain For Near and Far Target

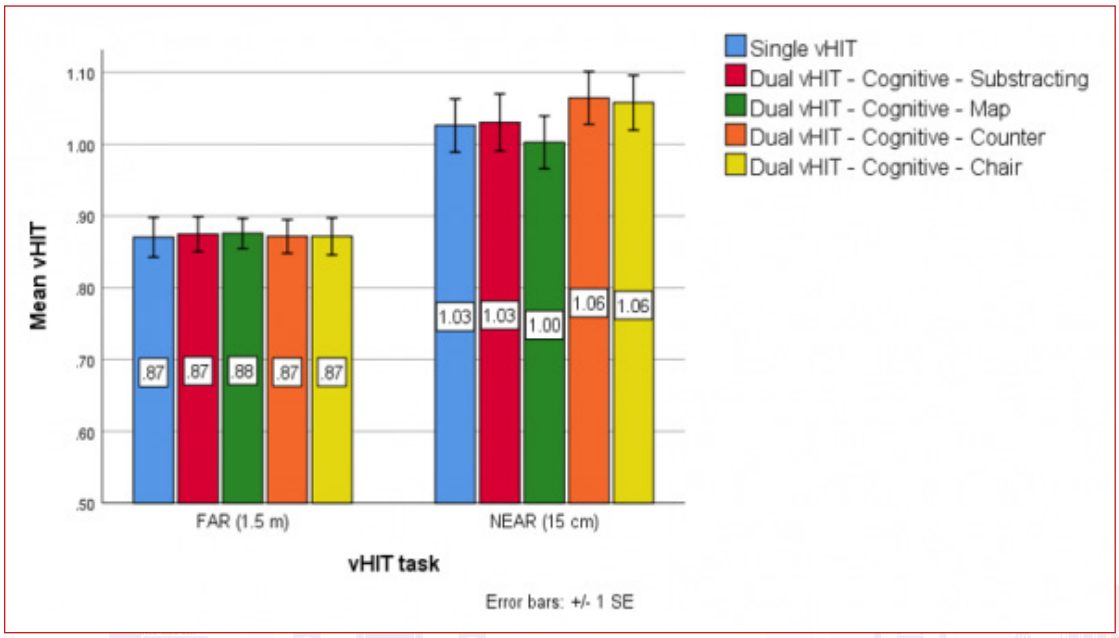
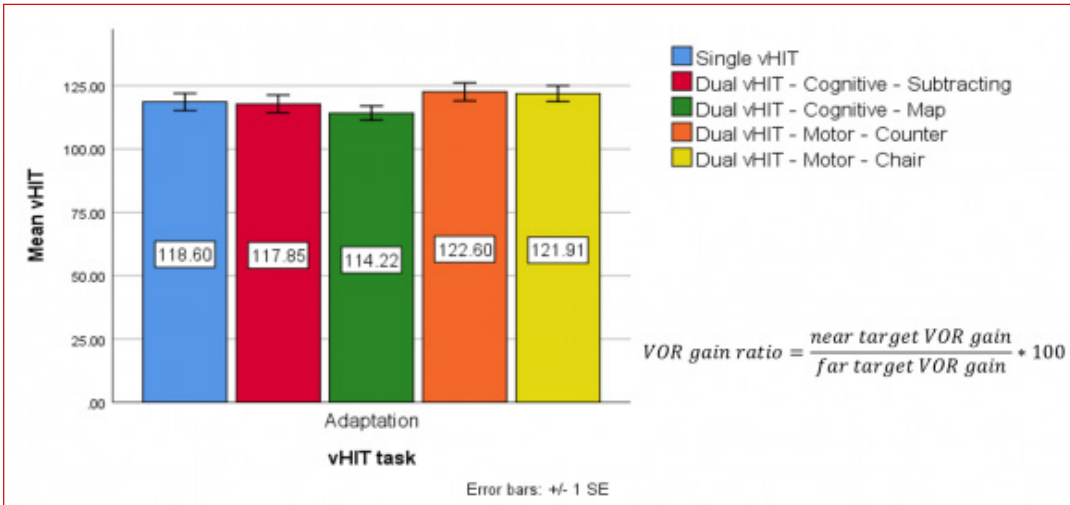


Figure: VOR Gain Adaptation Ratio



RP-04

COMBINING BATTERY OF AUDITORY AND VESTIBULAR TESTS FOR SEVERITY EVALUATION OF MENIÈRE'S DISEASE

Hui Wang[1]

[1]*Department of Otolaryngology-head and Neck Surgery, Shanghai Sixth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine*

Objective: We aimed to combine battery of auditory and vestibular tests to evaluate severity of Menière's Disease (MD), thereby advancing proposals for novel grading of MD.

Material and Method: Vestibular organs involvement (VOI) was assessed through vestibular-evoked myogenic potentials (VEMPs), the video head impulse test (vHIT), and the rotary chair test (RCT). Vertigo severity was quantified utilizing Dizziness Handicap Inventory (DHI) scores and vertigo episodes frequency. Pure-tone audiometry (PTA) was applied to evaluate hearing impairment. Subsequently, machine learning (ML) models were employed to identify significant variables. Cluster analysis, based on VOI, PTA, and vertigo episodes frequency, was conducted to categorize individuals into subtypes.

Results: Among 101 patients, saccular hypofunction correlated significantly with elevated DHI scores ($r = 0.31$, $P = 0.001$) and increased vertigo frequency ($r = 0.27$, $P = 0.007$). The significant predictors for DHI in ML models included RCT, anterior-canal vHIT, cervical VEMP, and vertigo episodes, eventually identified by Genetic Algorithm-Neural Network ($R2 = 0.906$). A five-cluster fitted the data best. Cluster1 (27.72%) demonstrated the PTA 45 and VOI 3, whereas those in Cluster4 (23.76%) presented with PTA 45 and VOI 3. Particularly, patients in Cluster5 (6.93%) experienced vertigo attacks predominately, with exceeding 20 occurrences annually. Among 25 patients followed-up post 18 to 24 months of treatment, 60% (3/5) in Cluster1 and 71% (5/7) in Cluster2 achieved control, whereas only 50% (2/4) in Cluster3.

Conclusions: Stratifying MD patients into 5 subtypes combining with vestibular tests outcomes and vertigo episodes to estimate disease progression may facilitate personalized early interventions.

Keywords: Meniere's disease, vertigo episode, Dizziness Handicap Inventory, machine learning, subtypes

RP-05

SUBJECTIVE VISUAL VERTICAL ALTERATIONS IN PARKINSONS DISEASE

Alexandra Belyakova-Bodina[1], Maria Tsvetkova[2], Anastasia Mezenchuk[1], Ekaterina Fedotova[1]
[1]Research Center of Neurology
[2]Lomonosov Moscow State University

Aim: To estimate the prevalence of abnormal subjective visual vertical (SVV) in Parkinsons disease (PD) and its relation to the severity of the disease symptoms.

Material and Method: 20 patients with PD were included (12 female; age Me 59,5 [57; 64]). Disease duration, MDS-UPDRS score, MoCa score, Morse fall scale score, and pull-test score were estimated. Each patient underwent a bucket test for SVV. Difference between the SVV and the true vertical ≥3° was considered abnormal. Two groups of PD patients were then formed, based on the presence of abnormal SVV. Differences between the groups were assessed using the Mann-Whitney criterion, and correlation was assessed using the Spearman coefficient.

Results: The disease severity assessed by MDS-UPDRS was the following: Part I (non-motor experiences of daily living) Me 3 [2; 5,5] Min=1, Max=8; Part II (motor experiences of daily living) Me 20,5 [15,25; 30]) Min=9, Max=35; Part III (motor examination) Me 38 [22,25; 42,75]) Min=18, Max=50; Part IV (motor complications) Me 4 [2; 7,25]) Min=0, Max=12; Part V (Hoehn and Yahr scale) Me 2 [2; 3] Min=2, Max=3; total score Me 63 [47; 73,75] Min=22, Max=83. All data is summarized in Table 1.

Patients were divided into two groups based on the SVV value. Abnormal SVV group comprised 7 patients, and the normal SVV group comprised 13 patients.

There was a statistically significant difference in Part III ($p = 0.015$) and Part V ($p = 0.005$) scores of MDS-UPDRS between the groups. There was also a statistically significant difference in the results of the pull-test in patients from two groups ($p = 0.022$).

No statistically significant difference between two groups was found for age, disease duration, Parts I, II, and IV of MDS-UPDRS, as well as MDS-UPDRS total score, MoCa score, and Morse fall test score.

Moderate correlation was established between the SVV and the Hoehn and Yahr stage ($r = 0.69$, $p=0.0008$), as well as between the SVV and pull-test score ($r = 0.57$, $p=0.0008$).

Discussion: The proportion of the abnormal SVV in PD patients reached 35% in our cohort, being consistent with the previously published data [1]. Correlation of SVV with both Hoehn and Yahr stage and pull-test score indicates the relation between SVV and postural instability, as well as with the disease progression. In previous studies, postural instability was found to be more consistent with SVV alterations than the overall disease severity [2]. Alterations in perception of verticality could be attributed both to otolith pathology and higher-level multisensory integration abnormalities, with the latter being more probable in PD.

Conclusion: Alterations in perception of verticality is a common phenomenon in PD patients, being underrecognized in clinical practice. SVV abnormalities are usually attributed to the otolith dysfunction, but can be seen also in the central pathologies, making the clinical context crucial for CVV test interpretation.

Keywords: Parkinsons disease, subjective visual vertical, central vestibular diseases, postural instability

References

1. Danta G, Hilton RC. Judgment of the visual vertical and horizontal in patients with Parkinsonism. Neurology. 1975 Jan;25(1):43-7. doi: 10.1212/wnl.25.1.43. PMID: 1167408.
2. Pereira CB, Kanashiro AK, Maia FM, Barbosa ER. Correlation of impaired subjective visual vertical and postural instability in Parkinson's disease. J Neurol Sci. 2014 Nov 15;346(1-2):60-5. doi: 10.1016/j.jns.2014.07.057. Epub 2014 Aug 4. PMID: 25127440.

Figure 1: Correlation between SVV and MDS-UPDRS Part V and pull-test scores in patients with Parkinsons disease

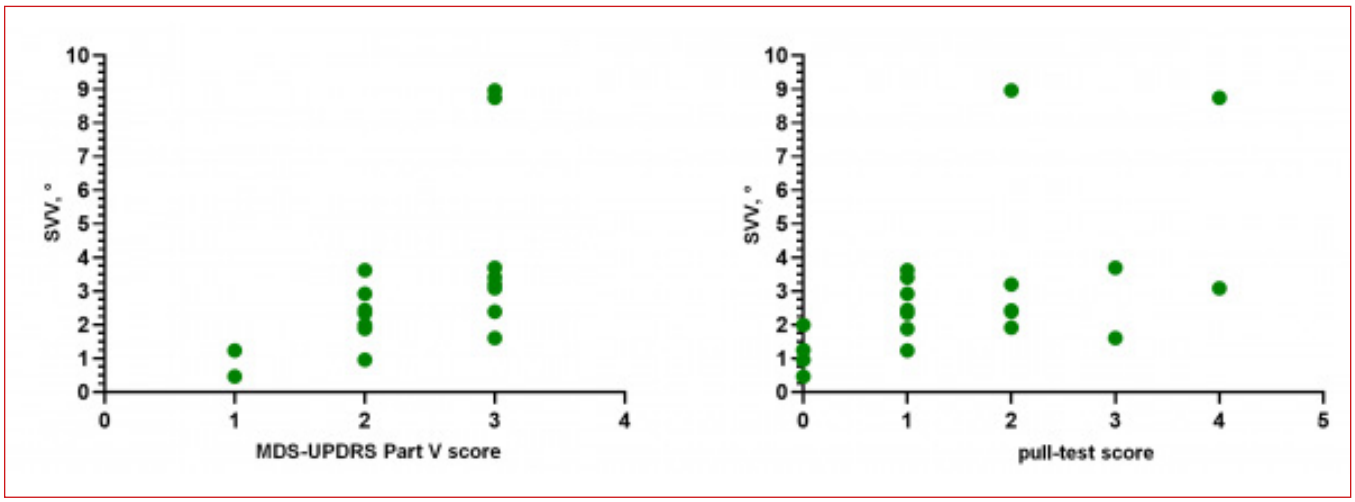


Table 1. Characteristics of Parkinsons disease patients cohort

Parameter	Abnormal SVV group	Normal SVV group
Female	61,5%	57%
Age, years	60 [57,5; 64]	59 [55; 66]
Disease duration, years	7 [4; 12]	10 [7; 16]
MDS-UPDRS Part I score	3 [2; 4]	3 [2; 8]
MDS-UPDRS Part II score	21 [12,5; 30,5]	19 [17; 28]
MDS-UPDRS Part III score	34 [20,5; 41]	42 [38; 49]
MDS-UPDRS Part IV score	4 [1,5; 4,5]	5 [2; 8]
MDS-UPDRS Part V score	2 [1,5; 2]	3 [3; 3]
MDS-UPDRS total score	59 [36; 75]	69 [61; 74]
Pull-test score	1 [0; 2]	2 [1; 3]
MoCa score	26 [24,5; 27,5]	26 [24; 26]
Morse fall scale score	40 [5; 50]	50 [45; 65]
SVV, grades	1,92 [1,24; 2,41]	3,62 [3,2; 8,74]

RP-06

VIDEONYSTAGMOGRAPHY FINDINGS IN VESTIBULAR MIGRAINE

Prateek Porwal[1], **Srinivas Dorasala**[2], **Pradeep Vundavalli**[3]
[1]*Prime Ent Center, Hardoi, India*
[2]*Jawaharlal Nehru Medical College, Belagavi, Karnataka, India*
[3]*Aasian Super Speciality Ent Hospital, Visakhapatnam, India*

Background: Vestibular migraine (VM) is a variant of migraine involving the vestibular system. While primarily a clinical diagnosis, videonystagmography (VNG) can reveal characteristic patterns in VM patients.

Objective: To document common VNG findings in patients with vestibular migraine.

Methods: This multicentric study analyzed VNG patterns in 540 patients diagnosed with VM from 2019 to 2024.

Results: The most frequent VNG findings in VM patients included:

1. Impaired smooth pursuit in horizontal and vertical directions
2. Saccadic abnormalities:
   a. Hypometric saccades
   b. Broken saccades
   c. Nystagmic intrusions
3. Spontaneous vertical nystagmus, exacerbated upon removal of fixation
4. Gaze-evoked nystagmus with rebound nystagmus
5. Central positional nystagmus
6. High-frequency head shake (HFHS) test revealing:
   a. Biphasic nystagmus
   b. Perverted nystagmus in the vertical plane
7. Visual dependency on dynamic subjective visual vertical (SVV) tests

Saccadic hypometria, nystagmic intrusions, and searching saccades were most common in acute VM cases. Vertical smooth pursuit impairment was more prevalent than horizontal. Most findings were observed during or within 24 hours of an attack and were not consistently reproducible on repeat testing.

Conclusions: While VM remains a clinical diagnosis, characteristic VNG findings can serve as a valuable diagnostic tool, particularly in cases with overlapping symptoms from other vestibular disorders. These oculomotor abnormalities may help improve diagnosis and guide treatment strategies for VM patients

Keywords: Vestibular migraine, VNG, videonystagmography, vertigo

References

1. Espinosa-Sanchez JM, Lopez-Escamez JA. Vestibular and Oculomotor Findings in Vestibular Migraine Patients. J Clin Med. 2023;12(16):53392.
2. Beh SC, Masrour S, Smith SV, Friedman DI. The Spectrum of Vestibular Migraine: Clinical Features, Triggers, and Examination Findings. Headache. 2019;59(5):727-7404.
3. Boldingh MI, Ljøstad U, Mygland A, Monstad P. Vestibular sensitivity and visual dependence in vestibular migraine. Cephalalgia. 2013;33(8):597-604

RP-07

GAIN VALUES OF VESTIBULO-OCULAR REFLEX IN VIDEO HEAD IMPULSE TEST IN CHILDREN WITHOUT OTONEUROLOGIC SYMPTOMS

Rosana Rodríguez-Villalba[1-2], Miguel Caballero-Borrego[3]

[1]*Department of Otorhinolaryngology, Hospital Sant Joan De Déu, Althaia Manresa, Barcelona, Spain*

[2]*Department of Otorhinolaryngology, Hospital Sant Joan De Déu, Barcelona, Spain*

[3]*Otorhinolaryngologyhead and Neck Surgery Department, Hospital Clínic, University of Barcelona, Spain*

Aim: To explore the vestibulo-ocular reflex (VOR) in healthy children at different development stages and to compare the obtained gain values to those in adult population.

Material and Method: This prospective, single-center study recruited 187 children from among patients without otoneurological diseases, healthy relatives of these patients, and staff families from a tertiary hospital. Patients were divided into three groups by age: 3–6 years, 7–10 years, and 11–16 years. The VOR was assessed by video Head Impulse Test, using a device with a high-speed infrared camera and accelerometer (EyeSeeCam®; Interacoustics, Denmark).

Results: We found a lower vestibulo-ocular reflex gain of both horizontal canals in the 3–6-year-old group when compared with the other age groups. No increasing trend was found in the horizontal canals from age 7–10 years to age 11–16 years, and no differences were found by sex.

Discussion: Although vHIT is among the most widely used methods for studying vertigo, normal VOR gain values have not been established for young children. This may reflect the difficulty in performing a complete vestibular evaluation, especially in young children. The present study shows that the VOR gains of the horizontal semicircular canals were more homogeneous than those of the anterior or posterior canals.

Conclusion: Gain values in the horizontal canals increased with age until children reached age 7–10 years and matched the normal values for adults.

Keywords: Adolescent, balance, children, vertigo, vestibulo-ocular reflex, video head impulse test

References

1. Brodsky JR, Lipson S, Bhattacharyya N (2020) Prevalence of pediatric dizziness and imbalance in the United States. Otolaryngol neck Surg Off J Am Acad Otolaryngol Neck Surg 162:241– 247. https:// doi. org/ 10. 1177/ 01945 99819 887375
2. Hazen M, Cushing SL (2021) Vestibular evaluation and management of children with sensorineural hearing loss. Otolaryngol Clin North Am 54:1241–1251. https:// doi. org/ 10. 1016/j. otc. 2021. 08. 001
3. Dhondt C, Dhooge I, Maes L (2019) Vestibular assessment in the pediatric population. Laryngoscope 129:490–493. https:// doi. org/ 10. 1002/ lary. 27255
4. Wiener-Vacher SR, Quarez J, Le PA (2018) Epidemiology of vestibular impairments in a pediatric population. Semin Hear 39:229–242
5. Sommerfleck PA, González Macchi ME, Weinschelbaum R et al (2016) Balance disorders in childhood: main etiologies according to age. Usefulness of the video head impulse test. Int J Pediatr Otorhinolaryngol 87:148–153. https:// doi. org/ 10. 1016/j. ijporl. 2016. 06. 020
6. Rodríguez-Villalba R, Caballero-Borrego M, Villarraga V et al (2020) Vestibulo-ocular reflex assessed with video head impulse test in children with vestibular migraine: our experience. Int J Pediatr Otorhinolaryngol 137:110161. https:// doi. org/ 10. 1016/j.ijporl. 2020. 110161

RP-08

INFLUENCE OF COGNITIVE LOAD ON CERVICAL VESTIBULAR EVOKED MYOGENIC POTENTIALS IN NORMAL SUBJECTS

Rahına Abubacker[1], Pradeep Yuvaraj[1], Anannya Adhıkarı[1], Aravınd Kumar Rajasekaran[1]
[1]National Institute of Mental Health and Neurosciences, Bengaluru, India

Introduction: In the real world, balance and vestibular functions don't happen as a unitary phenomenon but happen as a simultaneous function like that of cognitive tasks. The vestibular system, traditionally associated with reflex generation for spinal and ocular-motor control, is now recognized for its interaction with cognitive functions such as spatial navigation, space perception, body representation, mental imagery, attention, memory & social cognition. Vestibular contributions to spatial cognition have been difficult to study because the circuits involved are inherently multisensory. The cervical vestibular evoked myogenic potential (cVEMP) test, a reliable method for assessing vestibular function through short-latency myogenic responses to specific stimuli, has been primarily used to study the peripheral vestibular system. A cortical task, such as a task involving cognitive load & voluntary muscle contraction, can help assess how the CNS integrates and processes vestibular inputs. By performing a cortical task during the cVEMP, clinicians can examine both the peripheral and central pathways involved in vestibular responses. However, no studies to date have studied the effect of cognitive load on cVEMPs during cognitive tasks. Aim: To explore the effects of cognitive load on the cVEMP in healthy subjects.

Method: 30 healthy participants aged between 20 and 25 years with no history of audio-vestibular dysfunction or cognitive impairment were recruited. Each subject underwent two cVEMP recordings: the first without a cognitive task and the second while performing a visual Stroop task. The replicability of the response was determined based on two rarefaction recordings. The latency P1, N1, amplitude P1-N1, & Asymmetry Ratio (AR) are measured on the normalized waveform.

Results: Data analysis was performed using SPSS software (version19), and p-value less than 0.05 was considered statistically significant. To compare the results between the two groups, an independent sample t-test was employed. All subjects showed cVEMPs responses to AC stimuli in both conditions. There were significant differences between cVEMP in rest state and during the visual Stroop test in terms of p1-n1 amplitudes and AR ($P<0.02$) on both sides. There were no significant differences between P1-N1 latencies in both conditions for both ears.

Discussion: The results provide valuable insights into how cognitive load influences vestibular processing as measured by cVEMP. The decrease in P1-N1 amplitudes observed during the Stroop task reflects cognitive interference or a shift in attentional resources. The Stroop test, which requires inhibiting automatic responses and engage in executive control, may lead to reduced vestibular responsiveness as attentional resources are diverted toward the cognitive task. Previously, VEMPs served as diagnostic instruments for peripheral illnesses; however, they are now increasingly used at central & cognitive levels in the domain of balance. Cognitive load may have a differential impact on the cortical regions involved in vestibular processing or on the vestibular pathways, leading to altered AR between the 2 conditions. These findings underscore the interconnected nature of vestibular and cognitive pathways in the brain and have implications for understanding balance disorders and developing more comprehensive vestibular assessments. These findings contribute to understanding of the complex relationship between cognitive processes & sensory integration, highlighting the role of attentional and executive control mechanisms in modulating vestibular responses. However, the lack of significant changes in P1-N1 latencies suggests that cognitive load does not alter the speed of vestibular processing, which remains fast and automatic. Conclusion: The outcomes of this study establish the effect of cognitive load on cVEMP and could be explored for its clinical utility by studying patient population.

Keywords: Cervıcal vestıbular evoked myogenıc potentıal, stroop task, cognıtıon, vestıbular

References

1. Sanayi R, Rahimi V, Mohamadkhani Gh, Hoseinabadi R. The Effect of Cognitive Task on the Ocular Vestibular Evoked Myogenic Potentials in Healthy People. Iran J Otorhinolaryngol.2020:32(5); 311-317.
2. Talkowski, M. E., Redfern, M. S., Jennings, J. R., & Furman, J. M. (2005). Cognitive requirements for vestibular and ocular motor processing in healthy adults and patients with unilateral vestibular lesions. Journal of cognitive neuroscience, 17(9), 1432–1441.
3. Rosengren SM, Welgampola MS, Colebatch JG (2010) Vestibular evoked myogenic potentials: past, present and future. Clin Neurophysiol 121.
4. Heide G, Luft B, Franke J, Schmidt P, Witte OW, Axer H. Brainstem representation of vestibular evoked myogenic potentials. Clin Neurophysiol. 2010 Jul;121(7):1102-8.
5. Palla A, Lenggenhager B. Ways to investigate vestibular contributions to cognitive processes. FrontIntegr Neurosci. 2014;
6. Banich MT (2019) The Stroop Effect Occurs at Multiple Points Along a Cascade of Control: Evidence From Cognitive Neuroscience Approaches. Front. Psychol. 10:2164

7. Hitier, M., Besnard, S., & Smith, P. F. (2014). Vestibular pathways involved in cognition. Frontiers in Integrative Neuroscience, 8, 59.
8. Karnath HO, Ferber S, Dichgans J. The neural representation of postural control in humans. Proc Natl Acad Sci USA. 2000;97(25):13931–6.
9. Bigelow, Robin T. and Agrawal, Yuri. 'Vestibular Involvement in Cognition: Visuospatial Ability, Attention, Executive Function, and Memory'. 1 Jan. 2015 : 73 – 89

RP-09

VESTIBULAR REHABILITATION WITH VIRTUAL REALITY IN PATIENTS WITH LONG-TERM DIZZINESS

Daniele Corbo[1], Valentina Santomauro[1], Alessandro Maroli[2], Federica Simoni[1], Eolo Castello[1]
[1]*University of Genova, Department of Otorhinolaryngology Head and Neck Surgery, IRCCS Policlinico San Martino*
[2]*Cremona, Terma Maggiore Specilialist Clinic*

Objective: This study aims to evaluate the enhancement of vestibular reflexes through a traditional approach and an innovative one using virtual reality in patients with vestibular disorders, specifically with delayed vestibular compensation and persistent positional vertigo. The evaluation is based on the analysis of the vestibular outcomes post-rehabilitation and also on feedbacks of the patients, collected through questionnaires administered before, during, and after the rehabilitation process.

Methods and Materials: Two groups of patients experiencing dizziness lasting over three months were examined using instrumental vestibular tests, including the video head impulse test (vHIT), static posturography, subjective visual vertical (SVV) and horizontal (SVH) evaluations. The analyzed parameters included asymmetry, VOR gain, PR scores in HIMP and SHIMP modules, oscillation length in posturography, and angular deviations in SVV and SVH. Both groups followed a vestibular rehabilitation protocol divided into three phases: **t0** (initial diagnosis), **t1** (after 4 weeks of supervised exercises, 2-3 times per week), and **t2** (after an additional 8 weeks of home exercises, 2-3 times per week). In accordance with our protocol, the patients answered questionnaires at t0 , t1, t2 before, during and after the rehabilitation.

Results: The results showed significant improvements in vestibular reflexes and DHI scores at t1 and t2 in both groups. The virtual reality rehabilitation group achieved faster recovery during the first 30 days (t1), while the conventional exercise group demonstrated better results in the medium-to-long term (t2). The technological approach notably enhanced vestibular reflexes during the initial phase.

Discussion: Virtual reality proved effective in enhancing vestibular reflexes in a short time frame, likely due to increased multisensory stimulation. However, conventional exercises appeared more advantageous for long-term outcome maintenance. These results suggest that a hybrid approach could optimize the benefits of vestibular rehabilitation.

Keywords: Dizziness, vestibular reflexes, virtual reality, compensation, timescale for improvement

RP-11

RESULTS OF A VESTIBULAR REHABILITATION PROGRAM COMBINED WITH VIRTUAL REALITY IN BILATERAL VESTIBULAR HYPOFUNCTION

Bilal Burak Bayraklı[1], Ömer Kuzu[1], Canan Çelik[2]

[1]*Department of Physical Medicine and Rehabilitation, Ankara Bilkent City Hospital, Ankara, Türkiye*

[2]*Department of Physical Medicine and Rehabilitation, University of Health Sciences, Ankara Bilkent City Hospital, Ankara, Türkiye*

Aim: This study aimed to evaluate the results of a vestibular rehabilitation program combined with augmented and virtual reality applications in patients with chronic bilateral vestibular hypofunction (BVH).

Material and Method: Patients aged between 18 and 65 years who were diagnosed with bilateral vestibular hypofunction by video head impulse testing (vHIT) and who underwent augmented and virtual reality-combined balance and gait training program (in the clinic, 3 days a week, 45 minutes per day, 4 weeks and 12 sessions in total, habituation, balance and gait exercises with C-Mill VR+ and gaze stabilization exercises ; at home, on other days, gaze stabilization exercises) at the vertigo and balance disorders rehabilitation laboratory between January 2024 and November 2024 were included in the retrospective study. Patients with central and peripheral neurological diseases affecting balance and ambulation, orthopedic diseases and visual impairments, active Meniere›s disease or BPPV, advanced stage systemic diseases affecting general condition, and patients using vestibular system depressant drugs within the last 3 months were not included in the study. The demographic and clinical characteristics of the patients included in the study were evaluated from their clinical records, including age, gender, body mass index, and dizziness duration. The outcome measures were the Numerical Rating Scale (NRS) to assess dizziness severity, the Dizziness Handicap Inventory (DHI) to evaluate dizziness-related disability level, the Berg Balance Scale (BBS) and the Timed Up and Go Test (TUG) to assess balance and fall risk, and vestibular dominant scores obtained in static posturography, administered before and at the end of the rehabilitation program.

Results: Eighteen patients diagnosed with BVH were included in the study. The mean age of the patients was 50.89±12.20 and 10 (55.6%) were female. The mean dizziness duration was 14.88±11.25 months. According to the evaluations made after the vestibular rehabilitation program, statistically significant improvements were determined compared to pre-treatment in terms of NRS, DHI, BBS, TUG, and vestibular dominant score ($p<0.001$, $p=0.002$, $p=0.01$, $p=0.04$ and $p=0.011$, respectively).

Discussion: High-tech rehabilitation applications are one of the treatment options for vestibular hypofunction, and it has been concluded that the use of virtual reality increases exercise compliance and facilitates good balance training (Meldrum D., Herdman S. 2015; Viziano A., Micarelli A. 2019). C-Mill VR+, which is used for balance, habituation, and walking exercises, allows for augmented reality applications in addition to virtual reality, which may further increase the beneficial effects in vestibular rehabilitation.

Conclusion: Augmented and virtual reality-combined vestibular rehabilitation program applied to patients with BVH has positive effects on the patients' dizziness, functionality and balance levels. Randomized controlled trials with a control group are needed to evaluate the effectiveness of these applications.

Keywords: Vertigo, rehabilitation, virtual reality, augmented reality

RP-12

DIGITAL ADVANCEMENTS IN VESTIBULAR REHABILITATIONS: EVALUATING THE EFFECTIVENESS OF AN ONLINE THERAPY PROGRAM

Rajneesh Bhandari[1], Anita Bhandari[1]
[1]*Neuroequilibrium, India*

Background: Vestibular rehabilitation is an important modality of treatment of several vestibular disorders. The rehabilitation protocol needs to be customised according to the vestibular deficit. This study evaluates the efficacy of online Vestibular rehabilitation program for dizzy patients.

Method: 93 patients were enrolled in the online rehabilitation program for 6 weeks. The Dizziness Handicap Inventory (DHI) score was employed as a metric for measuring progress.

Results: Quantitatively, a 58% decrease in vertigo symptoms was observed post-rehabilitation (Figure 4). Detailed outcomes post-rehabilitation indicated that 81.7% of participants experienced improvement in vertigo, 5.4% achieved complete resolution of symptoms and 12.9% reported no change. The average DHI reduced from 38.1 to 16.5.

Conclusions: The study emphasizes the role of digital healthcare in delivering effective vestibular rehabilitation. The digital platform›s accessibility and tailored treatment plans stand out as key advantages. Further research is suggested to validate these findings on a larger scale.

Keywords: Vestibular rehabilitation, DHI, digital platform, gaze stabilization

RP-13

EFFECTIVENESS AND ADOPTION OF AN ONLINE VESTIBULAR TUTORIAL FOR PHYSIOTHERAPISTS: INSIGHTS FROM THE UTAUT MODEL

Yael Arbel[1-2], Liora Shmueli[1]
[1]Bar-Ilan University
[2]Clalit Health Services

Aim: To investigate the intention to adopt an innovative vestibular e-learning tutorial among physiotherapists specializing in vestibular rehabilitation, using the Unified Theory of Acceptance and Use of Technology (UTAUT) as a central analytical framework. The tutorial is designed to update professional knowledge, present case studies, and incorporate educational videos.

Materials and Methods: A unique vestibular tutorial was developed specifically for «Clalit Health Services», the largest public healthcare organization in Israel. A total of 260 certified vestibular physiotherapists participated in an online survey, which included the UTAUT model, selected for its ability to analyze the intention to adopt technology and identify key influencing factors. The UTAUT components examined were Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). Additionally, a knowledge questionnaire was used to assess baseline knowledge levels among participants and analyze factors influencing technology adoption. The tutorial's effectiveness was evaluated using a sample-based knowledge test conducted both before and after its implementation.

Results: Performance Expectancy (PE) and Facilitating Conditions (FC) were identified as the most influential factors, demonstrating high statistical significance ($p<0.001$) and substantial effects on the intention to adopt the tutorial.

Discussion: Using the UTAUT model as a central analytical tool provided a comprehensive understanding of the factors driving technology adoption among physiotherapists. The innovative vestibular tutorial addresses the unique needs of large-scale professional training, enabling broad and efficient dissemination of knowledge. With advancements in technology and artificial intelligence, incorporating insights from the UTAUT model into the development of smart, personalized training tools can maximize the impact and effectiveness of future educational programs.

Conclusions: Innovative tutorials like the one developed in this study have the potential to significantly enhance professional knowledge and support the training of vestibular physiotherapists. Emphasizing components such as Performance Expectancy (PE) and Facilitating Conditions (FC) in designing training programs ensures optimal learning outcomes and technology adoption. With the growing integration of technology and artificial intelligence in education, future efforts should focus on leveraging these advancements to create adaptive and impactful learning tools.

Keywords: Education, distance

RP-14

NEURAL CORRELATES OF VESTIBULAR ADAPTATION IN COSMONAUTS AFTER LONG-DURATION SPACEFLIGHT

Catho Schoenmaekers[1], Steven Jillings[1], Dmitrii Glukhikh[3], Elena Tomilovskaya[3], Ilya Rukavishnikov[3], Peter zu Eulenburg[4], Floris Wuyts[1-2]

[1]*Lab for Equilibrium Investigations and Aerospace, University of Antwerp, Antwerp, Belgium*
[2]*European Institute for Orl-hns, St Augustinus Hospital, Antwerp, Belgium*
[3]*SSC-RF Institute for Biomedical Problems, Russian Academy of Sciences, Moscow, Russi*
[4]*Institute for Neuroradiology, Ludwig-maximilians-university Munich, Munich, Germany*

Introduction: The otolith system is our main gravity detection system, essential for information about the vertical, but also for maintaining upright posture. Space crew who are exposed to weightlessness for prolonged periods are a very interesting cohort to study the mechanisms governing the otolith system. Our prior research explored the otolith-mediated ocular counter-roll (OCR) and found pre- to post-flight eye torsion differences. After flight, typically all cosmonauts had a reduced OCR output during stimulation of the otoliths by means of centrifugation on a mini centrifuge. This reduction of OCR however was strongly depending on previous flight experience. Another study showed alterations in functional connectivity (FC) after spaceflight, based on resting-state functional magnetic resonance imaging (rsfMRI) biomarkers, obtained in a partially overlapping cosmonaut group. This study retrospectively examined if OCR changes correlate with FC changes in specific vestibular cortical regions post a long-duration spaceflight mission.

Material and Methods: Fourteen cosmonauts (mean age: 47±5 years; mission duration: 187±51 days) underwent pre- and post-spaceflight brain MRI scans (pre: 89±199 days; post: 9±3 days). The OCR was evaluated 154±109 days pre-launch and 3±1 days post-landing. The rsfMRI data were collected, and FC was derived using a cortical vestibular atlas-based region-of-interest (ROI) approach. Vestibular function was measured using the OCR generated by off-axis centrifugation. Correlation between pre- to post-flight SBC and OCR differences was examined ($p<0.001$ uncorrected, cluster-level $p<0.05$ corrected with FDR).

Results and Discussion: Significant changes in FC were found between the vestibular seed region, OP2_PIVC r, and clusters involving the right and the left angular gyrus (+38-72+52, -52-62+48). These cluster locations were confirmed using the AAL3 atlas toolbox of SPM12 alongside CONN's atlas. These alterations correlated with a simultaneous decrease in OCR ($p(FDR)<0.020$, $p(FDR)<0.038$), suggesting a link between greater OCR decrease and lower post-flight connectivity. This underscores the angular gyrus' role in vestibular adaptation during spaceflight, aiding in cosmonauts' rapid adjustment to gravitational changes. We therefore hypothesize that the OCR may be partially governed by efferent pathways.

Keywords: Ocular counter-roll, vestibular adaptation, long-duration spaceflight, angular gyrus

References

Schoenmaekers C, De Laet C, Kornilova L, Glukhikh D, Moore S, MacDougall H, Naumov I, Fransen E, Wille L, Jillings S, Wuyts FL. Ocular counter-roll is less affected in experienced versus novice space crew after long-duration spaceflight. NPJ Microgravity. 2022 Jul 20;8(1):27.

RP-15

INVESTIGATION OF VESTIBULAR REHABILITATION EFFECTIVENESS IN CHILDREN WITH SPECIFIC LEARNING DISORDERS

Melda Acar[1], Eyyup Kara[1], Zehra Koyuncu[2], Mesut Yavuz[2], Hasan Ahmet Özdoğan[3]
[1]İstanbul University-cerrahpaşa Faculty of Health Sciences, Audiology Department
[2]İstanbul University-cerrahpaşa Faculty of Medicine, Department of Child and Adolescent Psychiatry
[3]İstanbul University-cerrahpaşa Cerrahpaşa Faculty of Medicine, Otorhinolaryngology

Objective: This study aims to evaluate the vestibular functions of children with Specific Learning Disorder (SLD) and to investigate the changes in their learning and balance skills following different vestibular rehabilitation methods.

Method: The study included three groups: two study groups consisting of children diagnosed with SLD aged 7–12, and a control group of healthy children within the same age range. Before vestibular rehabilitation, the vestibular functions of the study groups were assessed and compared to those of the control group. Vestibular tests included the Sensory Organization Test (SOT), Adaptation Test (AT), Limits of Stability (LOS), and gaze and saccade tests. The study group was randomly divided into two subgroups: one received traditional vestibular rehabilitation, while the other underwent rehabilitation using Nintendo WiiFit, a virtual reality-based technology. Following the interventions, both vestibular and learning skills were re-evaluated using the MOYA Teacher Form, MOYA Parent Form, and Bender-Gestalt Visual Motor Perception Test (BGGMAT).

Results: Children with SLD exhibited significantly lower vestibular ($p<0.001$) and composite ($p<0.001$) scores on the SOT, higher «Toes down» ($p<0.05$) scores on the AT, and reduced endpoint excursion ($p<0.001$), maximum excursion ($p=0.028$), and directional control ($p=0.005$) on the LOS test compared to the control group. The virtual reality rehabilitation group showed a greater increase in vestibular scores ($p=0.011$) than the traditional rehabilitation group.

Conclusion: The findings revealed that children with SLD have poorer general balance skills compared to their healthy peers. Both traditional vestibular rehabilitation and virtual reality-based interventions significantly improved balance and learning skills in children with SLD, with virtual reality showing superior effects on vestibular function.

Keywords: Specific learning disorder, learning, vestibular function, vestibular rehabilitation, virtual reality.

Table 1. Comparison of vestibular test results of participants before vestibular rehabilitation

	Control Group	Traditional Group	Technological Group	P
Somatosensory Score (%)	96.85 ± 3.96	93.97 ± 7.01	97.48 ± 4.56	0.085
Visual Score (%)	85.34 ± 6.31	78.88 ± 12.02	79.82 ± 7.94	0.052
Vestibular Score (%)	76.35 ± 11.09	58.63 ± 15.82	59.43 ± 14.25	<0.001**
Visual Preference Score (%)	95.78 ± 8.12	101.60 ± 14.75	99.01 ± 10.50	0.265
Composite Score (%)	78.86 ± 5.92	71.02 ± 9.20	70.95 ± 5.23	<0.001**
Toes Up (msec) (SES)	90.30 ± 18.59	103.85 ± 28.26	103.17 ± 22.24	0.115
Toes Down (msec) (SES)	59.66 ± 11.23	70.40 ± 13.01	71.59 ± 15.46	0.009*
Reaction Time (sec)	0.75 ± 0.13	0.79 ± 0.18	0.76 ± 0.19	0.763
Movement Velocity (o/sec)	5.70 ± 1.28	8.72 ± 15.43	5.15 ± 1.22	0.388
Endpoint Excursion (%)	89.58 ± 7.72	77.14 ± 12.33	76.72 ± 9.24	<0.001**
Maximum Excursion (%)	97.57 ± 5.68	91.44 ± 9.67	93.10 ± 6.44	0.028*
Directional Control (%)	78.92 ± 4.64	73.12 ± 6.87	75.18 ± 5.14	0.005*
Right Saccade Peak Velocity (o/sec)	370.66 ± 46.10	339.76 ± 59.55	352.14 ± 77.95	0.281
Right Saccade Accuracy (%)	84.90 ± 12.95	80.52 ± 23.69	85.33 ± 21.48	0.689
Right Saccade Latans (msec)	190.42 ± 22.62	182.85 ± 34.74	203.04 ± 45.35	0.185
Left Saccade Peak Velocity (o/sec)	-369.28 ± 42.54	-340.57 ± 52.20	-376.28 ± 86.34	0.161
Left Saccade Accuracy (%)	84.76 ± 13.65	84.52 ± 17.17	89.85 ± 4.50	0.712
Left Saccade Latans (msec)	187.57 ± 35.94	196.28 ± 37.00	194.09 ± 41.53	0.746

		Traditional Group	Technological Group	P
Somatosensory Score (%)	Pre	93.97 ± 7.01	97.48 ± 4.56	0.063
Somatosensory Score (%)	Post	98.40 ± 2.85	98.89 ± 3.45	0.617
		P=0.007*	P=0.227	
Visual Score (%)	Pre	78.88 ± 12.02	79.82 ± 7.94	0.768
Visual Score (%)	Post	85.95 ± 10.19	89.90 ± 8.25	0.175
		P=0.004*	P=0.001**	
Vestibular Score (%)	Pre	58.63 ± 15.82	59.43 ± 14.25	0.864
Vestibular Score (%)	Post	74.11 ± 7.19	81.85 ± 11.00	0.011*
		P=0.001**	P<0.001**	
Visual Preference Score (%)	Pre	101.60 ± 14.75	99.01 ± 10.50	0.517
Visual Preference Score (%)	Post	99.34 ± 9.34	97.88 ± 6.03	0.550
		P=0.607	P=0.596	
Composite Score (%)	Pre	71.02 ± 9.20	70.95 ± 5.23	0.975
Composite Score (%)	Post	78.30 ± 5.39	81.10 ± 4.80	0.083
		P<0.001**	P<0.001**	
Toes Up (msec) (SES)	Pre	103.85 ± 28.26	103.17 ± 22.24	0.931
Toes Up (msec) (SES)	Post	80.10 ± 14.28	80.07 ± 15.36	0.995
		P=0.001**	P<0.001**	
Toes Down (msec) (SES)	Pre	70.40 ± 13.01	71.59 ± 15.46	0.789
Toes Down (msec) (SES)	Post	57.07 ± 9.13	59.32 ± 10.03	0.452
		P<0.001**	P<0.001**	
Reaction Time (sec)	Pre	0.79 ± 0.18	0.76 ± 0.19	0.600
Reaction Time (sec)	Post	0.69 ± 0.13	0.69 ± 0.16	0.950
		P=0.019*	P=0.106	
Movement Velocity (o/sec)	Pre	8.72 ± 15.43	5.15 ± 1.22	0.304
Movement Velocity (o/sec)	Post	6.48 ± 1.54	6.91 ± 1.86	0.417
		P=0.526	P<0.001**	
Endpoint Excursion (%)	Pre	77.14 ± 12.33	76.72 ± 9.24	0.903
Endpoint Excursion (%)	Post	85.91 ± 12.22	88.42 ± 6.59	0.414
		P=0.001**	P<0.001**	
Maximum Excursion (%)	Pre	91.44 ± 9.67	93.10 ± 6.44	0.516
Maximum Excursion (%)	Post	95.58 ± 7.27	97.45 ± 5.71	0.359
		P=0.027*	P=0.020*	
Directional Control (%)	Pre	73.12 ± 6.87	75.18 ± 5.14	0.279
Directional Control (%)	Post	78.25 ± 6.99	80.76 ± 5.26	0.197
		P=0.001**	P=0.004*	
Right Saccade Peak Velocity (o/sec)	Pre	339.76 ± 59.55	352.14 ± 77.95	0.567
Right Saccade Peak Velocity (o/sec)	Post	331.85 ± 78.89	360.09 ± 76.33	0.245
		P=0.685	P=0.477	
Right Saccade Accuracy (%)	Pre	80.52 ± 23.69	85.33 ± 21.48	0.495
Right Saccade Accuracy (%)	Post	85.38 ± 28.27	84.85 ± 18.61	0.944
		P=0.507	P=0.931	
Right Saccade Latans (msec)	Pre	182.85 ± 34.74	203.04 ± 45.35	0.114
Right Saccade Latans (msec)	Post	188.76 ± 66.52	197.95 ± 51.01	0.618
		P=0.667	P=0.463	

		Traditional Group	Technological Group	P
Left Saccade Peak Velocity (o/sec)	Pre	-340.57 ± 52.20	-376.28 ± 86.34	0.114
Left Saccade Peak Velocity (o/sec)	Post	-323.47 ± 52.30	-383.19 ± 86.56	0.011*
		P=0.302	P=0.665	
Left Saccade Accuracy (%)	Pre	84.52 ± 17.17	89.85 ± 4.50	0.531
Left Saccade Accuracy (%)	Post	82.85 ± 19.15	88.61 ± 23.67	0.391
		P=0.763	P=0.865	
Left Saccade Latans (msec)	Pre	196.28 ± 37.00	194.09 ± 41.53	0.858
Left Saccade Latans (msec)	Post	185.19 ± 33.67	201.52 ± 47.59	0.207
		P=0.092	P=0.403	
MOYA/ Parent Form	Pre	136 ± 27.95	134.90 ± 25.08	0.894
MOYA/ Parent Form	Post	127.38 ± 26.10	119.61 ± 27.47	0.354
		P<0.001**	P<0.001**	
MOYA/ Teacher Form	Pre	145.33 ± 26.62	144.42 ± 25.31	0.911
MOYA/ Teacher Form	Post	137.85 ± 26.12	131.85 ± 26.28	0.462
		P<0.001**	P<0.001**	
Bender-Gestalt Visual Motor Perception Test	Pre	29.05±2.40	23.10±2.28	0.372
Bender-Gestalt Visual Motor Perception Test	Post	52.14±8.51	37.38±8.53	0.081
		P<0.001**	P<0.001**	

RP-16

NEW LIBERATORY MANEUVER FOR THE TREATMENT OF ANTERIOR CANAL BENIGN PAROXYSMAL POSITIONAL VERTIGO

Prateek Porwal[1], **Srinivas Dorasala**[2], **Pradeep Vundavalli**[3]
[1]*Prime Ent Center, Hardoi, Up, India*
[2]*Jawaharlal Nehru Medical College, Belagavi, Karnataka, India*
[3]*Asian Super Speciality Ent Hospital, Visakhapatnam, India*

This article describes the treatment options for anterior semicircular canal benign paroxysmal positional vertigo. Anterior canal benign paroxysmal positional vertigo is a very rare cause of benign paroxysmal positional vertigo, and there are very limited therapeutic options.

Forty-eight patients of anterior canal benign paroxysmal positional vertigo showing down beating nystagmus on Dix Hallpike and supine head hanging test were studied from 2018 to 2023.

They were treated with a new maneuver that involves the following steps:

Step 1 -Bend forward from a kneeling position so that your forehead touches the surface. Step 2- Flex your neck an additional 20 degrees. Step 3- Sit up quickly, extending your head by 20 degrees. Step 4 - Finally, bend your head forward by 20 degrees within 15 seconds of Step 3, and remain in this position for 1 minute.

All our cases showed no nystagmus on repeating the positional tests. This new liberatory maneuver can be used to treat anterior canal BPPV.

Keywords: Anterior Canal BPPV, Liberatory maneuver, BPPV, Bangalore Maneuver

References

1. Imbaud-Genieys S. Anterior semicircular canal benign paroxysmal positional vertigo: a series of 20 patients. European annals of otorhinolaryngology, head and neck diseases. 2013;130(6):303-7.
2. Yacovino DA, Hain TC, Gualtieri F. New therapeutic maneuver for anterior canal benign paroxysmal positional vertigo. Journal of neurology. 2009;256(11):1851-5.
3. Porwal P, V RA, Pawar V, Dorasala S, Bijlani A, Nair P, et al. Clinical and VNG Features in Anterior Canal BPPV-An Analysis of 13 Cases. Frontiers in neurology. 2021;12:618269.
4. Yang X, Ling X, Shen B, Hong Y, Li K, Si L, et al. Diagnosis strategy and Yacovino maneuver for anterior canal-benign paroxysmal positional vertigo. Journal of neurology. 2019.
5. Yao Q, Wang H, Song Q, Shi H, Yu D. Use of the Barany Society criteria to diagnose benign paroxysmal positional vertigo. Journal of vestibular research : equilibrium & orientation. 2018;28(5-6):379-84.

Figure: Particle movements

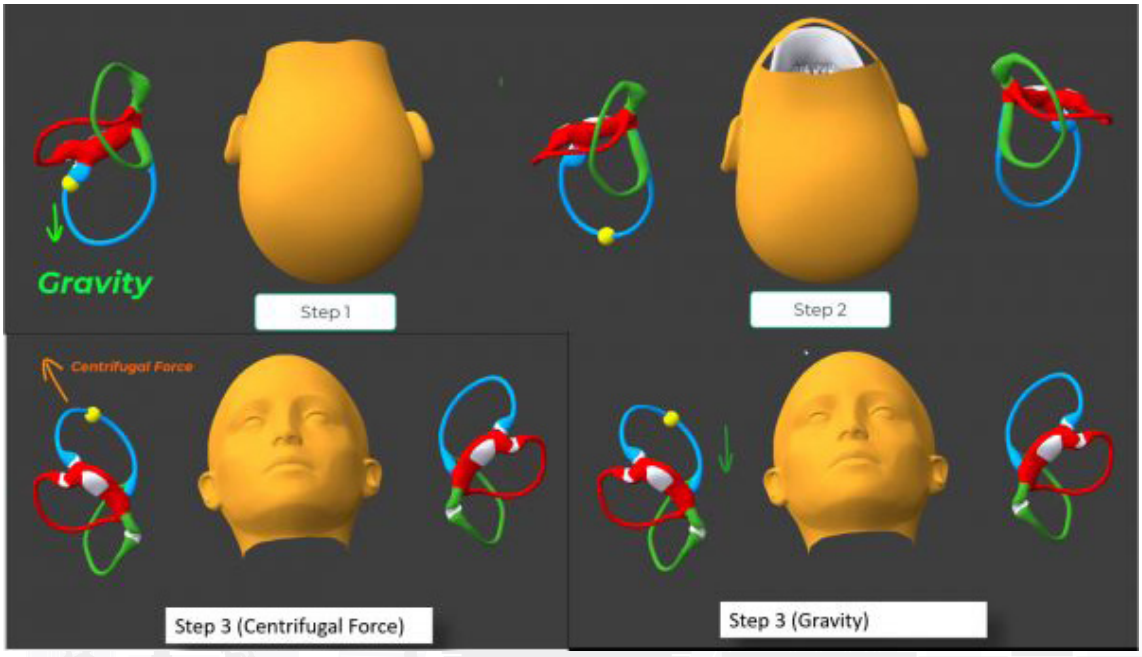


Figure: Step 3

RP-17

ENDOLYMPHATIC HYDROPS IMPAIR INNER EAR UPTAKE AND DISTRIBUTION OF IT INJECTED AGENTS IN PATIENTS WITH MENIERE'S DISEASE

Jing Zou[1], Hongbin Li[1], Minhui Zhu[1], Luguang Chen[2], Zhen Wang[2], Tianhao Lu[1], Yukun Chen[2], Jianping Lu[2], Ilmari Pyykkö[3]

[1]*Department of Otolaryngology-head and Neck Surgery, Center for Otolaryngology-head & Neck Surgery of Chinese Pla, Changhai Hospital, Second Military Medical University, Shanghai, China*

[2]*Department of Radiology, National Key Discipline, Changhai Hospital, Second Military Medical University, Shanghai, China*

[3]*Hearing and Balance Research Unit, Field of Otolaryngology, School of Medicine, Faculty of Medicine and Health Technology, Tampere University, Tampere, Finland*

Background: Intratympanic injection of gentamicin or corticosteroids has been used to treat Meniere's disease (MD). However, the outcome of controlling vertigo varies among patients. Likely, the endolymphatic hydrops (EH) reduced transport speed across the round and oval windows and the distribution volume of the therapeutics inside the inner ear. Dexamethasone does not interact with the visualization of EH in MD patients using MRI after the intratympanic injection of Gd-DTPA. Intratympanic injection of a mixture of dexamethasone and Gd-DTPA has been applied in routine work at Shanghai Changhai Hospital for the MRI diagnosis of EH and MD therapy, as this protocol can be used as a therapeutic procedure in addition to evaluate the EH grade. The present study aimed to investigate the impact of EH on the bioavailability of therapeutics in the inner ear of MD patients.

Materials and Methods: This study included 166 MD patients, 63 with definite MD and 103 with probable MD. A mixture of dexamethasone and 20-fold diluted Gd-DTPA was injected intratympanically. MRI was performed 24 hours later. The region of interest (ROI) with the strongest enhancement in the cochlea and vestibule was selected to calculate the signal intensity ratio (SIR), representing agents' transport speed into the inner ear. The enhancement area in the vestibular perilymph, indicating the distribution volume of agents, was measured. If the endolymph showed enhancement equal to or greater than that of the perilymph in the cochlea, saccule, or utricle of the vestibule, it was interpreted as impaired barrier of endolymph.

Results: EH was detected in 77.7% of patients, specifically in 60 out of 63 definite MD cases and 51 out of 103 probable MD cases. Vestibular EH was present in 76.1% of patients, with 13.3% classified as Grade 1, 16.3% as Grade 2, and 33.7% as Grade 3, whereas 17.5% exhibited impaired barrier of endolymph. Cochlear EH was observed in 68.7% of patients, with 28.9% classified as Grade 1, 39.8% as Grade 2, and 34.9% located at the apex; 12.7% had impaired barrier of endolymph. The severity of cochlear symptoms and the stage of MD significantly correlated with the presence of EH ($p<0.01$). The vestibular SIR was inversely correlated with cochlear and vestibular EH and stage of the disease ($p<0.01$) but positively correlated with the cochlear SIR ($p<0.01$). The cochlear SIR was inversely correlated with cochlear and vestibular EH and stage of the disease ($p<0.05$). The enhancement area of the vestibular perilymph correlated with the cochlear and vestibular SIR but inversely correlated with vestibular, cochlear, and apical EH, as well as with the severity and stage of MD ($p < 0.01$).

Conclusions: EH was associated with the progress of MD. EH significantly reduced the transport/passage of drugs from the middle ear into the inner ear and the distribution volume of the agents in the inner ear. The efficacy of middle-inner ear transport was also reduced in late-stage MD patients.

Keywords: Meniere's disease, MRI, endolymphatic hydrops, drug delivery, bioavailability

Figure: Representative MR images demonstrating endolymphatic hydrops (EH) and impaired barrier of endolymph in Meniere's disease patients.

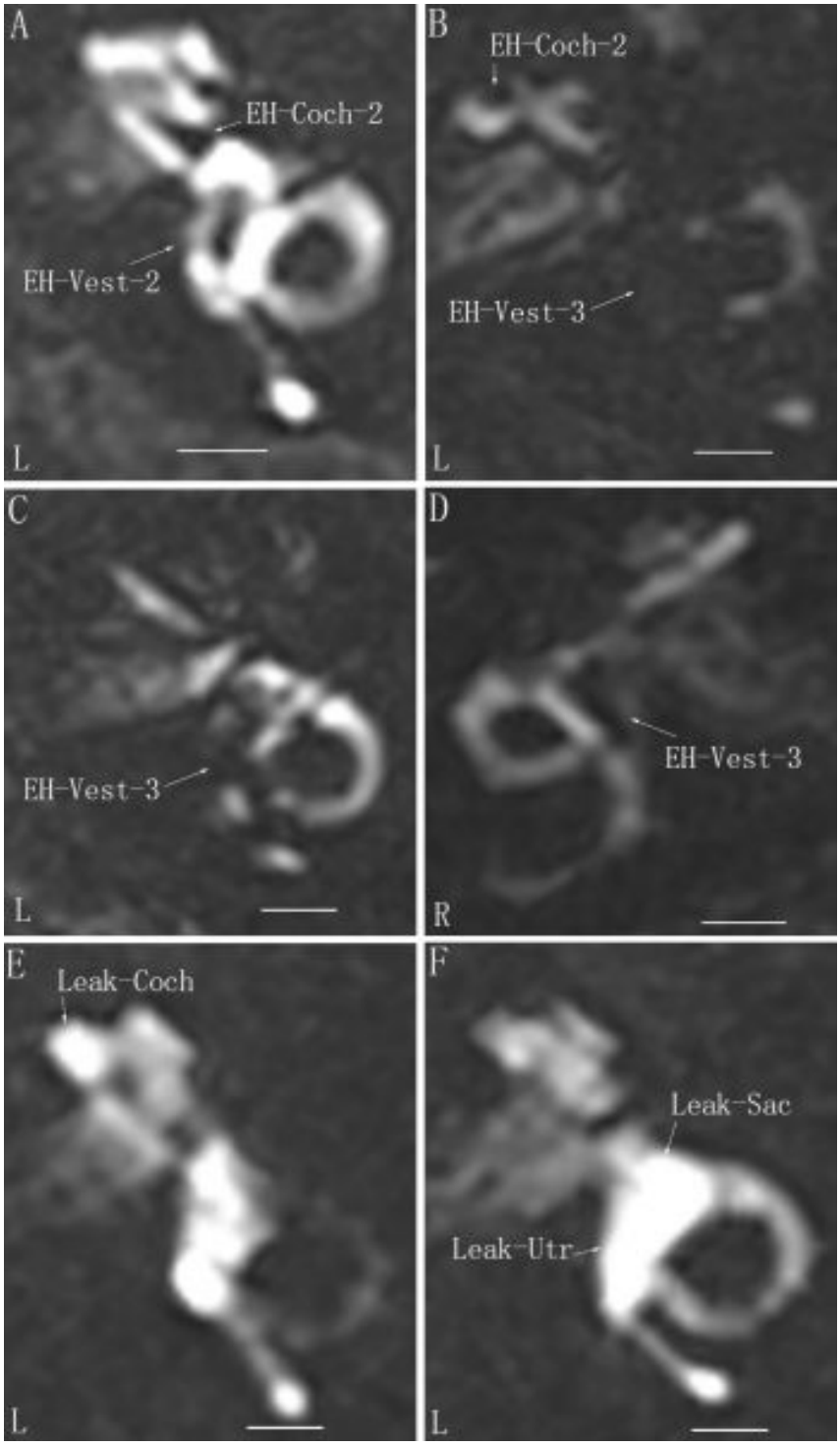
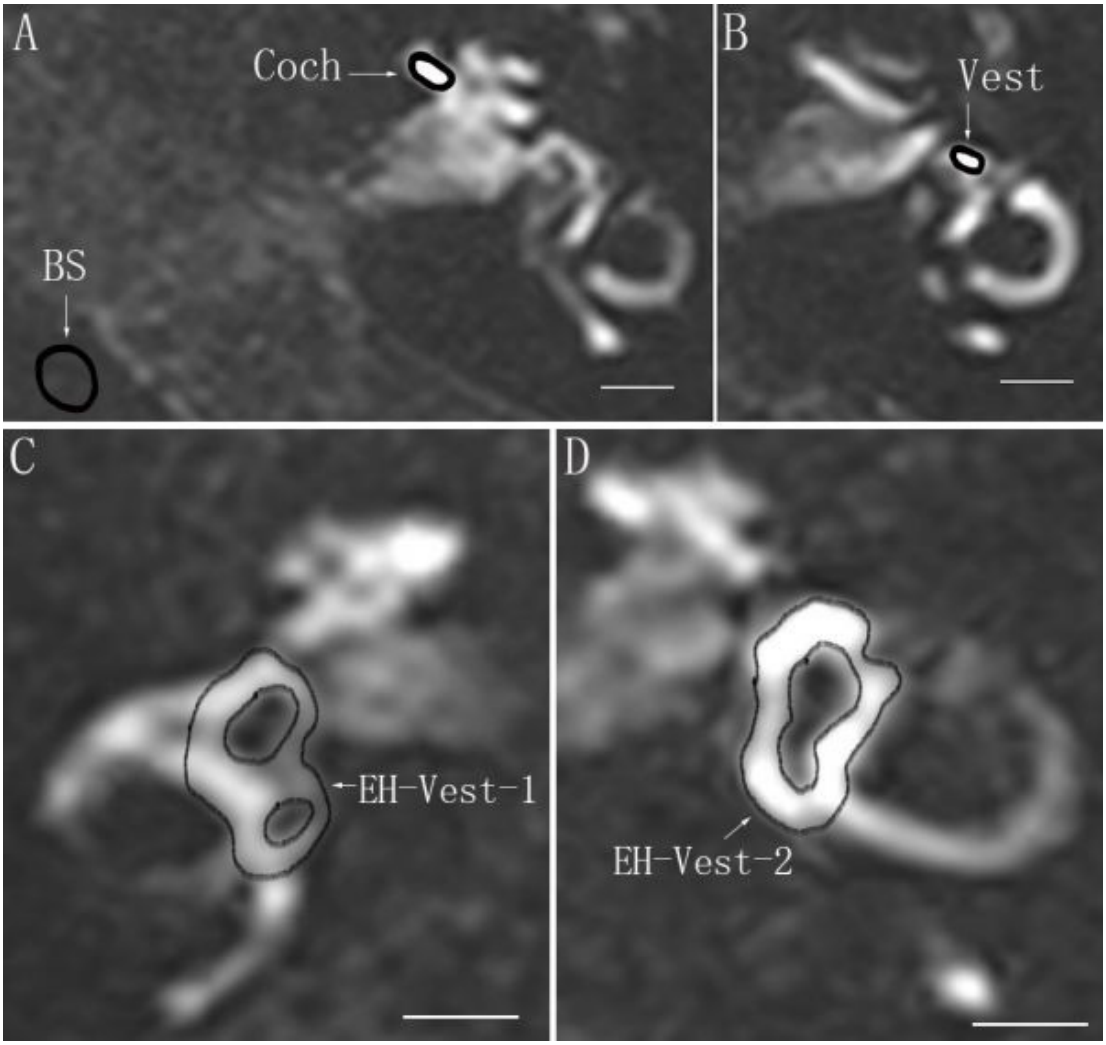


Figure: Measure of signal intensities in the inner ear and enhancement areas in the vestibular perilymph



RP-19

VESTIBULAR RESPONSES TO VIRTUAL REALITY IN INDIVIDUALS WITH AND WITHOUT MOTION SENSITIVITY

Hadas Ben-Rubi Shimron[1,2,3*], Mor Bitterman Peri[1*], Amit Wolfovitz[1], Yoav Gimmon[1-2]

[1]*Department of Otolaryngology- Head and Neck Surgery, Sheba Medical Center, Tel-hashomer, Israel*

[2]*Department of Physical Therapy, Faculty of Social Welfare & Health Sciences, University of Haifa, Haifa, Israel*

[3]*Department of Communication Disorders, Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel*

**Contributed equally*

Background: Integration of three primary sensory systems—vestibular, visual, and proprioceptive—enables human balance control. Motion sickness arises when there is a mismatch between these senses, such as during sailing or reading in a moving vehicle. Cybersickness is a form of motion sickness induced by the use of technology, particularly virtual environments. Symptoms include dizziness, fatigue, pallor, cold sweats, salivation, and nausea/vomiting. There are notable inter-individual differences in susceptibility to motion sickness for reasons not yet fully understood.

Aim: To characterize vestibular function before and after exposure to a virtual reality environment in individuals with varying sensitivities to motion sickness.

Design and Methods : A prospective cohort study was conducted with 20 healthy adult participants, all with sailing experience. Nine participants had a known tendency toward motion sickness, attributed to seasickness, while 11 participants did not. All participants completed background questionnaires assessing their motion sensitivity. Vestibular function was evaluated using video Head Impulse Test Paradigm (HIMP) and Suppression Head Impulse Paradigm (SHIMP) tests before and after exposure to a 7-minute virtual reality roller coaster simulation designed to induce motion sickness. Post-exposure, participants completed questionnaires on the severity of their symptoms and underwent repeated vestibular testing.

Results: The HIMP test showed no significant change in Vestibulo-Ocular Reflex (VOR) gain before and after virtual reality exposure.

However, SHIMP test revealed distinct patterns:

1. Participants without motion sensitivity exhibited a significant decrease in VOR gain (t=2.583, p=0.009) and peak velocity of the anticompensatory saccade (t=1.870, p=0.038) after virtual reality exposure.
2. Participants with motion sensitivity demonstrated a significant decrease in anticompensatory saccades latency (t=-1.937, p=0.034) and an increase in the total number of anticompensatory saccades (t=-1.822, p=0.042).

Discussion: The findings suggest that individuals with and without motion sensitivity adopt different vestibular strategies in response to sensory mismatch. Participants without motion sensitivity exhibited a vestibular suppression strategy, characterized by decreased VOR gain and anticompensatory saccade velocity. Conversely, motion-sensitive participants displayed altered vestibular behavior, including reduced latency and increased saccadic activity. The suppression strategy observed in participants without motion sensitivity may serve as a protective mechanism, while the altered vestibular behavior in motion-sensitive individuals could reflect heightened reactivity to sensory conflict.

Conclusion: This study highlights two distinct vestibular strategies in response to sensory mismatch induced through virtual reality exposure. Understanding these differences could contribute to developing interventions to mitigate cybersickness and enhance human performance in virtual environments.

Keywords: VOR, motion sensitivity, cybersickness, SHIMPS, virtual reality

RP-20

BEYOND ENVIRONMENTAL FACTORS: MIGRAINE AS A KEY CONTRIBUTOR TO BENIGN PAROXYSMAL POSITIONAL VERTIGO RECURRENCE

Pelin Kocdor[1], Emel Işık[1], Oğuzhan Çetin[1], Rüya Somer[1], Suat Avcı[1], Levent Naci Özlüoğlu[1]
[1]Baskent University, Ankara, Türkiye

Aim: Benign paroxysmal positional vertigo (BPPV) is one of the most common causes of vertigo. However, the relationship between BPPV and climatic changes remains unclear, and contributing risk factors for recurrence have yet to be fully determined. This study aimed to investigate the association between atmospheric pressure, temperature fluctuations, and BPPV incidence, as well as to identify possible factors associated with recurrence.

Material and Methods: Medical records of BPPV patients diagnosed between 2018 and 2024 at Başkent University Istanbul Hospital's ENT Clinic were retrospectively analyzed. Data included presentation date, season, demographics, co-existing conditions such as migraine and thyroid disease, and recurrences. Patients lacking definitive videonystagmography findings or diagnosed with other vertigo causes were excluded. Monthly average atmospheric pressure and temperature data for Istanbul (2018–2024) were obtained from the General Directorate of Meteorology.

Results: A total of 374 BPPV patients (mean age 63, range 14–94) were included, with 71.1% (266) females and 28.9% (108) males. January had the highest incidence (15.2%, 57 patients). There was a statistically significant monthly variation in BPPV cases ($p < 0.001$). However, no significant correlation was found between monthly BPPV incidence and atmospheric pressure ($r = 0.384$; $p = 0.217$) or temperature ($r = -0.434$; $p = 0.159$). Of 374 patients, 60 experienced recurrences. No significant differences were observed in age ($p = 0.704$) or canal involvement ($p = 0.681$) between those with and without recurrence. Migraine was present in 20% (15) of recurrent cases, showing a significant association ($p = 0.027$). No significant differences in atmospheric pressure or temperatures were noted at the time of diagnosis and recurrence among patients with or without migraine ($p > 0.05$).

Discussion: Previous studies have reported inconsistent seasonal patterns in BPPV incidence, with some associating higher rates with springtime and others noting peaks from January to June 1. The role of atmospheric pressure and temperature remains controversial, with some studies reporting positive and negative correlations, respectively 2. In our study, while January showed the highest incidence, no correlation with atmospheric pressure or temperature was found over the 6-year period. Female predominance (71.1%) and a mean age of 63 align with prior research. Though bone density data were unavailable, these findings may indicate a potential link between osteoporosis and BPPV. Regarding recurrence risk factors, previous studies have suggested associations with age, vitamin D deficiency, and migraine, but results remain inconclusive 3. Our findings support a significant association between migraine and BPPV recurrence, independent of age and environmental factors.

No relationship was observed between atmospheric pressure changes and recurrence. Recurrent vasospasms of the labyrinthine artery, potentially unrelated to atmospheric pressure changes, may predispose patients to BPPV recurrence 4.

Conclusion: Our findings indicate that while BPPV incidence shows seasonal variation, it is not directly influenced by atmospheric pressure or temperature changes. Instead, migraine appears to be a significant risk factor for recurrence. The observed female predominance may point to hormonal influences. These results underscore the potential role of vascular mechanisms in BPPV pathophysiology and highlight the need for further research into vascular and hormonal contributions to BPPV.

Keywords: Vertigo, migraine

References

1. Chen, J., Zhang, S., Cui, K. & Liu, C. Risk factors for benign paroxysmal positional vertigo recurrence: a systematic review and meta-analysis. J Neurol 268, 4117-4127 (2021). https://doi.org/10.1007/s00415-020-10175-0
2. Korpon, J. R., Sabo, R. T. & Coelho, D. H. Barometric pressure and the incidence of benign paroxysmal positional vertigo. Am J Otolaryngol 40, 641-644 (2019). https://doi.org/10.1016/j.amjoto.2019.05.016
3. Chu, C. H., Liu, C. J., Lin, L. Y., Chen, T. J. & Wang, S. J. Migraine is associated with an increased risk for benign paroxysmal positional vertigo: a nationwide population-based study. J Headache Pain 16, 62 (2015). https://doi.org/10.1186/s10194-015-0547-z
4. Teixido, M., Baker, A. & Isildak, H. Migraine and benign paroxysmal positional vertigo: a single-institution review. J Laryngol Otol 131, 508-513 (2017). https://doi.org/10.1017/S0022215117000536

RP-21

THE BASIC MECHANISM OF VERTIGO ATTACKS IN MENIERE'S DISEASE WITH EXPLANATORY ANIMATION

Stephen Gary Spring[1-2]
[1]*Sydney University*
[2]*Independent, Former Vp of Mrfi At Sydney University*

The immuno-defence of delicate hair and supporting cells is critical as they do not regenerate in humans. The endolymphatic sac (ES) guards the inner ear and is immunologically competent. A mechanism has evolved to transport viruses, bacterial and otoconia remnants, dead cells and other noxious agents to the ES for processing 'off site' to protect hair cells from infection and overt inflammation. An active transport mechanism is longitudinal flow of endolymph. Recent studies suggest the ES, itself a source of endolymph, activates to increase endolymph volume and initiate longitudinal flow.

Examples will be shown of transtympanic electrocochleography during a severe attack, and the audiogram recorded during a severe attack.

These findings show no change in the endocochlear potential and argue against a rupture of Reisner's membrane or ionic leakage.

We suggest that excess endolymph in hydropic ears with restricted endolymphatic ducts and/or dysfunctional ES cannot flow to the ES sufficiently quickly enough upon longitudinal flow activation. The sinus, which normally acts as a reservoir, cannot contain excess endolymph and the valve of Bast opens and cochlear endolymph enters the utricle, stretching the cristae of the semicircular canals causing vertigo.

Following initial vertigo attacks in an ear setup with hydrops, small increases of endolymph due to factors such as diet, lifestyle, infection and genetic susceptibility will present as a cluster of vertigo attacks until endolymph volume decreases sufficiently for remissions to occur. Vertigo by this mechanism provides an explanation for the multifactorial nature of hydropic inner ear disease, including immune activation.

Keywords: Vertigo attacks, Meniere's, endolymphatic hydrops

RP-22

POSTURAL DYSFUNCTION IN AUDITORY NEUROPATHY SPECTRUM DISORDER: A COMPUTERIZED DYNAMIC POSTUROGRAPHY STUDY

Pradeep Yuvaraj[1], Rahına Abubacker[1], Chethan K[1], Aravınd Kumar Rajasekaran[1], Muralıdharan Kesavan[2]
[1]Dept of Speech Pathology and Audiology, National Institute of Mental Health and Neurosciences, Bengaluru, India
[2]Dept of Pyschiatry, National Institute of Mental Health and Neurosciences, Bengaluru, India

Background: Auditory Neuropathy Spectrum Disorder (ANSD) is characterized by a disruption in the normal functioning of the auditory nerve, which leads to a mismatch between the normal cochlear function and the neural transmission of sound. The hallmark of ANSD is the presence of absent or abnormal auditory brainstem responses despite the presence of measurable cochlear responses (OAE). While the primary focus of ANSD research has been on hearing deficits, vestibular involvement is not uncommon. Emerging evidence suggests that individuals with ANSD may experience disruptions subclinical in balance and vestibular functions. In ANSD, the vestibular system in general is more resilient to damage, due to the co-existing nature of the vestibular & the cochlear nerve, balance disturbances can manifest. These symptoms may be subtle, often leading to underdiagnosis in clinical practice.studies has revealed balance issues in ANSD patients using vestibular tests such as VEMP &vHIT, which have yielded significant insights into vestibular function. However, the comprehensive assessment of balance in ANSD, especially in terms of postural control, has been less thoroughly explored. Computerized Dynamic Posturography (CDP) is a sophisticated and objective instrument that facilitates the assessment of postural stability across many sensory situations. There is a scarcity of studies that integrate CDP with ANSD to evaluate the comprehensive range of posture and balance impairments.

Aim: To assess postural control in individuals with ANSD using CDP

Method: 22 subjects aged 20-45 years (Female=10), diagnosed to have ANSD were compared with matched healthy Subjects (HS) (Female=12). All participants underwent CDP which included the Sensory Organization Test (SOT), Adaptation Test, Motor Control Test, Fall Risk Test, and Optokinetic Test. Equilibrium scores, sensory analysis, degree of sway, latency, amplitude, weight symmetry, fall risk, and sway velocity index were the parameters assessed.

Results: Data analysis on SPSS software, with a p-value less than 0.05 considered statistically significant. To compare the results between the two groups, an independent sample t-test was employed. Individuals with ANSD showed a significant difference ($p<0.05$) compared to HS on Equilibrium score of SOT, Fall risk, and Optokinetic test of CDP. Discussion: The results of this study highlight significant differences in postural control between individuals with ANSD and HS, as measured by CDP. Previous findings from VEMP, Caloric, vHIT are suggestive of involvement of both the inferior and superior vestibular nerve in individuals with ANSD, contributing to balance issues including dizziness and instability. However, there is a dearth of literature determining the risk of fall and posture control in ANSD. The use of CDP revealed that ANSD exhibited greater postural sway, highlighting imbalances in sensory integration mechanisms when visual information was compromised or not. The overall equilibrium score, i.e. the ability to maintain balance under various conditions, was significantly affected in the ANSD group, indicating greater instability even in the absence of overt vestibular complaints. Fall Risk test indicates the multisensory integration (proprioception, visual, vestibular) could be impaired in ANSD. Optokinetic test results suggest that while the vestibular system may function normally in individuals with abnormal sensory processing, the Central Nervous System may fail to properly integrate visual and vestibular information, leading to postural instability, as seen in our subjects with ANSD compared to HS.

Conclusion: The study underscores the significance of vestibular involvement in ANSD and highlights CDP as a comprehensive tool for evaluating postural control and sensory integration. By identifying balance deficits, clinicians can develop targeted rehabilitation strategies to improve quality of life for ANSD patients.

Keywords: ANSD, computerized dynamic posturography

References

Barco, P. P., Byl, F. M., & Nelson, J. (2015). Vestibular function and balance in patients with auditory neuropathy spectrum disorder. Audiology & Neurotology, 20(1), 39-45.

Berlin, C. I., Hood, L. J., & Morlet, T. (2003). Auditory neuropathy/dys-synchrony: Diagnosis and management. Seminars in Hearing, 24(2), 129-141.

Sinha, S. K., Neupane, A. K., & Gururaj, K. (2020). Importance of vestibulo-ocular reflex gain and refixation saccade analysis in individuals with auditory neuropathy spectrum disorder. Journal of Vestibular Research, 30(4), 249-256.

Starr, A., Sininger, Y. S., & Pratt, H. (2000). The varieties of auditory neuropathy. Journal of Basic and Clinical Physiology & Pharmacology, 11(3), 215-230.

Sazgar, A. A., Yazdani, N., Rezazadeh, N., & Yazdi, A. K. (2010). Vestibular evoked myogenic potential (VEMP) in patients with auditory neuropathy: Auditory neuropathy or audiovestibular neuropathy? Acta Otolaryngologica, 130(10), 1130-1134

Sujeet, K. S., Niraj, K. S., Animesh, B., Rajeshwari, G., & Sharanya, R. (2014). Cervical vestibular evoked myogenic potentials and caloric test results in individuals with auditory neuropathy spectrum disorders. Journal of Vestibular Research, 24(4), 313-323

Hu, J., Chen, Z., Zhang, Y., Xu, Y., Ma, W., Zhang, Y., Wang, J., Chen, Y., Xu, M., Yang, H., & Zhang, Q. (2020). Vestibular dysfunction in patients with auditory neuropathy detected by vestibular evoked myogenic potentials. Clinical Neurophysiology, 131(7), 1591-1597.

RP-23

BILATERAL NEURAL CONNECTIVITY BETWEEN VESTIBULAR END ORGANS IN PATIENTS WITH UNILATERAL VESTIBULAR SCHWANNOMA

Andy Beynon[1], Mehmet Ercan[1], Anne Voncken[1]
[1]*Radboud University Medical Center Nijmegen*

Aim and Background: Based on previous data in a small group of 34 patients with untreated unilateral vestibular schwannoma, we had noticed an ostensibly reduction of the vestibulo-ocular reflex (VOR) on the ipsilateral side, i.e. the site of the lesion, but also on the contralateral (non-tumor) side in 8 patients. Since this was only based on a relative small group of patients, we now have expanded this population to investigate this phenomenon to exclude any bias due to measurement procedures. The aim of this study is to investigate influence of unilateral vestibular schwannoma on the ipsi- and contralateral vestibular function.

Methods: For this study, VOR gains were obtained using video head impulse testing (vHIT) in a group of 500+ patients with untreated unilateral vestibular schwannomas and in a control group of healthy subjects. Mean VOR gains were calculated for all three semicircular canals (anterior, lateral, posterior) and compared between the ipsi- and the contralateral side for all canals.

Results: Results show a total loss of VOR in all canals in 13% of the VS patients on the ipsilateral side. In the other patients, VOR reduction was only found in the anterior (2%), lateral (5%), posterior (17%), anterior & lateral (2%), anterior & posterior (3%), lateral & posterior (6%) semicircular canals.

In a significant number of the patients, we found a reduction of VOR in at least one semicircular canal on both sides (22%).

In contrast to the lateral and anterior canals, the gain reduction of bilateral posterior semicircular canals were significantly correlated ($r = 0.695$, $p<0.01$), suggesting a contralateral routing of neural inhibition at the cost of the VOR of the contralateral side. To exclude any bias due to procedural flaws, we also performed vHIT tests in a group of 70 healthy subjects, showing no differences between both sides and semicircular canals.

Conclusion: Our results suggest contralateral between the tumor and non-tumor side, indicating that the presence of a vestibular schwannoma on the ipsilateral side can significantly affect the VOR gain of the contralateral non-tumor side with the highest incidence for the posterior canals.

Keywords: Vestibular schwannoma, VOR, video head impulse test, unilateral vestibular loss

RP-24

INVESTIGATION OF BEHAVIORAL VESTIBULAR FUNCTION AFTER INTRATYMPANIC INJECTION OF POTASSIUM CHLORIDE IN EPILEPTIC RATS

Yavuz Gündoğdu[1], Mahmut Furkan Beyaz[1], Fatma Nur Kömür[2], Orhan Asya[1], Ali Cemal Yumuşakhuylu[1]

[1]Marmara University, Department of Otolaryngology, School of Medicine, Istanbul, Türkiye

[2]Marmara University, Department of Audiology and Speech Disorders, Institute of Health Sciences, Istanbul, Türkiye; Kresge Hearing Research Institute and Department of Otolaryngology-head and Neck Surgery, University of Michigan, Ann Arbor, Michigan

Background and Objective: Very few publications attempt to produce Meniere's disease model in rats with different potassium chloride (KCl) concentrations. The present study aimed to examine the behavioral vestibular function after intratympanic injection of KCl in Genetic Absence Epilepsy in Rats from Strasbourg (GAERS) for the first time.

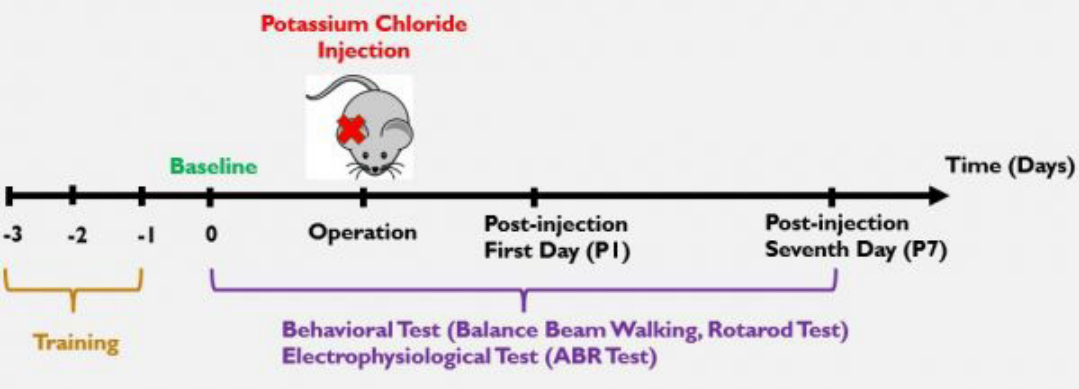
Methods: Low-dose KCl (1M), high-dose KCl (3M), and control sham (distilled water) GAERS were included for intratympanic injection in the right ear. Behavioral postural balance tests (beam and rotarod) scores were measured as the baseline, post-op first, and seventh days for compensation.

Results: The beam crossing time was significantly prolonged in the low-dose and high-dose groups than controls in the post-op first day ($p<0.05$). In addition, there were no significant differences between the baseline and post-op on the seventh day for the low-dose and control groups ($p>0.05$), while the high-dose group still had not reached baseline values in 7 days ($p<0.05$). However, there were no significant differences between groups in the rotarod test following days after KCl injection ($p>0.05$). ABR test showed that slight-mild sensorineural hearing loss was observed in the low-dose KCl, and moderate-severe sensorineural hearing loss was observed in the high-dose KCl in 2,4 and 8 kHz.

Conclusion: These results revealed that the high-dose KCl injection showed a more permanent effect on vestibular behavioral functions than the low-dose and controls. Both of these concentrations can be used for the Meniere model of vestibular diseases with permanent and transient effects. Future studies should focus on histological evidence and pathophysiology.

Keywords: Meniere disease, vestibular function tests, animal disase model, intratympanic injections, potassium chloride, sensorineural hearing loss

Figure: Study design



RP-25

TWO CENTURIES OF VERTIGO RESEARCH: TRENDS, GAPS, AND GLOBAL CONTRIBUTIONS

Melanie Grace Yap Cruz[1], **Deborah Manandi**[2], **Ma. Natividad Almazan**[3]

[1]*Far Eastern University - Dr. Nicanor Reyes Medical Foundation, Department of Orl-hns and Human Structural Biology, Quezon City, Philippines*

[2]*Susan Wakil School of Nursing and Midwifery, Faculty of Medicine and Health, The University of Sydney, Sydney New South Wales, Australia*

[3]*St. Lukes Medical Center College of Medicine, Department of Clinical Research, Quezon City, Philippines*

Vertigo is common but remains challenging to diagnose and manage due to its multifactorial nature and varying presentation. Understanding the vertigo-related research landscape is crucial for identifying trends, knowledge gaps, and improving clinical practices. Bibliometric studies, which analyze research outputs quantitatively, provide insights into vertigo studies, advancements, areas of collaboration, and evolving priorities.

Aim: To conduct a bibliometric review of scientific publications on vertigo and identify trends, characteristics, authorship and geographic details.

Methods: A search was conducted in PubMed using the term "vertig*" in titles or abstracts (January 17, 2025). Analyses were performed using Biblioshiny in RStudio version 2024.04.2

Results: A total of 18,920 publications were identified. Publications appeared sporadically following the first documented paper in 1804 but gained consistency in the 1980s, with a notable rise between 2020 and 2022. Among journals with more than 100 articles on vertigo (n=28), majority were ORL-HNS journals followed by only 3 journals in neurology and other specialties including general medicine (Cureus).

Of nearly 45,000 authors, 77% published only once, while only 1.5% of them contributed more than 10 papers. Despite ORL-HNS journals' dominance, over half of the most published authors were neurologists, followed by otolaryngologists and other specialties.

Among countries with over 100 publications (n=21), 71% of corresponding authors were from high-income countries, followed by middle-income countries, with no low-income countries represented. Geographically, 44% of publications originated in Asia, 35% in Europe, and 17% in North America. The USA and China had the most corresponding authors.

There were 1,048 clinical trials (622 RCTs), 410 systematic reviews, and 207 meta-analyses. There were 23 practice guidelines mostly focusing on BPPV (n=8) and Meniere's disease (n=5). 12 guidelines came from the USA, 6 from Europe, 4 publications were developed by society led-global collaborations, and only 1 guideline came from Asia.

The most common disease-specific keyword was "benign paroxysmal positional vertigo," with frequent mentions of physical therapy and drug therapy. "Pathologic nystagmus" appeared consistently in recent years, while terms related to "COVID-19/ pandemic" trended in newer publications.

Discussion: The rise in publications since the 2000s coincides with advancements in diagnostic tools and increased global focus on vertigo. Peaks between 2020 and 2022 correspond to COVID-19-related research, reflecting broader trends

The Lotka's Law analysis highlighted the disparity in contributions from authors. This emphasizes the need to understand the motivations and barriers faced by less prolific authors compared to frequent contributors.

Despite significant contributions from Asian countries in publication volume, clinical guidelines predominantly originated in USA. This discrepancy may stem from differences in funding opportunities, infrastructure, and editorial processes. Addressing these disparities could enhance the global representation of clinical guidelines.

While ORL-HNS journals dominate, majority of the authors are neurologists, raising questions about the distribution of expertise. Further exploration of collaborative dynamics between neurologists, otolaryngologists, and other specialists could yield valuable insights.

Conclusion: This bibliometric analysis investigated trends, collaboration, and contributions to vertigo research. The steady increase in publications since the 1980s and notable peaks in recent years show growing interest in the field. High-income countries lead in research and guideline development, reflecting systemic disparities. Supporting underrepresented researchers and regions could enhance inclusivity. Future efforts should prioritize equitable contributions and global collaboration to improve vertigo care and research worldwide.

Keywords: Vertigo, Benign Paroxysmal Positional Vertigo (BPPV), Ménière's disease, dizziness, bibliometrics

References

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. Journal of Informetrics, 11(4), 959-975.

Figure: Annual Trends

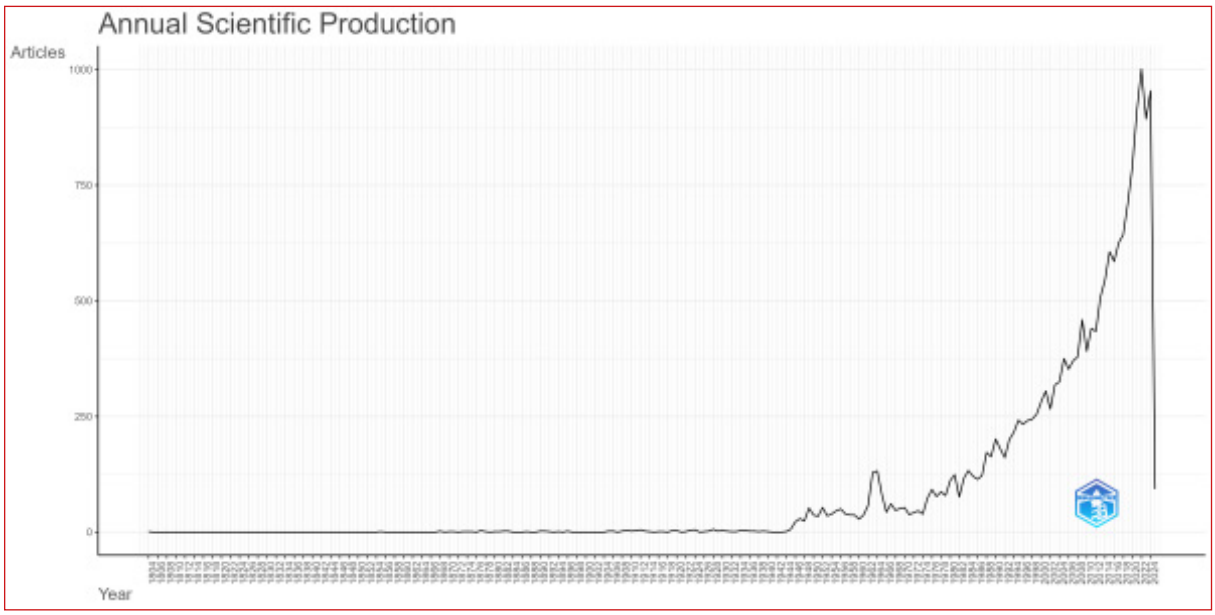


Figure: Scientific Contributions from Different Countries

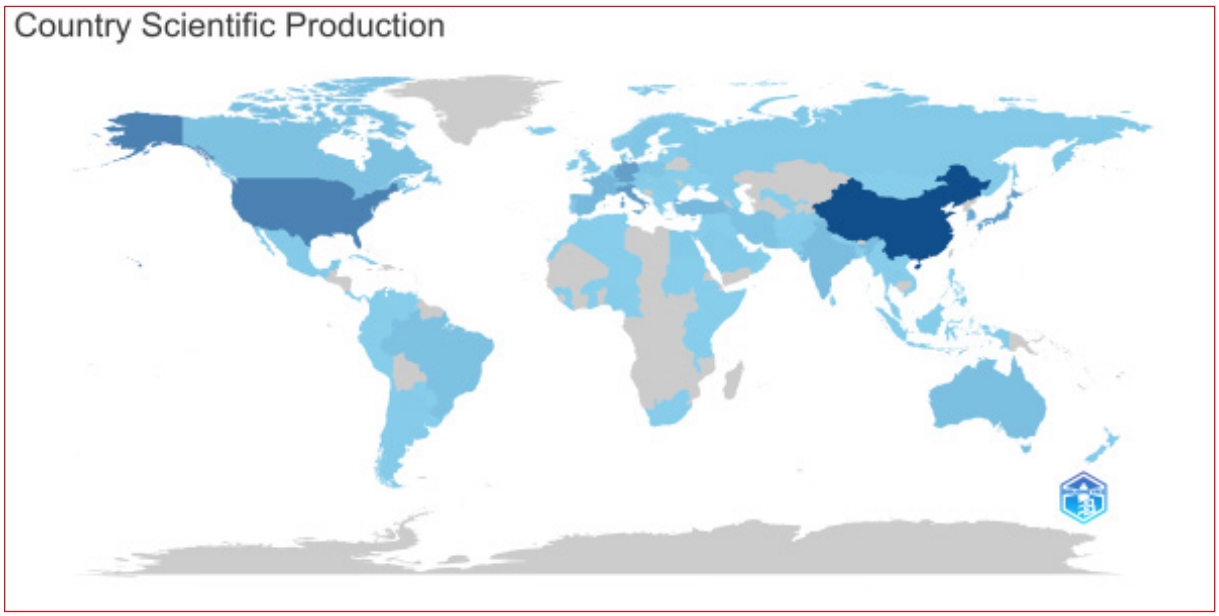


Table. SOURCES

OTOLOGY & NEUROTOLOGY: OFFICIAL PUBLICATION OF THE AMERICAN OTOLOGICAL SOCIETY, AMERICAN NEUROTOLOGY SOCIETY [AND] EUROPEAN ACADEMY OF OTOLOGY AND NEUROTOLOGY	564
ACTA OTO-LARYNGOLOGICA	482
THE LARYNGOSCOPE	435
FRONTIERS IN NEUROLOGY	401
EUROPEAN ARCHIVES OF OTO-RHINO-LARYNGOLOGY: OFFICIAL JOURNAL OF THE EUROPEAN FEDERATION OF OTO-RHINO-LARYNGOLOGICAL SOCIETIES (EUFOS) : AFFILIATED WITH THE GERMAN SOCIETY FOR OTO-RHINO-LARYNGOLOGY - HEAD AND NECK SURGERY	352
THE JOURNAL OF LARYNGOLOGY AND OTOLOGY	325
LIN CHUANG ER BI YAN HOU TOU JING WAI KE ZA ZHI = JOURNAL OF CLINICAL OTORHINOLARYNGOLOGY HEAD AND NECK SURGERY	309
OTOLARYNGOLOGY--HEAD AND NECK SURGERY: OFFICIAL JOURNAL OF AMERICAN ACADEMY OF OTOLARYNGOLOGY-HEAD AND NECK SURGERY	307
JOURNAL OF NEUROLOGY	226
ACTA OTO-LARYNGOLOGICA. SUPPLEMENTUM	225
AURIS, NASUS, LARYNX	210
HNO	204
THE ANNALS OF OTOLOGY, RHINOLOGY, AND LARYNGOLOGY	187
AMERICAN JOURNAL OF OTOLARYNGOLOGY	186
CUREUS	177
JOURNAL OF VESTIBULAR RESEARCH: EQUILIBRIUM & ORIENTATION	175
EAR, NOSE, & THROAT JOURNAL	166
THE AMERICAN JOURNAL OF OTOLOGY	162
NEUROLOGY	160
ACTA OTORHINOLARYNGOLOGICA ITALICA: ORGANO UFFICIALE DELLA SOCIETA ITALIANA DI OTORINOLARINGOLOGIA E CHIRURGIA CERVICO-FACCIALE	159
NIHON JIBIINKOKA GAKKAI KAIHO	153
INDIAN JOURNAL OF OTOLARYNGOLOGY AND HEAD AND NECK SURGERY : OFFICIAL PUBLICATION OF THE ASSOCIATION OF OTOLARYNGOLOGISTS OF INDIA	142
ACTA OTORRINOLARINGOLOGICA ESPANOLA	138
ZHONGHUA ER BI YAN HOU TOU JING WAI KE ZA ZHI = CHINESE JOURNAL OF OTORHINOLARYNGOLOGY HEAD AND NECK SURGERY	119
LARYNGO- RHINO- OTOLOGIE	111
THE INTERNATIONAL TINNITUS JOURNAL	107
OTOLARYNGOLOGIA POLSKA = THE POLISH OTOLARYNGOLOGY	104
REVUE DE LARYNGOLOGIE - OTOLOGIE - RHINOLOGIE	102

RP-26

TURKISH VALIDITY AND RELIABILITY STUDY OF THE VESTIBULAR ACTIVITIES AVOIDANCE INSTRUMENT-9

Merve Gundas[1], Gulce Kirazli[2], Feyza Inceoglu[3], Nese Celebisoy[4], Tayfun Kirazli[5]

[1]*Ege University, Institute of Health Sciences, Audiology and Speech Disorders Graduate Program, Izmir, Türkiye*

[2]*Ege University, Faculty of Health Sciences, Department of Audiology, Izmir, Türkiye*

[3]*Malatya Turgut Ozal University, Faculty of Medicine, Department of Biostatistics, Malatya, Türkiye*

[4]*Ege University, Faculty of Medicine, Department of Neurology, Izmir, Türkiye*

[5]*Ege University, Faculty of Medicine, Department of Ent, Izmir, Türkiye*

Aim: Balance problems such as dizziness, imbalance and vertigo are symptoms that significantly affect the quality of life. These symptoms can significantly limit the participation of patients in daily life (1). These restrictions can affect both the quality of life and the treatment process. Patients tend to limit their movements and avoid activities and certain situations due to experienced or anticipated attacks of dizziness and/or imbalance (2). The Vestibular Activities Avoidance Instrument-9 (VAAI-9) was designed to measure the avoidance behaviors of patients (3). The aim of our study is to conduct the validity and reliability study of the Turkish version of the VAAI-9 and to determine its correlation with the Dizziness Handicap Inventory (DHI).

Material Method: One hundred and twenty-two individuals between the ages of 18-80 (76 women and 46 men), who presented to Department of Otorhinolaryngology with balance problems were included in the study. The language validity and content validity phases of the VAAI-9 were initially completed. Content validity analysis was conducted by evaluating ten experts' opinions using Kendall's W analysis. No statistically significant difference was found among the reported expert opinions (Kendall W=0.065, p=0.721 > 0.05). Participants were then asked to fill out the VAAI-9 and the DHI. Twenty patients, randomly selected from the participants, completed the questionnaire again 7 days later. The final version of the VAAI-9 was established through the processes of language and content validity, construct validity, reliability, and test-retest analyses.

Results: In the validity analysis of the VAAI-9, the sample structure and size used for Exploratory Factor Analysis (EFA) were found to be acceptable (p=0.001<0.05). In the Confirmatory Factor Analysis (CFA), the χ^2 value derived from the path diagram was 40.203. The χ^2/df ratio, used to evaluate model fit, was 1.546, indicating an excellent fit. In the reliability analysis, the Cronbach's alpha (α) coefficient, which indicates internal consistency, was 0.911. The test-retest measurements of the scale showed a statistically significant, very high, and positive correlation (p<0.05). The mean score for the VAAI-9 was determined to be 33.71±13.46. The DHI subscales' scores were as follows: Emotional, 12.69 ± 8.35; Functional, 21.11 ± 10.27; and Physical, 16.46 ± 7.25. The total mean score for the DHI was 50.26 ± 22.36. A moderate positive correlation was found between the DHI Emotional and Physical subscales and the VAAI-9 score, while a high positive correlation was observed between the DHI Functional subscale and total scores and the VAAI-9 score (p<0.05).

Discussion: The validity and reliability studies of the VAAI-9 in the literature report a Cronbach's α coefficient between 0.85 and 0.92, with very high test-retest reliability (3, 4). Our findings, consistent with the literature, confirm the VAAI-9 as a valid and reliable scale across languages, including Turkish. The high correlation between VAAI-9 and the DHI Functional subscale in our study supports its effectiveness in detecting activity-related avoidance behaviors. While no prior studies have examined the correlation between VAAI-9 and DHI, moderate negative correlations have been reported between the Activity-Specific Balance Confidence (ABC), Vestibular Activities and Participation Measure (VAP), and DHI scores (5, 6). Dunlap et al. established convergent validity for VAAI-9 with VAP and SF-12, showing that greater fear-avoidance correlates with higher activity limitations, poorer health, and increased anxiety and depression, as indicated by correlations with HADS subscales (3).

Conclusion: In our study, the VAAI-9 scale was found to be a valid and reliable scale in Turkish. This study highlights the potential of the scale to improve treatment outcomes by measuring dizziness-induced avoidance behaviors in daily activities.

Keywords: Dizziness, fear-avoidance, scale validation, psychometrics, reliability and validity

References

1. Heinrichs, N., Edler, C., Eskens, S., Mielczarek, M. M. ve Moschner, C. (2007). Predicting continued dizziness after an acute peripheral vestibular disorder. Psychosomatic Medicine, 69(7), 700–707. doi:10.1097/PSY.0b013e318151a4dd
2. Mira, E. (2008). Improving the quality of life in patients with vestibular disorders: The role of medical treatments and physical rehabilitation. International Journal of Clinical Practice, 62(1), 109–114. doi:10.1111/j.1742-1241.2006.01091.x

3. Dunlap, P. M., Marchetti, G. F., Sparto, P. J., Staab, J. P., Furman, J. M., Delitto, A. ve Whitney, S. L. (2021). Exploratory Factor Analysis of the Vestibular Activities Avoidance Instrument. JAMA Otolaryngology - Head and Neck Surgery, 147(2), 144–150. doi:10.1001/jamaoto.2020.4203
4. Vereeck, L., Dunlap, P. M., Vanspauwen, R., Hendriks, E., ve Whitney, S. L. (2022). The reliability of the Dutch version of the vestibular activities avoidance instrument in persons with and without dizziness. Journal of vestibular research : equilibrium & orientation, 32(5), 423–431. https://doi.org/10.3233/VES-210108
5. Whitney, S. L., Hudak, M. T., ve Marchetti, G. F., (1999). The activities- specific balance confidence scale and the dizziness handicap- inventory: A comparison, J Vestib Res, 9; 253–259.
6. Cohen, H. S., Kimball, K. T. ve Adams, A. S. (2000). Application of the vestibular disorders activities of daily living scale. Laryngoscope, 110(7), 1204–1209. doi:10.1097/00005537-200007000-00026

RP-27

MAPPING THE SCIENTIFIC TRENDS AND COLLABORATION NETWORKS IN VESTIBULAR MIGRAINE: A BIBLIOMETRIC ANALYSIS

Emel Tahir[1], Nurullah Türe[2]
[1]Ondokuz Mayıs University Department of Otolaryngology
[2]Kütahya Health Sciences University Department of Otolaryngology

Objective: Vestibular migraine is a complex clinical condition characterized by the coexistence of headache and vestibular symptoms. In recent years, there has been growing awareness and research on this disease, focusing on its pathophysiology, diagnostic criteria, and treatment options. However, bibliometric analyses are needed to uncover trends, research areas, and international contributions in vestibular migraine literature. This study aims to comprehensively review the scientific literature on vestibular migraine, identify collaboration networks, and highlight the most influential studies.

Methods: Bibliometric data were obtained from the Web of Science database and analyzed using VOSviewer software. Co-authorship, keyword co-occurrence, and density visualization maps were generated to explore collaboration networks, key topics, and research trends.

WOSviewer software was employed to construct bibliometric maps, including co-authorship networks, keyword co-occurrence maps, and density visualization. The analysis focused on identifying influential authors, collaboration networks, and research clusters.

- Co-authorship networks were analyzed to identify collaborative relationships among researchers.
- Keyword co-occurrence analysis was conducted to determine thematic research trends.
- Density visualization maps highlighted the most active research areas and key contributors.

Inclusion Criteria: Peer-reviewed articles, reviews, and conference proceedings directly related to vestibular migraine.

Exclusion Criteria: Articles not available in full text, non-English publications, and irrelevant studies.

Results: Key findings revealed that researchers such as Michael Strupp, Thomas Brandt, and Marianne Dieterich are central figures with extensive collaboration networks, contributing significantly to the field. Turkish researchers, including Tayfun Kirazlı, Gülden Akdal, and Pınar Özçelik, form a regional cluster, representing independent contributions to the literature.

Red Cluster: Focuses on clinical features and diagnostic methods of vestibular migraine.

Green Cluster: Highlights physiological mechanisms and experimental studies, with contributions from researchers like Roberto Teggi and Mario Bussi.

Purple Cluster: Represents regional studies led by Turkish researchers.

Blue Cluster: Covers less central but specific topics, such as neurological correlations.

Density visualization emphasized the prominence of Strupp and Brandt, reflecting their high impact and citation frequency in the field.

Conclusion: This bibliometric analysis provides an in-depth overview of the distribution and collaboration patterns in vestibular migraine research. While Strupp, Brandt, and Dieterich play pivotal roles internationally, Turkish researchers contribute significantly at a regional level. Future studies should focus on bridging gaps between clinical applications and physiological mechanisms to advance understanding and treatment of vestibular migraine. The identification of distinct research clusters highlights the multidisciplinary nature of the field, ranging from clinical applications to experimental studies. Future research should focus on integrating physiological mechanisms with individualized treatment approaches to fill existing gaps and improve patient outcomes. Additionally, fostering international collaboration could further enhance the development of innovative diagnostic and therapeutic strategies in vestibular migraine management.

Keywords: Vestibular migraine, bibliometric analysis, collaboration networks, keyword co-occurrence, clinical features

Figure: cluster map

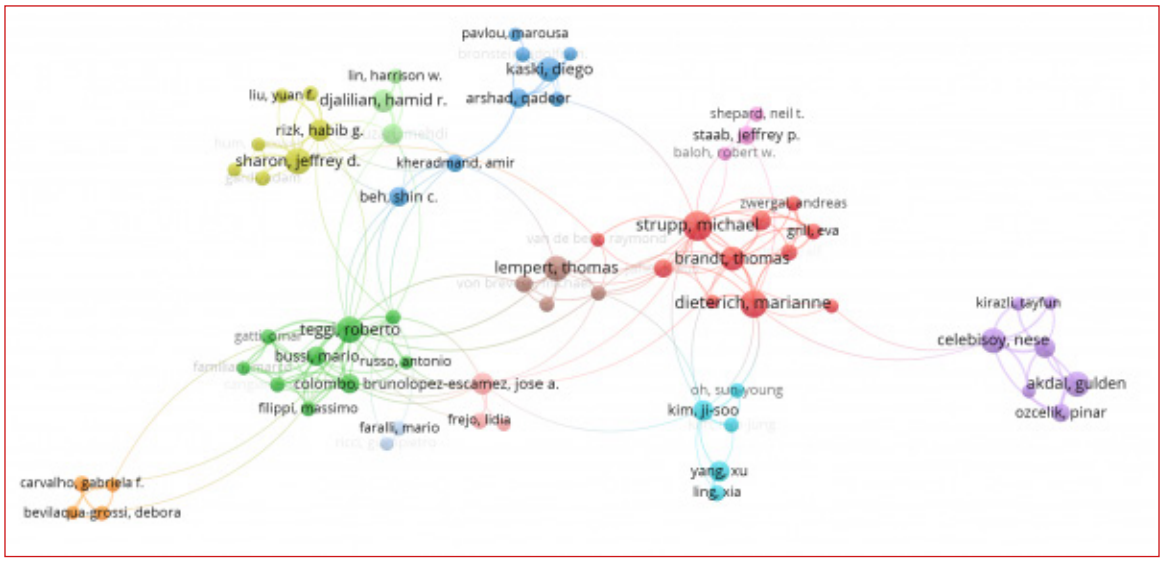
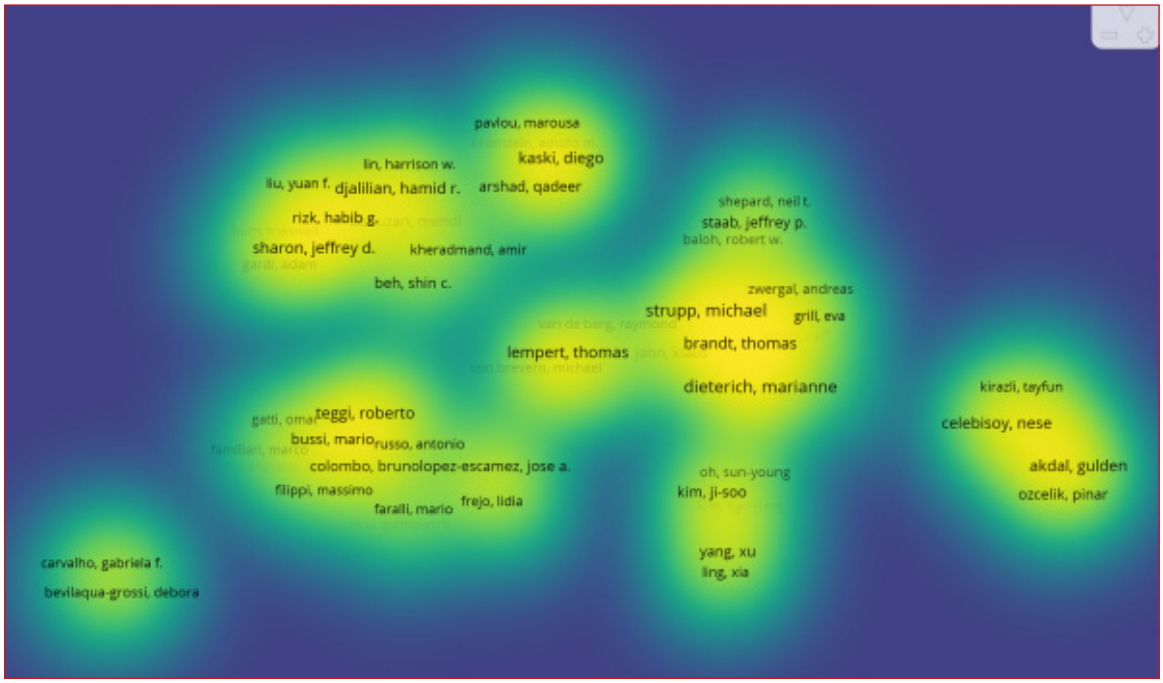


Figure: heat map



RP-28

ENDRE HŐGYES (1847-1906), FORGOTTEN FATHER OF THE VESTIBULO-OCULAR REFLEX

László T. Tamás[1], Albert Mudry[2]
[1]Department of Otolaryngology, Head and Neck Surgery, Petz Aladár University Teaching Hospital, Győr, Hungary
[2]School of Medicine, Department of Otolaryngology, Head and Neck Surgery, Stanford University, California, USA

Objective: Throughout the history of vestibular research, the discovery of the vestibulo-ocular reflex in 1881 by Endre Hőgyes (1847-1906) is rarely mentioned. The aim of this study is to review Hőgyes' vestibular research articles, all originally written in Hungarian and emphasize their epoch-making content.

Main data sources: Hőgyes' vestibular publications, originally written in Hungarian, which describe various eye movements of the rabbit in response to vestibular stimulation by rotation about three axes.

Results: Hőgyes was the first to use a three-axis turntable on an experimental animal, in this case a rabbit. He found that depending on the plane of rotation, different types of binocular eye movements were produced. He then demonstrated by destructive and excitatory experiments, the anatomical pathways and the physiological function producing this phenomenon. Ultimately, he explained the exact connections between the inner ear labyrinth and certain muscle contractions during eye movements. He identified this pathway as the "associating center of the ocular movements," later defined as the vestibulo-ocular reflex. Hőgyes' discovery was only superficially noted during his lifetime and ignored after his death.

Conclusion: Hőgyes was the first to demonstrate the vestibulo-ocular reflex. He was forgotten during the ensuing 140 years probably because his articles were appeared only in Hungarian and because a short time later, Róbert Bárány's award of the Nobel Prize overshadowed many of Bárány's predecessors and contemporaries, including Hőgyes and relegated them to the background.

Keywords: Vestibulo-ocular reflex, history, hőgyes, otology, ear

References

Tamás LT, Mudry A. Endre Hőgyes (1847-1906), Forgotten Father of the Vestibulo-Ocular Reflex. Otol Neurotol. 2019 Oct;40(9):e938-e943.

RP-29

VESTIBULAR SYSTEM IN PATIENTS AFTER MILD TRAUMATIC BRAIN INJURY

Magdalena Jozefowicz-Korczynska[1], Wojciech Skora[1], Bogna Zielinska-Kazmierska[1], Anna Puzio-Suwart[1]

[1]*Balance Disorders Unit, Department of Otolaryngology, Medical University of Lodz, The Norbert Barlicki. Memorial Teaching Hospital, 90-153 Lodz, Poland*

Background: In the literature vertigo, dizziness and disequilibrium as well as the type of vestibular dysfunction in patients after mild traumatic brain injury (MTBI) are reported at different frequencies.

The aim of the study was to assess the type of vestibular system dysfunction in MTBI patients after injury at the baseline and in 6 months follow-up.

Materials and Methods: From a group of 188 patients with vertigo/dizziness and balance instability after MTBI, prospective analysis of 50 patients with abnormal videonystagmography (VNG) tests results were enrolled into the study. Anamnesis, otoneurological examination, self-assessed Dizziness Handicap Inventory (DHI) and VNG test were carried out in each patient twice: at baseline and after 6 months.

Results: The most common reason of MTBI was traffic accidents in 16 participants (32%). Lost of consciousness was mentioned in 23 cases (46%). A significant improvement in the DHI total score (9,8 points, $p<0,001$) as well as in the subscales after 6 months were found. At the baseline VNG showed in 19 cases (38%) peripheral, in 20 patients (40%) central and 11 cases (44%) both (peripheral and central) vestibular system dysfunction. In 6 month follow-up 19 participants (38%) had normal VNG outcome. An improvement was significantly more frequently related to peripheral disorders, compared the central.

Conclusions: Subjective post-traumatic symptoms and vestibular system dysfunction in patients after MTBI decrease after 6 months follow-up. However more than half of patients still have abnormal VNG outcome, which indicating central vestibular system dysfunction.

Keywords: Vestibular system; mild traumatic brain injury

RP-30

CENTRAL CAUSES OF VERTIGO: A CASE SERIES OF VNG FINDINGS IN PATIENTS FROM 2023 TO 2025

Ceren Karaçaylı[1-2], Abdullah Sunar[1], Bülent Satar[3], Uğur Burak Şimşek[4]
[1]Department of Otorhinolaryngology, Gulhane Training and Research Hospital, Ankara, Türkiye
[2]Department of Audiology, University of Health Sciences, Ankara, Türkiye
[3]Department of Otorhinolaryngology, University of Health Sciences, Ankara, Türkiye
[4]Department of Neurology, Gulhane Training and Research Hospital, Ankara, Türkiye

Aim: This study aims to summarize VNG findings in patients presenting with vertigo to the ENT clinic between 2023 and 2025 and diagnosed with central causes.

Material and Methods: The study included 10 patients with vertigo complaints, diagnosed with central causes following diagnostic evaluations. Hospital records and VNG recordings were reviewed to summarize the findings.

Results: The case series identified diverse findings and lesion localizations in central vestibular and neurological pathologies. Common findings included saccade and tracking abnormalities, spontaneous nystagmus, direction-changing nystagmus, and disconjugate eye movements, often associated with central test abnormalities. Lesions were predominantly localized to the brainstem, cerebellum, and cerebral cortex.

Bifrontotemporal atrophy was linked to saccade and tracking impairments. A patient with temporoparietal-occipital encephalomalacia exhibited spontaneous nystagmus. Posterior circulation insufficiency was identified in one case with vertical spontaneous nystagmus intensifying with fixation, disconjugate eye movements during right gaze, and central test abnormalities. In a patient with multiple sclerosis affecting the brainstem, direction-changing nystagmus and disconjugate eye movements were documented.

A case of bilateral internuclear ophthalmoplegia (INO), thought to be congenital, revealed cerebellar asymmetry. A patient with cerebellar infarction showed upward left torsional nystagmus not suppressed with fixation, indicative of central lesions. Another patient with focal encephalomalacia in the frontal lobe exhibited spontaneous nystagmus and central test abnormalities. A patient with wild-type medulloblastoma had saccade and tracking impairments, while a patient with CNS lymphoma exhibited downbeat and lateral-beating nystagmus. In a case of stroke-induced balance disorder, central test abnormalities and a 5-degree left spontaneous nystagmus were detected.

This series underscores the role of lesion localization in central vestibular system disorders, highlighting the significance of brainstem, cerebellum, and cerebral cortex involvement.

Discussion: Nystagmus, characterized by involuntary oscillatory eye movements, results from central or peripheral causes. Central nystagmus arises from CNS dysfunction in areas processing vestibular functions, such as the cerebellum, brainstem, and cerebral cortex. Central lesions, including brainstem infarctions and cerebellar degeneration, often manifest as downbeat nystagmus, commonly linked to lesions in the lower posterior fossa or cervical medullary junction (1). Upbeat nystagmus indicates higher-level neural circuit dysfunction (2). Vertical or torsional nystagmus in primary gaze strongly suggests central etiologies (3,4).

Clinically, central nystagmus can be distinguished from peripheral types by history and examination. Central nystagmus persists with fixation, while peripheral nystagmus is suppressed4. Positional nystagmus without latency or limited to specific head positions further supports a central cause. Differentiating central from peripheral etiologies is critical in emergency settings to guide appropriate management (4–6). Medications, such as antiepileptics and chronic alcohol, may also induce gaze-evoked nystagmus through cerebellar dysfunction (7).

Conclusion: Central nystagmus is linked to diverse neurological and pharmacological factors. Precise etiological identification through clinical examination is vital for effective management and treatment.

Keywords: Vertigo, central causes, nystagmus, videonystagmography

References

1. Zapala DA. Down-beating nystagmus in anterior canal benign paroxysmal positional vertigo. J Am Acad Audiol. 2008;19(3):257-266. doi:10.3766/jaaa.19.3.10
2. Sharon JD, Carey JP, Schubert MC. Upbeat nystagmus after bilateral superior canal plugging: A peripheral cause of vertical nystagmus. Laryngoscope. 2017;127(7):1698-1700. doi:10.1002/lary.26314
3. Anagnostou E, Mandellos D, Limbitaki G, Papadimitriou A, Anastasopoulos D. Positional nystagmus and vertigo due to a solitary brachium conjunctivum plaque. J Neurol Neurosurg Psychiatry. 2006;77(6):790. doi:10.1136/JNNP.2005.084624

4. Salami A, Dellepiane M, Mora R, Taborelli G, Jankowska B. Electronystagmography finding in children with peripheral and central vestibular disorders. Int J Pediatr Otorhinolaryngol. 2006;70(1):13-18. doi:10.1016/j.ijporl.2005.05.001
5. Koohi N, Male AJ, Kaski D. Acute positional vertigo in the emergency department—peripheral vs. central positional nystagmus. Front Neurol. 2023;14:1266778. doi:10.3389/FNEUR.2023.1266778/BIBTEX
6. Wang W, Zhang Y, Pan Q, et al. Central nystagmus plus ABCD2 identifying stroke in acute dizziness presentations. Acad Emerg Med. 2021;28(10):1118-1123. doi:10.1111/acem.14295
7. Strupp M, Kremmyda O, Adamczyk C, et al. Central ocular motor disorders, including gaze palsy and nystagmus. J Neurol. 2014;261(SUPPL. 2):542-558. doi:10.1007/S00415-014-7385-9/FIGURES/8

RP-31

RISK FACTORS ASSOCIATED WITH BENIGN PAROXYSMAL POSITIONAL VERTIGO: A NATIONAL DATABASE STUDY

Nedim Durakovic[1], Prithwijit Roychowdhury[1]
[1]Washington University School Of Medicine

Aim: To characterize the demographics of patients with benign paroxysmal positional vertigo (BPPV) in the US and understand the association with osteoporosis (OP), migraine, head trauma, vitamin D deficiency and additional risk factors.

Material/Methods: This was a retrospective cohort study using a National database (TriNetX) sourced from 67 HCOs in the USA. Subjects were adults diagnosed with BPPV (ICD-10:H81.110-13), Controls were adults who were enrolled as normal comparisons and controls in clinical research programs (ICD-10:Z00.6). We evaluated the two groups by age, gender, race, migraine history, prior head trauma, vitamin D deficiency, OP, hyperlipidemia (HLD), hypertension (HTN), type 2 diabetes (TIIDM), obesity, smoking and alcohol use.

Results/Discussion: 504,958 subjects with BPPV were identified. Mean age at diagnosis of BPPV was 66 ± 17 (mean ± SD). The majority were female (65.1%, n=328,778) and white (67.6%, n=341,352). A subset of identified patients underwent comparisons with a propensity-matched cohort of control subjects (after-matching both cohorts were composed of 416,549 subjects). Subjects with BPPV had a greater risk of having a diagnosis of migraine (11.1% vs 5.2%, p<0.0001), vitamin D deficiency (21.3% vs 13.4%, p<0.0001), prior head trauma (1.0% vs 0.5%, p<0.0001), OP (9.9% vs 7.4%, p<0.0001), HLD (50.4% vs 38.2%, p<0.0001) and HTN (49.5% vs 44.3%, p<0.0001) compared to controls. There was no significant difference in diagnosis of TIIDM or obesity between cohorts. Of interest, control subjects had a greater risk of smoking (9.6% vs 8.6%, p<0.0001) and alcohol use (3.7% vs 2.7%, p<0.0001) when compared to subjects with BPPV.

Conclusions: Patients with BPPV demonstrated significant associations with migraine, vitamin d deficiency, prior head trauma, OP, HLD and HTN. Findings have implications for the understanding of the etiopathogenesis of BPPV.

Keywords: Benign paroxysmal positional vertigo, BPPV, migraine, epidemiology

RP-32

REVEALING THE UNDERLYING PATHOPHYSIOLOGICAL MECHANISMS OF MDDS WITH THE USE OF FUNCTIONAL MAGNETIC RESONANCE IMAGING

Catho Schoenmaekers[1], **Steven Jillings**[1], **Megan Van Deun**[1], **Andrzej Zarowski**[2], **Floris L Wuyts**[1-2], **Choi Deblieck**[1]

[1]*Lab for Equilibrium Investigations and Aerospace, University of Antwerp, Antwerp, Belgium*

[2]*European Institute for Orl-hns, Sint-augustinus Hospital, Wilrijk, Belgium*

Introduction: Mal de Debarquement Syndrome (MdDS), recognized as a neuro-vestibular disorder in 2020, manifests with subjective sensations of self-motion, typically triggered by e.g. sea or air travel. Although its exact pathophysiology remains elusive, MdDS symptoms are associated with maladaptation of the vestibulo-ocular reflex (VOR). Optokinetic stimulation (OKS) significantly alleviates symptoms by stimulating the velocity storage mechanism, correcting VOR maladaptation. This study aims to 1) enhance theunderstanding of MdDS pathophysiology and the effect of OKS treatment using resting-state functional magnetic resonance imaging (rs-fMRI) pre- and post-OKS treatment and 2) examine the correlation between changes in posturography measures and functional connectivity changes in specific vestibular cortical regions.

Methods: The study included 30 MT-MdDS patients who were treated for four consecutive days (Tuesday through Friday). rs-fMRI scans were collected on Sunday and Friday evening within the same week. FC was derived using a cortical vestibular atlas-based region-of-interest (ROI) approach. Correlation between pre- to post-treatment rs-fMRI and posturography differences was examined ($p<0.001$ uncorrected, cluster-level $p<0.05$ FDR corrected).

Results: The rs-fMRI showed increased connectivity in cerebellar crus I/II post-treatment and decreased connectivity between cerebellar lobule X and left middle temporal gyrus. Additionally, correlations were found with posturography and symptom severity. Also altered activity was found in the entorhinal cortex. These changes not only objectify OKS treatment impact, but point towards possible brain ROI's involved in the pathophysiology of MdDS.

Conclusion: Connectivity changes post-treatment indicate that OKS treatment has a measurable impact in certain ROI's in the brain. Additionally, decreased connectivity correlated with more severe symptoms, suggesting its potential as a biomarker for MdDS severity.

Keywords: Mal de Debarquement syndrome, MRI, resting-state functional connectivity changes, central adaptation

RP-33

THE UTILITY OF TWO-DIMENSIONAL PURE-TONE AND SPEECH MATRIX ANALYSIS FOR EVALUATING HEARING LOSS TREATMENT OUTCOMES

Tomoyasu Kitahara[1], Masafumi Sawada[1], Han Matsuda[1], Yukihide Maeda[1], Kei Sakamoto[1], Yohei Kawasaki[2], Tetsuo Ikezono[1]
[1]*Department of Otolaryngology, Saitama Medical University*
[2]*Department of Biostatistics, Saitama Medical University*

Background: Sensorineural hearing loss (SNHL) is primarily classified based on clinical manifestations, such as sudden, fluctuating, progressive, or recurrent hearing loss. Causative classifications, including hereditary,vestibular schwannomas or viral, account for only a small subset of cases or unknown prevalence. However, perilymphatic fistula (PLF) has gained attention as a causative diagnosis for SNHL due to the development of a novel perilymph leakage detection test utilizing the perilymph-specific diagnostic biomarker CTP (cochlin-tomoprotein). PLF with perilymph leakage (PLF w/Leakage) is now recognized as a legitimate clinical entity. The CTP test, known for its high diagnostic accuracy, is covered by Japan's national health insurance.

Method: Conducted a prospective study involving 104 cases of idiopathic sudden sensorineural hearing loss (iSSNHL).

Developed diagnostic criteria for "suspected-PLF" based on the study and treated 17 cases of sudden, fluctuating, and recurrent hearing loss unresponsive to steroid therapy using a novel non-invasive PLF repair surgery technique, performed as early as possible following diagnosis.

We evaluated treatment effects using not only conventional pure-tone audiometry but also speech tests. The two-dimensional matrix recommended by AAO-HNS in assessing both auditory threshold improvements and word recognition gains.

Results: In the prospective study of iSSNHL cases, 22% of the 74 enrolled patients had positive CTP results, suggesting PLF with leakage. Age and pre-treatment hearing levels were associated with CTP values, with higher values observed in patients aged 60 and older. Using the novel PLF repair surgery technique and diagnostic criteria for suspected PLF, 17 cases were treated: Group A: 9 cases treated within 41 days of onset. Group B: 8 cases treated after 42 days, with symptom duration extending up to 165 weeks.

Outcomes: Group A: 67% of cases showed pure-tone threshold improvement of more than 10 dB, and 100% achieved more than a 10% improvement in word recognition scores. Group B: 38% of cases showed pure-tone improvement of more than 10 dB, and 82% achieved more than a 10% improvement in word recognition scores.

Conclusion: Sensorineural hearing loss cases unresponsive to steroid therapy responded to this treatment. Treatment remained effective beyond the widely accepted "golden time" of 2 weeks post-onset for sudden hearing loss. Chronic cases, such as those previously diagnosed with Meniere's disease or recurrent sudden hearing loss over years, showed notable improvements in word recognition, often exceeding gains in pure-tone thresholds. Speech test revealed treatment effects that could not be measured using pure-tone audiometry alone, emphasizing the importance of two-dimensional matrix analysis offering a more comprehensive understanding of treatment outcomes

Keywords: Sensorineural hearing loss (SNHL), perilymphatic fistula (PLF), CTP (cochlin-tomoprotein)

RP-34

THE ASSOCIATION BETWEEN VESTIBULAR, HEARING AND COGNITIVE ABILITIES AMONG OLDER POPULATION

Wan Nabıla Wan Mansor[1], Afiq Ikmal Sahak[1], Nor Hanıza Abdul Wahat[1], Asma Abdullah[1], Noorlaılı Mohd Tohıt[1]
[1]National Unıversity of Malaysıa

Introduction: Ageing populations are increasing in numbers with an estimated 3.5 million people or 7% of the population in Malaysia who are above the age of 65. The Department of Statistics Malaysia estimated that the number of older generation age 60 and above is expected to reach 5.8 million in 2030. This will lead to an epidemic of age-related diseases, including presbycusis and vestibular dysfunction.

Methods: This is a pilot study that is aimed to describe the association between vestibular, hearing and cognitive abilities among older population.

A total of 237 participants will undergo vestibular assessment; Dix-Hallpike, Romberg and Fukuda stepping test, modified Clinical test of Sensory Interaction in Balance (mCTSIB), cervical vestibular evoked myogenic potential (cVEMP), ocular vestibular evoked myogenic potential (oVEMP), Pure Tone Audiometry (PTA) test and Montreal Cognitive Assessment (MoCA) Malay version.

Results: The expected result will show vestibular and cognitive impairment increases with aging. Hearing impairment is higher in patients with cognitive impairment whereas vestibular function is poorer among elderly with cognitive impairment as evidenced from the vestibular assessment.

Conclusion: The data from this study describes the association between vestibular, cognitive and hearing abilities. With the increasing aging population, the number of people suffering from presbycusis will also increase as well as cognitive impairment and vestibular dysfunction. This study will emphasize the need for awareness to address these problems in older population and to build a more holistic approach to manage this population.

Keywords: Vertigo, peripheral dementia hearing

RP-35

THE LEGS OF THE TRIPOD IN BALANCE EARS AND EYES; RESULTS OF VEMP IN AMBLYOPIA

Elif Kaya Çelik[1], Şerife Gülhan Konuk[2], Meriç Yıldız[3]
[1]Tokat Gaziosmanpasa University, Faculty of Medicine, Department of Otolaryngology
[2]Tokat Gaziosmanpasa University, Faculty of Medicine, Department of Ophthalmology
[3]Tokat Gaziosmanpasa University, Faculty of Medicine, Department of Audiology

Purpose: The present study aimed to investigate amblyopia›s influence on ocular vestibular evoked myogenic potentials (oVEMP) and cervical vestibular evoked myogenic potential (cVEMP) responses.

Methods: This prospective study was conducted with the Department of Ophthalmology and Otorhinolaryngology. The study included 23 patients, aged between 5 and 18 years, diagnosed with anisometropic amblyopia and without strabismus, and a control group of 21 healthy individuals, matched in age and gender. The hearing test was found to be normal in both groups. The cVEMP and oVEMP tests were performed on both the amblyopia and control groups. The amblyopic eye of amblyopic patients constituted Group 1, the healthy eye of amblyopia patients constituted Group 2, and the right eye of the control group constituted Group 3. The cVEMP and oVEMP test results were compared among the three groups.

Results: In Group 1, the spherical equivalent (SE) value was 3.65±3.43, and the best corrected visual acuity (BCVA) measured with the Snellen chart was 0.41±0.21. In Group 2, the SE value was 1.69±2.6, and the BCVA was 0.86±0.20. In Group 3, the SE value was 0.01±0.4, and the BCVA was 1.0±0. The differences among the groups were statistically significant (p≤0.000). There was no significant difference in the oVEMP test results between the groups. However, in the cVEMP test, the latencies of P1 and N1 were significantly shorter in both Group 1 and Group 2 compared to Group 3 (p=0.044, p=0.042, p=0.041, and p=0.002, respectively).

Conclusion: In amblyopia patients› amblyopic and control eyes, the latencies of P1 and N1 in the cVEMP test were shorter compared to the healthy control group. This suggests that the diminished visual transmission associated with amblyopia may result in compensatory mechanisms in other sensory organs.

Keywords: amblyopia, vestibular evoked myogenic potential, ocular vestibular evoked myogenic potential, vestibular-ocular reflex, Vestibular-spinal reflex

References

1. Williams C, Northstone K, Howard M, Harvey I, Harrad RA, Sparrow JM. Prevalence and risk factors for common vision problems in children: data from the ALSPAC study. The British journal of ophthalmology. 2008;92(7):959-64.
2. Levi DM. Visual processing in amblyopia: human studies. Strabismus. 2006;14(1):11-9.
3. Ozgirgin ON, Kingma H, Manzari L, Lacour M. Residual dizziness after BPPV management: exploring pathophysiology and treatment beyond canalith repositioning maneuvers. Frontiers in neurology. 2024;15:1382196.
4. Murofushi T. Clinical application of vestibular evoked myogenic potential (VEMP). Auris, nasus, larynx. 2016;43(4):367-76.
5. Zipori AB, Colpa L, Wong AMF, Cushing SL, Gordon KA. Postural stability and visual impairment: Assessing balance in children with strabismus and amblyopia. PloS one. 2018;13(10):e0205857.
6. Walther LE, Hormann K, Pfaar O. [Recording cervical and ocular vestibular evoked myogenic potentials: part 1: anatomy, physiology, methods and normal findings]. Hno. 2010;58(10):1031-45.

Table 1. The visual measurement results of the groups

	Group 1	Group 2	Group 3	p
Spherical equivalence (D)	3,65±3,43a	1,69±2,6a	0,01±0,4b	< 0.000*
Best corrected visual acuity	0,41±0,21a	0,86±0,20b	1.0±0b	< 0.000*

Table 2. The results of the VEMP by groups

	Group 1	Group 2	Group 3	p
oVEMP P1(ms)	10,13±2,40a	10,69±1,87a	10,35±1,26a	0.74
oVEMP N1 (ms)	15,14±1,45a	15,08±1,77a	15,18±1,03a	0.95
oVEMP P1N1(µV)	9,81±8,92a	10,41±9,17a	9,58±5,74a	0.17
cVEMP p1(ms)	12,97±1,36a	12,86±1,64a	13,86±1,44b	0.032*
cVEMP N1(ms)	19,04±2,08a	18,44±1,86a	20,34±1,93b	0.003*
cVEMP P1N1(µV)	182,42±133,64a	138,48±68,22b	149,73±76,00ab	0.73

RP-36

DIZZY PATIENT IN THE EMERGENCY, SHOULD WE CALL THE NEUROLOGIST

Adraa Nouini[1]
[1]*Chirec-delta*

Background: The management of dizziness and vertigo can be challenging in the emergency department (ED). It is important to rapidly diagnose vertebrobasilar stroke (VBS), as therapeutic options such as thrombolysis and anticoagulation require prompt decisions.

Objectıve: This study aims to assess the rate of misdiagnosis in patients with dizziness caused by VBS in the ED.

Methods and Results: The cohort was comprised of 82 patients with a mean age 55years; 51% were women and 49% men. Among dizzy patients, 15% had VBS. We used Cohen's kappa test to quantify the agreement between two raters – namely, emergency physicians and neurologists – regarding the causes of dizziness in the ED. The agreement between emergency physicians and neurologists is low for the final diagnosis of central vertigo disorders and moderate for the final diagnosis of VBS. The sensitivity of ED clinal examination for benign conditions such as BPPV was low at 56%. The positive predictive value of the ED clinical examination for VBS was also low at 50%.

Conclusıon: There is a substantial rate of misdiagnosis in patients with dizziness caused by VBS in the ED. To reduce the number of missing diagnoses of VBS in the future, there is a need to train emergency physicians in neurovestibular examinations, including the HINTS examination for acute vestibular syndrome (AVS) and the Dix-Hallpike (DH) maneuver for episodic vestibular syndrome. Using video head impulse test could help reduce the rate of misdiagnosis of VBS in the ED.

Keywords: Emergency room, stroke, dizziness, vertigo

Reference

Nouini A et al. J Vestib Res. 2023 Mar 6. doi: 10.3233/VES-220109.

RP-37

TRIPLE SEMICIRCULAR CANAL OCCLUSION FOR THE TREATMENT OF MÉNIÈRE'S DISEASE

Shankai Yin[1]

[1]*Department of Otolaryngology-head and Neck Surgery, Shanghai Sixth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine*

Background and Objectives: Ménière's disease commonly manifests as repetitive episodes of vertigo attributed to a disturbance arising from a transfer of endolymph, which contains elevated potassium levels, into the perilymph containing a higher sodium concentration. For refractory cases of this condition, several surgical approaches have been investigated including endolymphatic sac procedures, labyrinthectomy, and vestibular neurectomy. We aimed to investigate the effectiveness and safety of triple semicircular canal occlusion for Ménière's disease.

Methods: In 2005, our team conducted experiments involving triple semicircular canal occlusion (TSCO) in guinea pigs with endolymphatic hydrops. In 2008, we pioneered triple semicircular canal occlusion (TSCO) for Ménière's disease in three patients previously unsuccessful with endolymphatic sac decompression or mastoid shunt procedures.

Results: We found that TSCO successfully eliminated response of the semicircular canals to rotational and caloric stimulation while demonstrating safety in maintaining preoperative hearing in ears exhibiting hydrops with quick and complete the static compensation to the disequilibrium. These findings suggested that TSCO might provide an option for managing rotatory vertigo as seen in Ménière›s disease. Moreover, our work demonstrated that TSCO-associated hearing loss could be substantially reduced through technical refinements. Specifically, avoiding damage to delicate inner ear structures like the membranous labyrinth as well as shortening the operation time helped preserve auditory function. Notably, TSCO demonstrated a 100% complete control rate (class A) for vertigo4,5, surpassing the 66.0-77.0% rates for endolymphatic sac decompression and 77.0-90.2% for vestibular neurotomy reported in previous studies. The postoperative hearing levels closely matched the preoperative levels throughout the follow-up period. Our findings suggest that TSCO can serve as a viable alternative for Ménière's disease management in patients with intractable vertigo. Importantly, no surgery-related deafness or long-term vertigo attacks were observed during the 24-month follow-up assessments. Furthermore, our successful applications of horizontal semicircular canal occlusion for benign paroxysmal positional vertigo7 and surgical treatment of labyrinthine fistula caused by cholesteatoma with semicircular canal occlusion8 yielded positive outcomes without complications. In 2022, our investigations have yielded additional insights. We found TSCO to effectively control vertigo in most Ménière›s disease patients. Moreover, TSCO appears to confer the advantage of lower postoperative rates of paroxysmal dizziness and unsteadiness in intractable Ménière's disease patients up to 16 years follow-up compared to the alternative of vestibular nerve resection.

Conclusions: TSCO has received endorsement as a recommended therapeutic strategy within guidelines issued separately by the American Academy of Otolaryngology-Head and Neck Surgery as well as the Chinese Society of Otorhinolaryngology Head and Neck Surgery. Both societies have recommended TSCO, the former in its "Clinical Practice Guideline: Ménière's Disease" publication and the latter in its "Guideline of Diagnosis and Treatment of Ménière's Disease (2017)" . Over the past decade, our TSCO methodology has gained broader support among over 100 hospitals in China. It is now widely recognized in the international community as a cure for thousands of Ménière's disease patients seeking effective vertigo relief.

Keywords: Triple semicircular canal occlusion, ménière's disease, refractory vertigo

References

1. Yin S, Yu D, Li M, Wang J. Triple semicircular canal occlusion in guinea pigs with endolymphatic hydrops. Otol Neurotol. 2006 Jan;27(1):78-85
2. Shankai Yin, Dongzhen Yu, Zhengnong Chen, Zhenyu Cao, Jian Wang, Important factors for the hearing loss caused by the triple semicircular canal occlusion in guinea pigs, Otol Neurotol . 2007 Jun;28(4):513-9.
3. Shankai Yin, zhengnong Chen, Dongzhen Yu, Yaqin Wu, Haibo Shi, Huiqun Zhou, Jian Wang, Triple semicircular canal occlusion for the treatment of Ménière's disease, Acta Oto-Laryngologica, 2008; 128: 739-743.
4. Zhengnong Chen, Dongzhen Yu, Shankai Yin, Jian Wang, Horizontal Semicircular Canal Occlusion in a Patient with Benign Paroxysmal Positional Vertigo, J Otolaryngol Head Neck Surg . 2008 Jun;37(3): E69-72.
5. Chen Z, Dongzhen, Wu Y, Shi H, Zhou H, Wang J, Miyoshi A, Yin S. Surgical treatment of labyrinthine fistula caused by cholesteatoma with semicircular canal occlusion., Acta Otolaryngol. 2010;130(1):75-8
6. Yumeng Jiang, Maoxiang Xu, Qingxiu Yao, Zhuangzhuang Li, Yaqin Wu, Zhengnong Chen, Dongzhen Yu, Haibo Shi and Shankai Yin, Changes of Vestibular Symptoms in Ménière's Disease After Triple Semicircular Canal Occlusion: A Long-Term Follow-Up Study, Front. Neurol., 04 February 2022.

RP-38

EFFECTS OF THE VESTIBULOCOCHLEAR IMPLANT ON BALANCE AND GAIT IN BILATERAL VESTIBULOPATHY

Meichan Zhu[1-2], Rik Marcellis[3], Paul Willems[2], Jona Beckers[3], Bernd Vermorken[1], Benjamin Volpe[1], Stan van Boxel[1], Joost Stultiens[1], Elke Devocht[1], Angélica Pérez Fornos[4], Nils Guinand[4], Kenneth Meijer[2], Raymond van de Berg[1], Christopher McCrum[2]

[1]*Department of Otorhinolaryngology and Head and Neck Surgery, Division of Balance Disorders, Maastricht University Medical Center, School for Mental Health and Neuroscience, Maastricht, The Netherlands*

[2]*Department of Nutrition and Movement Sciences, Nutrım School of Nutrition and Translational Research İn Metabolism, Maastricht University, Maastricht, The Netherlands*

[3]*Department of Physical Therapy, Maastricht University Medical Center, Maastricht, Limburg, The Netherlands*

[4]*Service of Otorhinolaryngology and Head and Neck Surgery, Department of Clinical Neurosciences, Geneva University Hospitals, Geneva, Switzerland*

Aim: Bilateral vestibulopathy (BVP) often leads to, among many other symptoms, gait and balance issues and increased fall risk. The vestibulocochlear implant (VCI) is a neuroprosthesis that may offer a promising treatment for patients with severe BVP. This study aimed to explore the impact of different vestibular stimulation modes on gait and balance outcomes.

Material Method: The VertiGo! trial is a prospective, nonrandomized, single-center cohort study. The trial includes nine patients with severe BVP who demonstrated inadequate compensation despite conventional treatment. Nine patients received the VCI and were extensively tested in four testing weeks, the first providing reference data (no VCI stimulation) followed by three weeks each with different stimulation modes: (A) baseline stimulation combined with head motion-modulated stimulation, (B) reduced baseline stimulation combined with head motion-modulated stimulation, and (C) only baseline stimulation, without modulation. For the gait and balance assessments, patients walked at 0.6m/s, 0.8m/s, and 1.0m/s on an instrumented treadmill integrated in a 6-DoF motion platform (CAREN; Motek). Five walking conditions were evaluated: unperturbed walking in both lit and dark environments, along with three sizes of pseudorandom mediolateral platform sway perturbations. Coefficients of variation (CoV) were analyzed using 3D motion capture data for step time, step length, double support time and step width. Patients also completed the Mini-BESTest each week.

Results: Step time, length and double support time CoV consistently reduced with increasing walking speeds across all walking conditions whereas step width CoV increased with increasing walking speeds across all walking conditions. Larger perturbations increased CoV consistently. The CoV in the reference mode and stimulation modes A, B and C varied across patients for all gait parameters with no consistent effect for any one stimulation mode (e.g., 5 of 9 patients had lower step time CoV and step length CoV for one stimulation mode but these did not always align with the modes with lower CoVs in the other parameters and the stimulation mode that benefited one patient was often not the mode that benefited another patient). Darkness usually increased CoV but no clear effect of a specific stimulation mode in darkness was found. In the Mini-BESTest, at least one stimulation condition total score was higher than the reference total score for 6 of 9 patients but these were distributed across the different stimulation modes.

Discussion: The variability in gait parameters (CoV) decreased with increasing walking speeds for step time, length, and double support time, but increased for step width, with larger perturbations consistently elevating CoV. While some stimulation modes improved specific gait parameters for certain patients, no single mode showed consistent benefits across all parameters or patients, and the effects were similarly inconclusive in darkness; Mini-BESTest scores showed improvements under at least one stimulation mode for most patients but without a clear preference for a specific mode.

Conclusions: Walking speed, perturbations and stimulation modes can influence gait variability and balance performance. While specific stimulation modes may provide slight advantages during acute stimulation, individual responses exhibit considerable variability. The findings emphasize the importance of further investigating tailored stimulation. Investigation into potential differences between acute stimulation and ongoing stimulation is needed.

Keywords: Vestibulocochlear implant, bilateral vestibulopathy, gait

References

1. van Stiphout L, Szmulewicz DJ, Guinand N, Fornos AP, Van Rompaey V, van de Berg R. Bilateral vestibulopathy: a clinical update and proposed diagnostic algorithm. Front Neurol. 2023;14:1308485. doi:10.3389/fneur.2023.1308485
2. Strupp M, Kim JS, Murofushi T, et al. Bilateral vestibulopathy: Diagnostic criteria Consensus document of the Classification Committee of the Barany Society. J Vestib Res. 2017;27(4):177-189. doi:10.3233/VES-170619
3. Kim JS, Kim HJ. Bilateral vestibulopathy: the causes, diagnosis, and treatments. Curr Opin Neurol. Feb 1 2022;35(1):98-106. doi:10.1097/WCO.0000000000001014

4. Porciuncula F, Johnson CC, Glickman LB. The effect of vestibular rehabilitation on adults with bilateral vestibular hypofunction: a systematic review. J Vestib Res. 2012;22(5-6):283-98. doi:10.3233/VES-120464

5. van de Berg R, Guinand N, Stokroos RJ, Guyot JP, Kingma H. The vestibular implant: quo vadis? Front Neurol. 2011;2:47. doi:10.3389/fneur.2011.00047

Figure: CoV for gait parameters in VCI patients

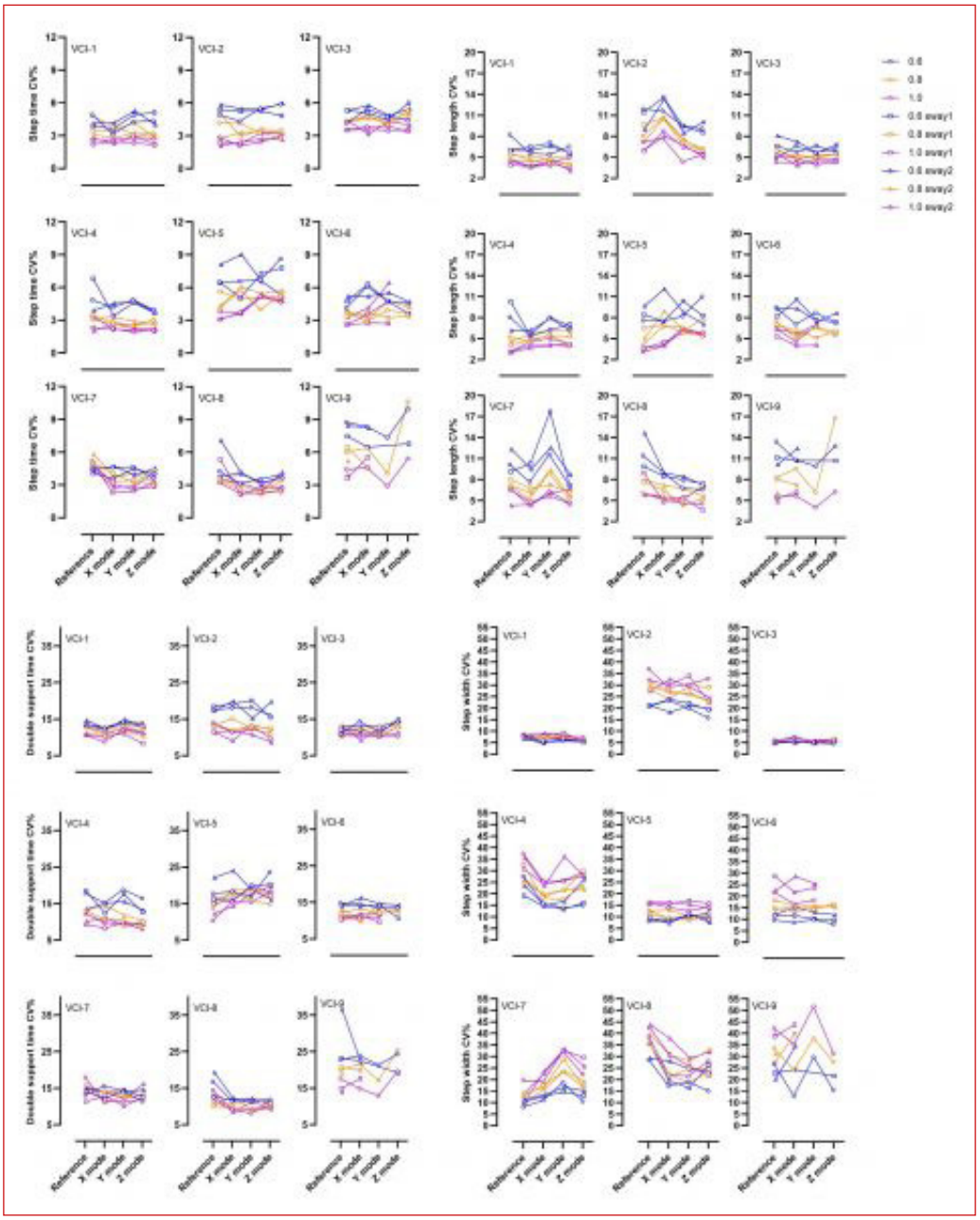
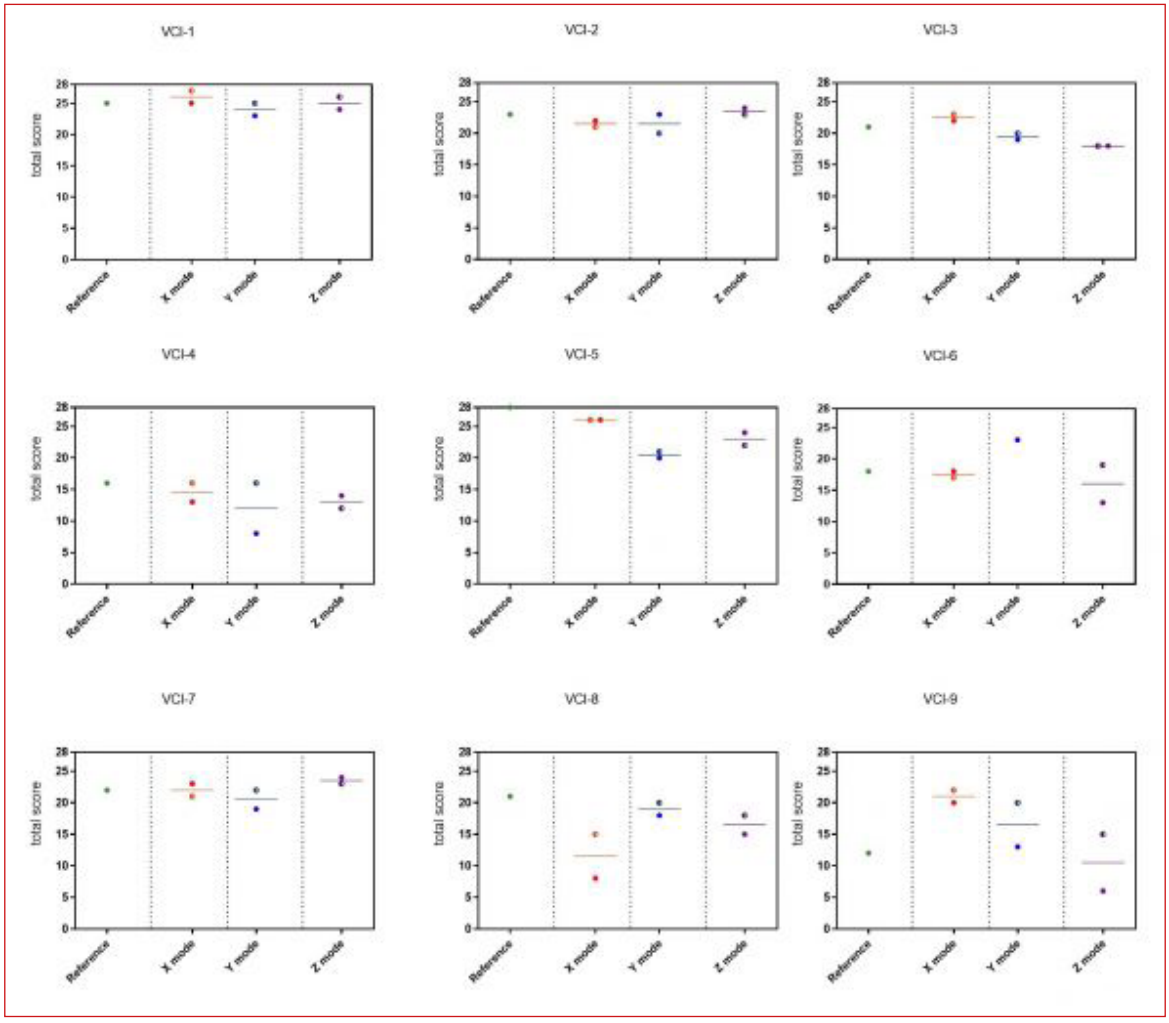


Figure: Minibestest results



RP-40

PRACTICAL QUALITY OF LIFE ASSESSMENT FOR VESTIBULAR IMPLANT CANDIDATES

Mehmet Kadir Ercan[1], Andy J Beynon[1]
[1]Radboud University Medical Center

Background and Aim: Quality of life includes emotional, social, and physical well-being and ability to function in ordinary living tasks. Bilateral vestibulopathy leads to balance problems, insufficient daily activities, performance deficiency in a paucity of enough visual and/or somatosensory hints, and cognitive and psychological problems. Comprehensive assessment of the vestibular implant candidates, as well as clinical tests, are needed. We aimed to draw up an inventory of quality-of-life questionnaire assessments that are suitable for evaluating patients with bilateral vestibular impairment before and after vestibular implant surgery.

Materials and Methods: As a first step, literature scanning was performed to find eligible questionnaires for comprehensive assessment of vestibular implant candidates. Secondly, questionnaires were separated into groups based on their main goals and contents, such as general health questionnaires, self-reported activity performance perception questionnaires, specialist-required performance-based questionnaires, cognition questionnaires, and psychological questionnaires. The questionnaires were inspected for required administration time, equipment need, usage in audiology /balance studies, usage in other studies, availability in English, Spanish, and Dutch languages, license/permission need, and main advantages and disadvantages parameters. Three different designs were recommended for usage in assessing vestibular implant candidates.

Results: Three designs were created to evaluate vestibular implant candidates pre-and post-operatively. The recommended topics include time-efficient and reliable questionnaires, cost-effective and reliable questionnaires, and detailed assessment. The administration time of cost-effective and reliable questionnaires, time-efficient and reliable questionnaires, and detailed assessment questionnaires is 35, 80, and 95 minutes, respectively.

Discussion and Conclusion: Vestibular implant candidates can be comprehensively assessed regarding cognitive function, self-reported daily activity perception, their real-life performance assessment, and psychological changes. By using a combination of several questionnaires, the comparison between the pre- and postoperative quality of life covers a broader spectrum than just using one questionnaire. Also, regular follow-ups of the condition of patients from different perspectives allow clinicians to postoperatively detect significant changes in different aspects.

Different aspects of assessing vestibular implant candidates will be more appropriate by combining specific non-overlapping questionnaires. Thus, vestibular implant candidates can be assessed more effectively, making an implantation decision justified for specialists and patients.

Keywords: Health-related quality of life, bilateral vestibulopathy, vestibular implant

RP-41

VIRTUAL REALITY APPLICATION MATCHES THE STANDARD TREATMENT FOR MDDS: A NON-INFERIORITY, RANDOMIZED, OPEN CLINICAL TRIAL

Catho Schoenmaekers[1], **Dario De Smet**[1], **Jan Van Riel**[2], **Andrzej Zarowski**[3], **Choi Deblieck**[1], **Floris Wuyts**[1-2]

[1]*Lab for Equilibrium Investigations and Aerospace, University of Antwerp, Antwerp, Belgium*

[2]*Telmio Bv, Luchthavenlaan 27, Vilvoorde, Belgium*

[3]*European Institute for Orl-hns, Sint-augustinus Hospital, Wilrijk, Belgium*

Introduction: Mal de Debarquement Syndrome (MdDS) is a debilitating neuro-otological disorder where individuals consistently feel oscillatory self-motion, like being on a boat. MdDS can be triggered by motion or emerge spontaneously without obvious triggers. Treatment with full field optokinetic stripes (OKS) in a special booth, in combination with head roll at a specific frequency alleviates the symptoms in a large part of the patients, the so-called VOR re-adaptation treatment (1,2). Our objective was to develop a virtual reality application (VRA) to mimic the full field OKS booth and evaluate its efficacy compared to the standard treatment.

Methods: In our randomized open non-inferiority clinical trial with 30 MT-MdDS patients, 15 received the gold standard and 15 the new VRA, both during four consecutive days, twice a day in two four-minute blocks. Treatment effectiveness was evaluated through questionnaires and posturography.

Results: The VRA group exhibited a response rate of 73%±12%, while the booth group had a response rate of 67%±13%, being not significantly different. However, the VRA showed advantages over the booth method, in improving blurry vision and self-motion perception.

Conclusion: Our study shows that VRA treatment has the same efficacy as the gold standard OKS booth. Interestingly, the VRA showed a significantly higher improvement for blurry vision and perception of self-motion compared to the booth. Since patients can use the VRA at home, we advocate that the VRA can be used as an accessible alternative to the booth method worldwide, effectively mitigating MdDS symptoms and enhancing the QoL of numerous MdDS patients.

Keywords: Mal de Debarquement syndrome, perception of self-motion, neuro-otological disorder, virtual reality application, VOR re-adaptation treatment

References

1. Schoenmaekers C, Jillings S, De Laet C, Zarowski A, Wuyts FL. Guideline for standardized approach in the treatment of the Mal de Debarquement syndrome. Front Neurol. 2024 Mar 19;15
2. Dai M, Cohen B, Smouha E, Cho C. Readaptation of the vestibulo-ocular reflex relieves the mal de debarquement syndrome. Front Neurol. 2014 Jul 15;5:124.

ACCEPTED POSTER PRESENTATIONS LIST

PP-02. CLINICAL UTILITY OF HIGH FREQUENCY HEAD SHAKE TEST IN VERTIGO PRACTICE.
Prateek Porwal, Pradeep Vundavalli, Srinivas Dorasala

PP-03. APPLICATION OF VR-ASSISTED VESTIBULAR REHABILITATION COMBINED WITH COGNITIVE BEHAVIORAL THERAPY IN PPPD
Ying Lin, Jia Shi, Wenfa Wu, Feng Yu

PP-06. PEDIATRIC VERTIGO & DIZZINESS IN OUR CLINICAL EXPERIENCE
István Tóth, Kinga Harmat, Emma Buczkó, Luca Csanádi, Beatrix Barcsi, László Lujber, Veronika Gaál, István Szanyi

PP-08. PERIPHERAL VESTIBULAR DISORDERS: PREVALENCE AND TRENDS AT A TERTIARY HOSPITAL
Wan Nabila Wan Mansor, Noor Dina Hashım, Asma Abdullah, Fatimah Sazari

PP-09. ASSOCIATIONS BETWEEN DIZZINESS HANDICAP INVENTORY SCORES AND VESTIBULAR FUNCTION TESTS: A CROSS-SECTIONAL SURVEY
Eun-Ju Jeon, Eun-Jin Son, Hyun Jin Lee

PP-11. MODERN METHODS OF DIAGNOSIS AND TREATMENT OF BENIGN PAROXYSMAL POSITIONAL VERTIGO IN MILITARY PERSONNEL
Dmytro Illich Zabolotnyi, Iryna Anatoliivna Bieliakova, Daria Hennadiivna Fedorchenko

PP-12. TRIPLE TRIGGER IN THE PATHOGENESIS OF BILATERAL VESTIBULAR HYPOFUNCTION IN PATIENT WITH CI
Yakubova Diyora Oybekovna, Sattarova Madina Gulamdjanovna, Karimova Nargiza Abdullayevna, Jakenova Saira Saira Saxepkereevna

PP-13. VESTIBULAR AND OCULOMOTOR FUNCTION IN FIBROMYALGIA: INSIGHTS FROM V-HIT, VNG, AND DHI ASSESSMENTS
Emel Tahir, Asuman Küçüköner, Emre Demirel, Ahmet Kıvanç Cengiz

PP-14. SUBJECTIVE COMPLAINTS AND OBJECTIVE FINDINGS IN PATIENTS WITH VESTIBULAR SYMPTOMATOLOGY
Mario Petrov Milkov, Miroslav Stoykov Stoykov

PP-15. VESTIBULAR DEFFICIENCIES IN MODERATE AND SEVERE OBSTRUCTIVE SLEEP APNEA CASES
Mario Petrov Milkov, Miroslav Stoykov Stoykov

PP-16. POST-HEAD SHAKE NYSTAGMUS TO EVALUATE VESTIBULAR DISEASE
Mehmet Kadir Ercan, Osman Refik Ayata, Bengi Arslan, Andy J Beynon

PP-17. A CLINICAL EVALUATION OF VESTIBULAR MIGRAINE AND ENDOLYMPHATIC HYDROPS OVERLAP
Zsuzsa Varga, Bence Bajor, Ákos Simon, Zsuzsanna Sevecsek, Szende Borbála Szabó, Anh Nguyet Nguyen

PP-18. EVALUATING OF LLM FOR VESTIBULAR REHABILITATION EDUCATION: COMPARING CHATGPT, GOOGLE GEMINI, AND CLINICIANS
Yael Arbel, Yoav Gimmon, Liora Shmueli

PP-19. PRELIMINARY VESTIBULAR FINDINGS OF POSTURAL ORTHOSTATIC TACHYCARDIA SYNDROME: A CASE REPORT
Özlem Ertuğrul, Merve Torun Topçu, Emirhan Ceviken, M. Tayyar Kalcioglu

PP-20. POTENTIAL MIGRAINE IMPACT ON MÉNIÈRE'S DISEASE REGARDING DEMOGRAPHICS AND ENDOTYPES
Kuei-You Lin, Steven D. Rauch

PP-21. ESTIMATION OF PARTICLE LOCALIZATION WITH ZUMA MANEUVER IN APOGEOTROPIC VARIANT OF HORIZONTAL SEMICIRCULAR CANAL BENIGN PAROXYSMAL POSITIONAL VERTIGO
Asuman Feda Bayrak

PP-02

CLINICAL UTILITY OF HIGH FREQUENCY HEAD SHAKE TEST IN VERTIGO PRACTICE

Prateek Porwal[1], **Pradeep Vundavalli**[2], **Srinivas Dorasala**[3]
[1]*Prime Ent Center, Hardoi, India*
[2]*Asian Super Speciality Ent Hospital, Visakhapatnam, India*
[3]*Jawaharlal Nehru Medical College, India*

The head-shaking nystagmus (HSN) test, particularly at high frequencies, is a diagnostic tool used to assess vestibular function by identifying imbalances in the vestibular system. Purpose of this study was to find the clinical utility of head shake test. In this study 200 patients underwent horizontal head shake testing with the videonystagmography device.

Method: The test involves rapid horizontal shaking of the head while monitoring eye movements using videonystagmography. It's performed in a dark room to eliminate visual fixation.

Results: In patients with unilateral vestibular loss such as vestibular neuritis, nystagmus typically beats towards the healthy side. In central nervous system disorders, the direction of nystagmus can be non-localizing or exhibit complex patterns like biphasic or perverted nystagmus. The presence of HSN can indicate ongoing vestibular compensation or reveal underlying abnormalities not apparent without provocation. HSN can help in diagnosing conditions like cerebellar degeneration and multiple system atrophy, where abnormal nystagmus patterns such as torsional or perverted nystagmus may appear.

Conclusion: The high-frequency head-shake test is a valuable diagnostic tool in neurotology, capable of revealing subtle vestibular dysfunctions and aiding in the diagnosis of both peripheral and central vestibular disorders.

Keywords: Horizontal head shake test, Perverted Nystagmus, Biphasic Nystagmus, Vestibular compensation.

References

1. Hain TC, Fetter M, Zee DS. Head-shaking nystagmus in patients with unilateral peripheral vestibular lesions Am J Otolaryngol. 1987;8:36–47
2. Fetter M, Zee DS, Koenig E, Dichgans J. Head-shaking nystagmus during vestibular compensation in humans and rhesus monkeys Acta Otolaryngol. 1990;110:175–81
3. Angeli SI, Velandia S, Snapp H. Head-shaking nystagmus predicts greater disability in unilateral peripheral vestibulopathy Am J Otolaryngol. 2011;32:522–7

Figure: Biphasic Nystagmus

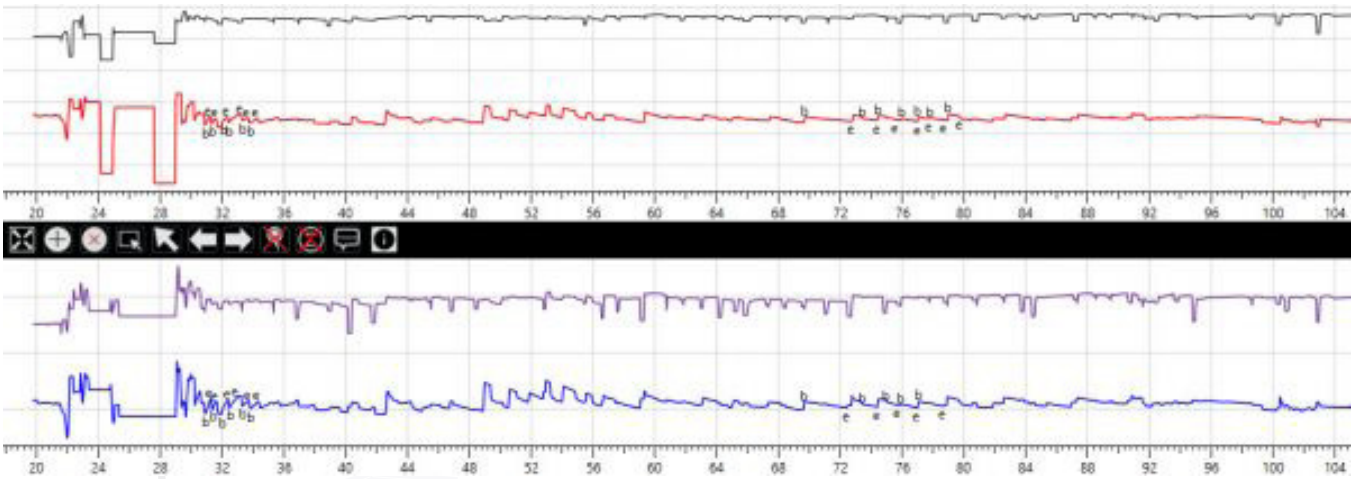
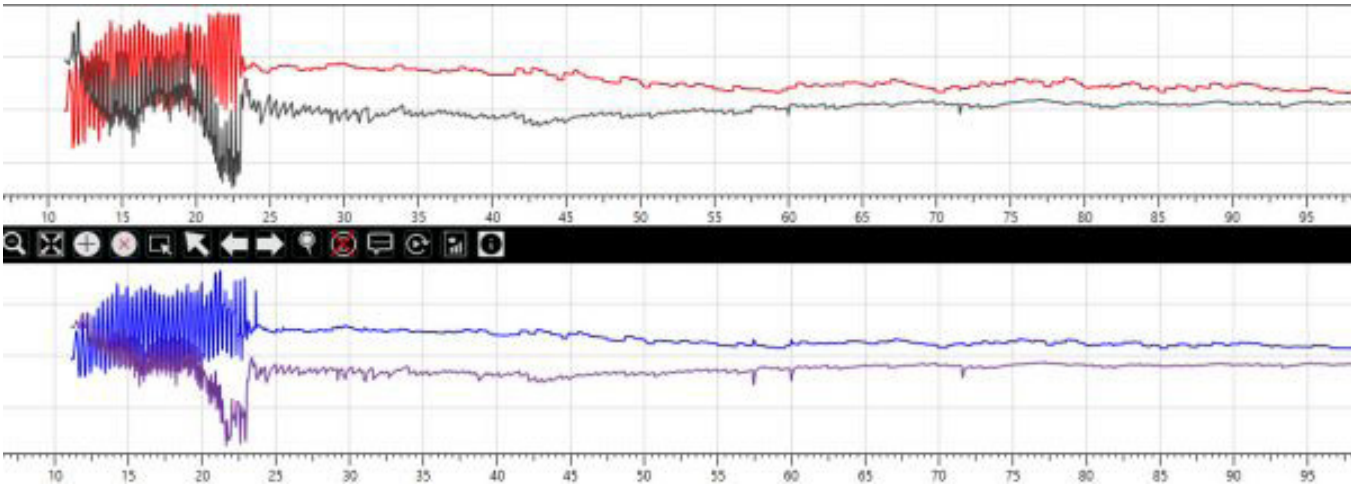


Figure: Down beating



PP-03

APPLICATION OF VR-ASSISTED VESTIBULAR REHABILITATION COMBINED WITH COGNITIVE BEHAVIORAL THERAPY IN PPPD

Ying Lin[1,2], Jia Shi[1,2], Wenfa Wu[1,2], Feng Yu[1,2]
[1]*Institute of Otolaryngology Head and Neck Surgery, Jinan University, China*
[2]*Guangzhou Red Cross Hospital, Medical College, Jinan University*

Objective: To evaluate the efficacy of virtual reality (VR)-assisted vestibular rehabilitation in combination with cognitive behavioral therapy (CBT) for the treatment of persistent postural-perceptual dizziness (PPPD).

Materials and Methods: Between January,2022 and December, 2023, 42 patients diagnosed with PPPD through a multidisciplinary team (MDT) evaluation involving otolaryngology, neurology, geriatrics, and psychology departments were enrolled in the study. Patients were randomly assigned to either the experimental group (VR combined with CBT, n=21) or the control group (CBT alone, n=21). There were no significant differences in baseline demographics between the groups. Outcomes were assessed using the Hamilton Anxiety Rating Scale (HAMA), Vestibular Symptom Index (VSI), Dizziness Handicap Inventory (DHI), and Berg Balance Scale (BBS) at baseline, after 4 weeks, and after 8 weeks of intervention.

Results: At baseline, all patients had HAMA scores >7, and no significant differences were observed between groups on any scale ($P > 0.05$). After 4 weeks, both groups demonstrated significant improvement, with reductions in HAMA, VSI, and DHI scores and increases in BBS scores compared to baseline ($P < 0.05$). After 8 weeks, the experimental group exhibited greater improvement than the control group across all measures, including HAMA (10.59 ± 4.23), VSI (18.67 ± 3.85), DHI (38.21 ± 11.30), and BBS (38.44 ± 4.12), with statistically significant differences compared to baseline ($P < 0.05$). Furthermore, at both 4 and 8 weeks, improvements in the experimental group were significantly greater than those in the control group ($P < 0.05$).

Conclusion: VR-assisted vestibular rehabilitation, combined with CBT, offers a novel, engaging, and effective approach for improving functional recovery and alleviating anxiety in patients with PPPD.

Keywords: Vertigo, persistent postural-perceptual dizziness, virtual reality, cognitive behavioral therapy, dizziness handicap inventory

PP-06

PEDIATRIC VERTIGO & DIZZINESS IN OUR CLINICAL EXPERIENCE

István Tóth[1], Kinga Harmat[1], Emma Buczkó[1], Luca Csanádi[1], Beatrix Barcsi[1], László Lujber[1], Veronika Gaál[2], István Szanyi[1]
[1]Department of Otolaryngology, University of Pécs, Hungary
[2]Department of Pediatrics, University of Pécs, Hungary

Aim: The frequency of vertigo in childhood is relatively rare. However, the occurrence of balance disturbance is a particularly frightening phenomenon for the child and the parent. The main problem is the separation of central and peripheral vestibular pathologies. When evaluating vestibular symptoms and instrumental examinations, special attention should be paid to the co-operativity of the child and the frequency of vestibular pathologies occurring in childhood. Our aim is to provide an overview of childhood dizziness, emphasizing the pathologies in question and the diagnostics.

Method : We retrospectively reviewed the documentation of the children with balance disturbance referred to our department for detailed otoneurologic examinations in the period 2017-2023. We highlighted the diagnostic tests performed during the examination and the eventual diagnosis yielded.

Results: During the analysed period, in our department 34 children were examined with dizziness. The mean age was 14,2 years (SD: 3,29); the most patients (76,5%) were between 13-18 years. The gender rate was 15 male and 19 female. From the 34 patients 25 were tested by at least one instrumental vestibular examination (most frequently (55,9%) by video head impulse test). Radiological examinations were performed in the case of 12 children (brain MRI in 32,4% of the cases).

The most frequent diagnosis (23,5%) was benign paroxysmal positional vertigo, while the second most yielded diagnosis, the vestibular migraine/benign paroxysmal vertigo of childhood frequency was 14,7%. In this analysed population, dangerous central disorders were diagnosed in 3 cases (intracranial infections in 2 children and epilepsy in 1 case).

Discussion: In our clinical practice we rarely meet children with balance disturbance. On the other hand, the department of pediatrics refers the complex cases to our centre for consultation and detailed vestibular examination. This requires a multidisciplinary collaboration. Also, it is necessary to have a good compliance of the child to perform different vestibular tests. To do that, time must be taken for the proper otoneurologic examinations. In our study we reviewed the cases of children referred to our department.

Conclusion: Most of the childhood dizziness is a benign condition, but precise evaluation of the child's complaints, symptoms, and instrumental examination findings is essential for establishing an accurate diagnosis and for excluding potentially dangerous diseases.

Keywords: Vertigo of childhood, pediatrics, vestibular tests

PP-08

PERIPHERAL VESTIBULAR DISORDERS: PREVALENCE AND TRENDS AT A TERTIARY HOSPITAL

Wan Nabila Wan Mansor[1,2], Noor Dina Hashim[1,2], Asma Abdullah[1,2], Fatimah Sazari[2]
[1]National University of Malaysia
[2]Hospital Canselor Tuanku Muhriz Kuala Lumpur

Introduction: Vertigo is a common symptom among older population. A total of 35 -55% of patients who had dizziness and vertigo had peripheral vestibular disorders. Benign paroxysmal positional vertigo (BPPV) is the most common peripheral vestibular disorder.

Objective/Hypothesis: This study aimed to describe the prevalence of peripheral vestibular disorders at Hospital Canselor Tuanku Muhriz, Malaysia from June 2023 until October 2025.

Study Design: A total of 55 patients from Otorhinolaryngology clinic were recruited in this cross-sectional study until now. This is the preliminary data.

Materials and Methods: We have recruited patients from the vertigo clinic Hospital Canselor Tuanku Muhriz Kuala Lumpur, with a total of 55 patients from 216 sample size to date with complete diagnosis and undergoing treatment. The demographic data and the treatments were recorded.

Results: There were 14 patients from age group of 50-59 years old. A total of 38 out of 55 patients were females. Malay race made up the majority followed by Chinese race. The majority, a number of 33 from 55 patients were diagnosed with BPPV, followed by Meniere disease and presbyvestibulopathy. All patients who were diagnosed with BPPV, were categorized into three types; lateral, posterior and superior BPPV. The patients were managed with canalith repositioning maneuver. One patient was diagnosed with traumatic BPPV. Whereas, two patients were diagnosed and treated for vestibular paroxysmia using gabapentin.

Conclusion: BPPV can be debilitating, and recurrence is high if it involves multiple semi-circular canals. In chronic vertigo, additional testing such as Magnetic Resonance Imaging (MRI) and objective vestibular assessment may be required to aid the diagnosis. The increasing trend of vestibular disorders among younger adults is alarming, and required further investigation.

Keywords: Vertigo, paroxysmal, semi-circular canals

PP-09

ASSOCIATIONS BETWEEN DIZZINESS HANDICAP INVENTORY SCORES AND VESTIBULAR FUNCTION TESTS: A CROSS-SECTIONAL SURVEY

Eun-Ju Jeon[1], Eun-Jin Son[2], Hyun Jin Lee[1]
[1]*The Catholic University of Korea*
[2]*Yonsei University College of Medicine*

Objectives: This study aims to evaluate the relationship between subjective dizziness disability, as assessed by the dizziness handicap inventory (DHI), and objective vestibular function test (VFT) results in patients presenting with dizziness.

Methods: We conducted a retrospective review of 177 patients who completed the DHI, vertigo visual analog scale (VVAS), and disability scale (DS) at their initial visit. Objective VFTs included videonystagmography (VNG) with caloric testing, cervical vestibular evoked myogenic potential (cVEMP), and the sensory organization test (SOT). Statistical analyses were conducted to assess correlations and differences in DHI scores based on VFT results and clinical characteristics.

Results: The DHI scores indicated a higher perceived dizziness handicap among female patients compared to males ($p = 0.012$). Chronic dizziness was associated with elevated DHI scores in specific items (DHI-2, DHI-12, DHI-21, $p < 0.05$). Patients with abnormal caloric responses exhibited higher scores in several DHI items and subscales (DHI-4, DHI-12, DHI-14, DHI-17, DHI-19, DHI-23, physical, emotional, functional, $p < 0.05$). No significant differences were found in cVEMP results. Only one SOT condition (equilibrium score 5) showed a statistically significant but weak association with DHI scores ($r = -0.151$, $p = 0.045$).

Conclusion: There were limited correlations between objective vestibular test outcomes and subjective dizziness disability. These findings underscore the multidimensional nature of dizziness and the importance of integrating subjective and objective measures for a comprehensive clinical assessment.

Keywords: Vestibular function tests, Dizziness handicap inventory, vestibular diseases

PP-11

MODERN METHODS OF DIAGNOSIS AND TREATMENT OF BENIGN PAROXYSMAL POSITIONAL VERTIGO IN MILITARY PERSONNEL

Dmytro Illich Zabolotnyi[1], **Iryna Anatoliivna Bieliakova**[1], **Daria Hennadiivna Fedorchenko**[1]
[1]*A.I. Kolomiychenko Institute of Otolaryngology of the National Academy of Medical Sciences of Ukraine*

The State Institution "O.S. Kolomiychenko Institute of Otolaryngology of the National Academy of Medical Sciences of Ukraine" is a scientific and medical centre equipped with the most modern medical equipment and aimed at diagnosing, examining, treating patients and military personnel with complaints of dizziness

Between February 2022 and December 2024, 3739 military personnel were examined. Patients complained about hearing disfunction, tinnitus, vertigo in the rotation form, swaying, falling, vertigo after the head and body change position, gait instability in the dark, nausea, headache, weakness, high fatigue, irritability. These complaints arose after suffering a mine-blast injury and acubarotrauma.

All military personnel underwent a comprehensive vestibulometric examinations. They included determination of statokinetic equilibrium, registration of spontaneous and positional nystagmus by video nystagmography, pendulum test, vestibulo-ocular reflex suppression test, video Head impulse Test, caloric test with an air system (the large number of military personnel with tympanic membrane perforation after acoustic trauma), experimental load tests, such as, rotational stimulation according to Barany and registration by video nystagmography.

Vertigo that occurred when changing the position of the head and body in space was diagnosed in 72% of the 3739 military personnels. Positional tests (Dix-Hallpike test, supine roll test) were performed to diagnose Benign paroxysmal positional vertigo (BPPV).

However, positional tests was not always possible to perform due to pathologies in the musculoskeletal system: diseases of the cervical and lumbar spine, post-traumatic spinal restrictions. Based on the listed restrictions, the TRV rehabilitation chair (Interacoustics, Denmark) was used for objective diagnosis, visualisation of the pathological process and further treatment.

This is a mechanical device that allows rotate the patient in all planes of the semicircular canals with simultaneous and accurate monitoring of eye movements by video nystagmography. There is also an option to fix the patient in a certain position for a detailed examination of each of the 6 semicircular canals. This facilitates the diagnosis of diseases and the detection of even discrete nystagmus, thereby increasing the sensitivity and specificity of the diagnostic method, and thus improving patient outcomes.

In the laboratory of clinical audiology and vestibulology from 2024 a TRV rehabilitation chair (Interacoustics, Denmark) was used, that greatly facilitated the diagnosis and treatment of BPPV in military personnel.

According to our results, 299 (8%) of the total number of patients (3739) were found BPPV, 200 (67%) – posterior semicircular canal involvement (otolithiasis of the posterior semicircular canal) was diagnosed, that characterised by nystagmus directed upwards and rotationally.

99 military personnel (33 %) had BPPV with the horizontal canal involved (otolithiasis of the horizontal semicircular canal), characterised by geotropic (directed to the ground) or apogeotropic (directed to the ceiling) nystagmus at supine position and the head turned to any side.

All military personnel underwent rehabilitation manoeuvres and received treatment, taking into account the detected pathology.

Conclusions: Thus, despite the benign nature of the disease, patients with BPPV are significantly limited in their daily activities. Although BPPV is quite easy to diagnose and in most cases can be treated with manoeuvres performed on an outpatient basis, there is a category of patients for whom these manoeuvres are contraindicated.

The rehabilitation chair helps not only to objectively diagnose and evaluate each of the 6 semicircular canals, but also to provide adequate treatment for military personnel with problems in all parts of the spine, as well as in case of multichannel lesions of the semicircular canals and frequent relapses.

Keywords: Benign paroxysmal positional vertigo (BPPV), military personnel, TRV rehabilitation chair

Figure: The number of examined military personnel

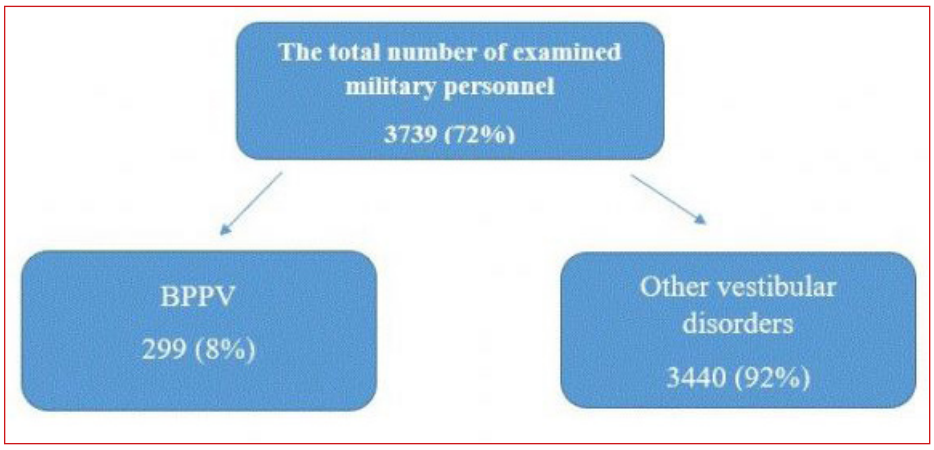
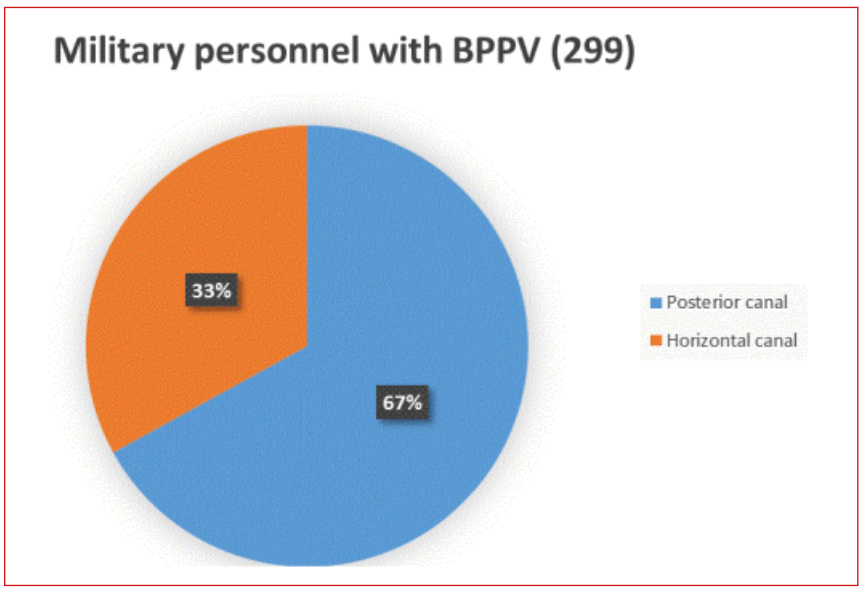


Figure: BPPV in military personnel



PP-12

TRIPLE TRIGGER IN THE PATHOGENESIS OF BILATERAL VESTIBULAR HYPOFUNCTION IN PATIENT WITH CI

Yakubova Diyora Oybekovna[1], **Sattarova Madina Gulamdjanovna**[1], **Karimova Nargiza Abdullayevna**[1], **Jakenova Saira Saira Saxepkereevna**[1,2]

[1]*Orl-hns Scientific Practical Center of Uzbekistan*

[2]*Ent Clinic Of Jakenova*

Bilateral vestibular hypofunction (VH) is characterized by a pronounced decrease in the function of the vestibular receptors of both labyrinths. Such patients suffer from impaired balance, which worsens in the dark or on a soft, uneven surface, and decreased clarity of vision when moving the head.

The purpose of our study is a 14-year-old child with severe instability and unsteadiness when walking after meningitis, caraccident and cochlear implantation.

Materials and Methods: The patient, born in 2010, complained of instability and pronounced swaying when walking. From the medical history, 6 months ago he suffered from bacterial meningitis - with severe headaches, persistent fever and coma for 1 week. After the disease, the child developed bilateral sensorineural deafness.A month after being discharged from the hospital, the boy gets into an accident. Only a year later the boy underwent a CI.

Results: The child came to the appointment with the support of his parents. General condition is satisfactory. Romberg's pose is unstable, the torso is deviated in different directions, Romberg's sensitized test is unstable, the Fukuda test is performed slowly, the torso is deviated in different directions.

Spontaneous nystagmus – absent, Head shaking test – nystagmus absent. There is no pathological nystagmus on the Dix-Hallpike Test.

V-HIT – THIEF subdued. LARP 0.20/0.23, RALP 0.23/0.12, lateral channels 0.16/0.26. Severe bilateral hypofunction of the vestibular apparatus. Halmagi test – Corrective saccade to the right and left.

Conclusion: these three undesirable pathogenetic factors caused severe bilateral hypofunction in this patient, which is difficult to compensate. Due to the risk of cochlear ossification following meningitis, CI could not be postponed. A triple trigger in the pathogenesis of CH: meningitis, a traffic accident and the post-CI condition led to a condition in the patient that made it difficult even to ride a bicycle.The patient has to undergo not only a course of auditory-speech, but also full-fledged vestibular rehabilitation.

Keywords: VH - Vestibular hypofunction, CI - cochlear implant, VOR - Vestibulo-ocular reflex,

Figure: RALP

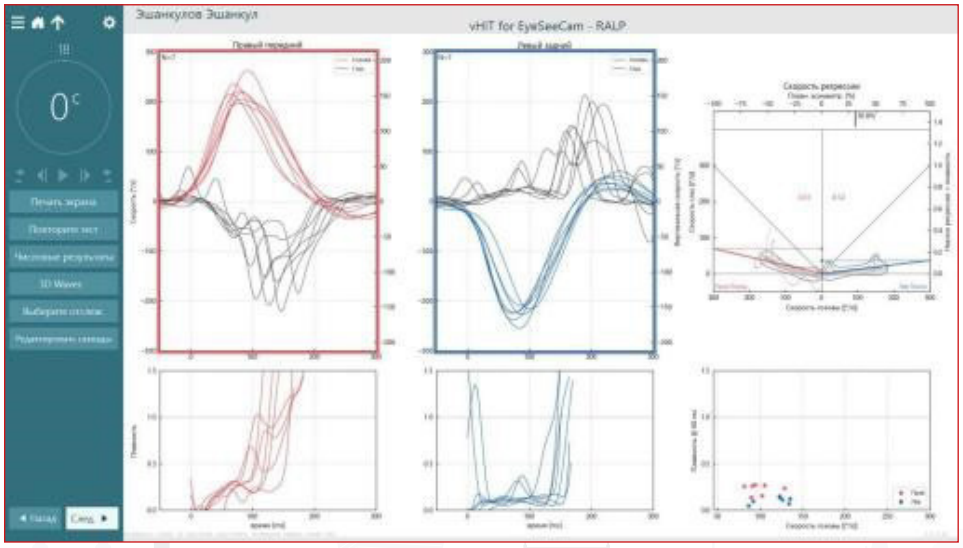
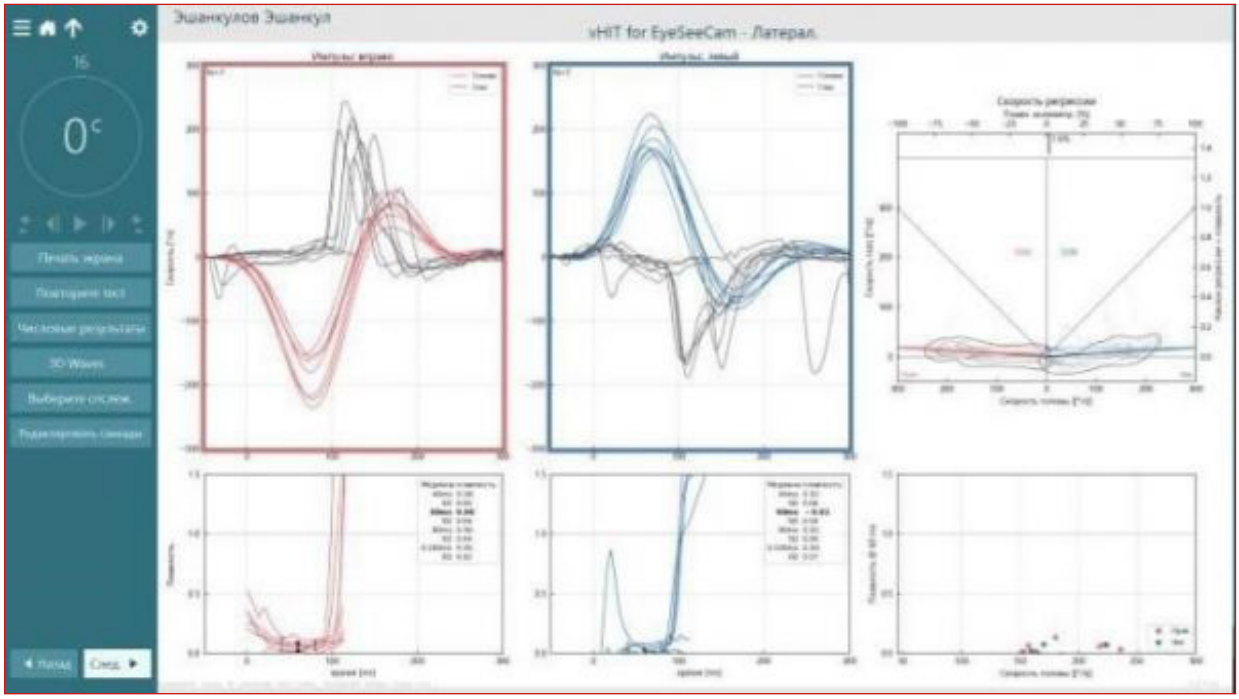


Figure: LATERAL



PP-13

VESTIBULAR AND OCULOMOTOR FUNCTION IN FIBROMYALGIA: INSIGHTS FROM V-HIT, VNG, AND DHI ASSESSMENTS

Emel Tahir[1], Asuman Küçüköner[1], Emre Demirel[1], Ahmet Kıvanç Cengiz[2]
[1]Ondokuz Mayıs University Dept of Otolaryngology
[2]Ondokuz Mayıs University Dept of Rheumatology

Objective: Fibromyalgia is a chronic condition associated with widespread pain and functional impairments, yet its impact on vestibular function remains underexplored. This study aims to evaluate vestibular and oculomotor functions in fibromyalgia patients using the video head impulse test (v-HIT), videonystagmography (VNG), and the Dizziness Handicap Inventory (DHI), comparing findings with a control group of age-matched, healthy individuals.

Methods: Prospective cohort study was conducted in a tertiary referral center and ermission for this study was obtained from Ondokuz Mayıs University Clinical Research Ethics Committee (OMUKAEK 2023-527), and informed consent was obtained from the patients. The study excluded individuals with known vestibule disease or complaints of vertigo/dizziness, neurological disease, vestibulosuppressant medication (benzodiazepines, antidepressants

Study Design and Participants: This cross-sectional study included 50 participants: 25 fibromyalgia patients diagnosed according to the American College of Rheumatology criteria and 25 age-matched healthy controls without dizziness complaints. Fibromyalgia patients were referred from a rheumatology clinic, while controls were hospital staff and university students.

Vestibular Assessment

- **Videonystagmography (VNG):** Visual Eyes™ (Interacoustics, Denmark) was used to evaluate spontaneous and positional nystagmus, saccades, optokinetics, and vestibulo-ocular reflex (VOR). Calibration was performed before tests, and eye movements were recorded during visual and vestibular stimuli.
- **Video Head Impulse Test (v-HIT):** Eye SeeCam VHIT (Interacoustics, Denmark) assessed VOR gains for all semicircular canals. Participants wore high-speed goggles, and 10 unpredictable head thrusts were performed in horizontal and vertical planes. VOR gains <0.8 or corrective saccades were considered abnormal.

Subjective Assessment: The Turkish version of the Dizziness Handicap Inventory (DHI) evaluated the impact of dizziness on quality of life. Scores ranged from 0 to 100, with higher scores indicating greater impairment.

Statistical Analysis

Data were analyzed using R Studio. Normality was assessed with Shapiro-Wilk tests. Parametric or nonparametric tests were applied accordingly, and $p<0.05$ was considered significant.

Results

- Fibromyalgia patients exhibited significantly reduced VOR gains across all canals, with pronounced deficits in lateral canal gains compared to controls ($p<0.05$).
- No pathological saccades or abnormal optokinetic or positional nystagmus were observed in either group in videonystagmography.
- DHI scores were significantly higher in fibromyalgia patients, indicating greater dizziness-related handicap ($p<0.05$).

Conclusion: This study demonstrates that fibromyalgia patients experience significant vestibular dysfunction, particularly in lateral canal VOR gains, and report a higher dizziness-related quality of life impairment. Fibromyalgia-related vestibular dysfunction could be attributed to altered muscle tension, connective tissue abnormalities, or small fiber neuropathy, which are known to affect sensory input from the semicircular canals. Additionally, chronic pain and stress may dysregulate the autonomic nervous system, further impacting vestibular function. These findings highlight the need for comprehensive vestibular assessment in fibromyalgia patients to address functional limitations and improve management strategies. Future studies should explore the underlying mechanisms linking fibromyalgia to vestibular deficits and assess the impact of targeted vestibular rehabilitation.

Keywords: Fibromyalgia, vestibular dysfunction, video head impulse test, dizziness handicap inventory, semicircular canals

References

Cervical and ocular vestibular evoked myogenic potentials in fibromyalgia syndrome patients. The Journal of International Advanced Otology, 20(3), 247-254. https://doi.org/10.5152/iao.2024.231269

Bayazıt, Y., Çelenk, F., Güçlü-Gündüz, A., Gündüz, B., Ondag, N., & Meray, J. (2010). Vestibular evoked myogenic potentials in patients with fibromyalgia syndrome. The Journal of Laryngology & Otology, 124(6), 610-615. https://doi.org/10.1017/s0022215110000010

Essam, M. (2023). Assessment of audiovestibular function in fibromyalgia patients. Egyptian Journal of Ear Nose Throat and Allied Sciences, 24(24), 1-9. https://doi.org/10.21608/ejentas.2023.233113.1673

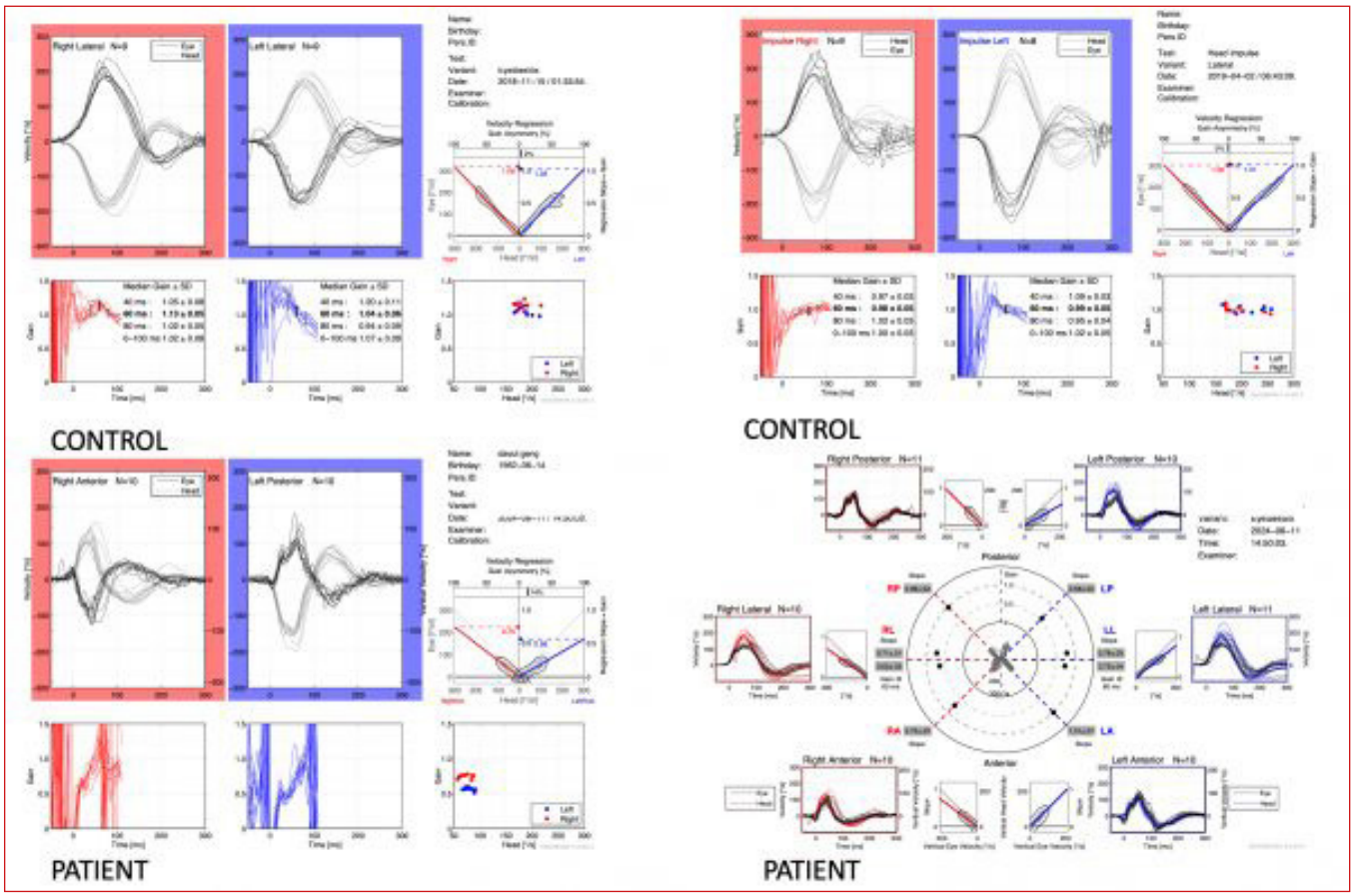
Hashimoto, K., Takeuchi, T., Ueno, T., Suka, S., Hiiragi, M., Yamada, M., ... & Hashizume, M. (2022). Effect of central sensitization on dizziness-related symptoms of persistent

postural-perceptual dizziness. Biopsychosocial Medicine, 16(1). https://doi.org/10.1186/s13030-022-00235-4

Matei, D. (2024). The efficiency of kinesiotherapy versus physical modalities on pain and other common complaints in fibromyalgia. Life, 14(5), 604. https://doi.org/10.3390/life14050604

Peinado-Rubia, A., Osuna-Pérez, M., Rodríguez-Almagro, D., Zagalaz-Anula, N., López-Ruiz, M., & Lomas-Vega, R. (2020). Impaired balance in patients with fibromyalgia syndrome: predictors of the impact of this disorder and balance confidence. International Journal of Environmental Research and Public Health, 17(9), 3160. https://doi.org/10.3390/ijerph17093160

Figure: abnormal vor gains



PP-14

SUBJECTIVE COMPLAINTS AND OBJECTIVE FINDINGS IN PATIENTS WITH VESTIBULAR SYMPTOMATOLOGY

Mario Petrov Milkov[1], Miroslav Stoykov Stoykov[1]
[1]*Medical University , Varna*

Aim: The aim of the following study is to analyze subjective complaints and objective findings in patients with vestibular symptomatology.

Material and Methods : For the aims of the following study, 134 patients aged between 8 and 87 years (84 female, 50 male) in the period 2021-2024, who visited the University medical and dental center, Medical University - Varna, were included. A specialized otorhinolaryngologic and a dental examination, focused on analyzing occlusion and TMJ disorders, were performed. All participants in the study were tested on a stabilometry platform, VNG and vHIT tests were executed. All patients filled in written informed consent, forms to share information about general diseases and allergies present, surgical interventions in the head and neck area, as well as written surveys, assessing their subjective vestibular complaints. Information gathered was statistically analyzed with SPSS version 23 (Chicago, IL, USA).

Results: Vestibular disorders were objectively detected in 79 (59%) of the 134 participants included in the study. The most frequently reported ($p<0.001$) subjective patients' complaints were vertigo (33.6%), dizziness (32.1%), gate instability (30.6%). The most frequently diagnosed ($p<0.001$) objective findings were vertigo (33.3%), dizziness (27.3%), staggering (27.1%). In most of the patients, more than one subjective complaint and objective finding appeared.

Discussion: A strong correspondence between the subjective complaints and objective findings was reported. All patients received personalized treatment plan and were called for re-assessment after at least 3 months.

Conclusion: Proper diagnosis of vestibular disorders is determined by the participation of interdisciplinary teams of specialists. In this way, patients receive an adequate treatment plan and better results from the therapy.

Keywords: vestibular disorders, subjective complaints, vertigo

PP-15

VESTIBULAR DEFFICIENCIES IN MODERATE AND SEVERE OBSTRUCTIVE SLEEP APNEA CASES

Mario Petrov Milkov[1], Miroslav Stoykov Stoykov[1]
[1]Medical University, Varna

Aim: The purpose of the study is to investigate the vestibular defficiencies in moderate and severe obstructive sleep apnea and snoring syndrome cases.

Materials and Methods: A total of 120 patients (85 male and 35 female) with symptoms of sleep apnea were examined in the period 01.2023–10.2024 in the University medical and dental center, Medical University - Varna, Bulgaria. The conducted examinations were: polygraphy (HSAT-Home sleep apnea test), video Head impulse test (vHIT), videonystagmography (VNG). All patients were examined by an otorhinolaryngologist and a physician in dental medicine. All patients filled out sleep assessment questionnaires, written informed consent forms, medications intake, general diseases and allergies present questionnaires.

Results: Patients with moderate and severe forms of the syndrome of obstructive sleep apnea and snoring (SOSAS) were more dizzier, more unsteady and with more changes in the gait than patients with only a vestibular disorder present. Treating SOSAS improved the present vestibular defficiencies in more than 75% of the patients examined. Men were affected by more severe forms of SOSAS than women.

Discussion: Untreated SOSAS has direct implications on the vestibular status of patients, expressing the symptomatology.

Conclusion: The syndrome of obstructive sleep apnea and snoring is the sleep disorder burden of the century. Adequate treatment restores the severely reduced quality of life (QoL) of the patients affected.

Keywords: obstructive sleep apnea, vestibular defficiencies

PP-16

POST-HEAD SHAKE NYSTAGMUS TO EVALUATE VESTIBULAR DISEASE

Mehmet Kadir Ercan[1,2], Osman Refik Ayata[2], Bengi Arslan[2], Andy J Beynon[1]
[1]Radboud University Medical Center
[2]Ankara Bilkent City Hospital

Aim and background: To show the relevance of post-head shake nystagmus in assessing previous vestibular pathologies. The head-shake (HS) maneuver as a screening test is a debatable topic in the literature. Many publications showed that HS is not a reliable test based on the variabilities among pathologies, and it has low sensitivity and specificity ratios, while others have claimed that HS can provide prominent information regarding asymmetry in the peripheral vestibular system and velocity storage mechanism.

Materials and Methods: Vestibular test results, including spontaneous nystagmus, post-head shake nystagmus records, caloric test, and video head impulse test (vHIT) were retrospectively analyzed in six patients. Data was obtained more than one visit after their initial vestibular complaints and consisted of spontaneous nystagmus, post-head shake nystagmus, and caloric test results (n=3) and additional vHIT results (n=3). A post-head shake nystagmus was defined as positive as at least 3 consecutive nystagmus with a slow phase velocity of > 5 degrees/second.

Results: Post-head shake nystagmus was positive in five patients, though no pathological results were found in the caloric test and vHIT outcomes. In one case, only overt saccades were present in vHIT in addition to positive post head shake nystagmus.

Discussion and Conclusion: Follow-up studies taking HS nystagmus into account during the period of recovery are limited in the literature. We presented six cases that showed resolved caloric weakness in one month. Post-HS nystagmus can be valuable in assessing previous vestibular asymmetry based on caloric and vHIT. This is the first report describing one month follow-ups suggesting that post-HS nystagmus can be used to prove the presence of a previous vestibular disease, despite normal caloric test or vHIT outcomes.

Keywords: post-head shake nystagmus, caloric test, video head impulse test

PP-17

A CLINICAL EVALUATION OF VESTIBULAR MIGRAINE AND ENDOLYMPHATIC HYDROPS OVERLAP

Zsuzsa Varga[1,2], Bence Bajor[1,2], Ákos Simon[1], Zsuzsanna Sevecsek[3], Szende Borbála Szabó[4], Anh Nguyet Nguyen[1,2]
[1]Bajcsy Hospital Budapest
[2]Ent House Budapest
[3]Central Hospital Of Northern Pest – Military Hospital, Department Of Otorhinolaryngology, Head And Neck Surgery, Budapest
[4]Heim Pal Children's Hospital, Budapest

Introduction: Vestibular migraine (VM) and endolymphatic hydrops (EH) are common causes of episodic vertigo with overlapping symptoms such as vertigo attacks, imbalance, nausea and auditory manifestations. The differentiation of VM and EH are often challenging due to the diversity of clinical appearance. The concomitant existence of the two is a genuine diagnostic dilemma. Advanced examination technologies and longitudinal follow-up can enhance the diagnostic accuracy of VM and EH.

Material and methods: We compared the clinical, audiological, neurotological findings and 3T MRI scans of the inner ear among patients with VM or probable VM and concurrent definite or probable EH. During the follow-up period, we used the diagnostic battery proposed by Chen to confirm or revise our initial diagnosis and treatment protocols.

Results: Between January and December 2024, a trial was conducted among eleven patients who were diagnosed with VM and EH overlap. In all cases, we documented recurrent episodes of dizziness, aural symptoms and headache. Audiometry confirmed hearing loss in eight patients. Video head impulse test showed impaired function in four cases. Caloric test was abnormal in eight patients. Radiological findings revealed endolymphatic hydrops in six cases. In two patients, the first line EH treatment protocol was successful. The initial EH or VM treatment regimen was revised for nine patients and converted to treat the other assumed condition, VM or EH. Despite MRI scans revealing EH for three patients, VM therapy led to the complete remission of symptoms. In two cases, combined VM and EH treatment resulted in effective symptom control.

Conclusion: VM and EH share certain clinical features, making the differential diagnosis a challenge in clinical practice. Precise diagnosis can greatly contribute to early treatment and provide better symptom control and quality of life.

Keywords: Vestibular migraine, endolymphatic hydrops, overlap

PP-18

EVALUATING OF LLM FOR VESTIBULAR REHABILITATION EDUCATION: COMPARING CHATGPT, GOOGLE GEMINI, AND CLINICIANS

Yael Arbel[1,2], Yoav Gimmon[3,4], Liora Shmueli[1]
[1]Bar-ılan University, Department of Management
[2]Clalit Health Services, Department of Physical Therapy
[3]Department of Physical Therapy, Faculty of Social Welfare & Health Studies, University of Haifa
[4]Department of Otolaryngology-head and Neck Surgery, Sheba Medical Center

Objective: This study aimed to compare the performance of two large language models, ChatGPT and Google Gemini, against experienced physical therapists and students in responding to multiple-choice questions related to vestibular rehabilitation. The study further aimed to assess the accuracy of ChatGPT's responses by board-certified otoneurologists.

Methods: This study was conducted among 30 physical therapist professionals experienced with VR (vestibular rehabilitation) and 30 physical therapist students. They were asked to complete a vestibular knowledge test (VKT) consisting of 20 multiple-choice questions that were divided into three categories: (1) Clinical Knowledge, (2) Basic Clinical Practice, and (3) Clinical Reasoning. ChatGPT and Google Gemini were tasked with answering the same 20 VKT questions. Three board-certified otoneurologists independently evaluated the accuracy of each response using a 4-level scale, ranging from comprehensive to completely incorrect.

Results: ChatGPT outperformed Google Gemini with a 70% score on the VKT test, while Gemini scored 60%. Both excelled in Clinical Knowledge scoring 100% but struggled in Clinical Reasoning with ChatGPT scoring 50% and Gemini scoring 25%. According to three otoneurologic experts, ChatGPT's accuracy was considered «comprehensive» in 45% of the 20 questions, while 25% were found to be completely incorrect. ChatGPT provided «comprehensive» responses in 50% of Clinical Knowledge and Basic Clinical Practice questions, but only 25% in Clinical Reasoning.

Conclusion: Caution is advised when using ChatGPT and Google Gemini due to their limited accuracy in clinical reasoning. While they provide accurate responses concerning Clinical Knowledge, their reliance on web information may lead to inconsistencies. ChatGPT performed better than Gemini. Healthcare professionals should carefully formulate questions and be aware of the potential influence of the online prevalence of information on ChatGPT's and Google Gemini's responses. Combining clinical expertise and clinical guidelines with ChatGPT and Google Gemini can maximize benefits while mitigating limitations. The results are based on current models of ChatGPT3.5 and Google Gemini. Future iterations of these models are are expected to offer improved accuracy as the underlying modeling and algorithms are further refined.

Keywords: Therapeutics

PP-19

PRELIMINARY VESTIBULAR FINDINGS OF POSTURAL ORTHOSTATIC TACHYCARDIA SYNDROME: A CASE REPORT

Özlem Ertuğrul[1], **Merve Torun Topçu**[2], **Emirhan Ceviken**[1,3], **M. Tayyar Kalcioglu**[1,3]

[1]*Goztepe Prof. Dr. Suleyman Yalcin City Hospital, Ent Department, Istanbul, Türkiye*

[2]*Istanbul Medeniyet University, Faculty of Health Sciences, Department of Audiology, Istanbul, Türkiye*

[3]*Istanbul Medeniyet University, Faculty of Medicine, Department of Otorhinolaryngology, Istanbul, Türkiye*

Introduction: A 13-year-old female presented to our clinic with a primary complaint of brief dizziness. Her medical history included episodes of 2-3 second dizziness, blurred vision, and diplopia upon sudden standing. Notably, the patient had been actively involved in kickboxing for four years.

Clinical Findings: Vestibulospinal examination revealed bilateral ataxia during both eye-open and eye-closed walking tests. Other vestibulospinal tests, including Romberg, sharpened Romberg, Unterberger, and one-legged standing tests, were unremarkable.

Neuro-otological assessments encompassed oculomotor testing, spontaneous nystagmus, post-head shake nystagmus, Dix-Hallpike maneuver, Roll test, saccadicometry, and video head impulse testing (vHIT).

Oculomotor findings included low gain on optokinetic testing at 40 degrees per second. Saccadicometry revealed,normal prosaccades but prolonged left latency on antisaccades with a 13% directional error rate. Spontaneous nystagmus without fixation demonstrated 7 degrees of upbeat nystagmus. Post-head shake nystagmus exhibited horizontal nystagmus beating to the right followed by vertical nystagmus.

Dix-Hallpike and Roll tests consistently elicited vertical nystagmus in all positions. vHIT demonstrated normal gain across all channels.

Prior Investigations: The patient underwent prior evaluations by Pediatric Neurology, Internal Medicine, and Pediatric Cardiology. EEG, echocardiogram, and cranial/temporal MRI results were all within normal limits. A tilt table test performed by Pediatric Cardiology suggested a diagnosis of Postural Orthostatic Tachycardia Syndrome (POTS).

Discussion: POTS is a condition characterized by a significant increase in heart rate (≥30 beats/minute or >120 beats/minute) within 10 minutes of standing. While primarily a cardiovascular disorder, POTS frequently presents with dizziness, including vertigo-like symptoms. This association has been attributed to hypoperfusion of the vestibular pathways and impaired vestibulo-autonomic connectivity(1).

Conclusion: In this case, the patient presented with a constellation of symptoms suggestive of POTS, including dizziness and likely vestibular dysfunction. Given the findings, recommendations included lifestyle modifications and further evaluation to assess otolith function and monitor disease progression.

Keywords: Postural orthostatic tachycardia syndrome, vertigo, dizziness

PP-20

POTENTIAL MIGRAINE IMPACT ON MÉNIÈRE'S DISEASE REGARDING DEMOGRAPHICS AND ENDOTYPES

Kuei-You Lin[1], **Steven D. Rauch**[2]

[1]*Shin Kong Wu Ho-Su Memorial Hospital, Department of Otolaryngology, Taiwan*

[2]*Massachusetts Eye and Ear, Department of Otolaryngology-Head and Neck Surgery, United States*

Objective: The close relationship between migraine and Ménière's disease has been noticed for long since it was first described in 1861. In hope to better appreciate migraine in Ménière's disease, this study aims to investigate the potential roles of migraine in Ménière's disease of different endotypes based on clinical comparisons.

Methods: With the 2015 criteria, 1128 patients with Ménière's disease visited by an experienced neurotologist in Mass Eye and Ear were included. According to the disease laterality with the additional consideration of concurrent migraine headache, the enrolled patients were divided and received demographic comparisons. Among the included patients, 223 with available temporal bone high-resolution CT additionally underwent radiological measurements of the angular trajectory of vestibular aqueduct to determine the disease endotypes. The endotype distribution among pathologic ears were then analyzed considering the migraine concomitance in Ménière's attacks or not.

Results: In patients with Ménière's disease, the migrainous group demonstrated a female-to-male ratio of 1.76:1. The female preponderance was especially obvious in unilateral migrainous Ménière's disease. On the other hand, the patients with unilateral non-migrainous Ménière's disease were significantly older (50 ± 14 years) than all the other included groups. In terms of the disease endotype, the bilateral nonmigrainous Ménière's disease group demonstrated 53% and 39% of degenerative and hypoplastic features, significantly different from the other groups. Additionally, migraine headache was more noticed in the Ménière's ears with endotypes of degenerative (22%) than hypoplastic (9%) features.

Conclusions: As a neurologic disease, migraine could affect Ménière's disease via disturbing the inner-ear homeostasis locoregionally and distorting the audiovestibular symptoms centrally. During managing Ménière's disease, better treatment quality would be achieved with additional appreciation of migraine.

PP-21

ESTIMATION OF PARTICLE LOCALIZATION WITH ZUMA MANEUVER IN APOGEOTROPIC VARIANT OF HORIZONTAL SEMICIRCULAR CANAL BENIGN PAROXYSMAL POSITIONAL VERTIGO

Asuman Feda Bayrak[1]
[1]Atatürk EAH, İzmir Kulak Burun Boğaz Kliniği

Aim: To estimate the localization of otoliths by observing nystagmus patterns during the zuma maneuver in patients with apogeotropic variant of horizontal canal benign paroxysmal positional vertigo (HC-BPPV)

Material Method: Among the patients we followed in the vertigo outpatient clinic and diagnosed with BPPV using videonystagmography (VNG), we identified those with HC apogeotropic variant. Of the 19 patients, 7 were male and 12 were female. The left ear was affected in 11 patients and the right ear was affected in 8. After the Roll test, Bow and Lean tests were applied to determine the affected ear. Nystagmus patterns were monitored with VNG while the patients underwent the repositioning Zuma maneuver. The Zuma maneuver is performed with patients in the sitting position. First, the patient is asked to quickly lie down on the affected side (step I) and is held in this position for 3 minutes. Then, the patient's head is rotated 90° toward the ceiling (step II) and held in this position for another 3 minutes. After 3 minutes, the patient moves the body into dorsal decubitus and the head is turned 90° toward the unaffected side (step III) and held in this position for another 3 minutes. Finally, the patient's head is tilted slightly forward (step IV), followed by a slow return of the patient to the sitting position (step V).

Results: The left ear was affected in 11 of 19 patients, and there was horizontal apogeotropic nystagmus beating to the right in the Roll test.

The right ear was affected in 8 patients and there was horizontal apogeotropic nystagmus beating to the left in the roll test.

In 2 patients who had transient apogeotropic nystagmus in the step 1 during the zoom maneuver for the left ear, the nystagmus changed direction in the step 2 and showed a geotropic form in the step 3.

In 2 patients who had transient apogeotropic nystagmus in the step 1 during the zoom maneuver for the right ear, the nystagmus changed direction in the step 2 and showed a geotropic form in the step 3.

During the zoom maneuver applied to 2 patients for the right ear and 2 patients for the left ear, the transient horizontal apogeotropic nystagmus seen in the step 1 changed direction in the step 2 and ended as a transient geotropic form in the step 3.

Patients with persistent horizontal apogeotropic nystagmus in the step 1 during the Zuma maneuver were considered to have cupulolithiasis (6 patients for the right ear and 8 patients for the left ear). These patients who ended with apogeotropic form in the step 3 were evaluated as having utricular side cupulolithiasis. In one patient with left ear involvement, persistent apogeotropic nystagmus was observed in the step 1 and transient geotropic nystagmus in the step 3, and this was evaluated as canalicular side cupulolithiasis.

Discussion: Ramos et al suggested that we can assume where the otoliths are located in horizontal canal BPPV apogeotropic nystagmus using the Zuma maneuver. In this study, we tried to estimate the localization of otoliths while treating patients with horizontal canal BPPV apogeotropic nystagmus by applying the Zuma maneuver. Knowing the location of otoliths within the semicircular canal may be beneficial in terms of patient follow-up and treatment. We found utricular side cupulolithiasis in the majority of our cases. Similarly, a previous study suggested that utricular side cupulolithiasis may be more common than canal side cupulolithiasis and canalithiasis in the anterior arm of HC.

Conclusion: The localization of otoliths can be estimated by observing nystagmus during the Zuma maneuver.

References

1. Zuma e Maia F. New Treatment Strategy for Apogeotropic Horizontal Canal Benign Paroxysmal Positional Vertigo. Audiol Res. 2016 Nov 24;6(2):163. doi: 10.4081/audiores.2016.163.
2. Ramos BF, Cal R, Brock CM, Mangabeira Albernaz PL, Zuma e Maia F. Apogeotropic variant of horizontal semicircular canal benign paroxysmal positional vertigo: Where are the particles? Audiol Res. 2019 Aug 29;9(2):228. doi: 10.4081/audiores.2019.228.
3. Shim DB, Ko KM, Lee JH, Park HJ, Song MH. Natural history of horizontal canal benign paroxysmal positional vertigo is truly short. J Neurol. 2015 Jan;262(1):74-80. doi: 10.1007/s00415-014-7519-0.

SUPPORTED COMPANIES

Meeting Sponsor

Abbott

Exhibitors

Abbott

Abbott

NeuroEquilibrium Diagnostic Systems Pvt. Ltd.

Neuro Equilibrium

Mediszintech Audiológia Kft.

VIRTUALIS

Interacoustics

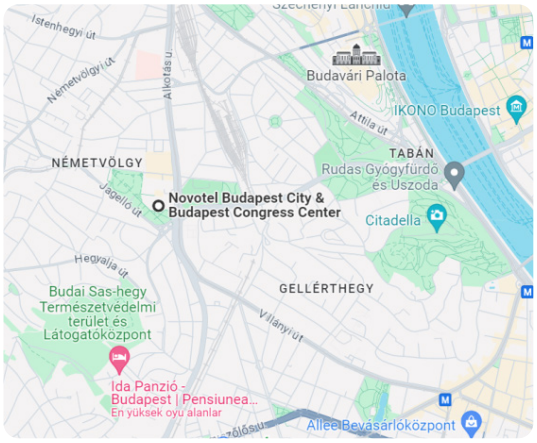
Equidor Medtech

equidor medtech

GENERAL INFORMATION FOR MEETING VENUE

Meeting Venue (Headquarter Hotel)

Venue name and location
NOVOTEL BUDAPEST CITY & BUDAPEST CONGRESS CENTER (BCC)
Address Hotel: H-1123 Budapest, Alkotás u. 63-67
Congress Center: H-1123 Budapest, Jagelló u. 1–3.
Website: www.bcc.hu



Novotel Budapest City & Budapest Congress Center is located in the heart of the main business, culture and entertainment district of Budapest.

The hotel is just a 20-minute drive from the Vaci utca pedestrian street in the center of Budapest.

The hotel has good connections to Budapest Ferenc Liszt International Airport.

The distance between the Hotel and the Budapest Ferenc Liszt International Airport is 24,2 km.

Access map to the venue:

VISITOR INFORMATION

Languages of Budapest: The official language is Hungarian, while visitors from abroad can use English to communicate.

Currency: Hungarian Forint (HUF)

Weather: In April, Budapest typically experiences mild spring weather. Average daytime temperatures range from about 10°C (50°F) to 18°C (64°F). Nights can be cooler, with temperatures dropping to around 5°C to 10°C (41°F to 50°F). Rainfall is moderate, so you might encounter some rainy days. Overall, it›s a pleasant time to visit, with blooming flowers and fewer tourists compared to the summer months.

Electricity: Budapest's electric power supply follows the European standard:
Voltage: 230 V
Frequency: 50 Hz
Plug Type: Type C (Europlug) and Type F (Schuko)

If you're traveling to Budapest, ensure that your devices are compatible with this voltage and plug type, or bring an appropriate adapter and voltage converter if necessary.

Emergency Numbers: In Budapest, Hungary, the main emergency numbers you need to know are:
General Emergency : 112
(This is the European emergency number, which you can call for police, fire, or medical emergencies)
Ambulance : 104
Fire Department : 105
Police : 107
These numbers are toll-free and can be dialed from any phone, including mobile phones, without the need for a prefix.

Taxi Stands: Located at airports, train stations, and busy city areas.
Hailing on the Street: You can hail a taxi on the street; make sure it's a licensed oneç Booking: You can book a taxi by phone or through mobile apps.

GETTING TO BUDAPEST

By Plane (Carries)

Wizz Air: https://wizzair.com/
Ryanair: https://www.ryanair.com/
Lufthansa: https://www.lufthansa.com/
British Airways: https://www.britishairways.com/
Air France: https://www.airfrance.com/
KLM Royal Dutch Airlines: https://www.klm.com/
Austrian Airlines: https://www.austrian.com/
LOT Polish Airlines: https://www.lot.com/
Turkish Airlines: https://www.turkishairlines.com/
Emirates: https://www.emirates.com/
Qatar Airways: https://www.qatarairways.com/
Finnair: https://www.finnair.com/
Swiss International Air Lines: https://www.swiss.com/
Brussels Airlines: https://www.brusselsairlines.com/

International Airport

• Budapest Ferenc Liszt International Airport (BUD): Located about 16 kilometers southeast of Budapest city center.

• Flights to Budapest: Direct flights from major European cities, including London, Paris, Berlin, Rome, Istanbul and Barcelona, as well as intercontinental flights from North America, Asia, and the Middle East.

Airport Transfer Options

• Airport Shuttle: Shared shuttle services and private transfers are available from the airport to the city center.

Important Note: *Roundtrip transfer Budapest Ferenc Liszt Airport - Novotel Hotel- Budapest Ferenc Liszt Airport can be provided for participants who received the accommodation service* ***from Serenas Group (Official Agent of the VAI Meeting) together with announced accommodation fees.***

• Public Transport: Bus 100E connects the airport to Deák Ferenc Square in central Budapest.
• Taxi and Ride-Sharing: Taxis and ride-sharing services are readily available at the airport.

By Train

International Trains:

• **From Vienna, Austria:** Direct trains run frequently between Vienna and Budapest (duration approximately 2.5-3 hours).
• **From Prague, Czech Republic:** Direct trains connect Prague and Budapest (duration around 6-7 hours).
• **From Bratislava, Slovakia:** Direct trains from Bratislava to Budapest (duration approximately 2-2.5 hours)
• **From Munich, Germany:** There are direct train connections from Munich to Budapest (duration around 6-7 hours).

Domestic Trains:

• From other Hungarian cities: Budapest is well-connected by rail to major cities within Hungary, including Debrecen, Szeged, and Pécs.

Train Stations in Budapest
· **Keleti (Eastern) Railway Station:** Main international and domestic hub located in Pest.
· **Nyugati (Western) Railway Station:** Another major station, located close to the city center in Pest.
· **Déli (Southern) Railway Station:** Situated in Buda, serves regional and some international routes.

By Car

From Nearby Countries:
· **From Vienna, Austria:** Drive along the E60/A4 highway, approximately 2.5-3 hours.
· **From Bratislava, Slovakia:** Take the E75/D2 highway, around 2 hours.
· **From Prague, Czech Republic:** Via the D1 and E65 highways, approximately 5-6 hours.
· **From Munich, Germany:** Drive via the A94 and A3 highways, around 6-7 hours.

Distance from Budapest to the main European cities:
1. **Vienna, Austria:** Approximately 250 kilometers (155 miles) to the west.
2. **Prague, Czech Republic:** Approximately 525 kilometers (326 miles) to the northwest.
3. **Berlin, Germany:** Approximately 770 kilometers (478 miles) to the north.
4. **Bratislava, Slovakia:** Approximately 200 kilometers (124 miles) to the northwest.
5. **Warsaw, Poland:** Approximately 550 kilometers (342 miles) to the northeast.
6. **Rome, Italy:** Approximately 1,220 kilometers (758 miles) to the southwest.
7. **Paris, France:** Approximately 1,350 kilometers (839 miles) to the west.
8. **Madrid, Spain:** Approximately 2,400 kilometers (1,491 miles) to the southwest.
9. **London, United Kingdom:** Approximately 1,600 kilometers (994 miles) to the northwest.
10. **Athens, Greece:** Approximately 1,050 kilometers (652 miles) to the southeast.

These distances are approximate and can vary depending on the specific route taken and mode of transportation (e.g., car, train, or plane).

VISA INFORMATION

Visa Regime for Entering to Hungary

Please click for Ministry of Foreign Affairs of the Republic of Hungary:
https://2015-2019.kormany.hu/en/ministry-of-foreign-affairs-and-trade/contacts

Visitors to Hungary must obtain a Visa from one of the Hungarian diplomatic missions unless they come from one of the visa exempt countries.

Embassies in Hungary

United States: Szabadság tér 12, 1054 Budapest
· Phone: +36 1 475 4400
· Website: hu.usembassy.gov

United Kingdom: Füge utca 5-7, 1022 Budapest
· Phone: +36 1 266 2888
· Website: www.gov.uk/world/hungary

Germany: Úri utca 64-66, 1014 Budapest
· Phone: +36 1 488 3500
· Website: budapest.diplo.de

France: Lendvay utca 27, 1062 Budapest
· Phone: +36 1 374 1100
· Website: hu.ambafrance.org

Italy: Stefánia út 95, 1143 Budapest
· Phone: +36 1 460 6200
· Website: ambbudapest.esteri.it

Canada: Ganz utca 12-14, 1027 Budapest
· Phone: +36 1 392 3360
·Website: www.canadainternational.gc.ca/hungary-hongrie

Australia: Királyhágó tér 8-9, 1126 Budapest
· Phone: +36 1 457 9777
· Website: hungary.embassy.gov.au

Spain: Eötvös utca 11/B, 1067 Budapest
· Phone: +36 1 269 5050
· Website: exteriores.gob.es/Embajadas/Budapest

Russia: Bajza utca 35, 1062 Budapest
· Phone: +36 1 332 0166
· Website: hungary.mid.ru

China: Benczúr utca 18, 1068 Budapest
· Phone: +36 1 413 2400
· Website: hu.china-embassy.gov.cn

Japan: Zugligeti út 57, 1125 Budapest
· Phone: +36 1 398 3100
· Website: www.hu.emb-japan.go.jp

India: Búzavirág utca 14, 1025 Budapest
· Phone: +36 1 325 7742
· Website: www.eoibudapest.gov.in

Brazil: Verecke út 79, 1025 Budapest
· Phone: +36 1 326 2888
·Website:www.gov.br/mre/pt-br/embaixada-budapeste

South Korea: Rézmál utca 6, 1021 Budapest
· Phone: +36 1 462 3050
· Website: overseas.mofa.go.kr/hu-en/index.do

Turkey: Benczúr utca 16, 1068 Budapest
· Phone: +36 1 413 3810
· Website: budapest.be.mfa.gov.tr

Sweden: Kapisztrán tér 8-9, 1014 Budapest
· Phone: +36 1 460 7000
· Website: swedenabroad.se/en/embassies/hungary-budapest

Netherlands: Szabadság tér 7, 1054 Budapest
· Phone: +36 1 301 4950
· Website: netherlandsandyou.nl/your-country-and-the-netherlands/hungary

Switzerland: Benczúr utca 16, 1068 Budapest
· Phone: +36 1 460 7020
· Website: eda.admin.ch/countries/hungary

ABOUT BUDAPEST, HUNGARY

Hungary, nestled in the heart of Central Europe, is a country renowned for its rich history, vibrant culture, and stunning landscapes. From the grandeur of Budapest, its capital city split by the Danube River, to the tranquil beauty of Lake Balaton, Europe's largest freshwater lake, Hungary offers diverse experiences for visitors.

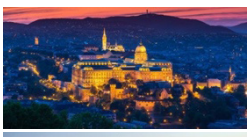
Historically, Hungary has been at the crossroads of Europe's major civilizations, shaping its unique identity. The country's heritage is reflected in its architecture, with medieval towns like Szentendre and Eger preserving their historic charm alongside magnificent palaces and cathedrals. Culturally, Hungary is celebrated for its classical music tradition, including composers like Franz Liszt and Béla Bartók, and its folk traditions, such as vibrant festivals and intricate handicrafts.

Hungarian cuisine is also a highlight, with dishes like goulash, paprika-spiced stews, and hearty pastries delighting palates worldwide. Nature lovers are drawn to Hungary's diverse landscapes, from the rolling hills of the wine-growing regions to the forested hills of the Bükk and Mátra Mountains. Thermal baths, a legacy of the country's Ottoman and Roman past, provide relaxation and rejuvenation in places like Széchenyi and Hévíz. Today, Hungary is a member of the European Union, contributing dynamically to regional politics, economics, and culture. Its warm hospitality and rich tapestry of experiences make Hungary a captivating destination for travelers seeking both history and modernity in a European context.

Hungary is a landlocked country located in Central Europe, bordered by Slovakia to the north, Ukraine to the northeast, Romania to the east, Serbia to the south, Croatia and Slovenia to the southwest, and Austria to the west. Its capital and largest city is Budapest, situated along the Danube River.

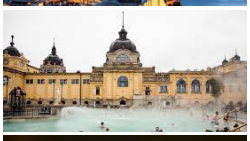
The country covers an area of approximately 93,000 square kilometers (35,900 square miles) and is known for its diverse landscapes. The Great Hungarian Plain (Alföld) dominates the eastern part of the country, characterized by flat, fertile plains ideal for agriculture. To the north, the landscape becomes hillier and more mountainous, particularly near the border with Slovakia and Austria. The highest point in Hungary is Kékes Mountain, reaching 1,014 meters (3,327 feet) above sea level.

Hungary's strategic location in Central Europe has historically shaped its cultural and economic development. The country has a rich cultural heritage, influenced by its history as part of the Austro-Hungarian Empire and its later independence. Today, Hungary is a member of the European Union and plays a significant role in regional politics and economics. In summary, Hungary's map reflects a diverse terrain with plains, hills, and mountains, while its central location in Europe positions it as a crossroads of history, culture, and commerce.

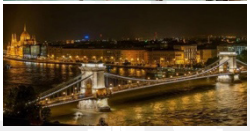


Buda Castle and Castle Hill: Explore the historic Buda Castle complex, including the Royal Palace, Matthias Church, and Fisherman›s Bastion, offering stunning panoramic views of the city.

Parliament Building: Admire the Gothic Revival architecture of Hungary›s Parliament, situated along the Danube River and illuminated beautifully at night.



Széchenyi Thermal Bath: Relax in Europe›s largest medicinal bath complex, featuring outdoor and indoor pools, saunas, and therapeutic spa treatments.



Chain Bridge: Walk or drive across Budapest's iconic Chain Bridge, connecting Buda and Pest, and enjoy spectacular views of the Danube River and cityscape.

HISTORY AND CULTURE IN BUDAPEST

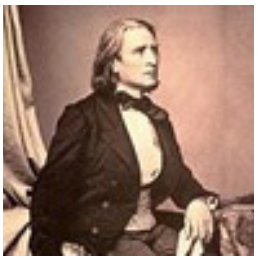
Budapest, the dynamic capital of Hungary, stands as a testament to a rich tapestry of history and culture. Nestled along the scenic banks of the Danube River, this city has been shaped by over a millennium of events and influences, evolving into a vibrant hub in the heart of Europe.

Budapest's history unfolds like a chronicle of Central Europe's tumultuous past. It traces its origins back to Roman times when the settlement of Aquincum thrived as a key outpost of the Roman Empire. In the medieval period, Buda and Pest emerged as separate towns on opposite sides of the Danube, with Buda becoming a royal seat and Pest a bustling trade center.

The city endured Ottoman rule for about 150 years starting from the mid-16th century, leaving behind a legacy of thermal baths that remain popular attractions today, such as Széchenyi and Gellért Baths. The Habsburg era saw Budapest flourish as a vital part of the Austro-Hungarian Empire, undergoing significant urban development and modernization.

Culturally, Budapest is a melting pot of architectural styles, arts, and traditions. Gothic and Baroque churches stand alongside elegant Art Nouveau buildings, showcasing the city's diverse architectural heritage. The Hungarian State Opera House and the grandeur of Heroes' Square exemplify Budapest's love for music and the arts. The city's cultural scene is enriched by museums like the Hungarian National Museum, which preserves the nation's history through its extensive collections, and contemporary galleries such as the Ludwig Museum of Contemporary Art. Budapest's culinary delights, from hearty goulash to sweet pastries, reflect its warm hospitality and culinary traditions found in bustling markets like the Great Market Hall.

Famous People from Hungary



Ferenc Liszt
Renowned composer and virtuoso pianist, known for his contributions to Romantic music.

John von Neumann
Mathematician, physicist, and computer scientist who made fundamental contributions to mathematics, quantum mechanics, and computing.

Magda Szabó
Renowned novelist and playwright, known for works like "The Door" and "Abigail."

Imre Kertész
Nobel Prize-winning author known for his writings about the Holocaust and totalitarian regimes.

CORRESPONDENCE

Scientific Secretary

Enis Alpin Güneri, M.D
E-mail : scientific@vai2025.org

Scientific Consultant

Herman Kingma, M.D
E-mail : scientific@vai2025.org

Organizing Secretary

Tuncay OZCELIK, M.D.
E-mail : info@vai2025.org

Local Committee

Imre Gerlinger, M.D.
E-mail : info@vai2025.org

Organizing Secretariat

Serenas International Tourism Congress Org. Inc.
Turan Gunes Bulvari 5. Cadde No: 13 06550 Yildiz, Ankara, Turkey
Phone : +90 312 440 50 11
E-mail : vertigo@serenas.com.tr or info@vai2025.org

INDEX OF ABSTRACT AUTHORS

INDEX OF ABSTRACT AUTHORS

INTERNATIONAL FEDERATION OF OTORHINO LARYNGOLOGICAL SOCIETIES

IFOS

ifostanbul

September 09-13, 2026

XXIII. WORLD CONGRESS of OTORHINOLARYNGOLOGY

Innovation, Artificial Intelligence, Global Diversity

SERENAS GROUP

ifosistanbul2026.org

info@ifosistanbul2026.org

Abbott

MTP2347751


Vertigo Academy International
A Trademark of International Vestibular Society