Minimum Stimulus Strategy in the diagnosis of BPPV

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Learner Outcomes

•After this course, participants will be able to describe horizontal canal BPPV (both geotropic and apogeotropic variants) from the upright position.

•After this course, participants will be able to describe posterior canal BPPV from the upright position.

•After this course, participants will be able to describe multicanal BPPV from the upright position.

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Acknowledgments

Prof. Giacinto Asprella Libonati

Dr. Salvatore Martellucci

Dr. Pasquale Malara

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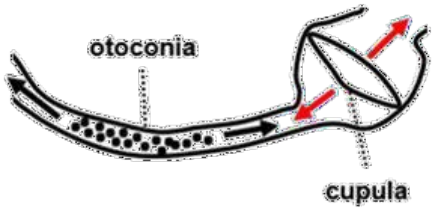
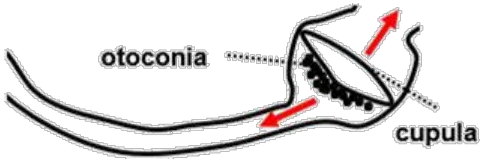
BPPV

- BPPV is the most common vestibular disorders, characterized by **brief vertigo spells triggered by head position changes** with abrupt onset and rapid decrease.

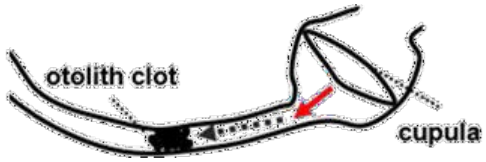
- BPPV is ascribed to **otoconia dislodging from utricular macula**



- **Canalolithiasis:** otoconia are free to float back and forth along the canal ➔ **paroxysmal direction-changing nystagmus**



- **Cupulolithiasis:** otoconia adhere to the cupula overloading the cupula itself ➔ **persistent direction-changing nystagmus with a neutral point**



- **Canalith jam:** otolith clot entirely or partially entrapped in the canal lumen generating persistent endolymphatic flows ➔ **either spontaneous nystagmus or persistent direction-fixed positional nystagmus**

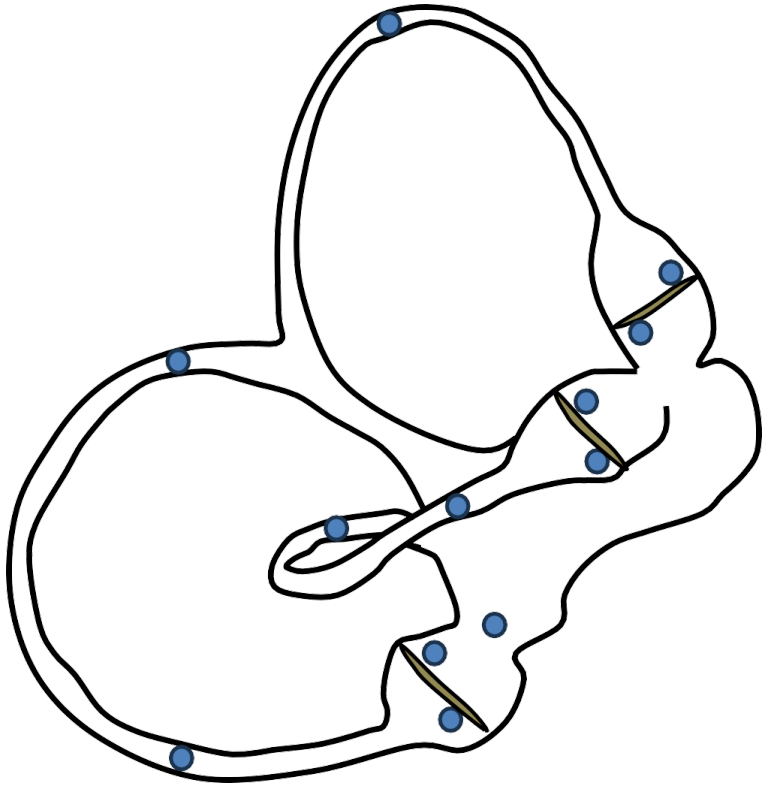
BPPV

A common disorder is not an easy disorder

- **Common variants**
  - PSC BPPV (geotropic variant)
  - HSC BPPV (geotropic and apogeotropic variant)
  - HSC cupulolithiasis

- **«Atypical variants»**
  - PSC cupulolithiasis
  - BPPV associated to positional down-beating ny
    - ASC BPPV
    - Apogeotropic variant of PSC BPPV
  - Sitting up vertigo
  - Canalith Jam

- **Multicanal BPPV**



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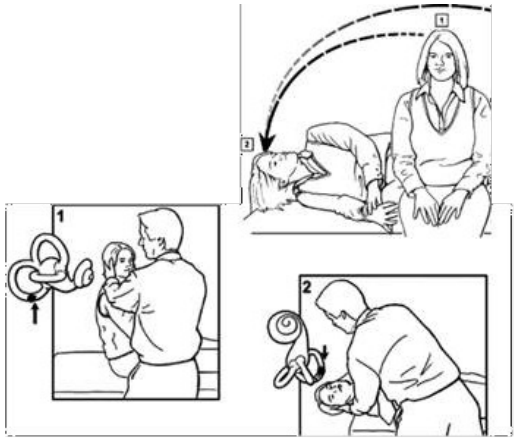
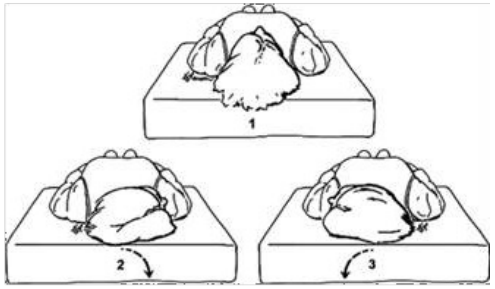
BPPV – diagnostic strategies

The diagnosis of BPPV includes
detection of the **affected ear**
detection of the **involved canal and arm**

TRADITIONAL APPROACH

Testing each semicircular canal with the traditional diagnostic maneuvers





MINIMUM STIMULUS STRATEGY

Diagnosis and treatment with the least possible amount of maneuvers

NYSTAGMUS-GUIDED APPROACH
minimally invasive tests

The key point is
UPRIGHT BPPV PROTOCOL

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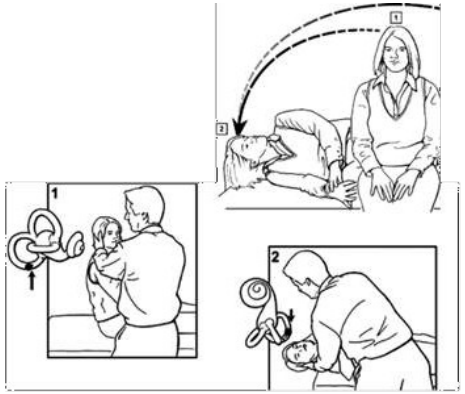
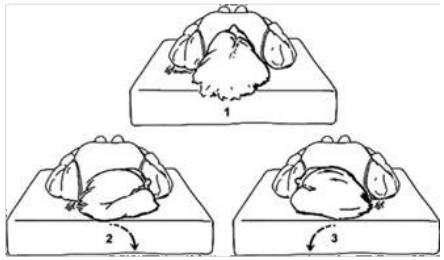
Traditional approach

- It is based on **positioning tests**, also known as **diagnostic maneuvers**.
- Diagnostic maneuvers move free-floating debris which bend the affected SC cupula by using
  - **gravity**
  - **inertial/centrifugal forces**
- Several maneuvers have been proposed to properly diagnose each BPPV variant **moving the patient's head along the plane of the examined SC.**





Clinical Practice Guideline

AMERICAN ACADEMY OF OTOLARYNGOLOGY–HEAD AND NECK SURGERY FOUNDATION

Clinical Practice Guideline: Benign Paroxysmal Positional Vertigo (Update)

Neil Bhattacharyya, MD[1], Samuel P. Gubbels, MD[2], Seth R. Schwartz, MD, MPH[3], Jonathan A. Edlow, MD[4], Hussam El-Kashlan, MD[5], Terry Fife, MD[6], Janene M. Holmberg, PT, DPT, NCS[7], Kathryn Mahoney[8], Deena B. Hollingsworth, MSN, FNP-BC[9], Richard Roberts, PhD[10], Michael D. Seidman, MD[11], Robert W. Prasaad Steiner, MD, PhD[12], Betty Tsai Do, MD[13], Courtney C. J. Voelker, MD, PhD[14], Richard W. Waguespack, MD[15], and Maureen D. Corrigan[16]

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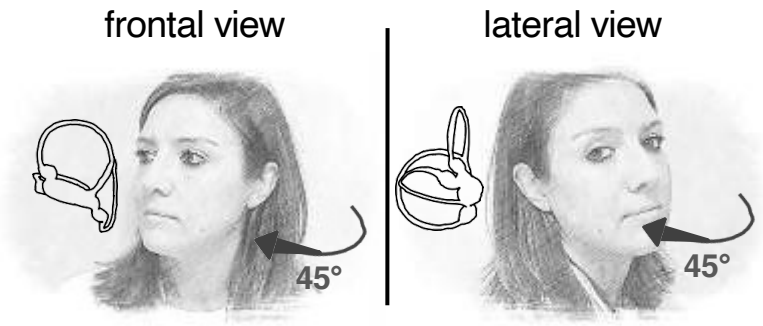
Traditional approach



- **Dix Hallpike test ➔ gold standard for PSC BPPV**
- It exploits **rapid movements of the whole trunk** from the sitting to the supine position with the **head aligned with the involved PSC** to impart otoconia **maximal inertial forces**, thus achieving **maximal flow velocity of the endolymph**.
  - **Gravity, inertial and centrifugal forces are involved**

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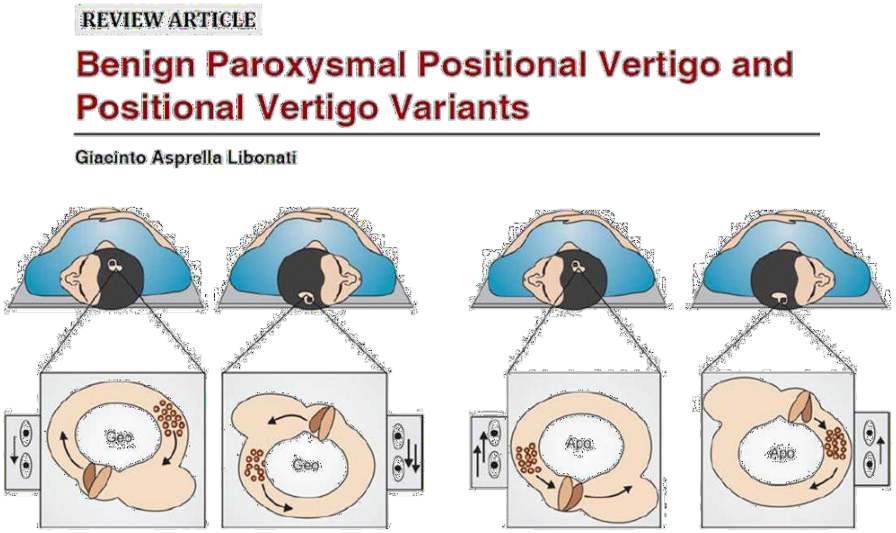
Traditional approach



- **Pagnini-McLure Test** (Head Roll Test or Supine Head Yaw Test) ➔ **gold standard for HSC BPPV**
- It exploits **rapid movements of the head** from one side to the other side with the **head aligned with both HSC** to impart otoconia **maximal inertial forces**, thus achieving **maximal flow velocity of the endolymph**.
  - **Gravity, inertial and centrifugal forces are involved**
- **Ewald's second law:** ampullopetal endolymphatic flow generates a stronger response than ampullofugal flow in the horizontal canal

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Traditional approach

- **Accurate identification of the affected side** is **pivotal for an effective treatment strategy** in BPPV.
- **Unilateral PSC-BPPV** might sometimes account for **bilaterally positive diagnostic test**, potentially resulting in **erroneous diagnosis and improper treatment strategy** for the healthy side in case the examiner only relies on the positional nystagmus on the side randomly tested first.

ORIGINAL ARTICLE

Unilateral Mimicking Bilateral Benign Paroxysmal Positioning Vertigo

Sven Steddin, Thomas Brandt, MD

Journal of Otology 16 (2021) 232–237

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Unilateral mimicking bilateral BPPV- a forgotten entity? Characteristics of a large cohort of patients, comparison with posterior canal BPPV and clinical implications

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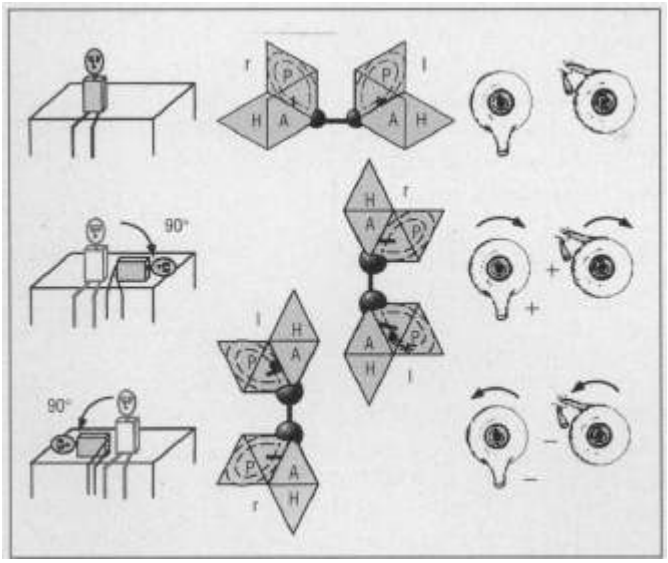

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Traditional approach

- **Accurate identification of the affected side** is **pivotal for an effective treatment strategy** in BPPV.

- The affected side in **HSC-BPPV** might sometimes be **difficult to be detected only relying on the difference of nystagmus amplitude in lateral positionings**, potentially resulting in **erroneous diagnosis and improper treatment strategy** for the healthy side

- **Repeated positioning maneuvers** might impair the sensitivity of the diagnostic tests by **dispersing canaliths along the canals** and reducing their "piston action" on the ampullary cupula

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Traditional approach

- **Accurate identification of the affected side** is **pivotal for an effective treatment strategy** in BPPV.

- A diagnostic maneuver which is recommended for a specific canal **might evoke a nystagmus suggesting the involvement of another canal**

- **The diagnosis should always be based on the evoked nystagmus rather than on the positioning test performed**

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Traditional approach

- **Accurate identification of the affected side** is **pivotal for an effective treatment strategy** in BPPV.

- A diagnostic maneuver which is recommended for a specific canal **might evoke a nystagmus suggesting the involvement of another canal**

- **The diagnosis should always be based on the evoked nystagmus rather than on the positioning test performed**

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Traditional approach

- **Intense autonomic symptoms** accompanying vertigo spells can be **highly enhanced by rapid supine positionings** ➔ **significant discomfort**
  - **acute patients (< 48 h)**
  - in this **"active period",** the **traditional diagnostic maneuvers might hardly be conducted in patients with severe autonomic and anxiety-related symptoms.**
  - **relapsing BPPV** ➔ reactive anxiety and avoidance
- All these factors might potentially **prevent to achieve a correct diagnosis and complete CRM** in case **the side and the canal affected are not correctly predicted before starting CRM**.

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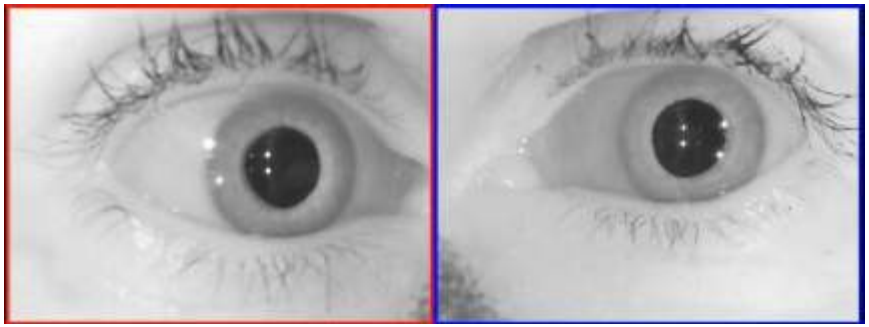
Minimum Stimulus Strategy

- The **Minimum Stimulus Strategy** is a **nystagmus-guided approach** for the diagnosis of BPPV which aims to **minimize patients' discomfort** imparting **slight head rotations** just enough to move free-floating particles, **mainly exploiting gravity**.
- It has been developed in response to the need for a **better-tolerated and non-invasive diagnostic approach to BPPV**, in particular for **patients with recent onset of symptoms and anxious subjects**.



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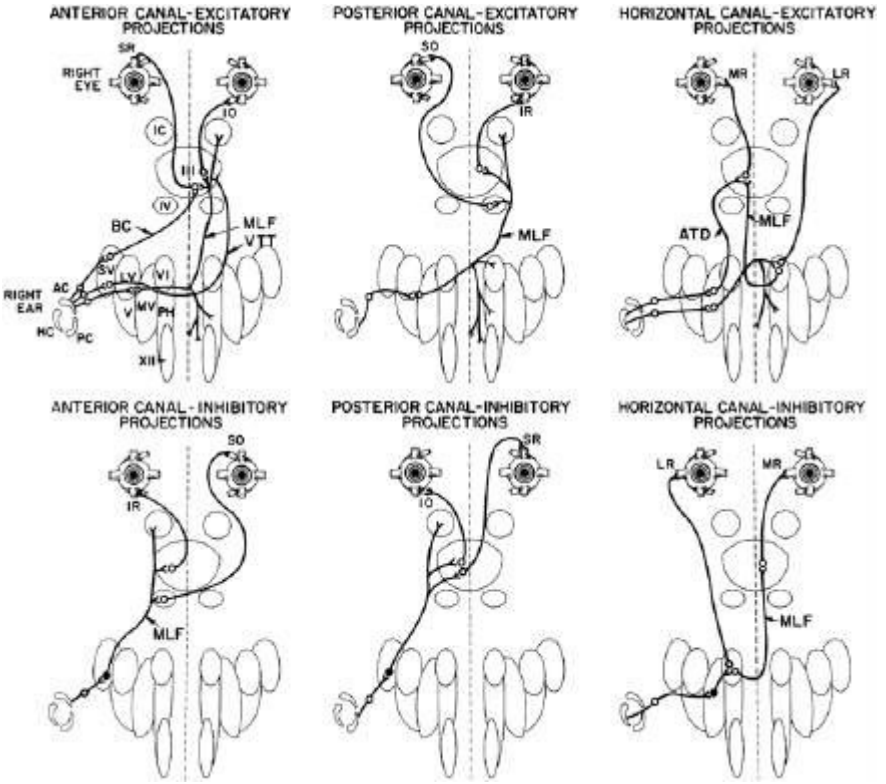
Nystagmus-guided approach

- According to the **VOR pathophysiology**, each cupular deflection, either exciting or inhibiting the corresponding ampullary afferents, generates the **contraction of specific extraocular coupled-muscles leading to typical nystagmus**

SEMICIRCULAR CANAL	EXCITATION	INHIBITION
HORIZONTAL	IPSILATERAL MEDIAL RECTUS	CONTRALATERAL MEDIAL RECTUS
	CONTRALATERAL LATERAL RECTUS	IPSILATERAL LATERAL RECTUS
POSTERIOR	IPSILATERAL SUPERIOR OBLIQUE	IPSILATERAL INFERIOR OBLIQUE
	CONTRALATERAL INFERIOR RECTUS	CONTRALATERAL SUPERIOR RECTUS
ANTERIOR	IPSILATERAL SUPERIOR RECTUS	IPSILATERAL INFERIOR RECTUS
	CONTRALATERAL INFERIOR OBLIQUE	CONTRALATERAL SUPERIOR OBLIQUE



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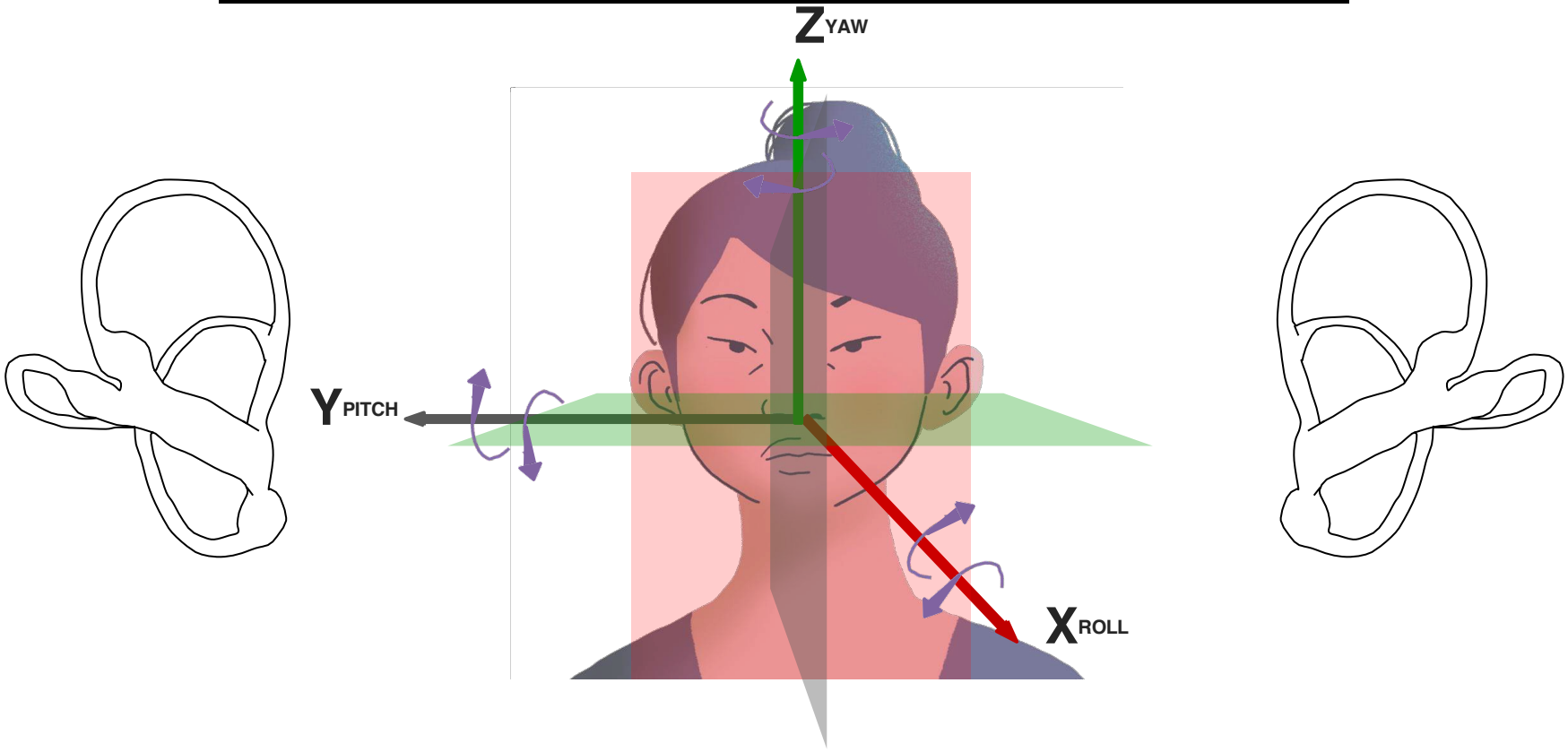
Spatial axes and planes



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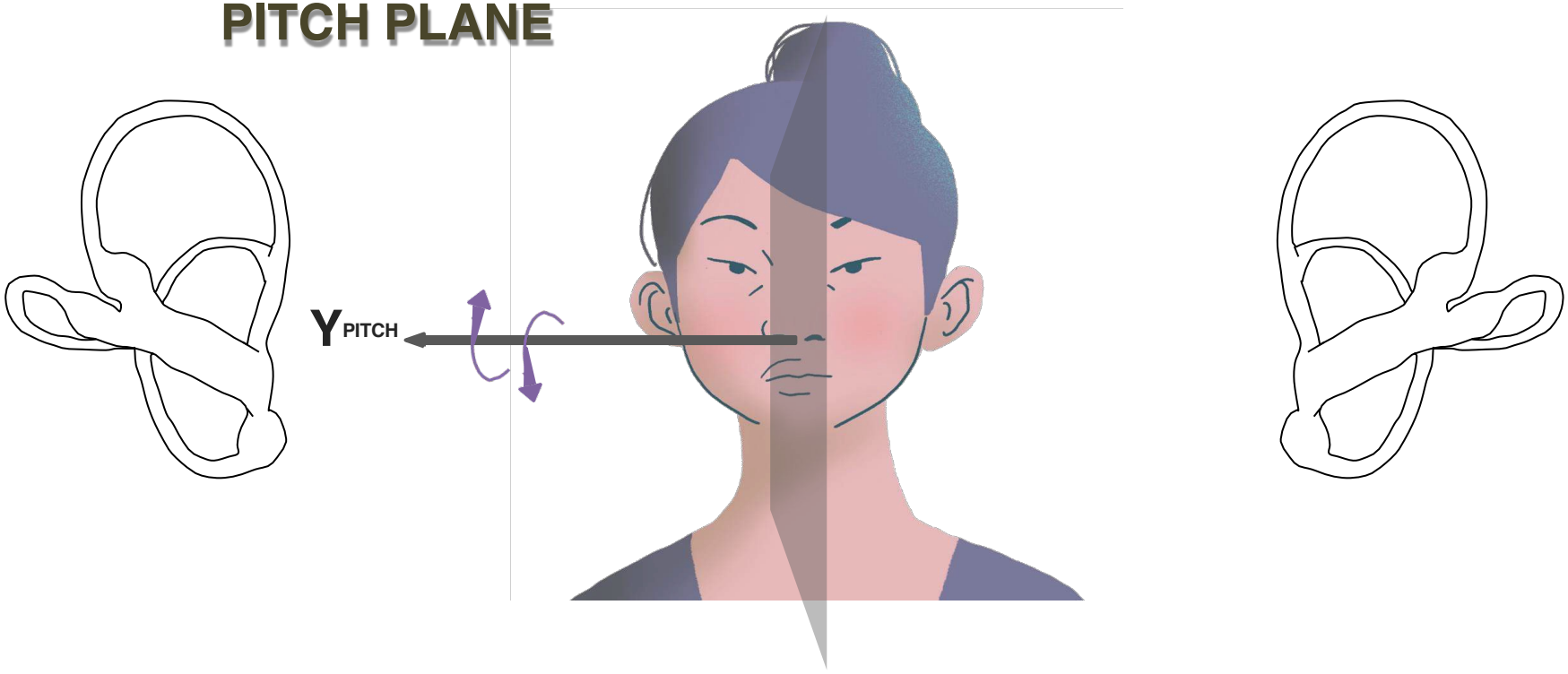
Spatial axes and planes

PITCH PLANE



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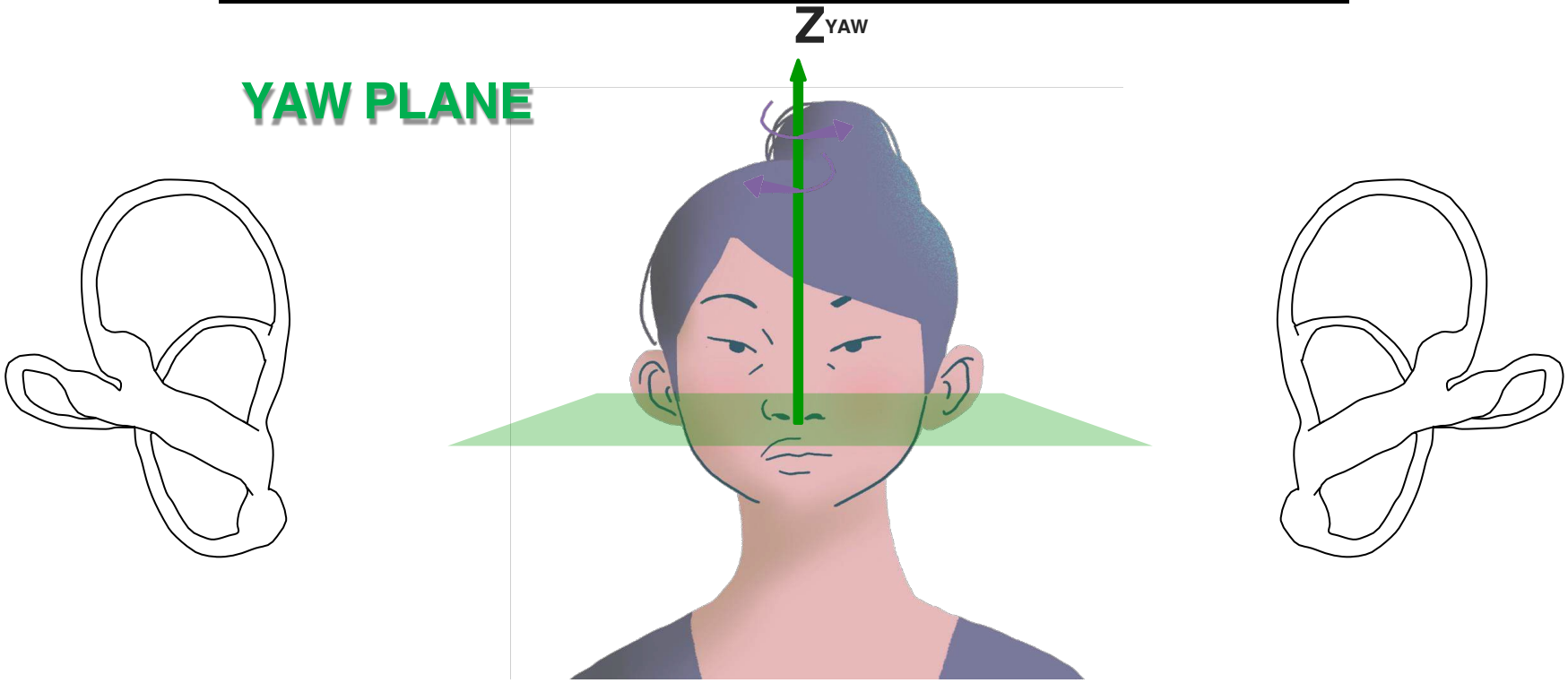
Spatial axes and planes



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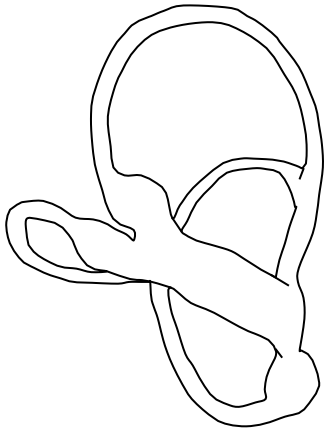
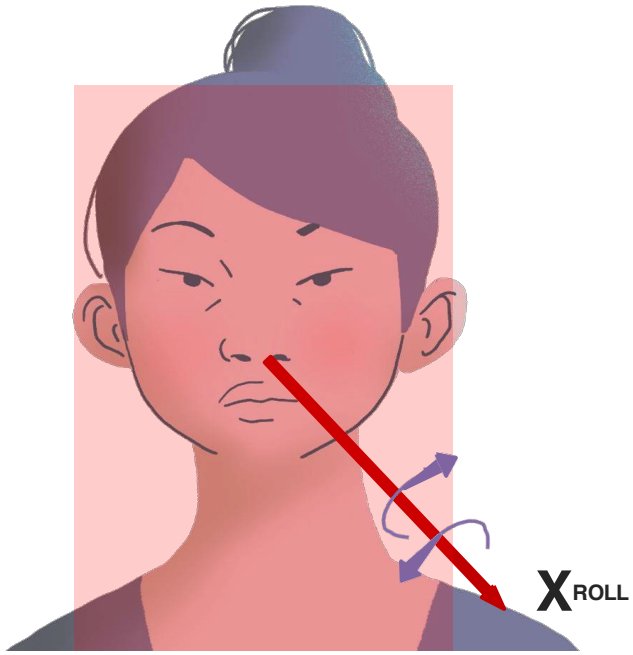
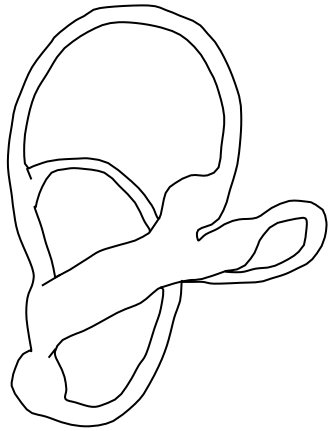
Spatial axes and planes

ROLL PLANE







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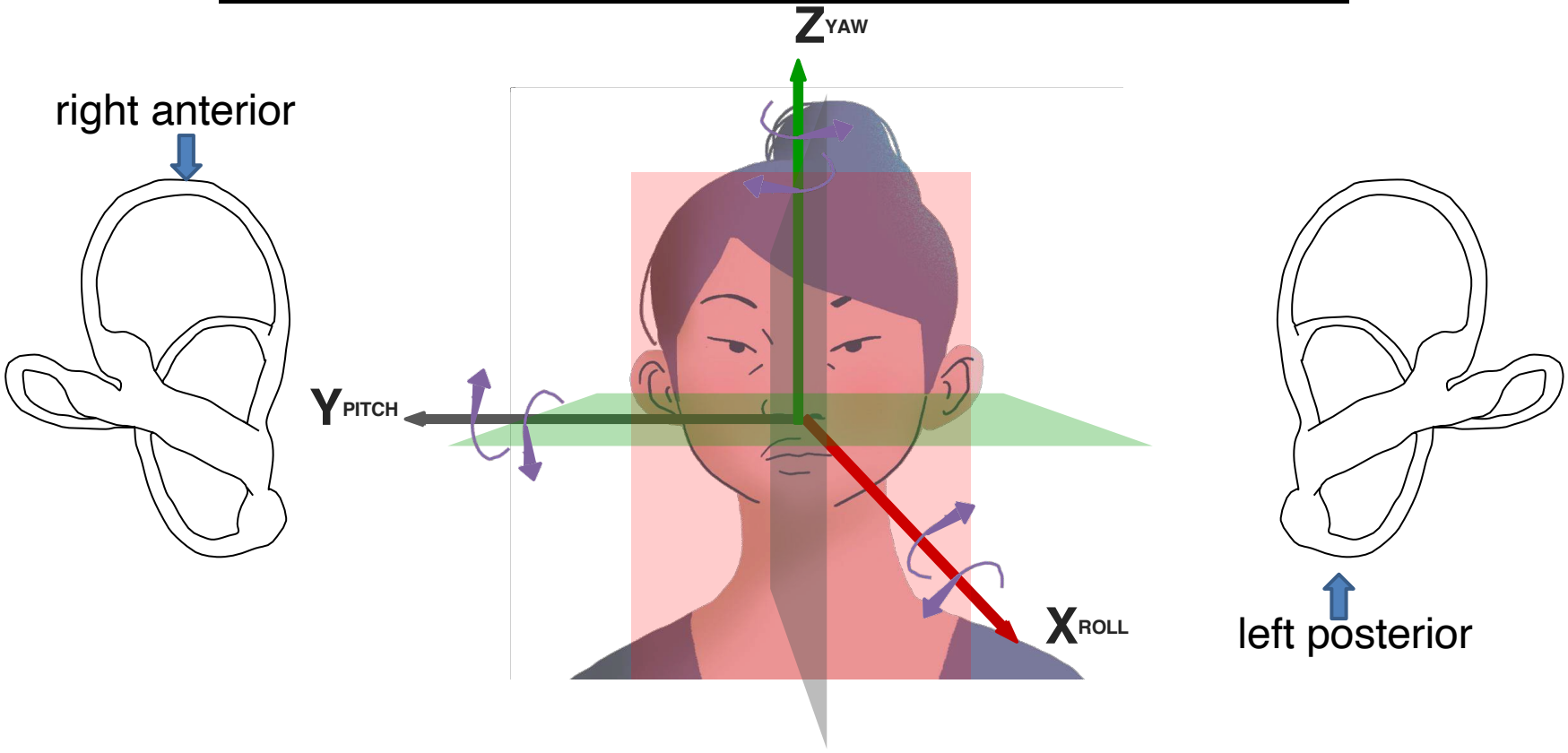

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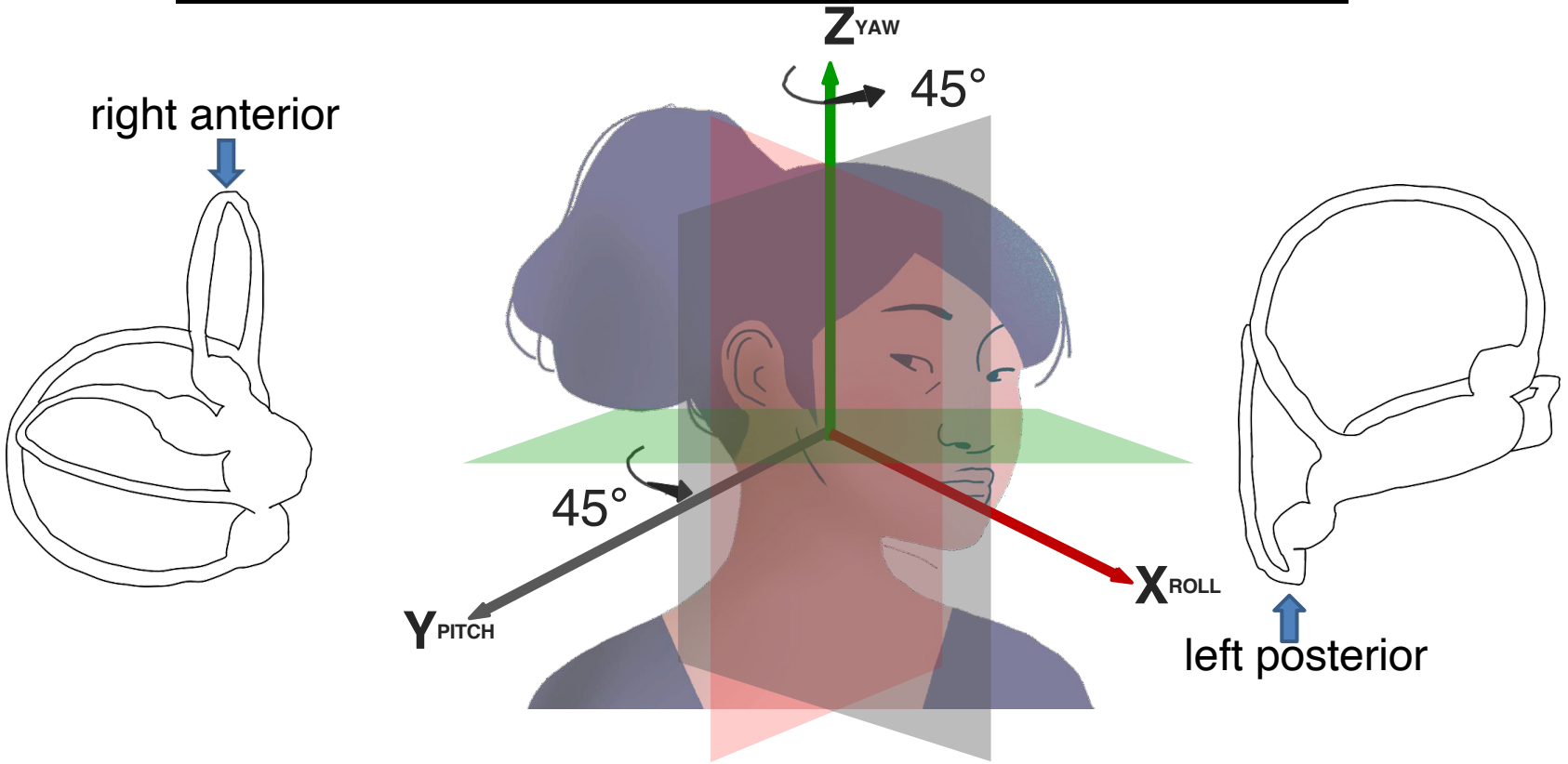
Spatial axes and planes



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Spatial axes and planes

RALP PLANE

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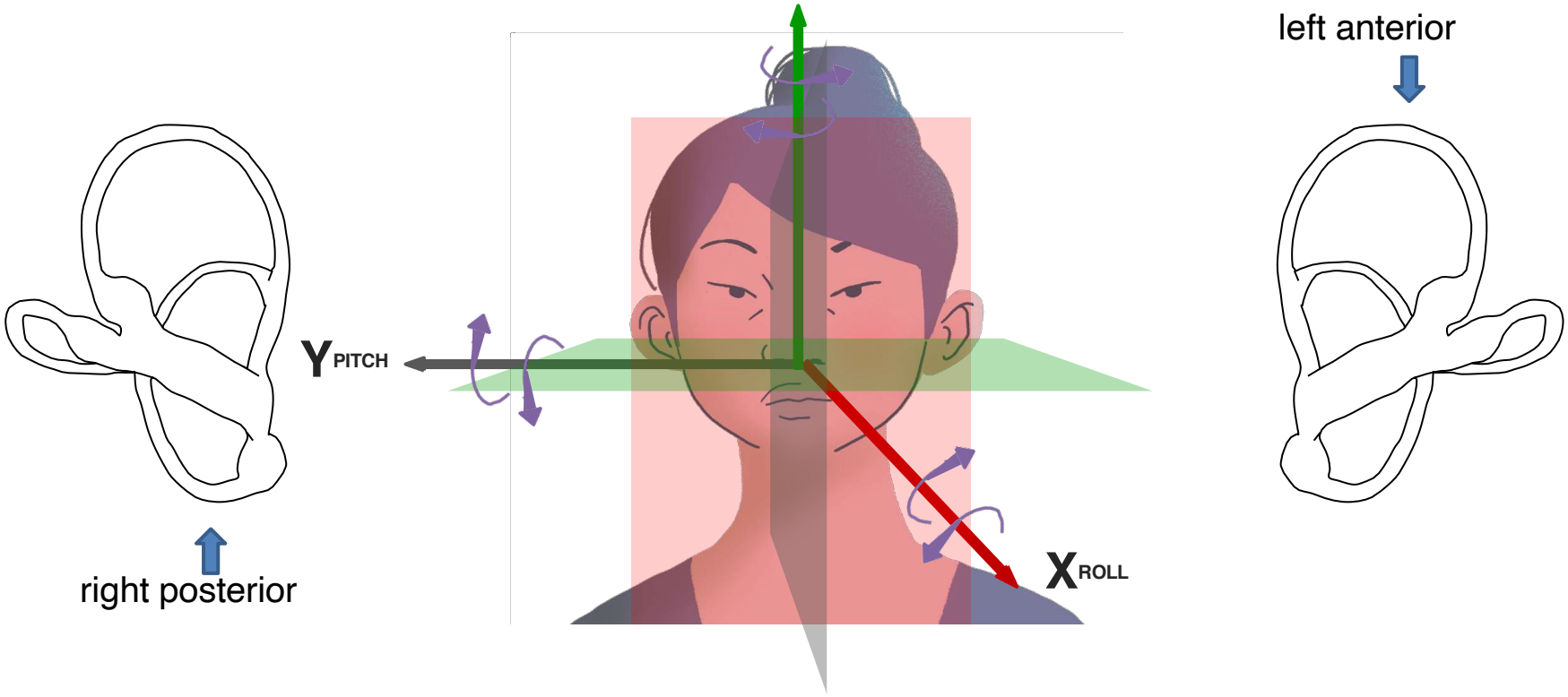
Spatial axes and planes



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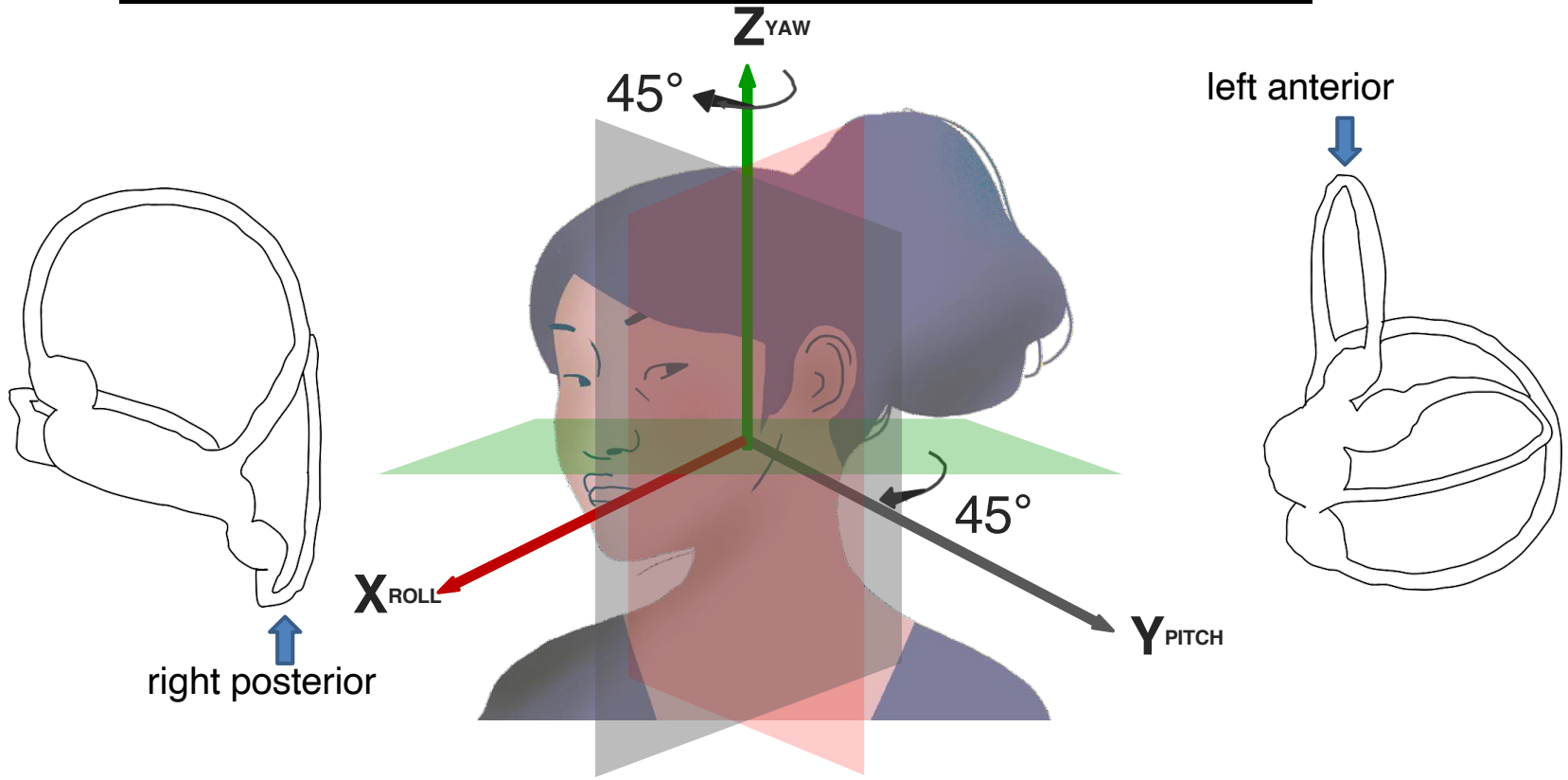
Spatial axes and planes



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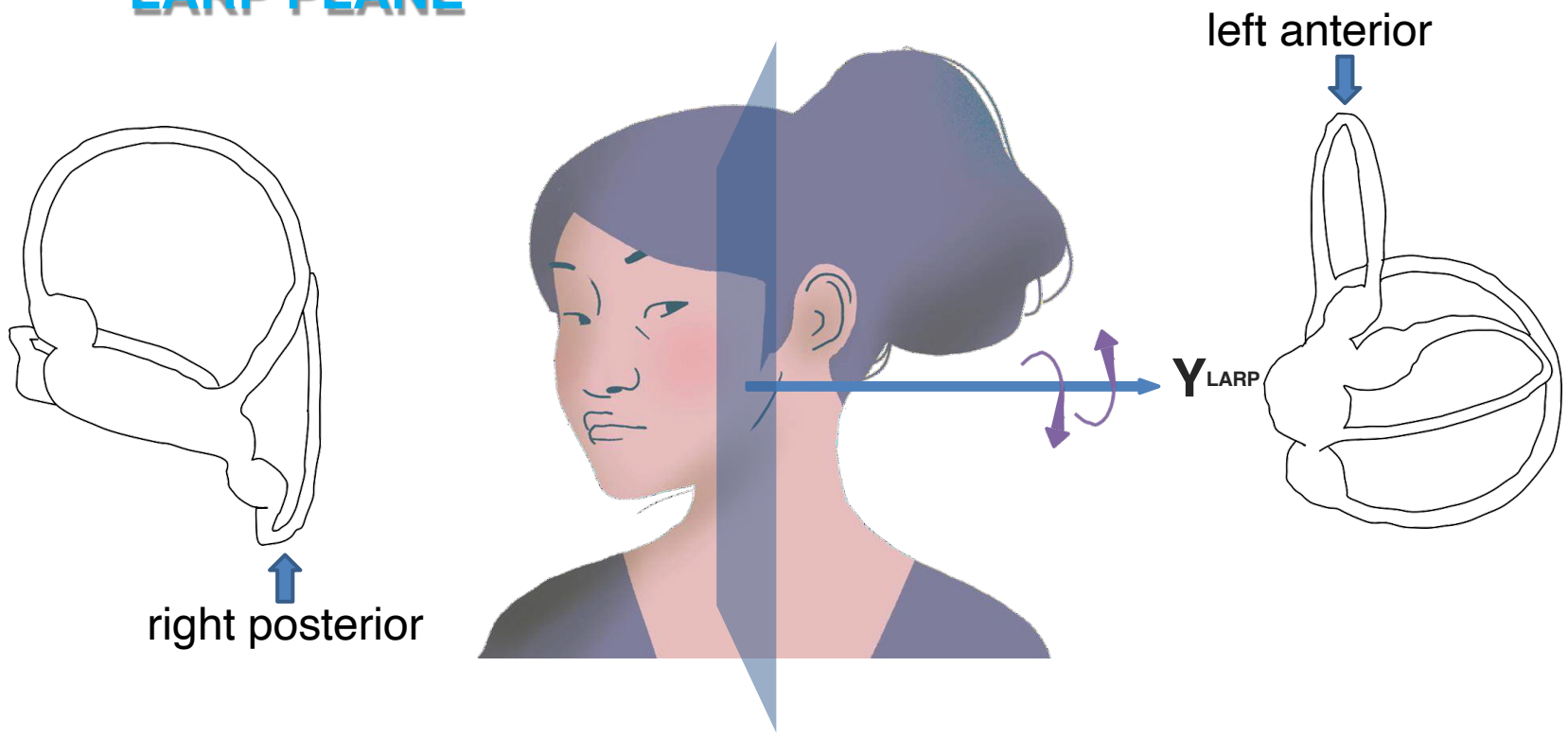
Spatial axes and planes

LARP PLANE



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Minimum Stimulus Strategy

- **The Upright protocol** is the **crucial part of the minimum stimulus strategy**

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Review Article

Minimum Stimulus Strategy: A step-by-step diagnostic approach to BPPV

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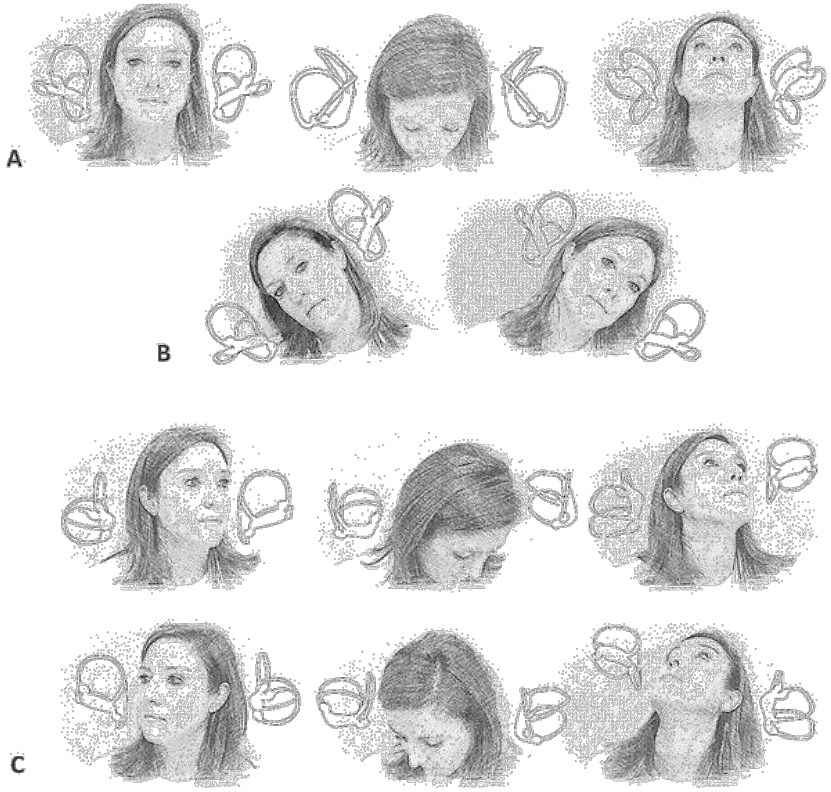

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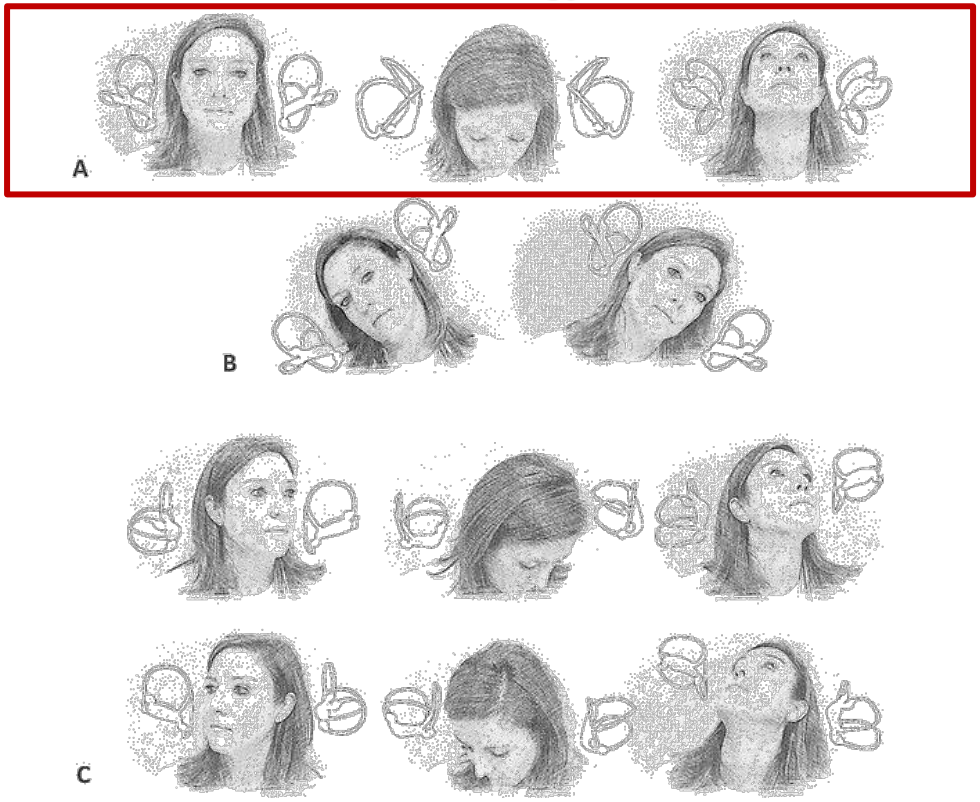
Minimum Stimulus Strategy

- **The Upright protocol** is the **crucial part of the minimum stimulus strategy**

head pitch test (HPT)



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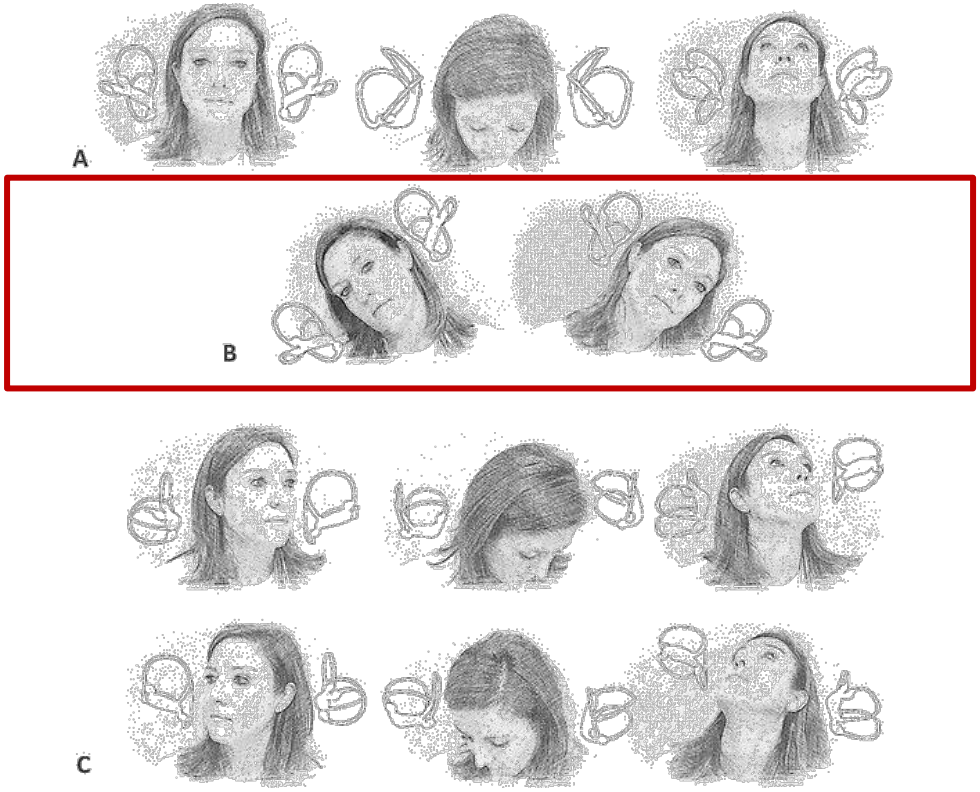
Minimum Stimulus Strategy

- **The Upright protocol** is the **crucial part of the minimum stimulus strategy**

upright head roll test (uHRT)



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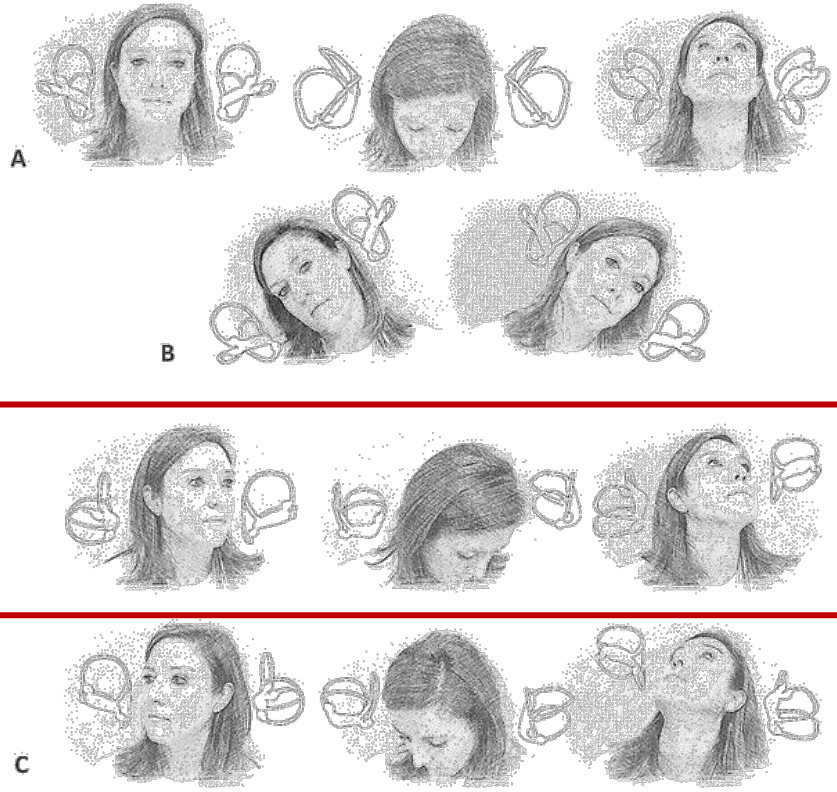
Minimum Stimulus Strategy

- **The Upright protocol** is the **crucial part of the minimum stimulus strategy**



upright RALP (uRALP) test

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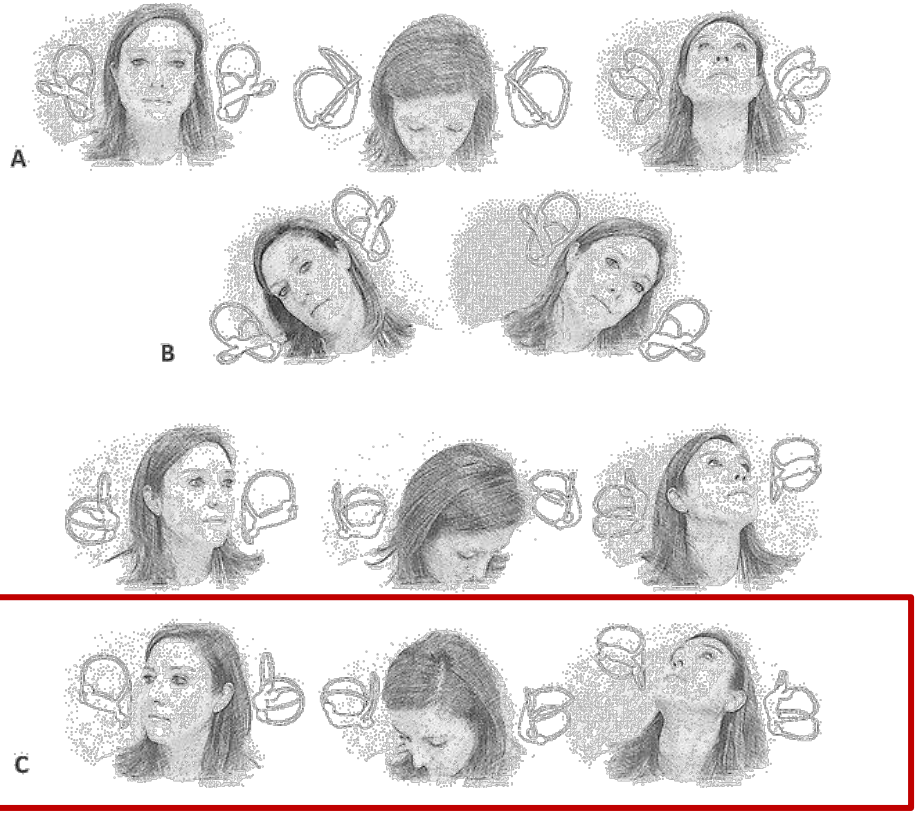
Minimum Stimulus Strategy

- **The Upright protocol** is the **crucial part of the minimum stimulus strategy**



upright LARP (uLARP) test

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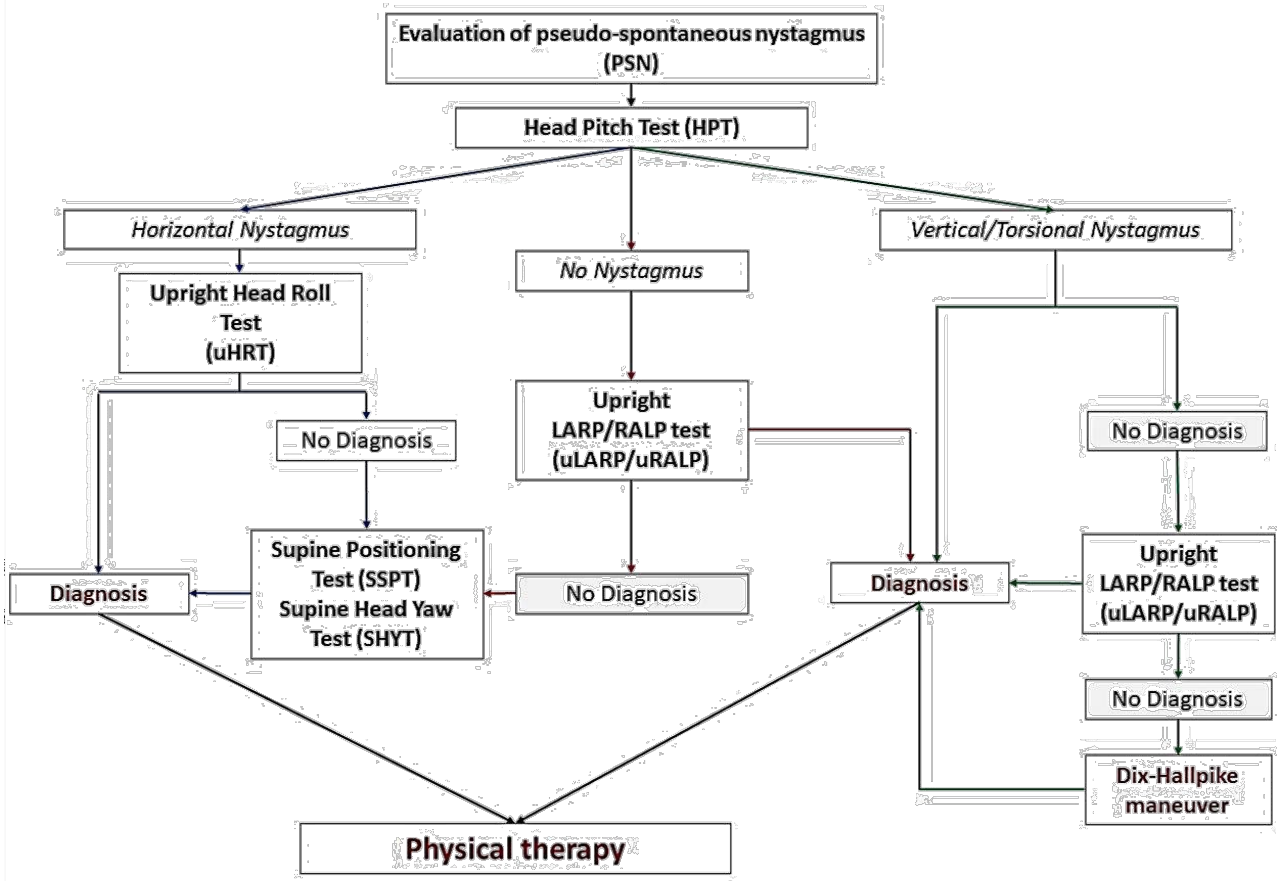
Minimum Stimulus Strategy



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Minimum Stimulus Strategy in HSC BPPV

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pagepress

Upright head roll test: A new contribution for the diagnosis of lateral semicircular canal benign paroxysmal positional vertigo

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Upright BPPV Protocol: Feasibility of a New Diagnostic Paradigm for Lateral Semicircular Canal Benign Paroxysmal Positional Vertigo Compared to Standard Diagnostic Maneuvers

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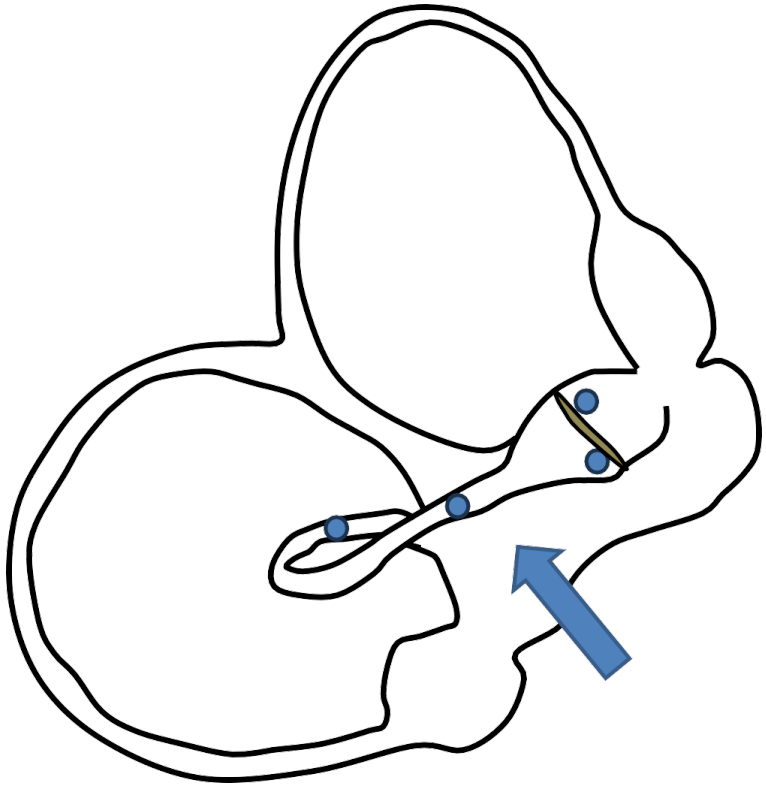

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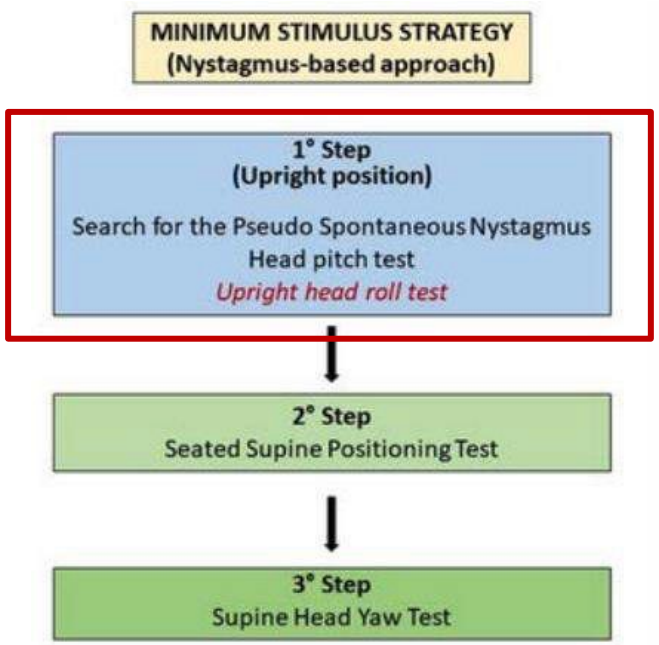
Minimum Stimulus Strategy in HSC BPPV



Upright protocol for HSC BPPV

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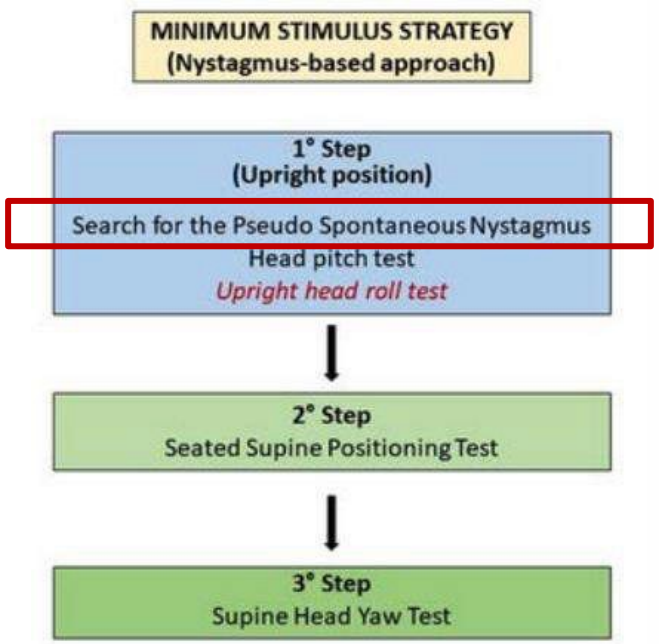
Minimum Stimulus Strategy in HSC BPPV



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Minimum Stimulus Strategy in HSC BPPV

Pseudo-spontaneous nystagmus

VESTIBOLOGY

Pseudo-Spontaneous Nystagmus: a new sign to diagnose the affected side in Lateral Semicircular Canal Benign Paroxysmal Positional Vertigo

Il nistagmo pseudo-spontaneo: un nuovo segno clinico per la diagnosi del lato affetto nella vertigine parossistica posizionale benigna del canale semicircolare laterale

G. ASPRELLA-LIBONATI
Unit of Audiology-Vestibology and Phoniatry, Department of Otorhinolaryngology and Head and Neck Surgery, "Madonna delle Grazie" Hospital, Matera, Italy

Lateral canal BPPV with Pseudo-Spontaneous Nystagmus masquerading as vestibular neuritis in acute vertigo: A series of 273 cases

Giacinto Asprella-Libonati
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Spontaneous nystagmus in benign paroxysmal positional vertigo

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Received 27 September 2009

OPEN

Pseudo-spontaneous nystagmus in horizontal semicircular canal canalolithiasis

Dong Hyuk Im, MD, Young Soo Yang, MD, Hyerang Choi, MD, Seongjun Choi, MD, Jung Eun Shin, MD, PhD, Chang-Hee Kim, MD, PhD*

Pseudo-Spontaneous Nystagmus in Lateral Semicircular Canal Benign Paroxysmal Positional Vertigo

Hyo-Jeong Lee, MD · Yong Hyun Kim, MD · Sung Kwang Hong, MD · Hyung-Jong Kim, MD
Department of Otolaryngology-Head and Neck Surgery, Hallym University College of Medicine, Anyang, Korea

Pseudo-Spontaneous and Head-Shaking Nystagmus in Horizontal Canal Benign Paroxysmal Positional Vertigo

*Sun-Uk Lee, †Hyo-Jung Kim, and ‡Ji-Soo Kim
**Department of Neurology, Ajou University College of Medicine, Ajou University Hospital, Suwon; †Kangwon National University College of Medicine, Medical Research Institute, Seoul National University Bundang Hospital, Seongnam; and ‡Department of Neurology, Seoul National University College of Medicine, Seoul National University Bundang Hospital, Seongnam, Republic of Korea*

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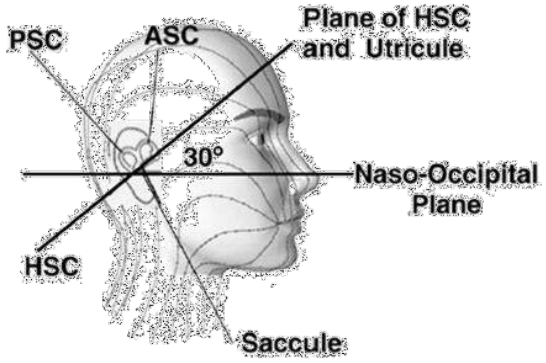
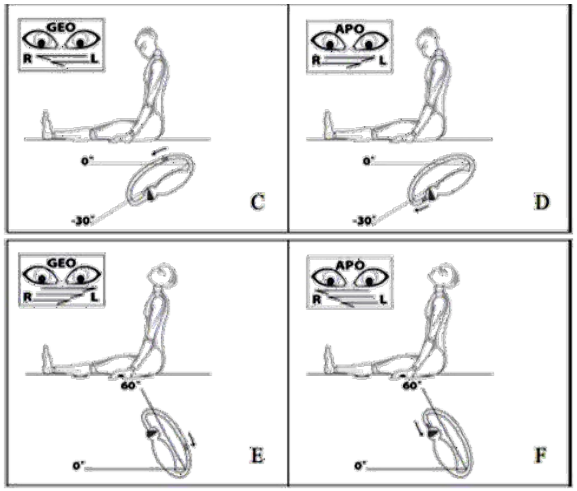
Minimum Stimulus Strategy in HSC BPPV

Pseudo-spontaneous nystagmus

- **PSN** can be observed in patients with **HSC BPPV**
- It develops because the natural **canal inclination of 30° relative to the horizontal plane** in the upright position results in a **gravity-induced slow falling of free-floating debris** or in a **persistent deflection of the overloaded cupula**
- Due to its **gravity dependency**, PSN usually **changes direction with the head pitch test and the supine roll test**;





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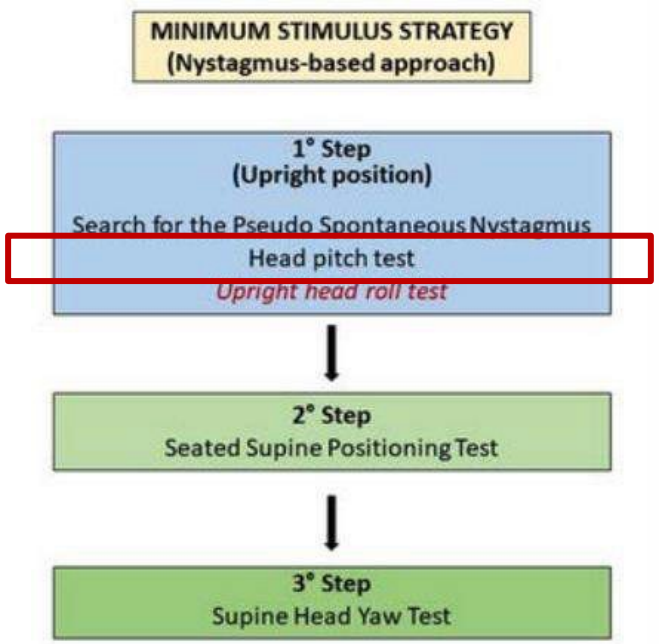
Minimum Stimulus Strategy in HSC BPPV



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Minimum Stimulus Strategy in HSC BPPV

Head pitch test

The Laryngoscope
Lippincott Williams & Wilkins, Inc.

'Bow and Lean Test' to Determine the Affected Ear of Horizontal Canal Benign Paroxysmal Positional Vertigo

Yun-Hoon Choung, DDS, MD, PhD; You Ree Shin, MD, PhD; Hison Kahng, MD; Keehyun Park, MD, PhD; Sung Jun Choi, MD

Nystagmus during neck flexion in the pitch plane in benign paroxysmal positional vertigo involving the horizontal canal

Seung-Han Lee [a], Kwang-Dong Choi [b], Seong-Hae Jeong [c], Young-Mi Oh [c], Ja-Won Koo [d], Ji Soo Kim [c,*]

The Laryngoscope

Efficacy of the "Bow and Lean Test" for the Management of Horizontal Canal Benign Paroxysmal Positional Vertigo

Jong Bin Lee, MD; Dong Hee Han, MD; Seong Jun Choi, MD; Keehyun Park, MD, PhD; Hun Yi Park, MD; In Kyung Sohn, MD; Yun-Hoon Choung, DDS, MD, PhD

OTOLOGY

Lateralization of horizontal semicircular canal canalolithiasis and cupulopathy using bow and lean test and head-roll test

Chang-Hee Kim[1] · Yong Gyu Kim[2] · Jung Eun Shin[1] · Young Soo Yang[1] · Donghyuk Im[1]

CME

Localizing signs in positional vertigo due to lateral canal cupulolithiasis

Alexandre R. Bisdorff, MD; and Damien Debatisse, MSc

Diagnostic Role of Head-Bending and Lying-Down Tests in Lateral Canal Benign Paroxysmal Positional Vertigo

Sertac Yetiser and Dilay Ince

Department of Otorhinolaryngology, Anadolu Medical Center, Kocaeli, Turkey

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Minimum Stimulus Strategy in HSC BPPV

Head pitch test

AUDIOLOGICAL MEDICINE 2005; 3(1): 16–20

Taylor & Francis

Lateral Canal BPPV: Which is the Affected Side?

DANIELE NUTI[1], PAOLO VANNUCCHI[2] AND PAOLO PAGNINI[2]

From the [1]Dipartimento di Scienze Ortopediche, Radiologiche ed Otorinolaringoiatriche Università degli Studi di Siena, Siena, Italy, and [2]Dipartimento di Scienze Oto-Neuro-Oftalmologiche, Università degli Studi di Firenze, Firenze, Italy

VESTIBOLOGY

"Secondary signs of lateralization" in apogeotropic lateral canalolithiasis

"Segni secondari di lateralità" nella canalolitiasi laterale apogeotropa

L. CALIFANO, M.G. MELILLO, S. MAZZONE, A. VASSALLO
Unit of Audiology and Phoniatrics, Surgical Sciences Department, "G. Rummo" Hospital, Benevento, Italy

VESTIBOLOGY

Nystagmus intensity and direction in bow and lean test: an aid to diagnosis of lateral semicircular canal benign paroxysmal positional vertigo

Intensità e direzione del nistagmo nel "bow and lean test": un contributo alla diagnosi nella vertigine parossistica da posizionamento benigna del canale semicircolare laterale

V. MARCELLI
Department of Neuroscience, Vestibular and Audiology Unit, University of Naples "Federico II", Naples, Italy.
Vestibular and Audiology Unit, ASL NA-1, San Giovanni Bosco Hospital, Naples, Italy

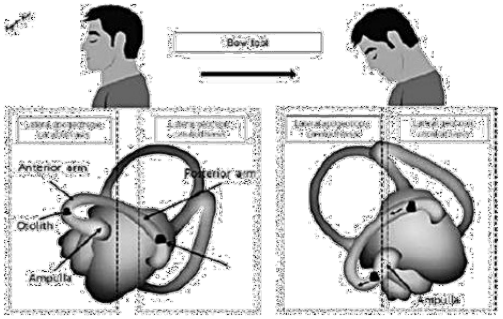

Fig. 2. Mechanism of bowing nystagmus in apogeotropic and geotropic canalolithiasis (left lateral canal: lateral view).

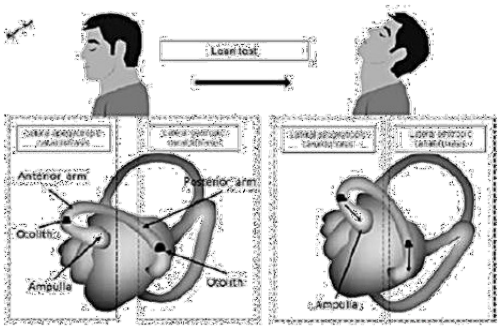

Fig. 3. Mechanism of leaning nystagmus in apogeotropic and geotropic canalolithiasis (left lateral canal: lateral view).

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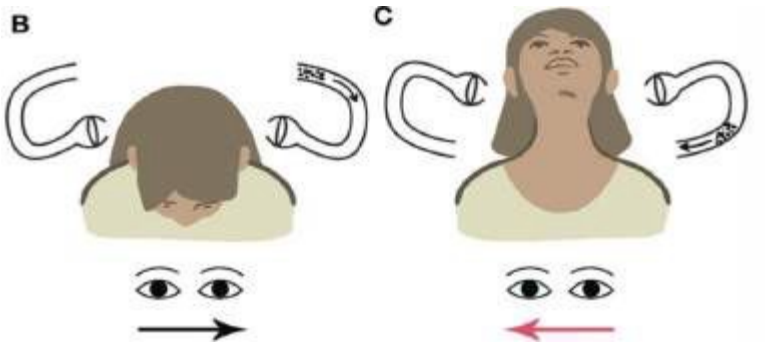
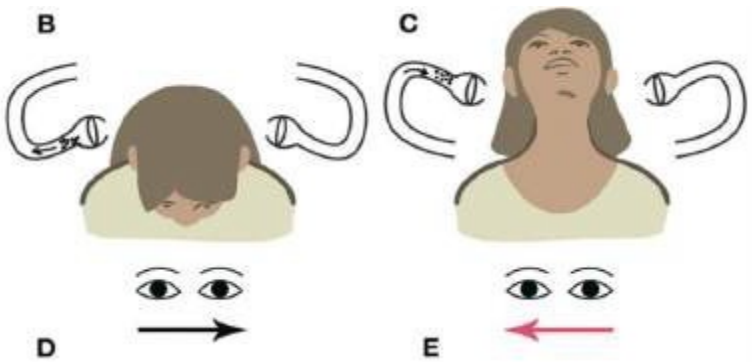
Minimum Stimulus Strategy in HSC BPPV





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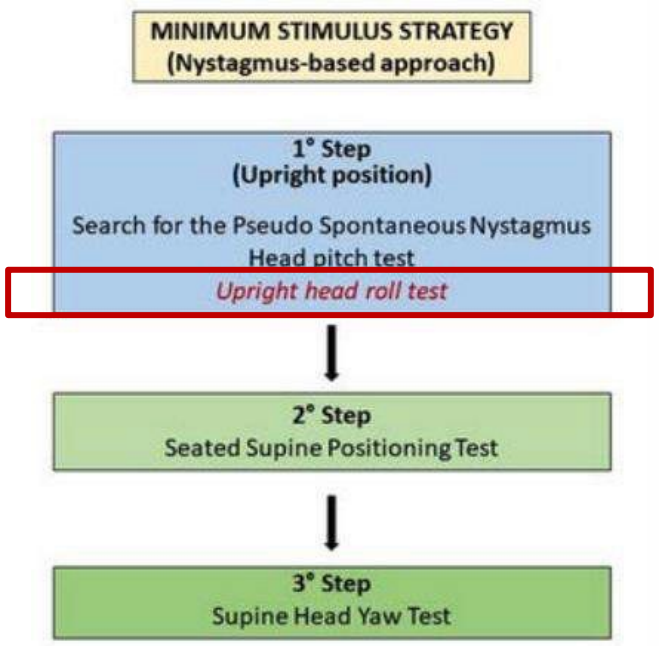
Minimum Stimulus Strategy in HSC BPPV



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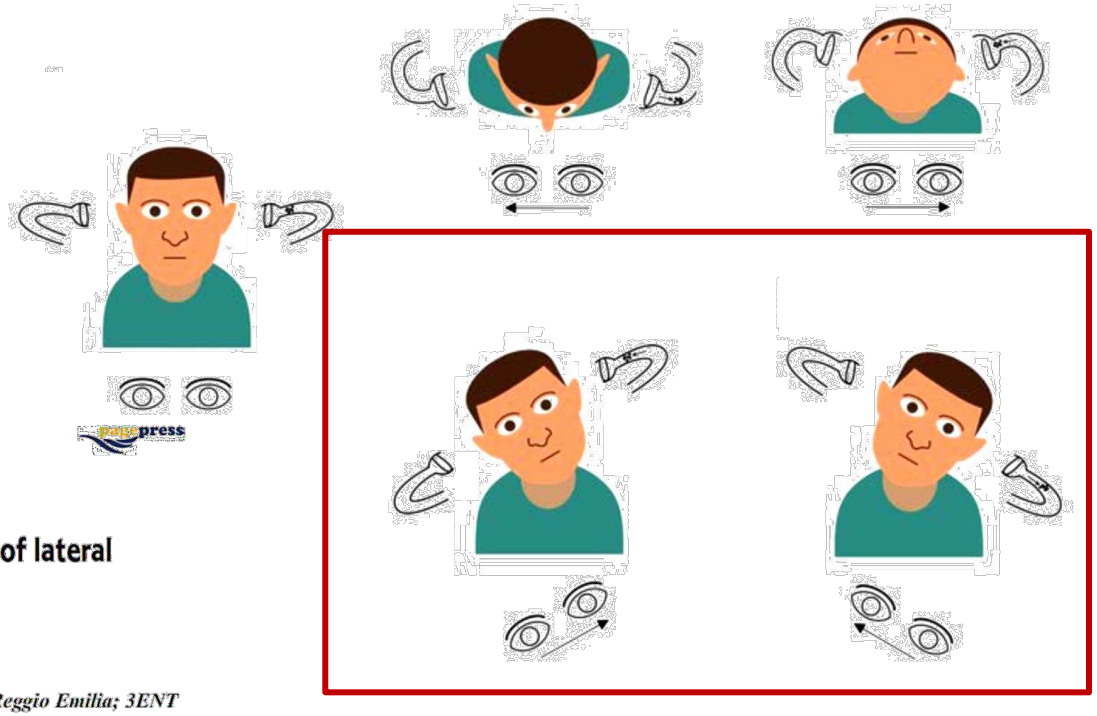
Minimum Stimulus Strategy in HSC BPPV

Upright head roll test



Audiology Research 2020; volume 10:236

Upright head roll test: A new contribution for the diagnosis of lateral semicircular canal benign paroxysmal positional vertigo

Pasquale Malara,[1] Andrea Castellucci,[2] Salvatore Martellucci,[3,4]

[1]Audiology & Vestibology Service, Centromedico Bellinzona, Bellinzona, Switzerland;
[2]ENT Unit, Department of Surgery, Arcispedale Santa Maria Nuova, AUSL - IRCCS, Reggio Emilia; 3ENT Unit, Ospedale "Santa Maria Goretti", Azienda USL Latina; [4]Department of Sense Organs, ENT Clinic, Sapienza University of Rome, Italy

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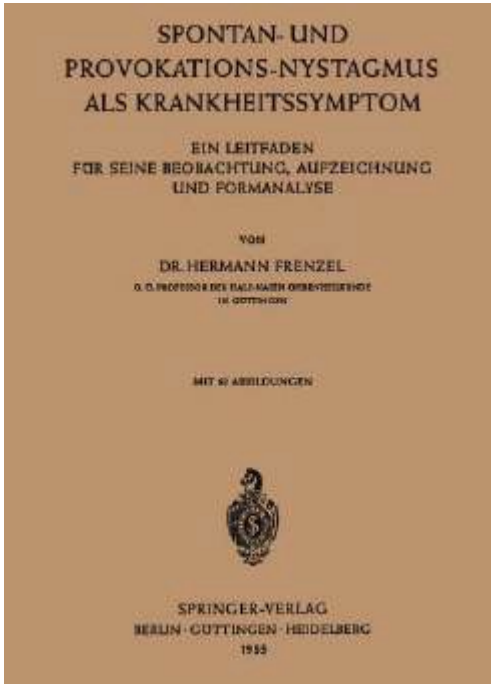
Minimum Stimulus Strategy in HSC BPPV

Upright head roll test


SPONTAN- UND
PROVOKATIONS-NYSTAGMUS
ALS KRANKHEITSSYMPTOM

EIN LEITFADEN
FÜR SEINE BEOBACHTUNG, AUFZEICHNUNG
UND FORMANALYSE

VON

DR. HERMANN FRENZEL

MIT 80 ABBILDUNGEN

SPRINGER-VERLAG
BERLIN · GÖTTINGEN · HEIDELBERG
1955

Abb. 36.

Vereinfachte Kopflageprüfung im Sitzen zur groben Orientierung.
a) Null-Lage; b) Rechtslage; c) Linkslage; d) Rückenlage.

Für die hier nicht dargestellte Bauchlage, durch Vorwärtsbeugen des Rumpfes, gilt das gleiche wie für die Bauchlage in der Lageprüfung der Abb. 35.

Erregbarkeitsprüfungen". Er ist aus den Abb. 34—36 ersichtlich. Zur Führung der Augen in die verschiedenen Blickrichtungen bedient man sich zweckmäßig eines Stabes, der in eine farbige Kugel ausläuft. Die Kugel läßt man fixieren. Die Untersuchungen zu 34a und d—f können auch durch den vor oder etwas seitlich vor dem Kranken stehenden Untersucher vorgenommen werden. Beim horizontalen Kopfschütteln wird dann in der Schlußposition 34f der Kopf des Kranken etwas zurückgebeugt.

Benign paroxysmal positional vertigo and rotatory-induced nystagmus

A. LEDOUX and J. DE VOS

E.N.T. Department, University of Liège

Introduction

In some treatises, it is still asserted that the impossibility of inducing rotatory nystagmus may point to the diagnosis of tumour of the ponto-cerebellar angle, or of hypertension of the posterior fossa. This rotatory nystagmus is provoked by the cold caloric test in Brünings' position III, i.e. the head bent backwards by 30°, then inclined by 45° so that the non-irrigated ear is undermost (fig. 1). It is also induced when rotation around a fronto-occipital axis is stopped, and finally by the galvanic test. These tests are seldom done now, since the data they yield are regarded as negligible and in no way pathognomonic of a central lesion [3].

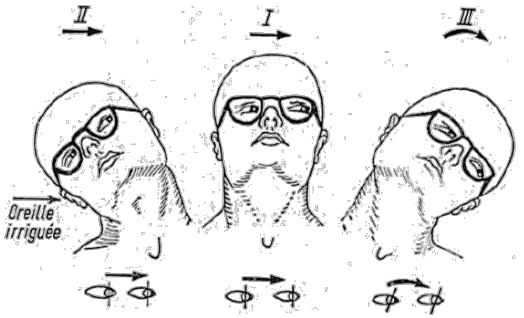


Fig. 1. Brünings' positions I, II, III, during irrigation of the right ear.

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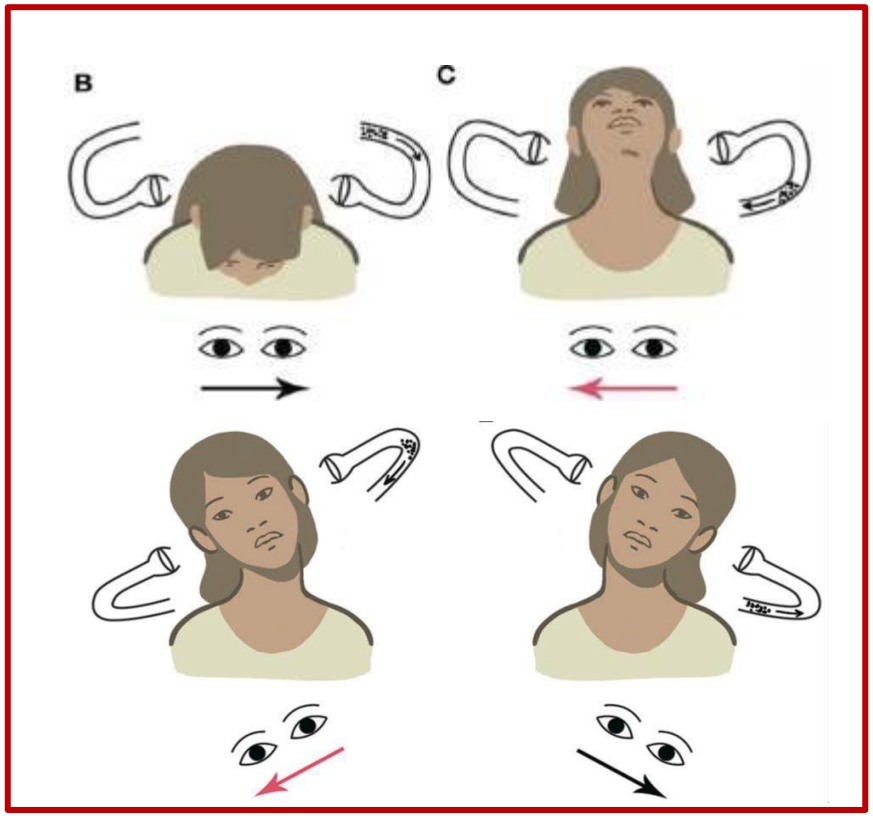
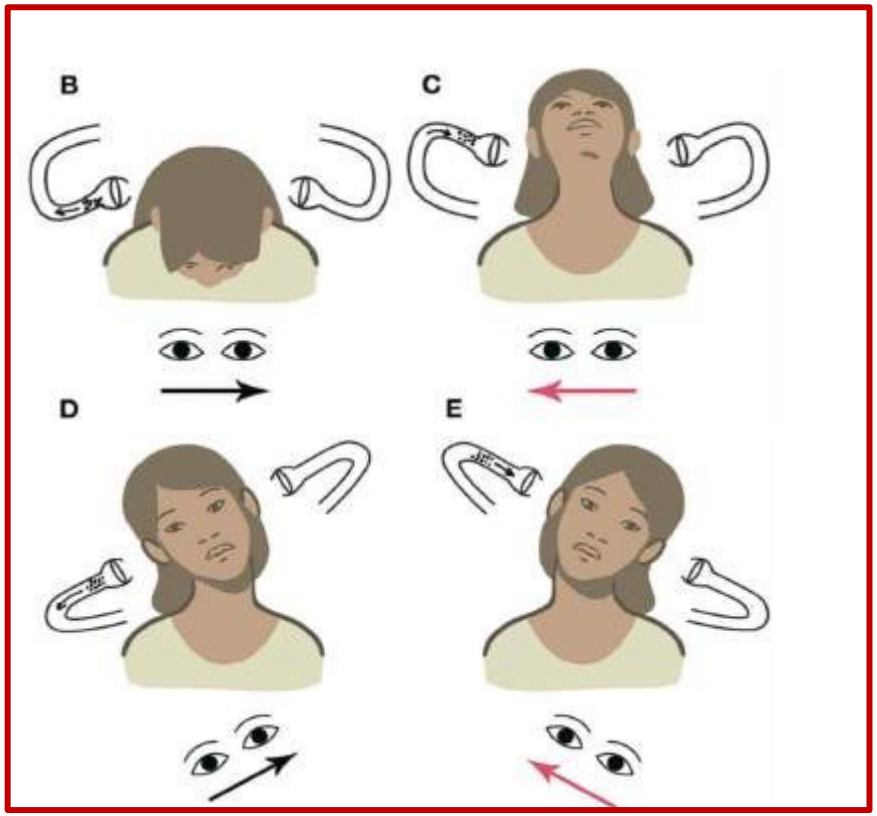
Minimum Stimulus Strategy in HSC BPPV





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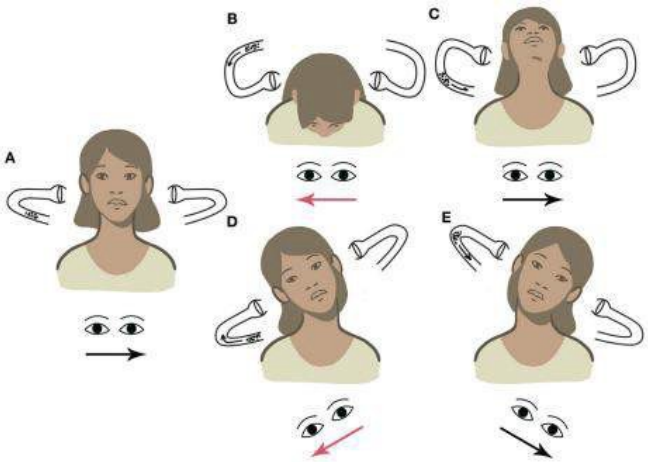
Minimum Stimulus Strategy in HSC BPPV

Right HSC-BPPV
Geotropic

frontiers in Neurology



BENIGN PAROXYSMAL POSITIONAL VERTIGO OF LATERAL SEMICIRCULAR CANAL

RIGHT SIDE, GEOTROPIC VARIANT

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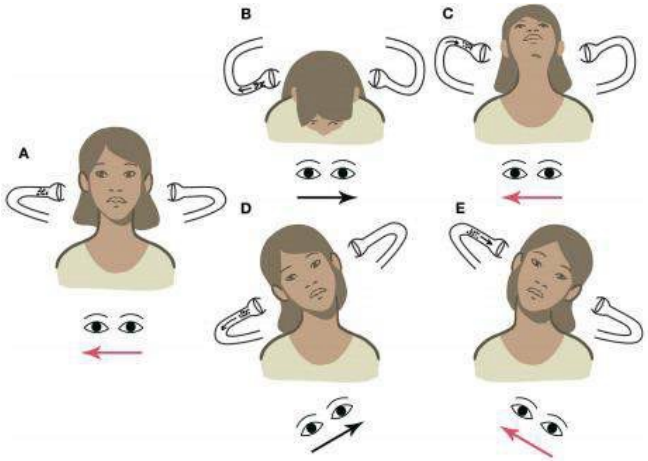
Minimum Stimulus Strategy in HSC BPPV

Right HSC - BPPV
Apogeotropic

frontiers in Neurology



BENIGN PAROXYSMAL POSITIONAL VERTIGO
OF LATERAL SEMICIRCULAR CANAL

RIGHT SIDE, APOGEOTROPIC VARIANT

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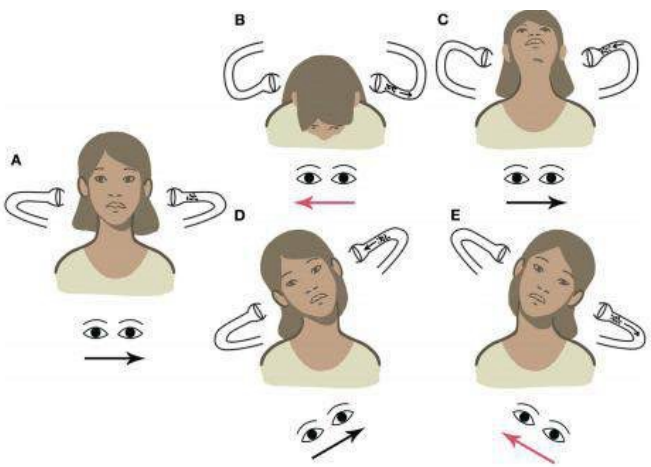
Minimum Stimulus Strategy in HSC BPPV

Left HSC BPPV
Apogeotropic



frontiers in Neurology

BENIGN PAROXYSMAL POSITIONAL VERTIGO OF LATERAL SEMICIRCULAR CANAL

LEFT SIDE, APOGEOTROPIC VARIANT

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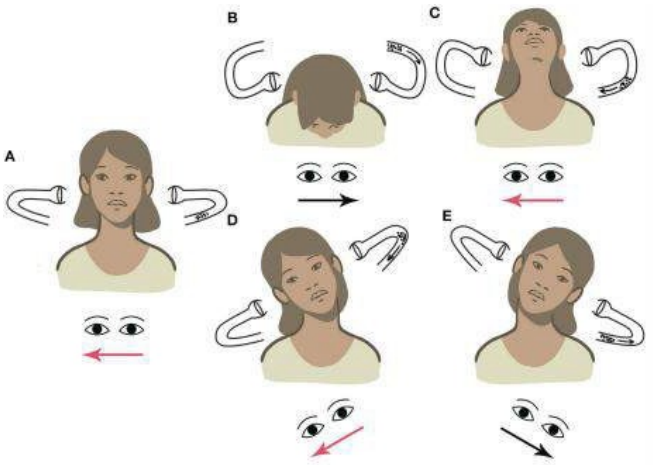
Minimum Stimulus Strategy in HSC BPPV

Left HSC - BPPV
Geotropic

frontiers in Neurology



BENIGN PAROXYSMAL POSITIONAL VERTIGO
OF LATERAL SEMICIRCULAR CANAL

LEFT SIDE, GEOTROPIC VARIANT

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Minimum Stimulus Strategy in HSC BPPV

- If the **history** of the patient is **consistent with BPPV** and we have **all the key sign at the upright protocol**, it might not be essential performing the supine head roll test
  - We can **directly proceed with the treatment from the same sitting position** (Gufoni maneuver)

Left HSC - BPPV Geotropic

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Minimum Stimulus Strategy in HSC BPPV

- If the **history** of the patient is **consistent with BPPV** and we have **all the key sign at the upright protocol**, it might not be essential performing the supine head roll test
  - We can **directly proceed with the treatment from the same sitting position** (Zuma maneuver)

Left HSC - BPPV
Apogeotropic

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Minimum Stimulus Strategy in HSC BPPV

- To achieve a **correct diagnosis** we might only need **two nystagmus**

  - one nystagmus on the **pitch plane**
  - one nystagmus on the **roll plane**

Left HSC - BPPV Geotropic

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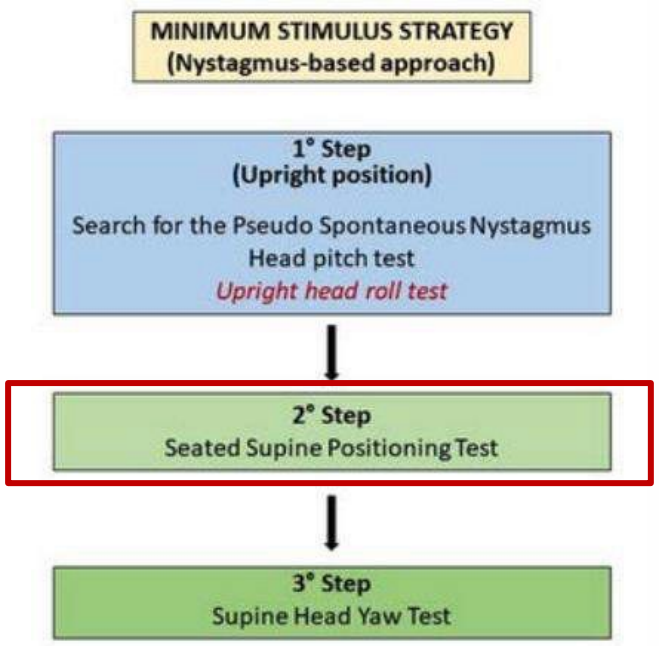
Minimum Stimulus Strategy in HSC BPPV



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Minimum Stimulus Strategy in HSC BPPV

Seated – supine positioning test

RESEARCH ARTICLE Open Access

Lying-down nystagmus and head-bending nystagmus in horizontal semicircular canal benign paroxysmal positional vertigo: are they useful for lateralization?

Jung-Hwan Oh, Sook-Keun Song, Jung Seok Lee, Jay Chol Choi, Sa-Yoon Kang and Ji-Hoon Kang*

Value of Lying-Down Nystagmus in the Lateralization of Horizontal Semicircular Canal Benign Paroxysmal Positional Vertigo

*Ja-Won Koo, *Il Joon Moon, *Woo Sub Shim, †So Young Moon, and †Ji Soo Kim

Nystagmus while recumbent in horizontal canal benign paroxysmal positional vertigo

Byung In Han, MD; Hui Jong Oh, MD, PhD; and Ji Soo Kim, MD, PhD

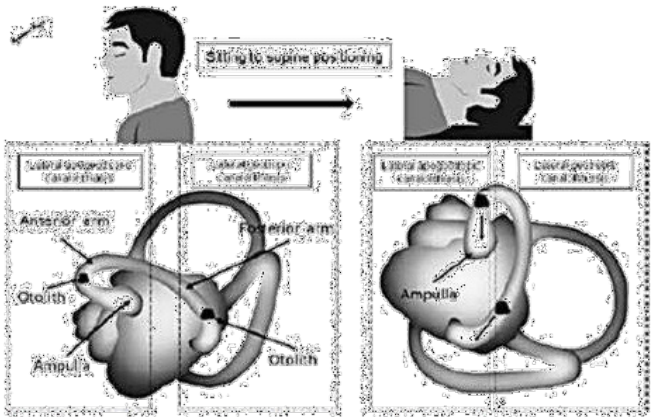

Fig. 4. Mechanism of sitting to supine positioning nystagmus in apogeotropic and geotropic canalolithiasis (left lateral canal: lateral view).

VESTIBOLOGY

"Secondary signs of lateralization" in apogeotropic lateral canalolithiasis

"Segni secondari di lateralità" nella canalolitiasi laterale apogeotropa

L. CALIFANO, M.G. MELILLO, S. MAZZONE, A. VASSALLO
Unit of Audiology and Phoniatrics, Surgical Sciences Department, "G. Rummo" Hospital, Benevento, Italy

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Minimum Stimulus Strategy in HSC BPPV

Additional "secondary signs" of lateralization in HSC BPPV

- Null-point in the vertical plane
- Null-point in the horizontal plane
- Latency Test

Lateralization of horizontal semicircular canal benign paroxysmal positional vertigo (HSC-BPPV) with the latency test: a pilot study

Alfonso Scarpa[a], Claudia Cassandro[b], Federico Maria Gioacchini[c], Pasquale Viola[d], Rossella Cuofano[e], Shaniko Kaleci[f], Massimo Ralli[g], Giuseppe Chiarella[d] and Ettore Cassandro[a]

[a]Department of Medicine and Surgery, University of Salerno, Salerno, Italy; [b]Surgical Sciences Department, University of Turin, Turin, Italy; [c]ENT Unit, Department of Clinical and Molecular Sciences, Polytechnic University of Marche, Ancona, Italy; [d]Unit of Audiology, Regional Centre for Cochlear Implants and ENT diseases, Department of Experimental and Clinical Medicine, Magna Graecia University, Catanzaro, Italy; [e]Department of Otorhinolaryngology, University Hospital 'San Giovanni di Dio e Ruggi d'Aragona', Salerno, Italy; [f]Department of Diagnostic Medicine, Clinical and Public Health, University Hospital of Modena, Modena, Italy; [g]Department of Sense Organs, Sapienza University Rome, Rome, Italy

Positional Nystagmus Showing Neutral Points

Kiyoshi Hiruma Tsutomu Numata

Department of Otorhinolaryngology, Chiba University School of Medicine, Chiba City, Japan

Two types of direction-changing positional nystagmus with neutral points

Kiyoshi Hiruma[a,*], Tsutomu Numata[b], Toshio Mitsuhashi[a], Takuya Tomemori[a], Ryoko Watanabe[a], Yoshitaka Okamoto[c]

[a]Department of Otorhinolaryngology, Tokyo Metropolitan Komagome Hospital, Tokyo, Japan
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Minimum Stimulus Strategy in HSC BPPV

Audiology Research 2020; volume 10:236

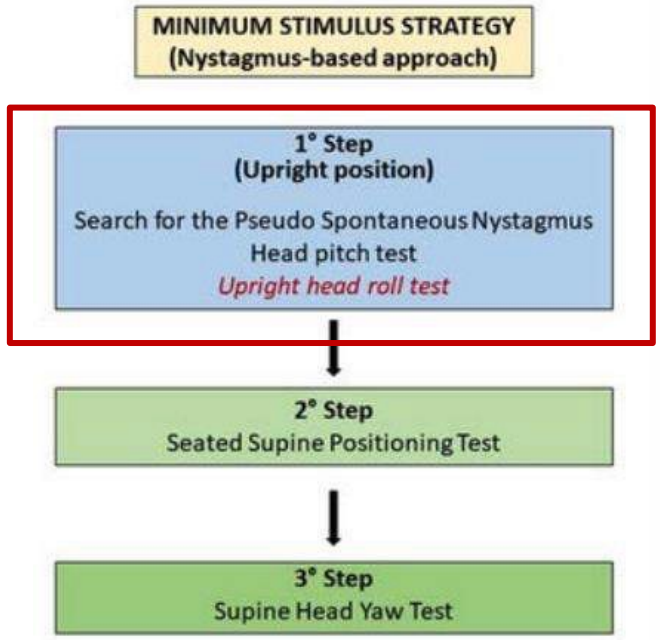
Upright head roll test: A new contribution for the diagnosis of lateral semicircular canal benign paroxysmal positional vertigo

Pasquale Malara,[1] Andrea Castellucci,[2] Salvatore Martellucci[3]

[1]Audiology & Vestibology Service, Centromedico Bellinzona, Bellinzona, Switzerland;
[2]ENT Unit, Department of Surgery, Arcispedale Santa Maria Nuova, AUSL - IRCCS, Reggio Emilia;
[3]ENT Unit, Ospedale "Santa Maria Goretti", Azienda USL Latina, Latina, Italy

UBP

- **2019: Prospective Preliminary study**
- 12 consecutive patients diagnosed with **HSC BPPV**, comparing
  - **UPRIGHT BPPV PROTOCOL**
  - 3-step test battery (**COMPLETE PROTOCOL**)



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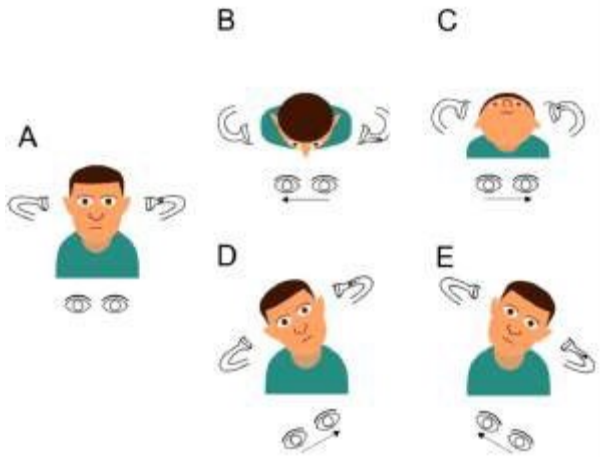
Minimum Stimulus Strategy in HSC BPPV

Table 1. Demographic and clinical records of patients enrolled in this preliminary study.

Patient	Age	Sex	PSN	HPT-F	HPT-B	UHRT-R	UHRT-L	SST	HYT	Side and LSC arm involved	Onset time
1	55	F	L	R	L	L	R	No	A-N	L-amp	2 - 7 d
2	60	M	No	L	R	No	L	R	G-L	L-non-amp	> 7 d
3	58	M	L	R	L	R	L	L	G-R	R-non-amp	< 2 d
4	50	F	L	L	R	L	R	No	A-N	R-amp	2 - 7 d
5	52	F	R	L	R	L	R	R	A-L	R-amp	< 2 d
6	50	F	No	L	R	R	L	R	G-L	L-non-amp	2 - 7 d
7	60	F	L	R	L	R	L	L	G-R	R-non-amp	< 2 d
8	35	M	No	No	L	R	L	L	G-R	R-non-amp	> 7 d
9	60	M	R	R	L	R	L	L	G-R	R-non-amp	2 - 7 d
10	50	F	No	L	R	L	R	No	A-N	R-amp	> 7 d
11	62	F	No	R	L	L	R	L	A-R	L-amp	> 7 d
12	83	M	No	R	No	R	L	L	G-R	R-non-amp	> 7 d

A-L: apogeotropic nystagmus, more intense on the left side; A-N: apogeotropic nystagmus, no differences in intensity between right and left side; A-R: apogeotropic nystagmus, more intense on the right side; d: day(s); F: female; G-L : geotropic nystagmus; more intense on the left side; G-N: geotropic nystagmus; no differences in intensity between right and left side; G-R : geotropic nystagmus, more intense on the right side; HPT-B: head pitch test backward; HPT-F: head pitch test forward; HYT: head yaw test; L: left-beating nystagmus; L-amp: ampullary arm of the left canal; L-non-amp: non-ampullary arm of the left canal; LSC: lateral semicircular canal; M: male; No: no nystagmus; PSN: pseudo-spontaneous nystagmus; R: right-beating nystagmus; R-amp: ampullary arm of the right canal; R-non-amp: non-ampullary arm of the right canal; SST: seated-supine test, UHRT-L: Upright Head Roll Test on the left side; UHRT-R: Upright Head Roll Test on the right side.



- **PSN** was detected in 50% of cases.
- **HPT** was positive in all cases, eliciting a direction-changing horizontal nystagmus with either head bending in 10 patients (83.3% of cases).
- **UHRT** elicited a direction-changing positional nystagmus on either side in all patients but one.
- The **upright protocol was effective as the complete protocol (100% of diagnostic accuracy)**

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Minimum Stimulus Strategy in HSC BPPV

OPEN ACCESS

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Upright BPPV Protocol: Feasibility of a New Diagnostic Paradigm for Lateral Semicircular Canal Benign Paroxysmal Positional Vertigo Compared to Standard Diagnostic Maneuvers

Salvatore Martellucci[1], Pasquale Malara[2], Andrea Castellucci[3], Rudi Pecci[4], Beatrice Giannoni[4], Vincenzo Marcelli[5], Alfonso Scarpa[6], Ettore Cassandro[6], Silvia Quaglieri[7], Marco Lucio Manfrin[7], Elisabetta Rebecchi[8], Enrico Armato[9], Francesco Comacchio[10], Marta Mion[11], Giuseppe Attanasio[12], Massimo Ralli[12,13], Antonio Greco[12,13], Marco de Vincentiis[13,14], Cecilia Botti[3,15], Luisa Savoldi[16], Luigi Califano[17], Angelo Ghidini[3], Giulio Pagliuca[1], Veronica Clemenzi[1,13], Andrea Stolfa[1,13], Andrea Gallo[1,13] and Giacinto Asprella Libonati[18]*

TABLE 1 | Demographic data.

	Age	Onset time		Side		Geotropic forms	Apogeotropic forms
62 Males (46.26%)	56.82 ± 14.46 (range: 25–89)	<48h	21 (15.67%)	Right	33 (26.62%)	21 (15.67%)	12 (8.95%)
		2–7 days	23 (17.16%)				
		>7 days	18 (13.43%)	Left	29 (21.64%)	20 (14.92%)	9 (6.71%)
72 Females (53.73%)	57.04 ± 15.58 (range: 22–85)	<48h	20 (14.92%)	Right	39 (29.10%)	22 (16.41%)	17 (12.68%)
		2–7 days	34 (25.37%)				
		>7 days	18 (13.43%)	Left	33 (26.64%)	17 (12.68%)	16 (11.94%)
	56.94 ± 15.01 (range: 22–89)				134 (100%)	80 (59.70%)	54 (40.29%)

- **2020: Multicentric study**
- 134 consecutive patients diagnosed with **HSC-BPPV**
- **3 groups according to the onset time**
  - < 2 days
  - 2-7 days
  - >7 days
- **UPRIGHT PROTOCOL** (PSN, HPT, UHRT)
- **SUPINE PROTOCOL** (SSPT, SHRT)
- 3-step test battery (**COMPLETE PROTOCOL** - PSN, PSN, HPT, UHRT, SST, SHRT)

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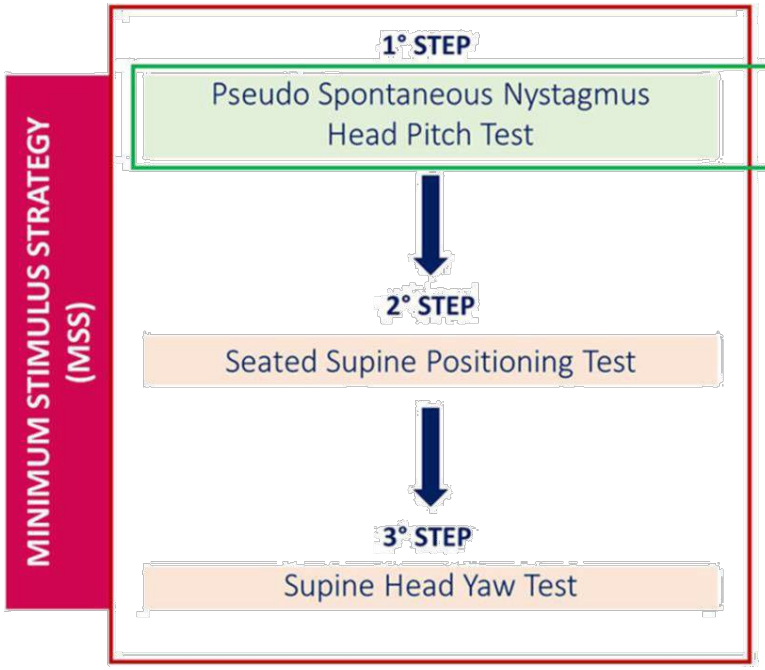
Minimum Stimulus Strategy in HSC BPPV



Cases	No. of cases	% concordance	Chi-square test	*p*-value	Cohen's kappa
Incomplete HPT	35	100.0%	105.0	<0.000	1.000
Incomplete UHRT	27	96.3%	81.0	<0.000	0.947
HPT and UHRT both incomplete	12	100.0%	36.0	<0.000	1.000

- **Correct diagnosis with UBP**: 95.5% of cases
- Almost **complete concordance between UBP e CDP** ($p < 0.000$, Cohen's kappa = 0.94)
- **Correct diagnosis only using the SHRT: 85.1%**

- **UBP**
  - **No difference according to onset time**
  - The upright protocol was **effective even if either HPT, UHRT or both give incomplete results.**

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Minimum Stimulus Strategy in HSC BPPV

- **MINIMUM DISCOMFORT FOR THE PATIENT**
- **ONLY ONE NYSTAGMUS ON BOTH PLANES (PITCH AND ROLL) IS ENOUGH FOR THE DIAGNOSIS**
- **DOES NOT ALLOW TO CLEARLY RECOGNIZE THE PAROXISM OF NYSTAGMUS**

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Minimum Stimulus Strategy in PSC BPPV

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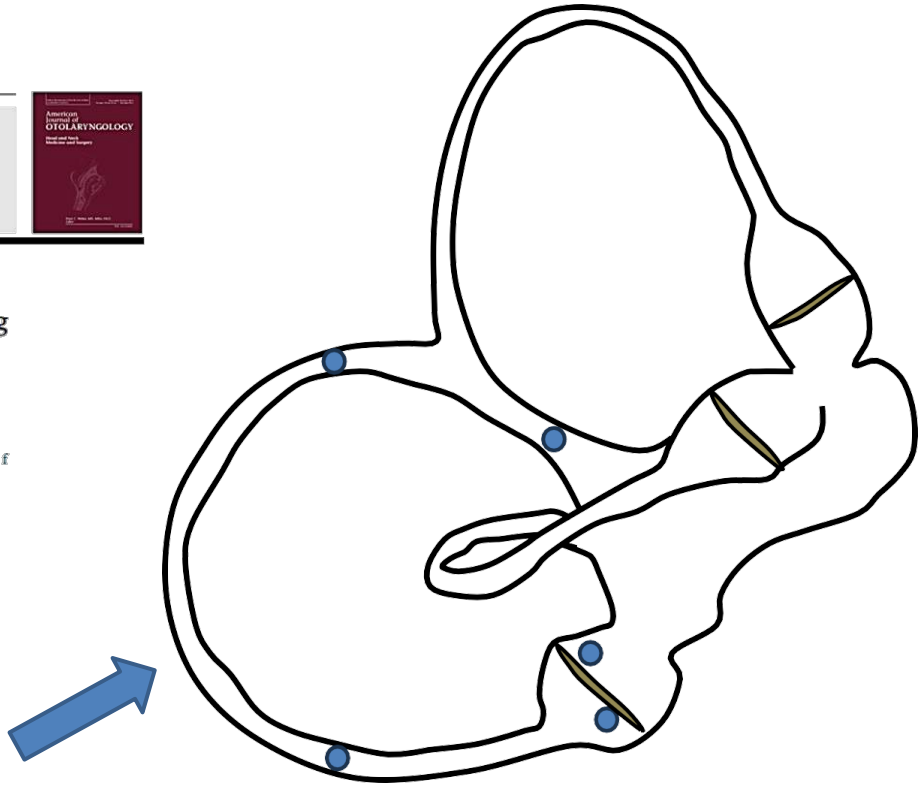
Salvatore Martellucci[a], Andrea Castellucci[b,*], Pasquale Malara[c], Giovanni Ralli[d], Giulio Pagliuca[a], Cecilia Botti[b,e], Andrea Gallo[a,d], Angelo Ghidini[b], Giacinto Asprella Libonati[f]



Minimum Stimulus Strategy in PSC BPPV

The Laryngoscope
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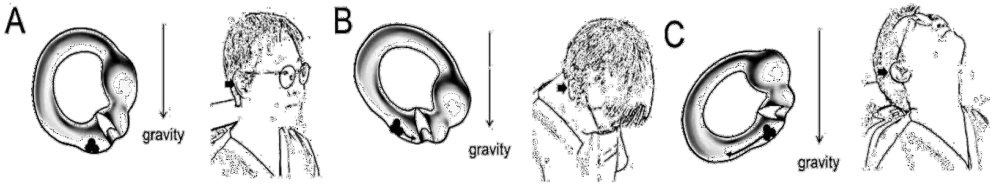
Utility of the Bow and Lean Test in Predicting Subtype of Benign Paroxysmal Positional Vertigo

Seongjun Choi, MD; Hye Rang Choi, MD; Hyunjoo Nahm, MD; Kyujin Han, MD; Jung Eun Shin, MD, PhD; Chang-Hee Kim, MD, PhD



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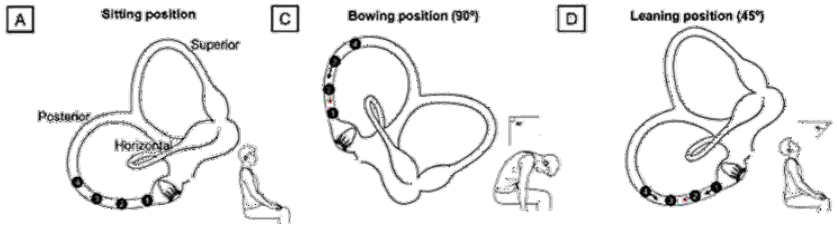
Vertical Nystagmus in the Bow and Lean Test may Indicate Hidden Posterior Semicircular Canal Benign Paroxysmal Positional Vertigo: Hypothesis of the Location of Otoconia

Oak-Sung Choo, Hantai Kim, Jeong Hun Jang, HunYiPark & Yun-Hoon Choung



- **HPT could be suited to move debris in the affected PSC**, thus modifying the discharge activity of the PSC afferents depending on cupular bendings
  - Both **PSC** lie in a plane approximately **45° to the mid-sagittal plane** ➔ **head rotations along the pitch plane seem not to represent the most appropriate movements to shift debris longitudinally through the PSC lumen.**
  - The use of the gravitational force with head bendings along an offset plane with respect to the PSC orientation likely explains why the sole HPT only achieved a correct diagnosis in 75.2%

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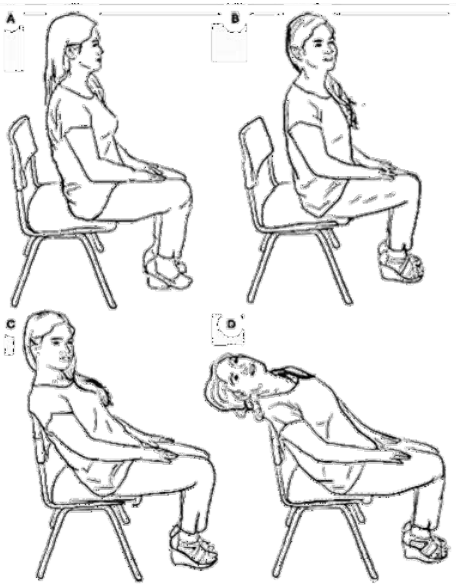
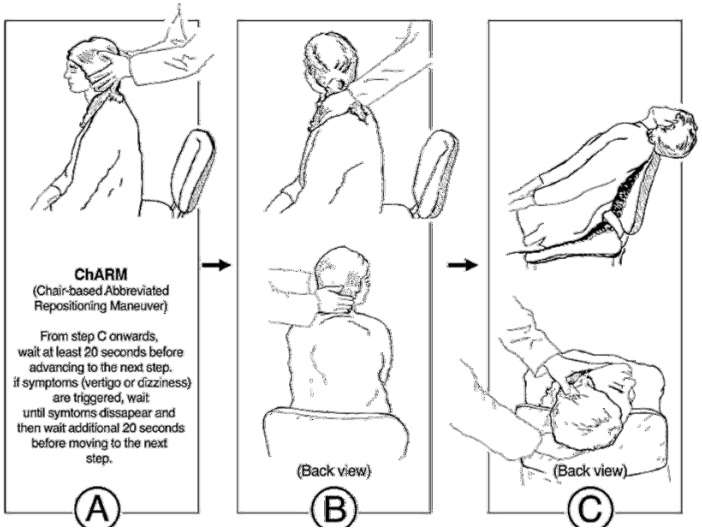
An Abbreviated Diagnostic Maneuver for Posterior Benign Positional Paroxysmal Vertigo

*Pia Michael[1], Carolina Estibaliz Oliva[1], Marcia Nuñez[1], Cristian Barraza[1], Juan Pablo Faúndez[1] and Hayo A. Breinbauer[1,2]**

[1] Otolaryngology Department, San Juan de Dios Hospital, University of Chile, Santiago, Chile, [2] Clínica Alemana de Santiago, Facultad de Medicina Clínica Alemana, Universidad del Desarrollo, Santiago, Chile





European Archives of Oto-Rhino-Laryngology (2019) 276:2191–2198
https://doi.org/10.1007/s00405-019-05460-2

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Check for updates

A Chair-based Abbreviated Repositioning Maneuver (ChARM) for fast treatment of posterior BPPV

Pia Michael[1] · Daniel Muñoz[1] · Anton Tuma[2] · Matías Gárate[1] · Cristian Barraza[1] · Marcia Nuñez[1] · Hayo Andrés Breinbauer[1,2,3]

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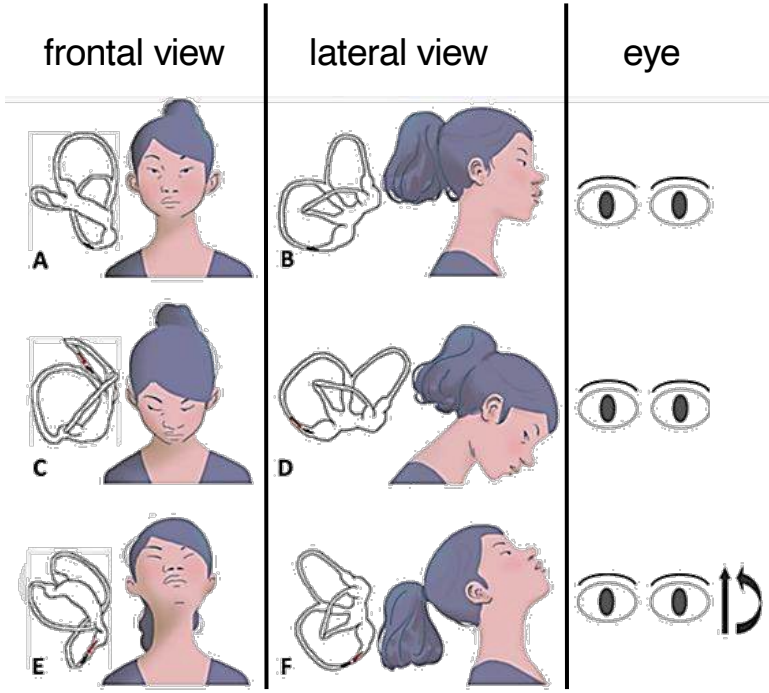
Minimum Stimulus Strategy in PSC BPPV

Right PSC - BPPV



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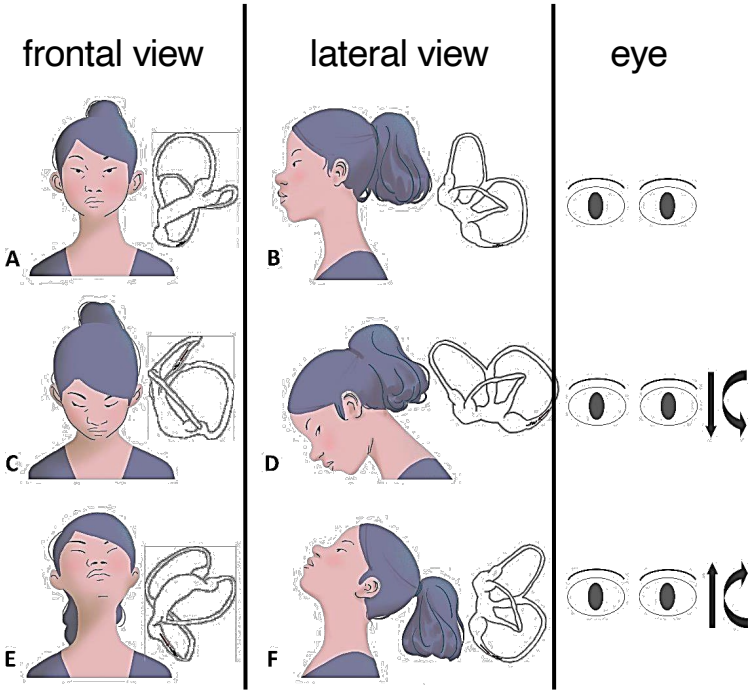
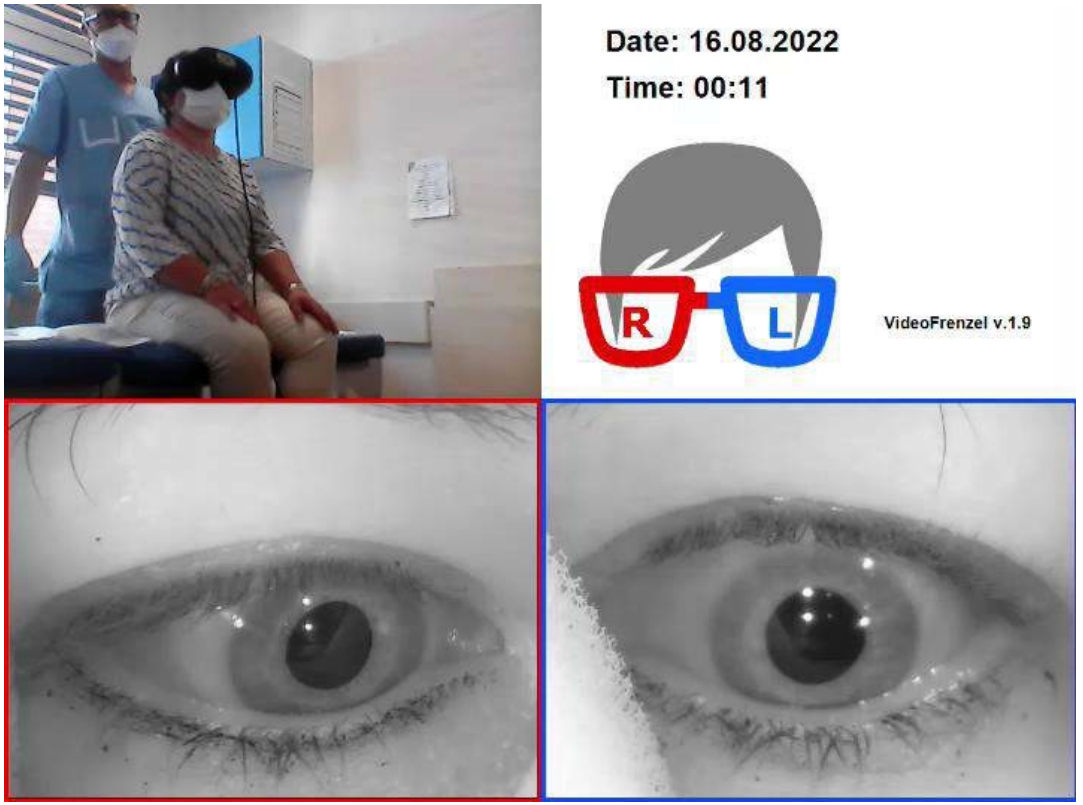
Left PSC - BPPV





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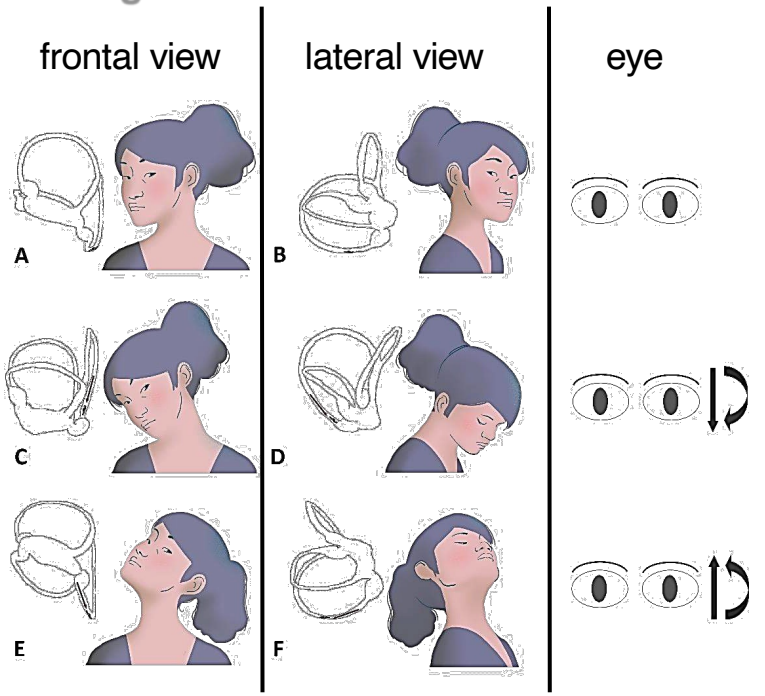
Right PSC - BPPV



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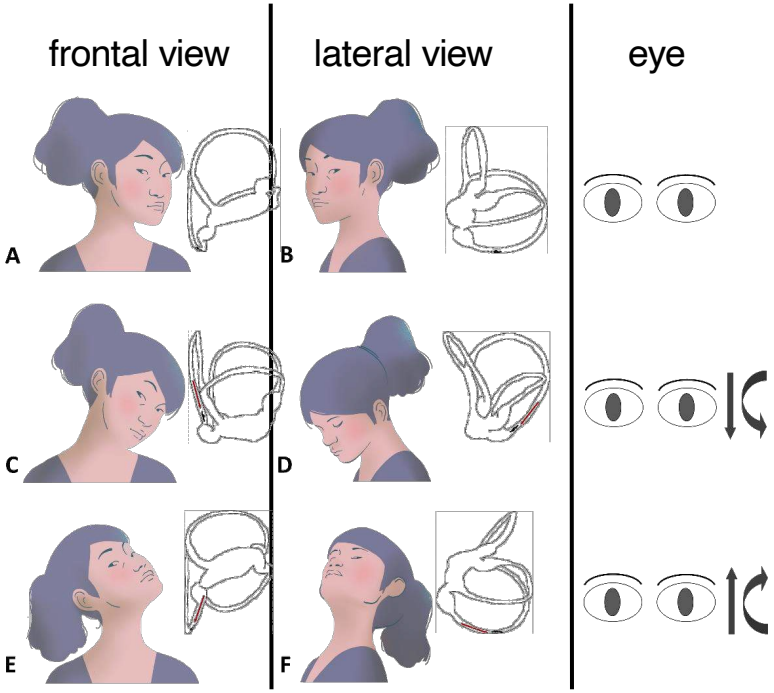
Left PSC - BPPV



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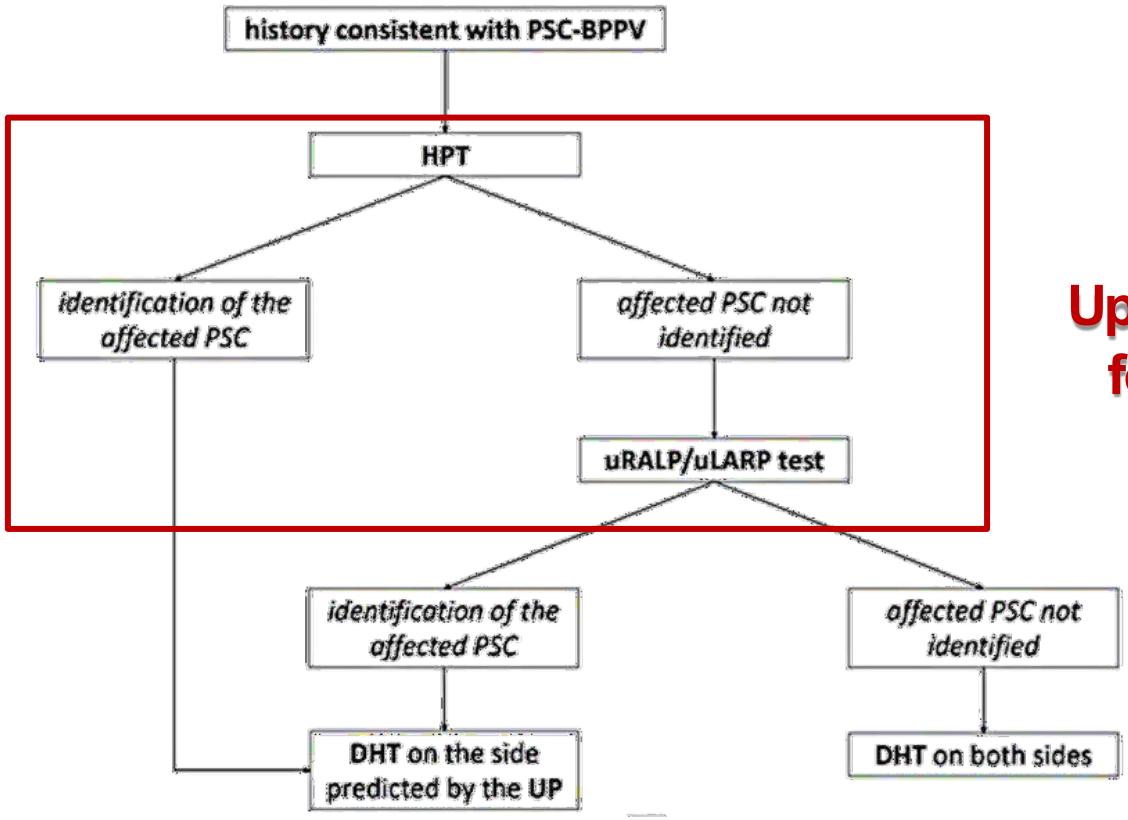

Upright protocol for PSC BPPV

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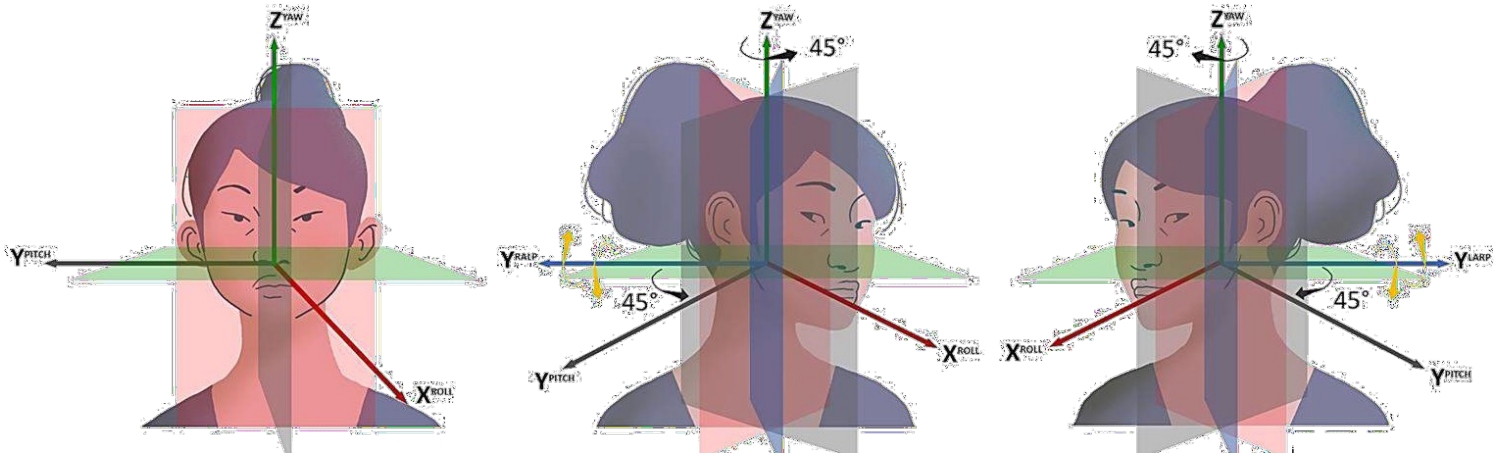
- **2022: prospective multicentric study**
- 109 consecutive patients finally diagnosed with **PSC-BPPV**

- **3 Group according to the onset time**
  - < 2 days
  - 2-7 days
  - >7 days



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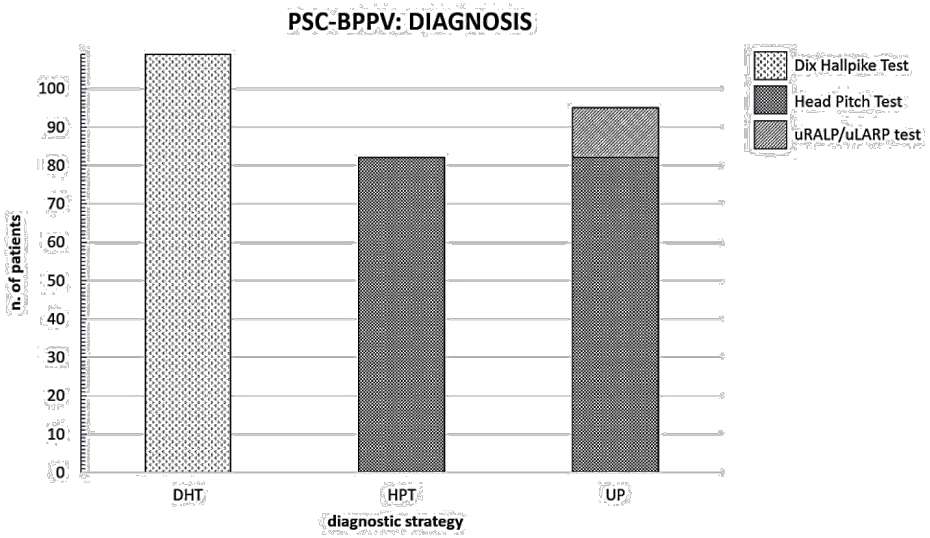

- **The HPT** elicited positional ny in 92 cases (84.4%)
  - 40 cases (36.7%) in both head bendings
  - 47 cases (43.1%) only in backward position
- **The HPT predicted a correct diagnosis in 82 subjects** (75.2%)
- **The uRALP and uLARP tests enabled to identify the affected side in additional 13 cases**.
- the **Upright protocol allowed a correct diagnosis of PSC-BPPV in 95 cases (87.2%)**

- **The diagnostic sensitivity of the UBP was 100% in patients presenting within 7 days** from symptoms onset (64/64),
- It reduced to **68.9% in patients examined later (31/45) ($p < 0.001$)**

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Minimum Stimulus Strategy in PSC BPPV

- The **intensity of positional nystagmus in BPPV depends on** several factors
  - **critical mass**
  - **position of canaliths**

- Since the **otoconial mass** is thought to be **larger** and **settle the central portion of the canal lumen** in the **first stage of the disease**, cupular deflections should be wider in these conditions, accounting for stronger vertigo spells and related autonomic symptoms

- Accordingly, **diagnostic tests based on otoconial gravitations** along the affected canal due to slight head movements are likely **more sensitive in the acute stage of the disease**, mainly if head **movements are closely aligned with the canal plane**.

A mathematical model for top-shelf vertigo: the role of sedimenting otoconia in BPPV☆

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Clinical Implications of a Mathematical Model of Benign Paroxysmal Positional Vertigo

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Minimum Stimulus Strategy in PSC BPPV

- Therefore, the impairment of the UP sensitivity over time might be related to a **reduced cupular bendings and weak nystagmus due to**
  - **progressive reduction of the otoconial mass**
  - **otoconial dispersion along the membranous duct**

Long-lasting
Right PSC - BPPV

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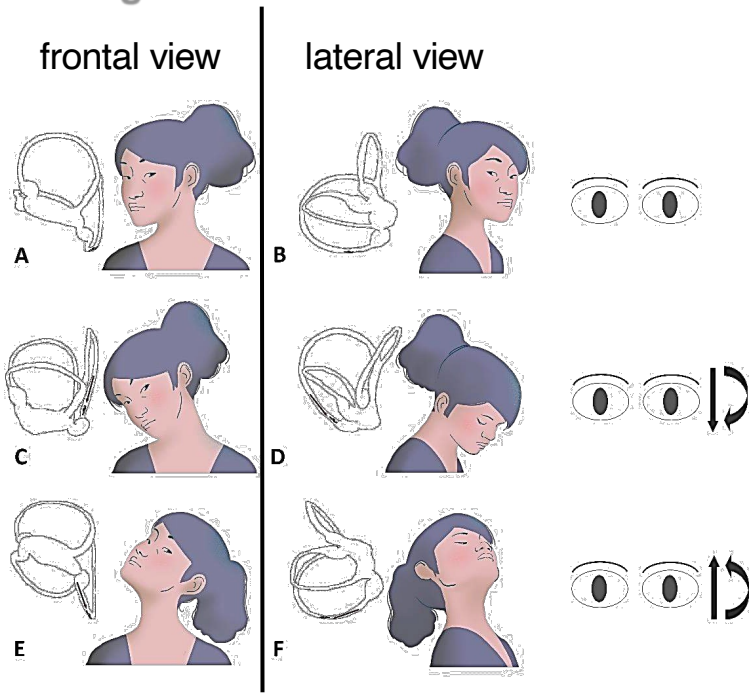
Minimum Stimulus Strategy in PSC BPPV

Right PSC - BPPV



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Minimum Stimulus Strategy in PSC BPPV

- **MINIMUM DISCOMFORT FOR THE PATIENT**
- **VERY HIGH SENSITIVITY MAINLY IN THE ACUTE STAGE**

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Minimum Stimulus Strategy in multicanal BPPV

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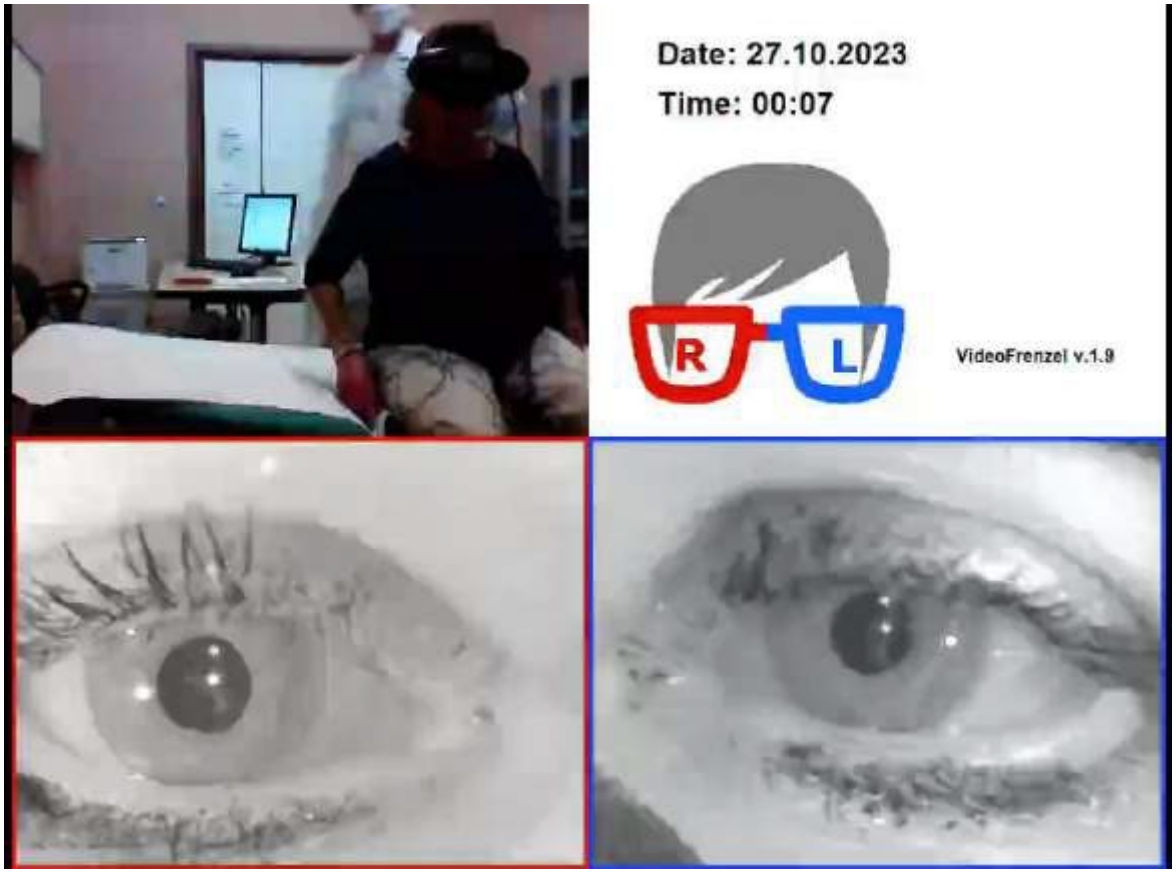

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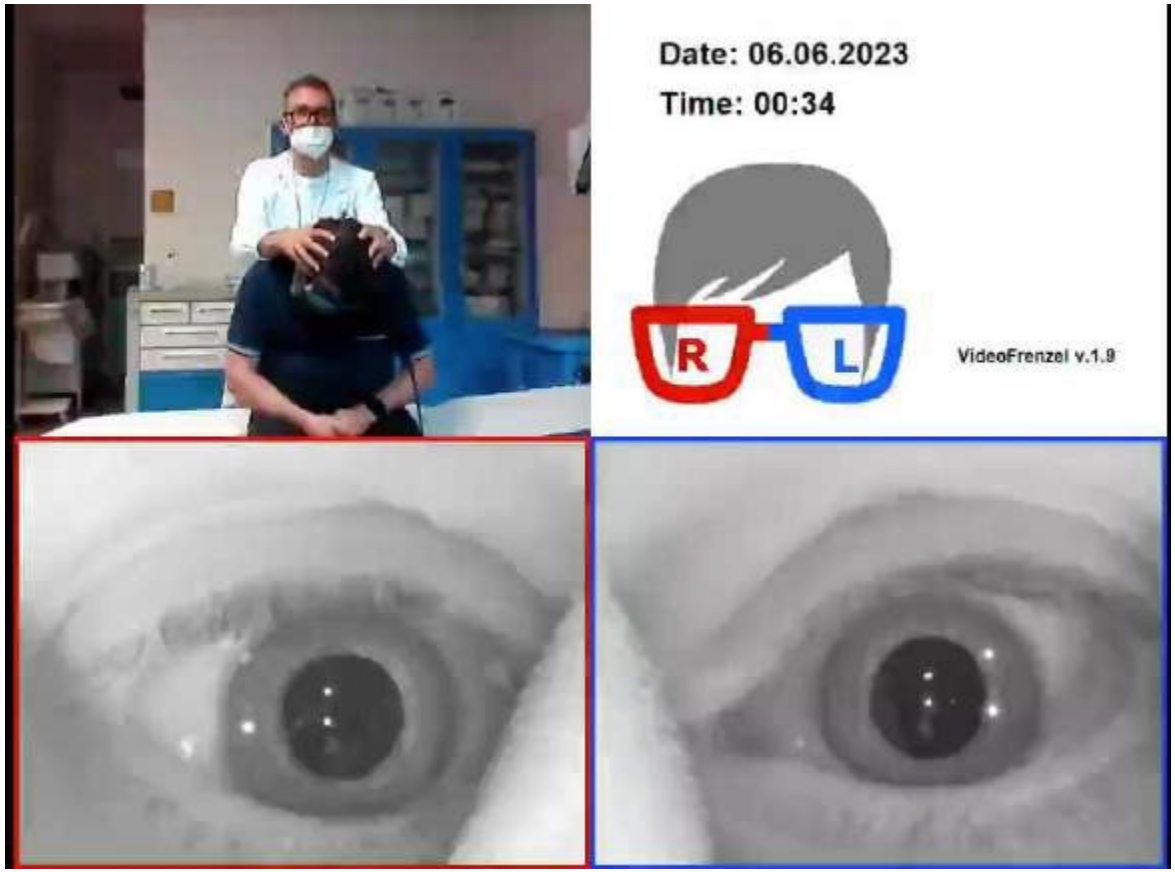

Thank You

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