

Case Report

Topodiagnosis of the Inner Ear: Illustrative Clinical Cases

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Abstract

We present two clinical cases to illustrate that we are currently in a position to accurately locate the site of the lesion in vestibular system diseases thanks to advances in complementary tests.

Keywords

- Vestibular syndrome
- Downbeating nystagmus
- Upbeating nystagmus
- vHIT

ABBREVIATIONS

HIT: Head Impulse Test; vHit: Video Head Impulse Test; VNG: Videonystagmography; Y.O.: Years Old MRI: Magnetic Resonance Imaging; VVOR: Visual Vestibulo Ocular Reflex; VOR: Vestibulo-Ocular Reflex; BPPV: Benign Paroxysmal Positional Vertigo

INTRODUCTION

In recent years, we have witnessed a progress in the study of the vestibular system. Thanks to the development of new examination techniques and the improvement of existing ones, we have been able to accurately locate the lesion within this system. We present two clinical cases to illustrate what we have just mentioned.

CASE PRESENTATION

CASE 1

Male, 18 y.o.

Date of consultation: 02/07/17

Patient who presents left ear tinnitus and hearing loss, and acute vestibular syndrome with permanent vertigo accompanied by neurovegetative symptoms two days before consultation.

During the first 24 hours after onset of symptoms, he presents sudden deafness in the left ear audiogram (Figure 1). Intratympanic dexamethasone is administered, he was medicated with pentoxifylline and betahistine at another center.

During the first week he continues experiencing dizziness and vertigo that lasts seconds upon positional changes. These symptoms are still present at the moment of the first consultation at our Department.

Cerebellopontine angles and brain MRI show no evidence of disease.

Physical examination: Lateropulsion to the left with Romberg, nystagmus post head shaking to the right, bedside HIT does not show refixation saccade.

02/21/17 - two weeks later

vHIT are performed.

vHIT shows drop in the response of the left posterior semicircular canal (Figure 2). A downbeat nystagmus after 30 seconds latency is observed, with the concomitant vertigo sensation when Dix-Hallpike maneuver to the left with Video Frenzel is performed.

Epley maneuver is performed with good outcome.

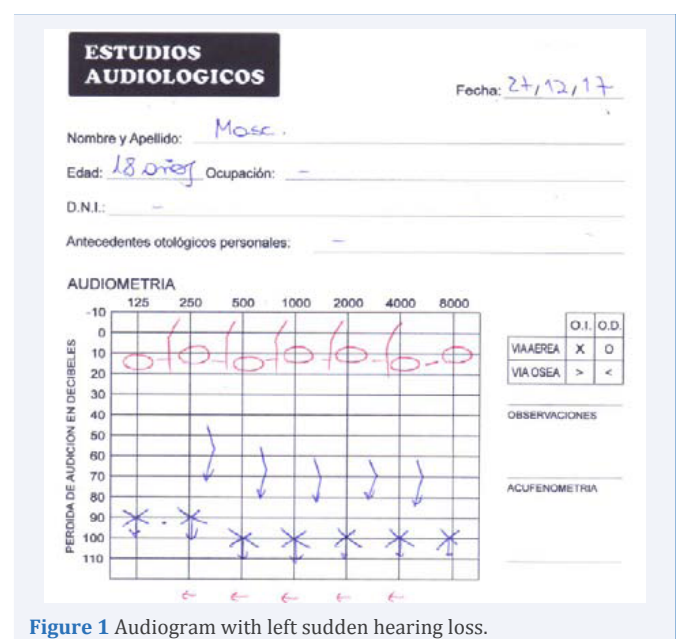


Figure 1 Audiogram with left sudden hearing loss.

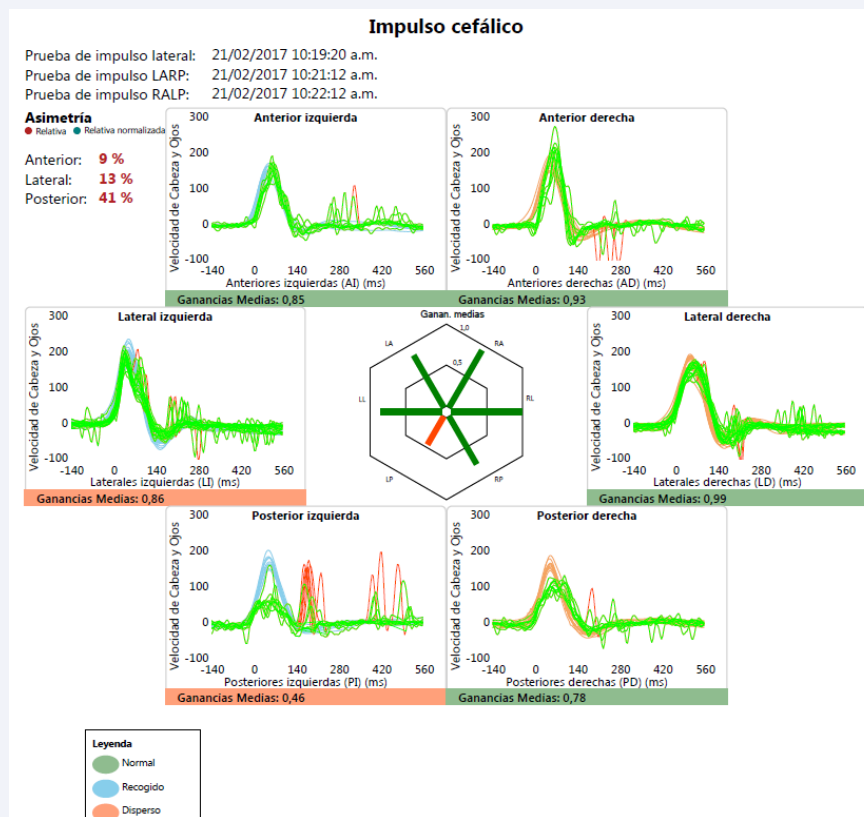


Figure 2 vHIT shows a drop in the response of the left posterior semicircular canalv.

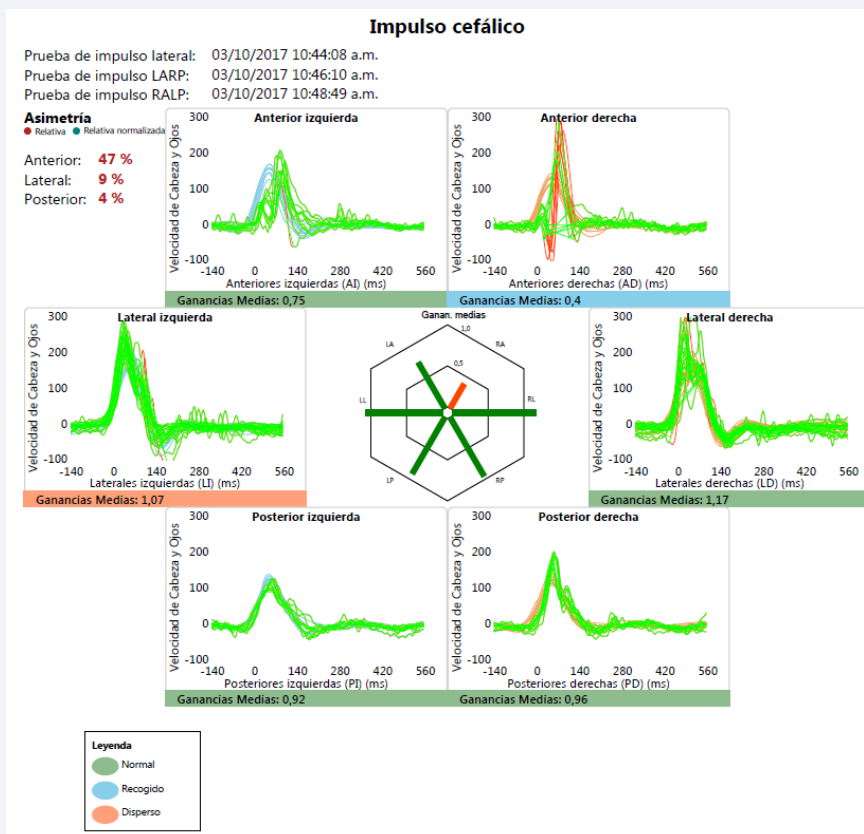


Figure 3 vHIT shows a pure drop of the right anterior semicircular canal.

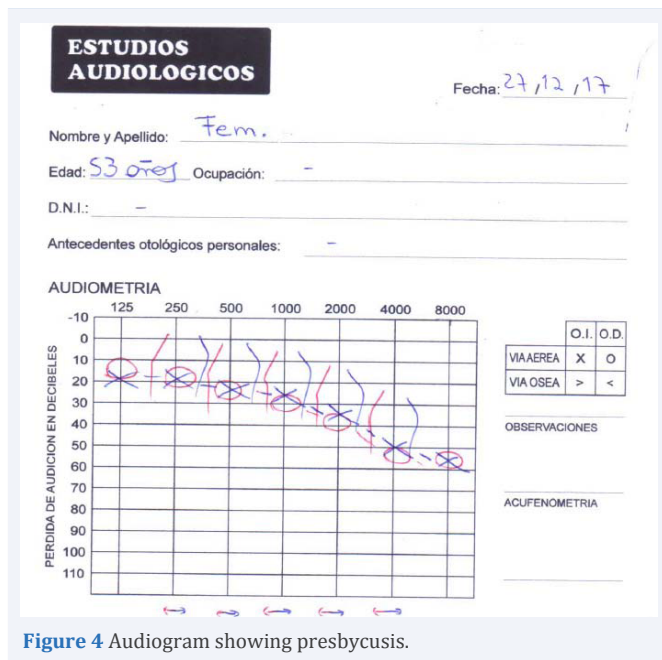


Figure 4 Audiogram showing presbycusis.



Figure 5 Model that show that a cochleo-vestibular artery compromise would cause a selective compromise of the posterior semicircular canal and of the acute frequencies.

03/28/2017 - one month later

Control under Frenzel video without nystamus.

Patient refers an improvement in his symptoms.

He can perform his normal daily activities.

CASE 2

Female patient, 53 y.o., who suffers from an acute vestibular syndrome that forces her to stay in bed for 48 hours eleven months before consultation. Since then, and for several weeks, she feels as if "her head goes to the right". She also experiences instability and positional dizziness.

Current physical examination shows a spontaneous vertical upbeat nystagmus; when fixation is removed (video 1, 2: Postural 0°) the nystagmus accentuates slightly with positional changes (video 3, 4: Postural 30° and left turn and right turn), the rest of the neuro-otologic and neurologic examination was normal, hearing is preserved and symmetric.

Supplementary studies: a brain and ears MRI with Gadolinium was performed with normal results.

vHIT shows a pure drop of the right anterior semicircular canal, with covert saccades, a significantly marked interaural asymmetry (Figure 3), optical reflexes including VVOR, VOR and saccades were completely normal.

Audiogram was normal according to age (Figure 4).

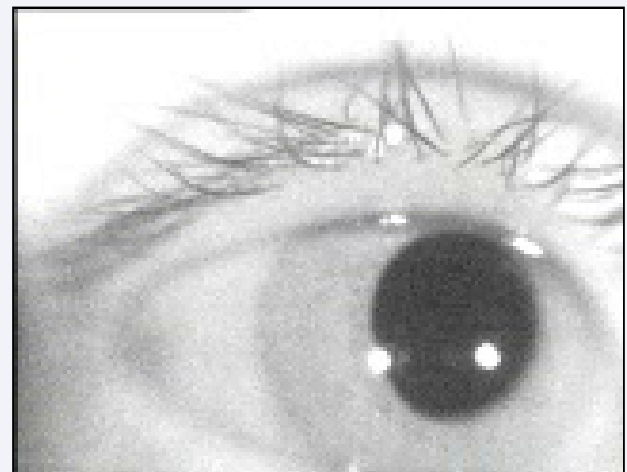
DISCUSSION

The combination of vestibular symptoms and sudden hearing loss is not unusual [1], but its mechanism is unclear. Recent inner ear circulation compromise modelsshow that a cochleo-vestibular artery compromise would cause a selective compromise of the posterior semicircular canal and of the acute frequencies (Figure 5) [2].

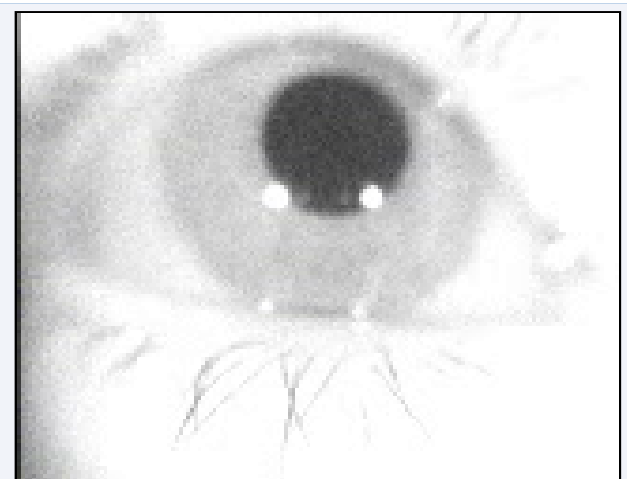
In the first case, given the patient's age and the fact that he has no history of vascular diseases, a viral etiology [3] must be considered, since this mechanism can produce anacusia and a selective compromise of the vestibular nerve inferior division which is shown by a drop of the posterior semicircular canal VOR gain with corrective saccades.

The Video Head Impulse Test is a useful tool, associated in this case to the audiometric data for the correct diagnosis of the inner ear sensors.

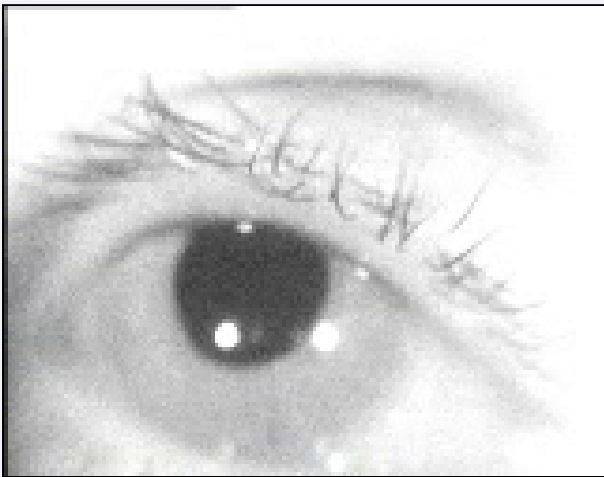
The presence of vertical downbeat nystagmus with latency would suggest an apogeotropic variant of the posterior semicircular canal [4] which is highly probable given the response



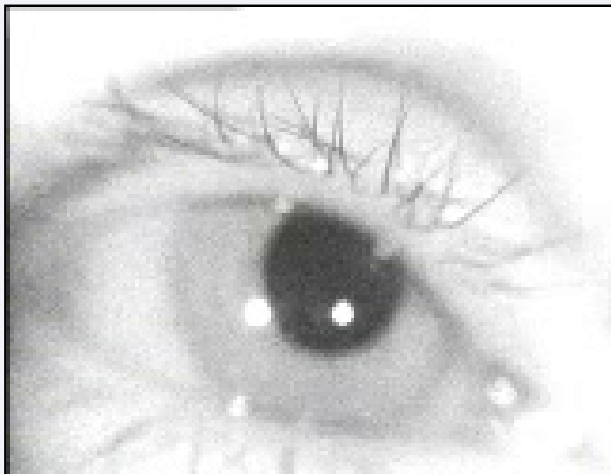
Video 1



Video 2



Video 3



Video 4

to Epley maneuver.

Another possibility is a selective damage of the posterior semicircular canal macula.

A central vestibular compromise in the loop that connects the vestibular nuclei with the archicerebellum should always be ruled out in the presence of positional downbeat nystagmus, given the fact that selective inhibition over the anterior semicircular canal is weaker than over the posterior one.

Recent publications [4-6]. CITAR EL PAPER NUEVO CON ASPRELLA consider the existence of anterior semicircular canal BPPV highly unlikely, yet, a dysfunctional misbalance between both vertical canals may lead, theoretically speaking, to a downbeat nystagmus which is seen only with a change in position [7].

In the second case, we conclude that the patient suffered from neuritis of the right vestibular nerve superior division with a selective compromise of the anterior semicircular canal.

In this case, the Video Head Impulse Test makes it possible to perform a topodiagnosis consistent with the clinical picture and evolution.

Our greater physiopathological knowledge makes it possible for us to study the inner ear function from a neurophysiological point of view, to rule out a central compromise and to anticipate the evolution of patients with cochleo-vestibular compromise such as the one in this case.

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