

The patients with Meniere's disease results in the discrepancy between video head impulse test and caloric testing

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Introduction

Video head impulse test (vHIT) was established in 2009 and has been widely performed for clinical examination. It was reported that the results of vHIT were different from those of the caloric testing in some cases with Meniere's disease. The aim of this study was to clarify whether the discrepancy exists.

Subjects and Method

The subjects consisted of 14 cases of unilateral Meniere's disease, 6 cases of vestibular neuritis and 3 case of Ramsay Hunt syndrome.

The vHIT were examined using ICS Impulse. When VOR gain was lower than 0.8, we defined the result as abnormal.

$$\text{Gain asymmetry (GA) \%} = 100 \times \frac{\text{VOR gain on right ear} - \text{VOR gain on left ear}}{\text{VOR gain on right ear} + \text{VOR gain on left ear}}$$

CP% was calculated from monothermal caloric testing. When CP% exceeded 25%, we defined a result to be abnormal.

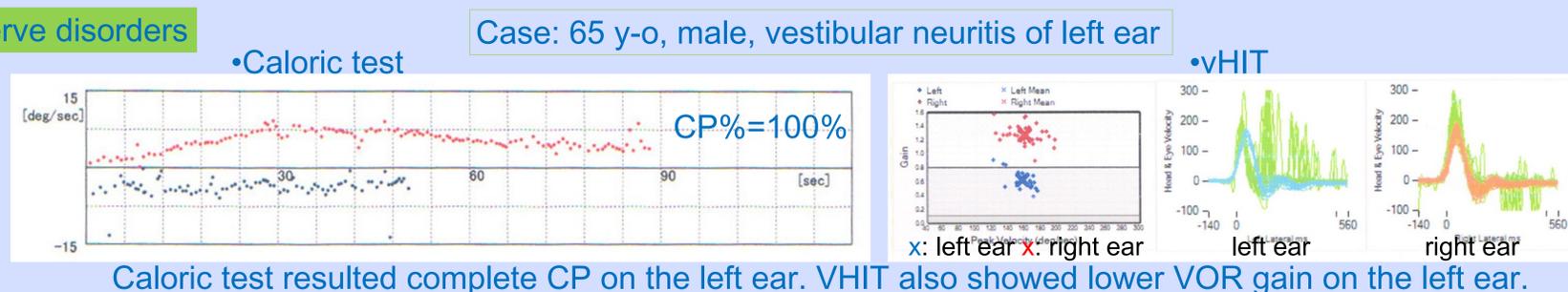
$$\text{Canal paresis (CP) \%} = 100 \times \frac{\text{SPVmax on right ear} - \text{SPVmax on left ear}}{\text{SPVmax on right ear} + \text{SPVmax on left ear}}$$

SPVmax: maximum velocity of slow phase eye movement



Result:

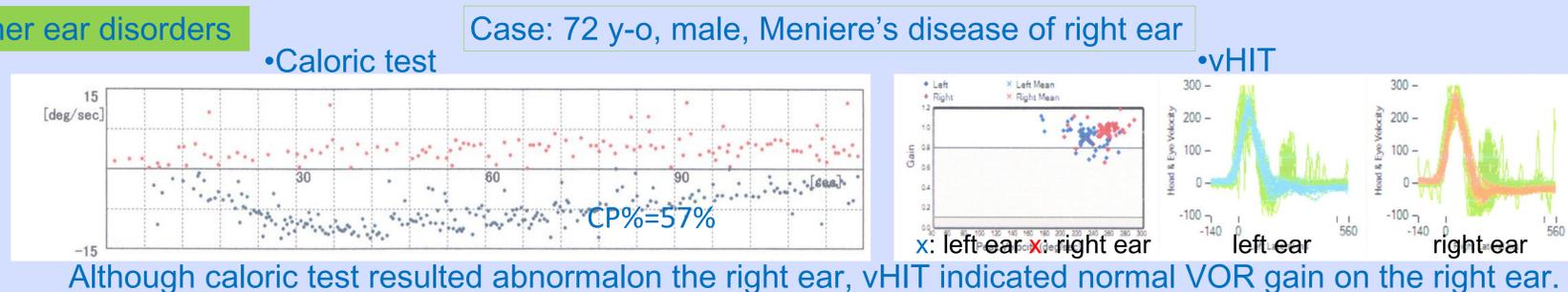
• Nerve disorders



Caloric test resulted complete CP on the left ear. vHIT also showed lower VOR gain on the left ear.

Abnormal results in caloric testing were shown in 9 cases, vHIT showed abnormality in 8 of them. The results on caloric testing and those on vHIT were strongly related.

• Inner ear disorders



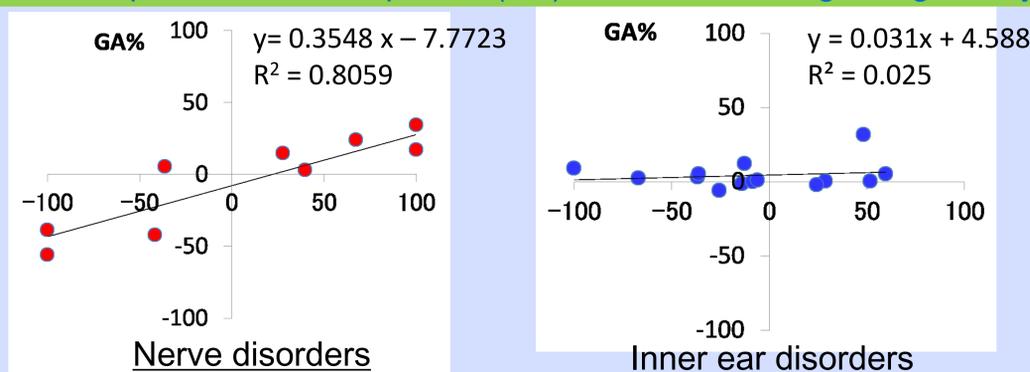
Although caloric test resulted abnormal on the right ear, vHIT indicated normal VOR gain on the right ear.

Results of caloric test	Results of vHIT	
	normal	abnormal
Normal	5	0
Abnormal	7	1

p=0.6154 (Fisher's exact test)

The results on vHIT were independent of those on caloric testing.

• Relationship between canal paresis(CP) on caloric testing and gain asymmetry (GA) on vHIT.



The results on caloric testing were strongly related to those on vHIT in cases with nerve disorders but are not in cases with Meniere's disease.

Discussions:

Discrepancy between the results on vHIT and those on caloric testing was confirmed. We suggested the following mechanism for the discrepancy:

1) Difference of stimulating frequencies (Park, 2005)

Stimulating frequency on caloric test is 0.003 Hz and those on vHIT is 2Hz. Both afferent fibers from type 1 cell and type 2 cell are damaged in vestibular neuritis. Type 2 cells which are mainly respond to lower frequencies are more damaged than type 1 cells which are mainly respond to higher frequencies in Meniere's disease.

2) Detaching cupula from ampular wall (Imura, 2010)

Endolymphatic hydrops causes the enlarged ampula portion, and the top of cupula became detached from ampular wall. Then convection flow during caloric stimulation decrease. When sensory cell or cupula are not damaged, vHIT shows normal even in enlarged ampula portion.