

Evaluation and treatment of patients with vestibular disorders: an overview of current approaches used in French physiotherapy clinics.

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Speakers: M. DEBUE, O. DUMAS, T MISERE, J. ORTEGA SOLIS



Dynamic Visual Acuity

Michel DEBUE

High velocity rehabilitation, oscillopsia, saccades.

Olivier DUMAS

Rotatory chair

Thierry MISERE

OKN & Virtual Reality current approach in French PT clinics: Survey data about their use for treatment of Visual Vertigo & Motion Sickness

José ORTEGA SOLIS



High Velocity Rehabilitation

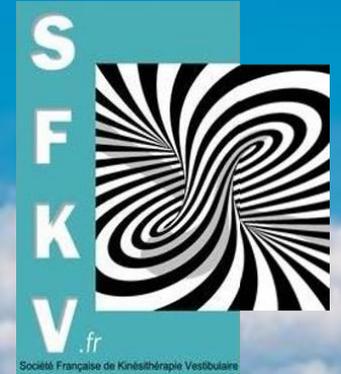
Oscillopsia

Saccades



ENT WORLD PARIS
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“Good morning. I would like to begin by thanking the organising committee of this impressive symposium for allowing me to talk to you about the rehabilitation of oscillopsia.”

Olivier Dumas Lyon France

Oscillopsia:

Erroneous perception (illusion) of an instability of the visual field during head movements.

- in the horizontal plane
- in the vertical planes

“We are going to discuss the treatment of oscillopsia in the context of rapid head motions at velocities greater than $150^\circ/\text{second}$. In fact, during low- and mid-velocity head motions, central compensation is sufficient to correct oscillopsia, with the exception, of course, of bilateral areflexia.”

... and covert saccades

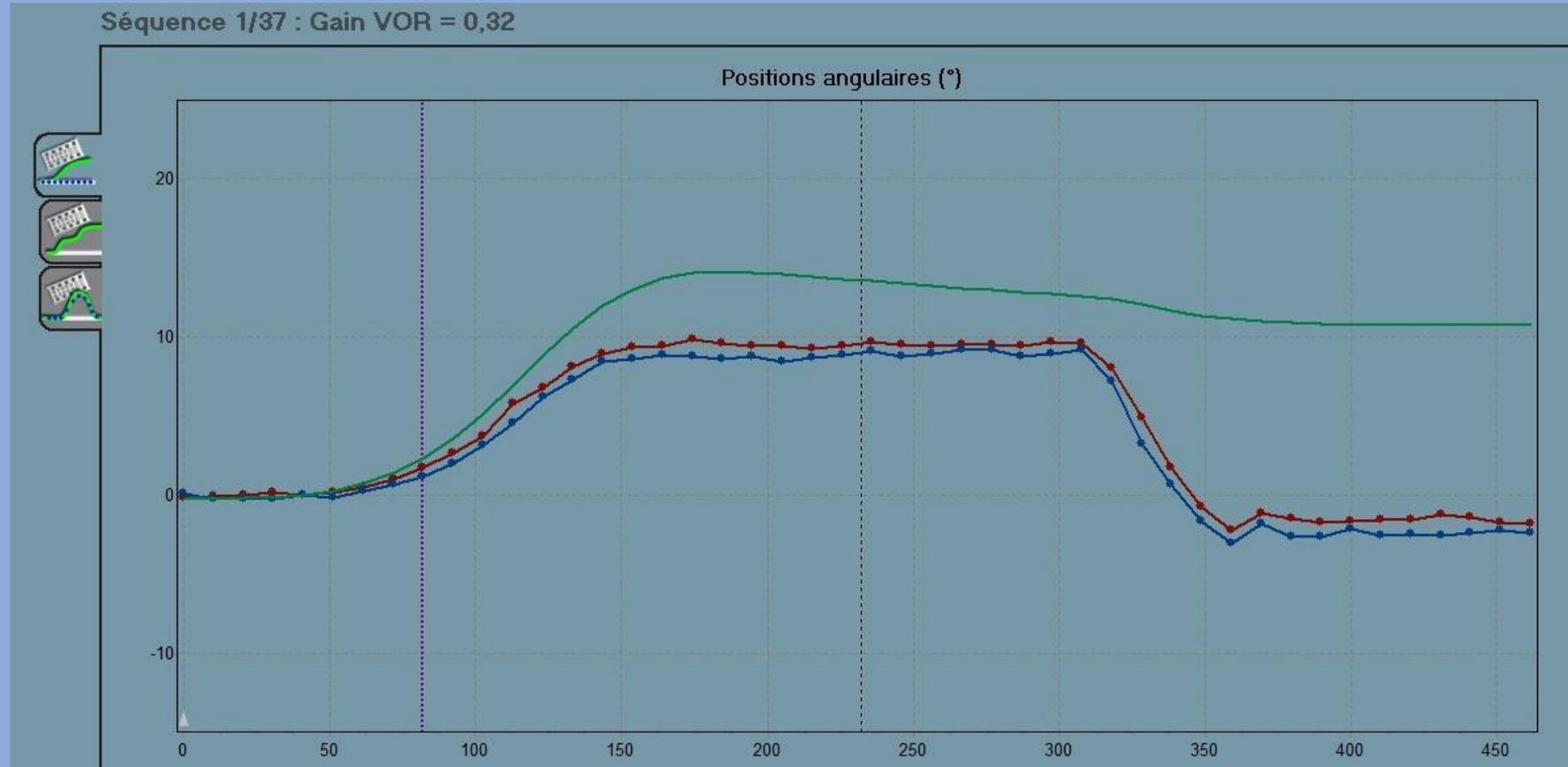
Followed by:

- The establishment of an early saccade strategy
- The quality of early saccades in terms of:
 - Gain
 - Latency
 - Organisation

“Oscillopsia is primarily combated by substituting the vestibular ocular reflex with covert saccades, but to be effective these early catch-up saccades must be adequate in terms of gain, latency and organisation.”

Mr B. 68 years old before rehabilitation

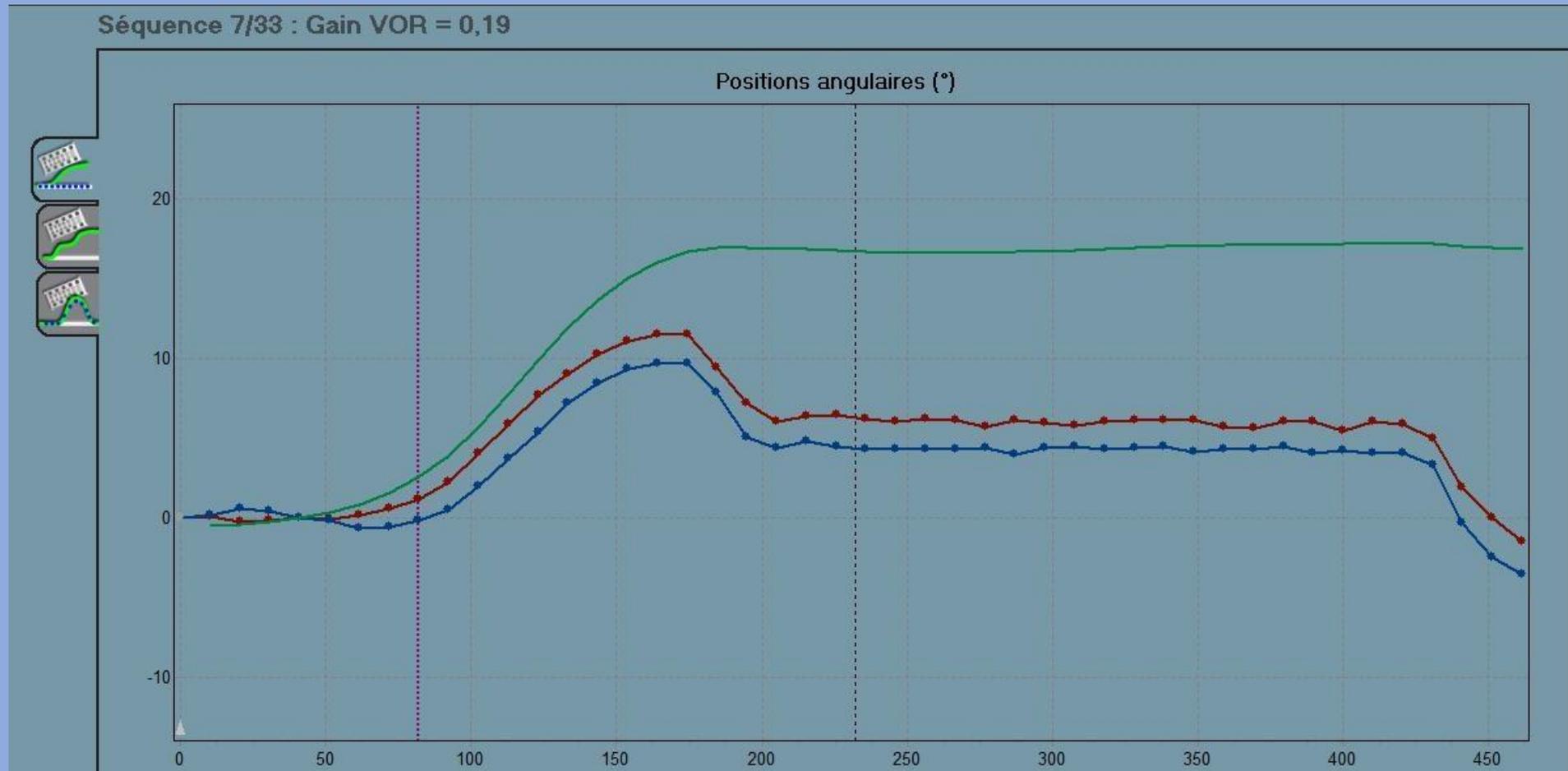
right chemical labyrinthectomy



“Mr B., who is 68 years old, underwent transtympanic gentamicin treatment (labyrinthectomy) for severe right-sided Menière’s Disease. He complained of visual field instability during rapid horizontal head motions to the right. Here you see that before rehabilitation, this patient did not display any covert saccade, but only an overt saccade that occurred after the head movement ; this saccade was voluntary-generated, associated with the instruction to fix the target. Here you will see a slow-motion film of the eyes during a passive head thrust to the right at $200^{\circ}/s$; you can see the late catch-up saccade. “

Mr B. 68 years old during rehabilitation
(4 sessions, 8 days)

right chemical labyrinthectomy

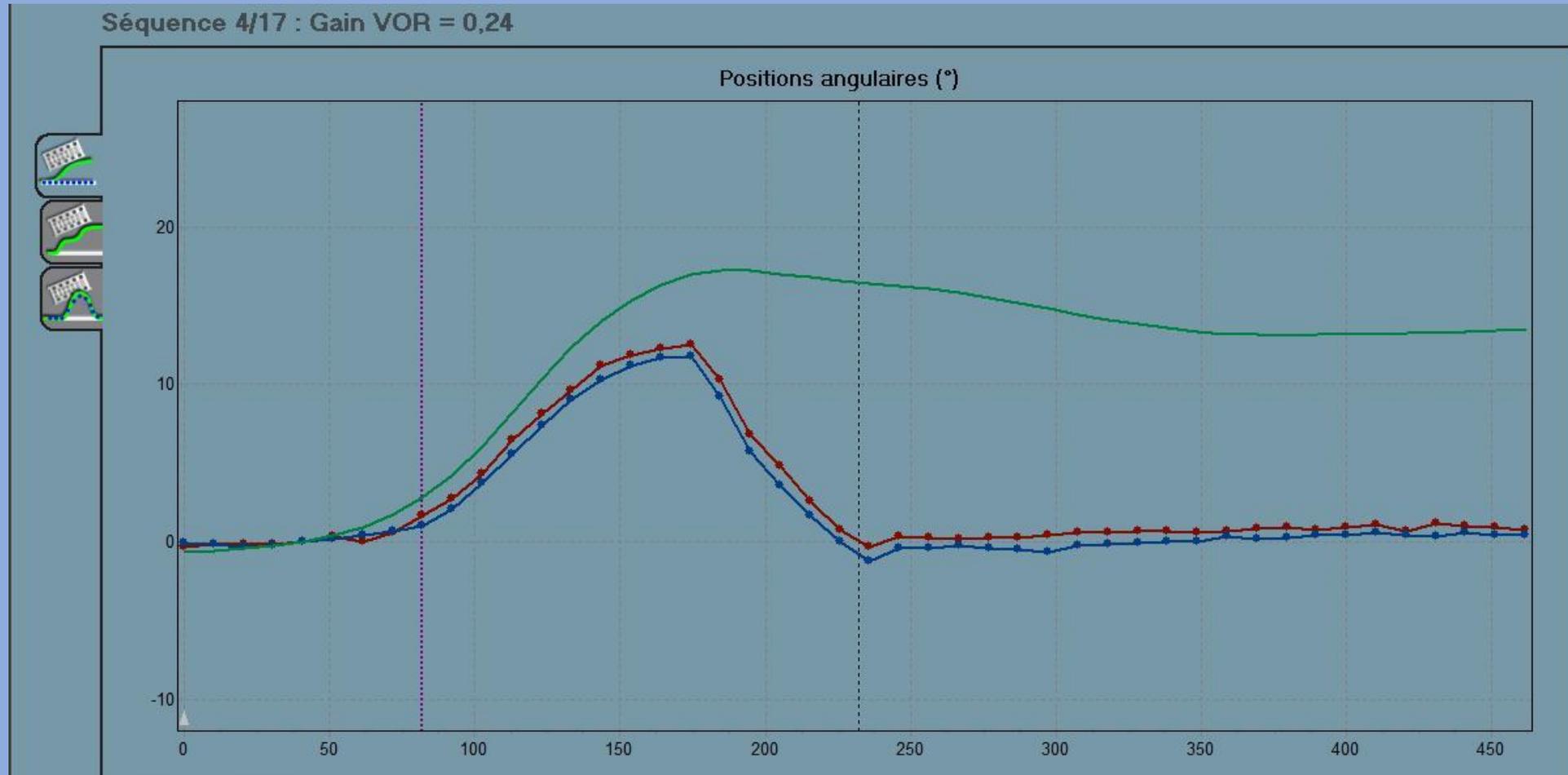


Position graph

“After four sessions of rehabilitation, the patient demonstrated the beginnings of covert saccades but the gain was still low ; he therefore generated an overt saccade in order to reacquire the target. “

Mr B. 68 years old after rehabilitation
(6 sessions, 15 days)

right chemical labyrinthectomy



Position graph

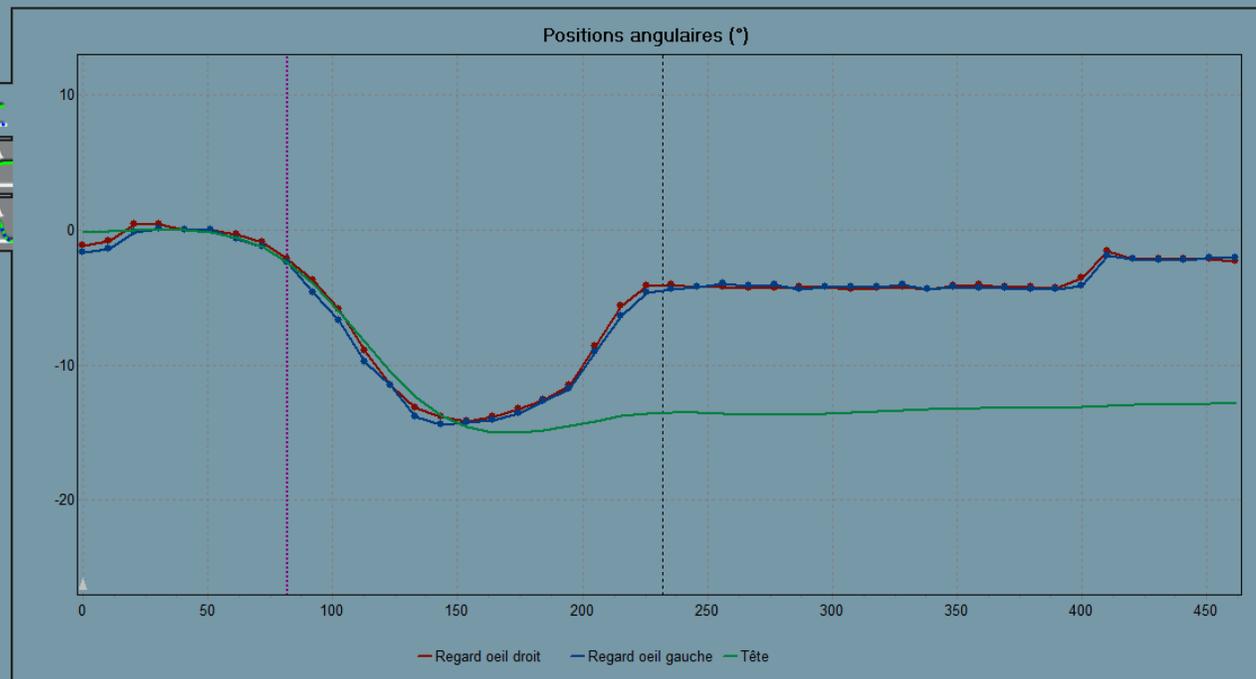
“After eight sessions of rehabilitation therapy, this same patient was able to generate an early catch-up saccade in order to recover the lost target. The position and velocity gain for this saccade was 1. “

Mrs T. 29 years old before rehabilitation

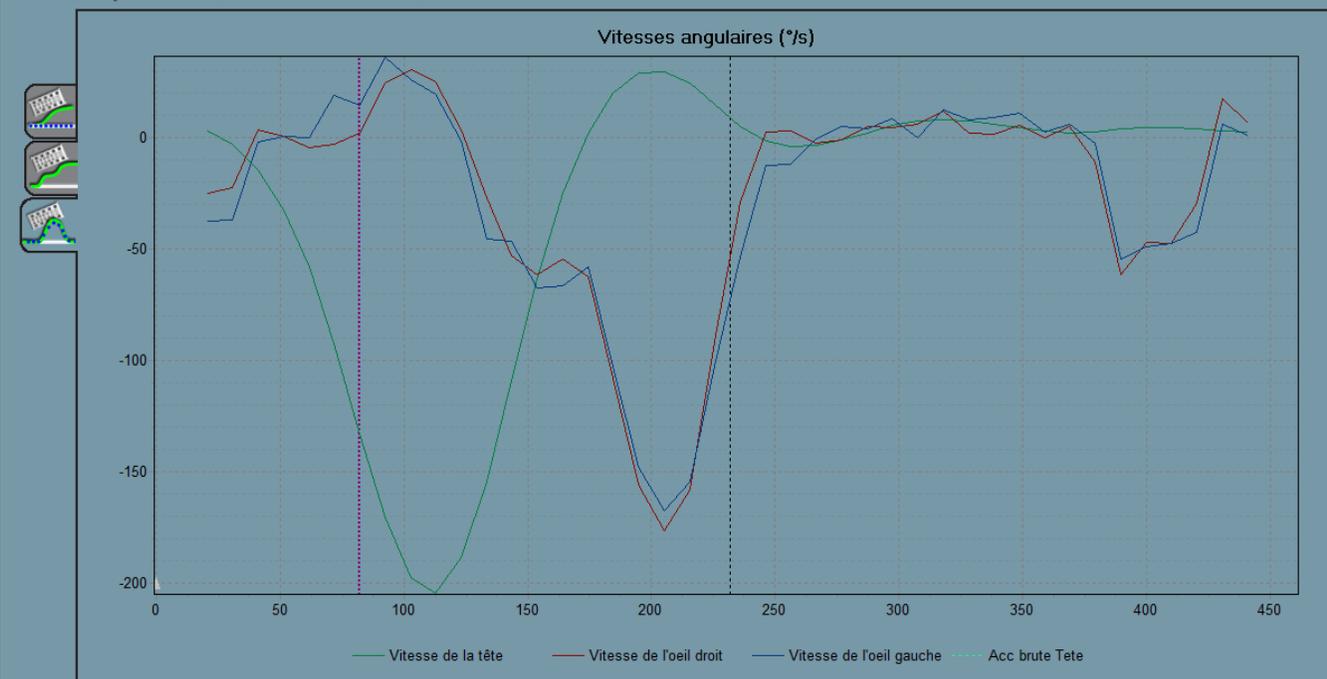
Neuritis of the left superior vestibular nerve

Position graph

Séquence 13/30 : Gain VOR = -0,05



Séquence 13/30 : Gain VOR = -0,05



Velocity graph

“Six months ago, Mrs T., aged 29 and physically active, presented with left-sided neuritis affecting the superior vestibular nerve, and described visual field instability during rapid head motions to the left.

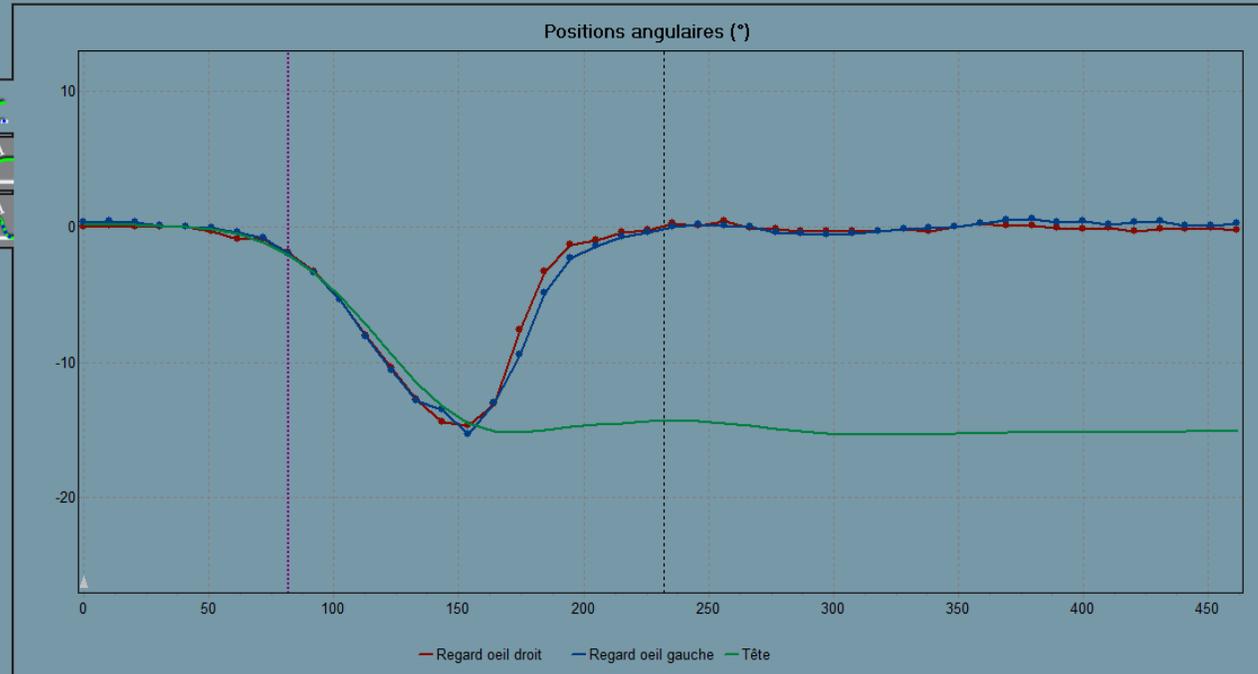
Before treatment, she was exhibiting early catch-up saccades with a position gain that fell well short of 1. The saccade was somewhat delayed. Here we see the covert and overt saccades used to reacquire the target.”

Mrs T. 29 years old during rehabilitation
(3 sessions, 9 days)

Neuritis of the left
superior vestibular nerve

Position graph

Séquence 1/46 : Gain VOR = -0,05



Séquence 1/46 : Gain VOR = -0,05



Velocity graph

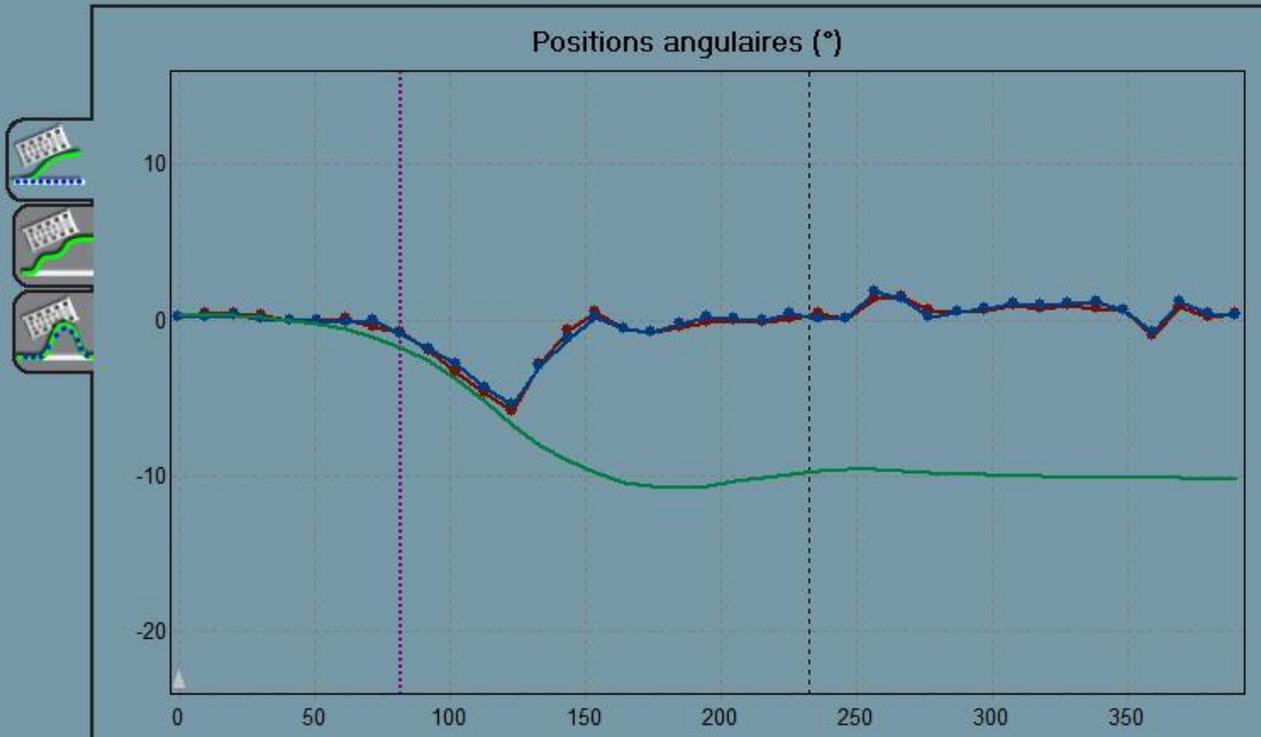
“After three sessions of rehabilitation, the saccade had a shorter latency, higher velocity and a good position gain.”

Mrs T. 29 years old after rehabilitation
(8 sessions, 21 days)

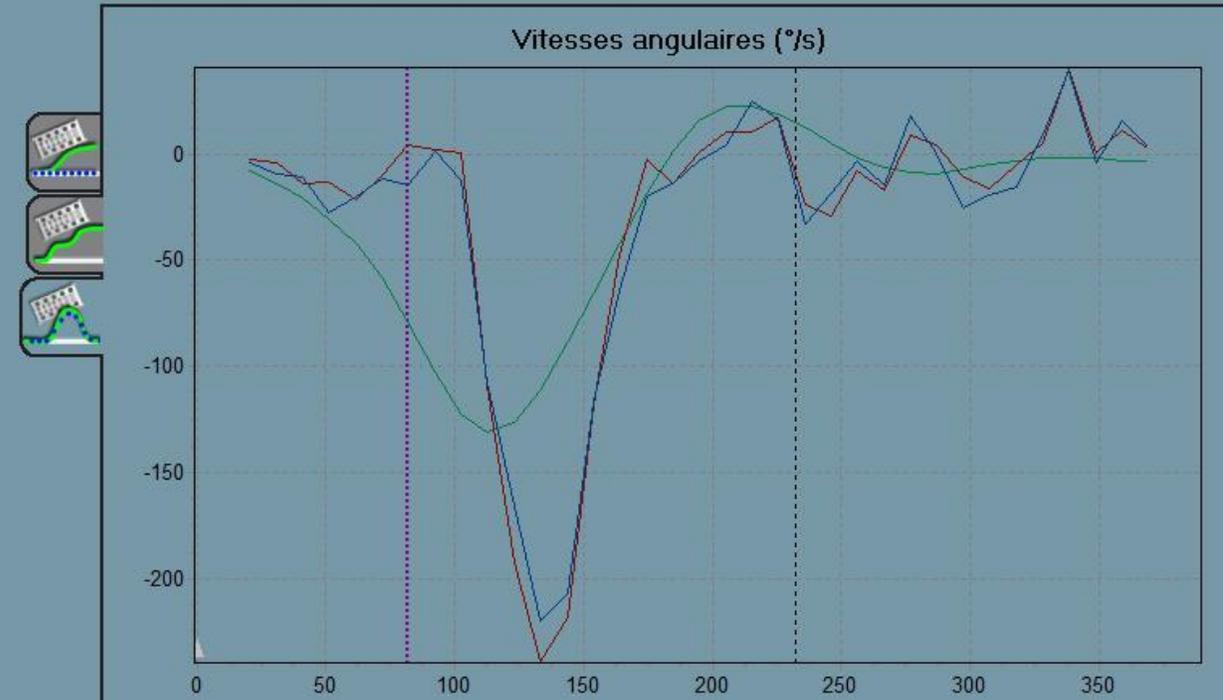
Neuritis of the left
superior vestibular nerve

Position graph

Séquence 13/23 : Gain VOR = 0,12



Séquence 13/23 : Gain VOR = 0,12



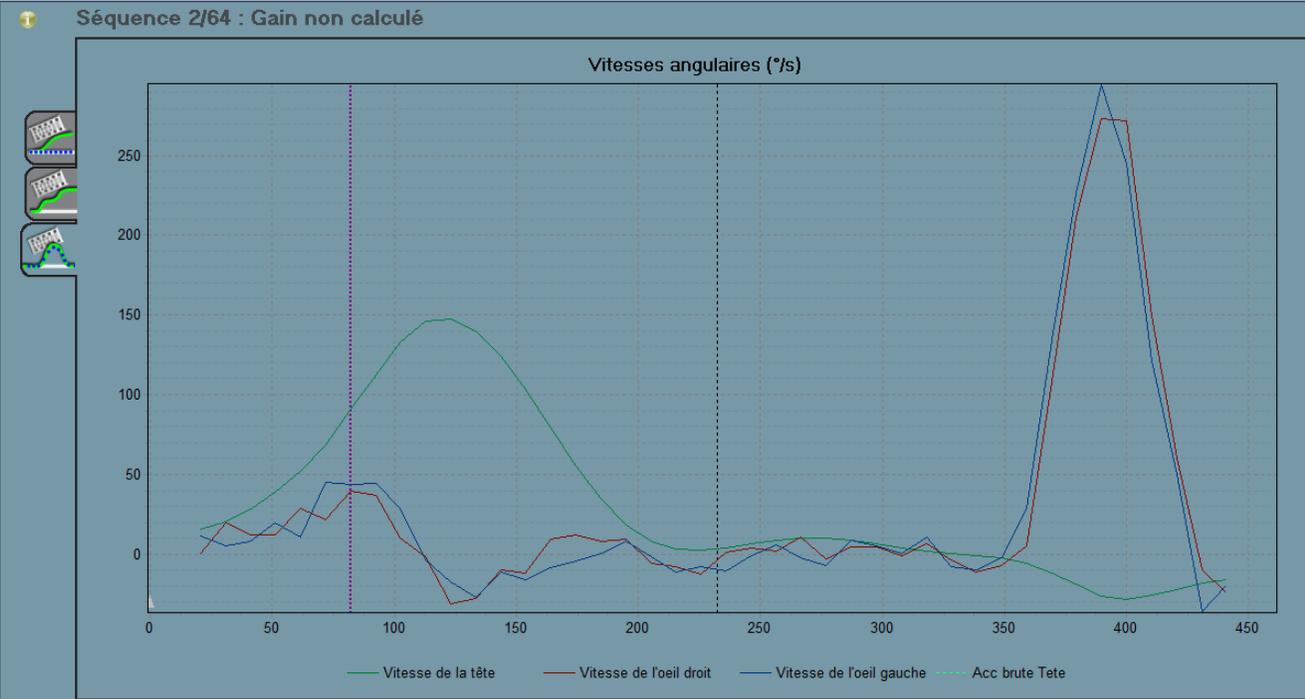
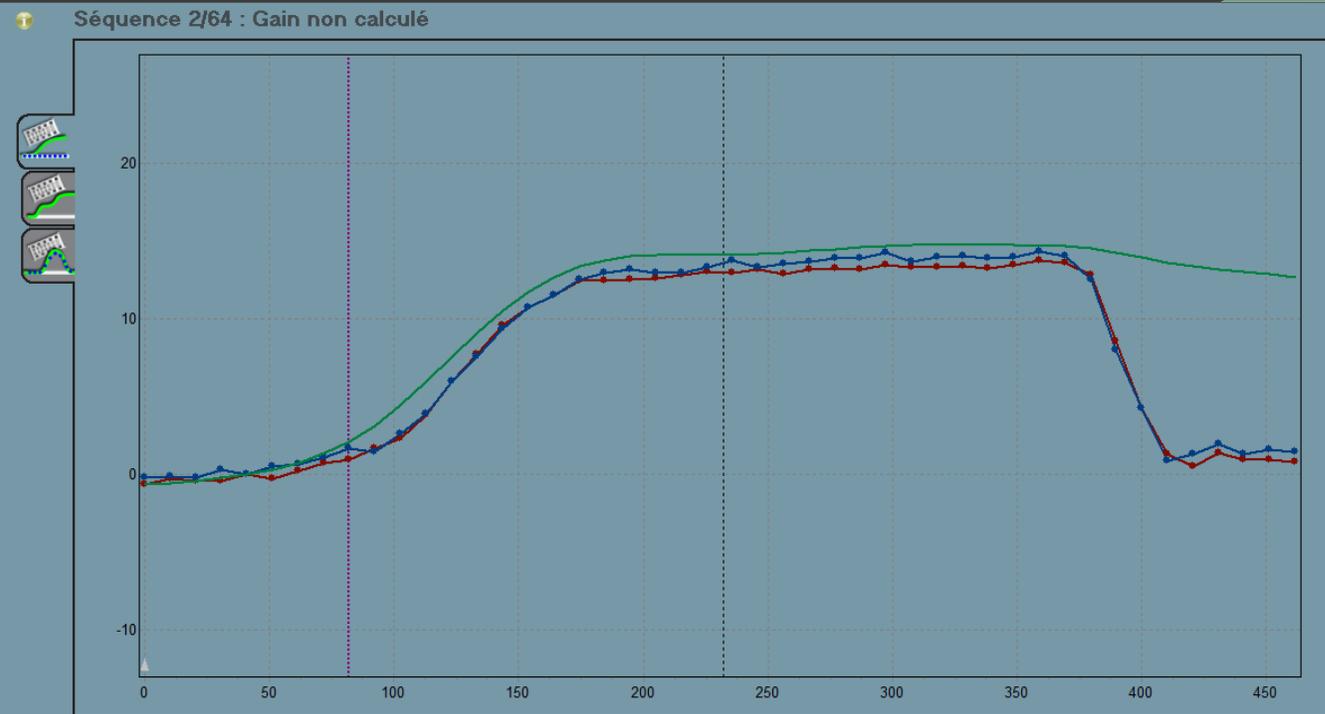
Velocity graph

“After eight sessions, she was generating very early catch-up saccades, which therefore very quickly stabilised her eyes on the target.”

Mrs D. 56 years old before rehabilitation

Schwannoma treated surgically D +20

Position graph



Velocity graph

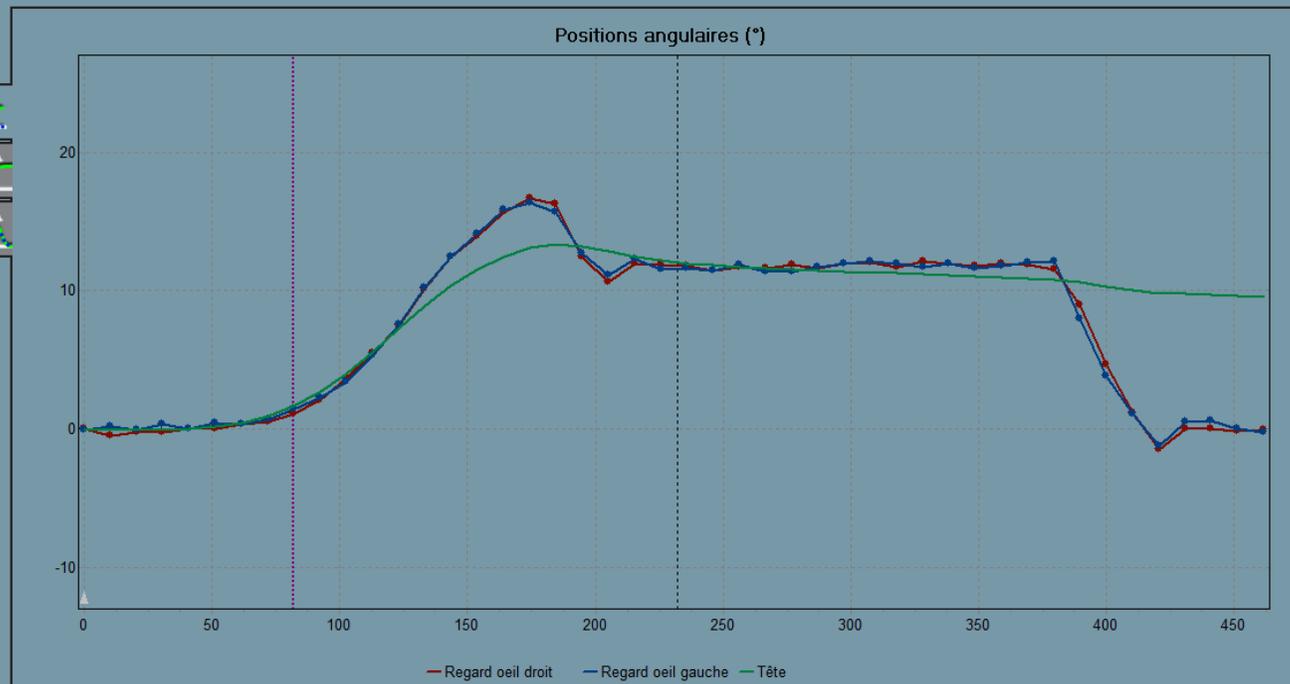
“Mrs D. is 56 years old and had undergone surgery for vestibular schwannoma 20 days previously ; she was not generating any covert saccade. We observed how she adopted blatant strategies for avoiding high velocity head movements.”

Mrs D. 56 years old, 2 days later

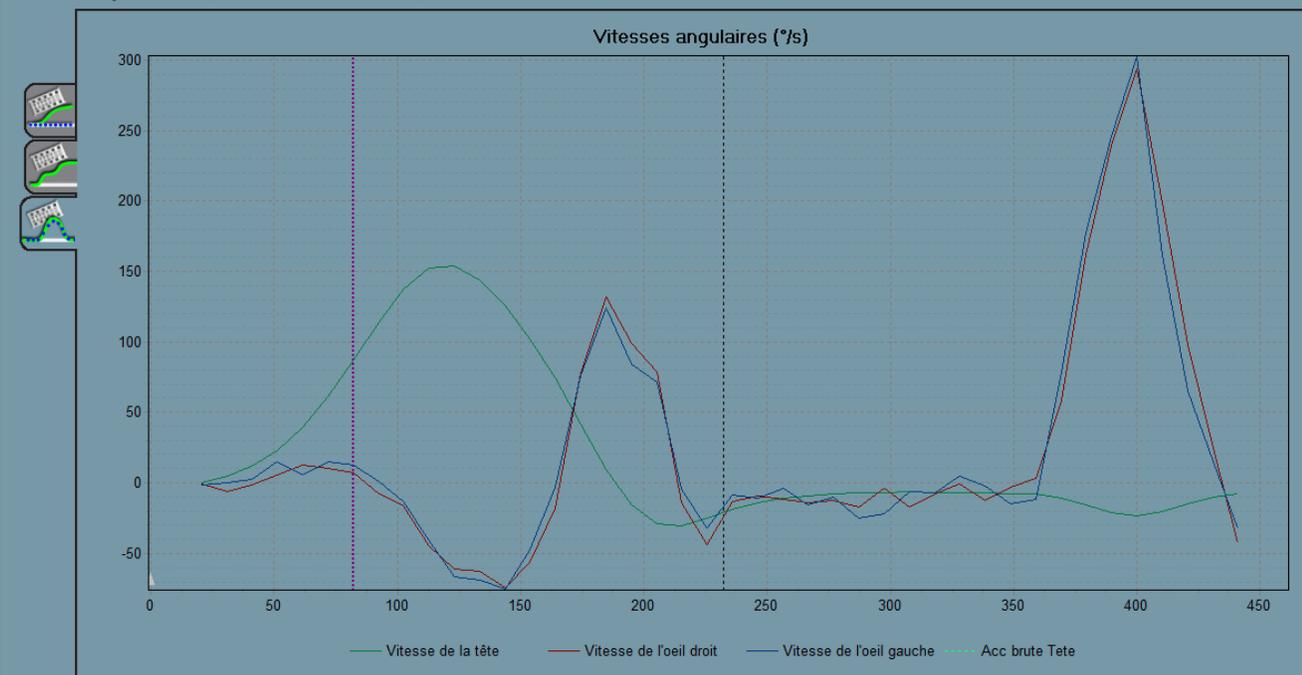
Schwannoma treated surgically D + 22

Position graph

Séquence 12/40 : Gain VOR = -0,05



Séquence 12/40 : Gain VOR = -0,05



Velocity graph

“Two days later, after just one rehabilitation session, she had begun to develop catch-up saccades. Here is the tiny covert saccade, followed by a late-onset refixation saccade. In just a few days, this patient was able to perform a covert saccade and reacquire the target during head movement.”

	HORIZONTAL PLANE		VERTICAL PLANE	
	GAIN	LATENCY	GAIN	LATENCY
Subject 1	0.8	140 ms	0.7	130 ms
Subject 2	0.7	150 ms	0.8	150 ms
Subject 3	0.6	130 ms	1	160 ms
Subject 4	0.9	140 ms	0.8	140 ms
Subject 5	0.8	110 ms	0.9	130 ms
Subject 6	0.5	160 ms	0.8	160 ms
Subject 7	0.8	130 ms	0.7	120 ms
Subject 8	0.7	140 ms	0.8	130 ms
Subject 9			0.8	100 ms
Subject 10			0.7	120 ms
Subject 11			0.6	140 ms
average	0.73	137.5 ms	0.93	135.8 ms

“Thierry Mis r  and I conducted a study of eleven bilateral areflexic subjects showing either vertical or horizontal oscillopsia, or in both planes. Our results showed that, in the horizontal plane, the feeling of visual field instability disappeared when the covert saccades had a gain greater than 0.73, as well as a latency of less than 137 ms. In the vertical plane, a much higher gain of 0.93 was required, but with the same latency.”

SHIMP

suppression head impulse paradigm

PASSIVE/ACTIVE

high head speeds

A new saccadic indicator of peripheral vestibular function based on the video head impulse test.

[MacDougall HG¹](#), [McGarvie LA¹](#), [Halmagyi GM²](#), [Rogers SJ¹](#), [Manzari L¹](#), [Burgess AM¹](#), [Curthoys IS¹](#), [Weber KP¹](#).

[Neurology](#). 2016 Jul 26

“One year ago, gentlemen Curthoys, Halmagyi and Macdougall reported on a new vHIT test known as the Suppression Head Impulse Paradigm.”

SHIMP

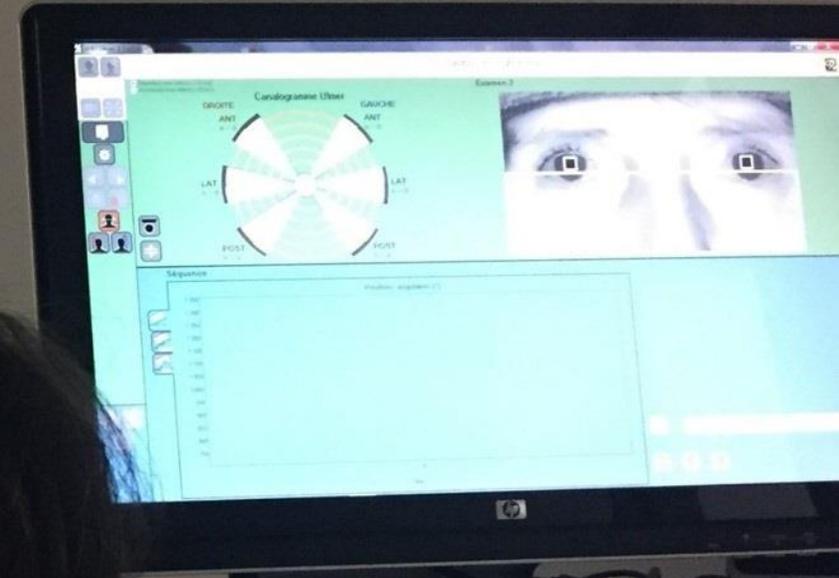
suppression head impulse paradigm



“With this new vHIT paradigm, the target is no longer fixed in the space. Rather it is mobile and follows the movements of the head. The target is generated by a laser pointer attached to the patient's head.”

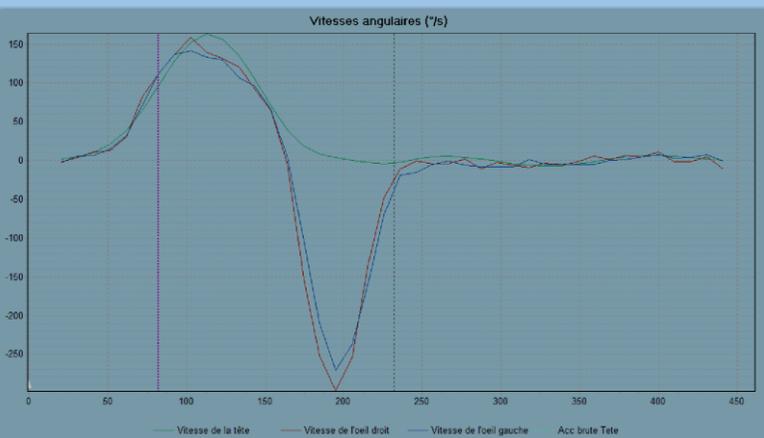
... in passive SHIMP mode but **particularly in active mode (self-generated -voluntary- head movement)**

“We were interested in not only the passive form of this new paradigm but also the active form, with the head thrust being generated by the patient himself.”



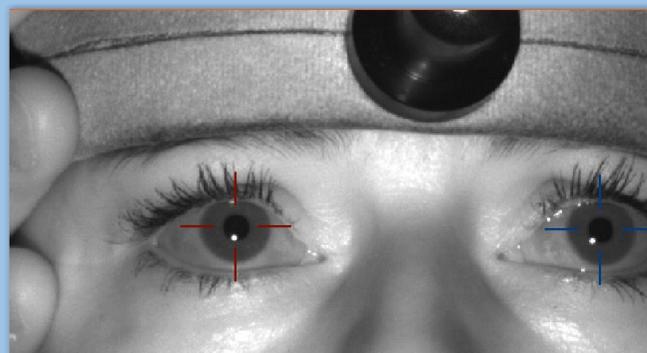
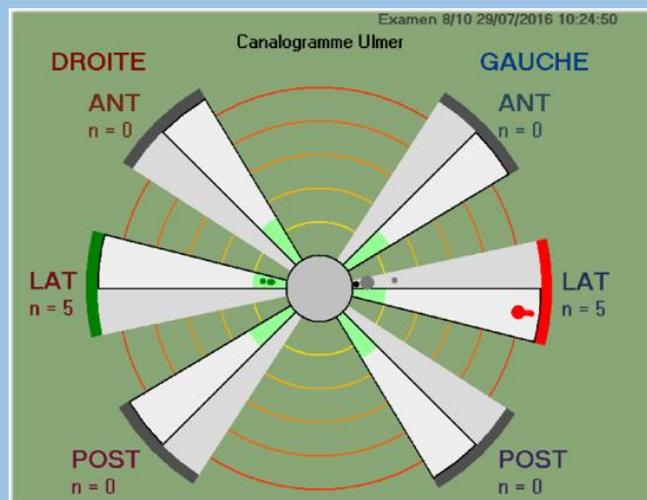
position

with saccade



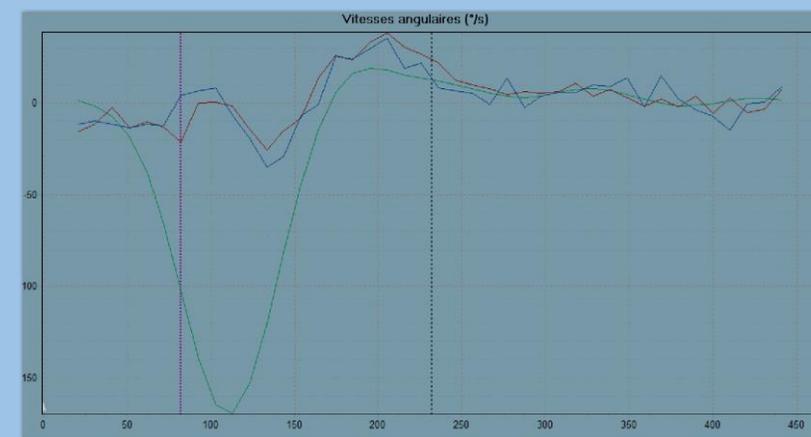
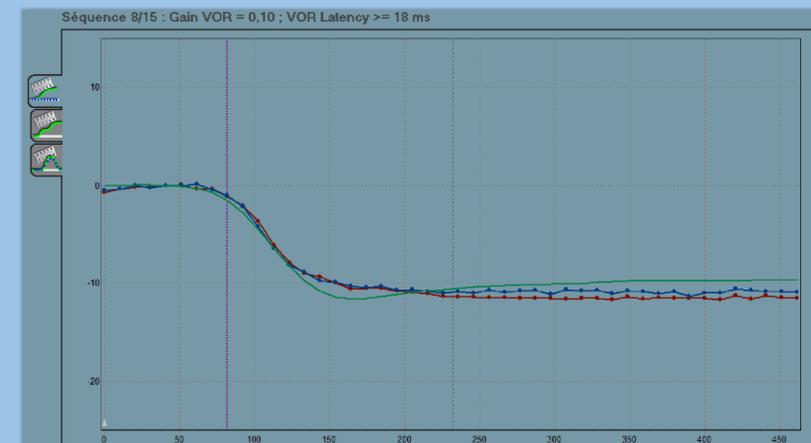
speed

SHIMP passive



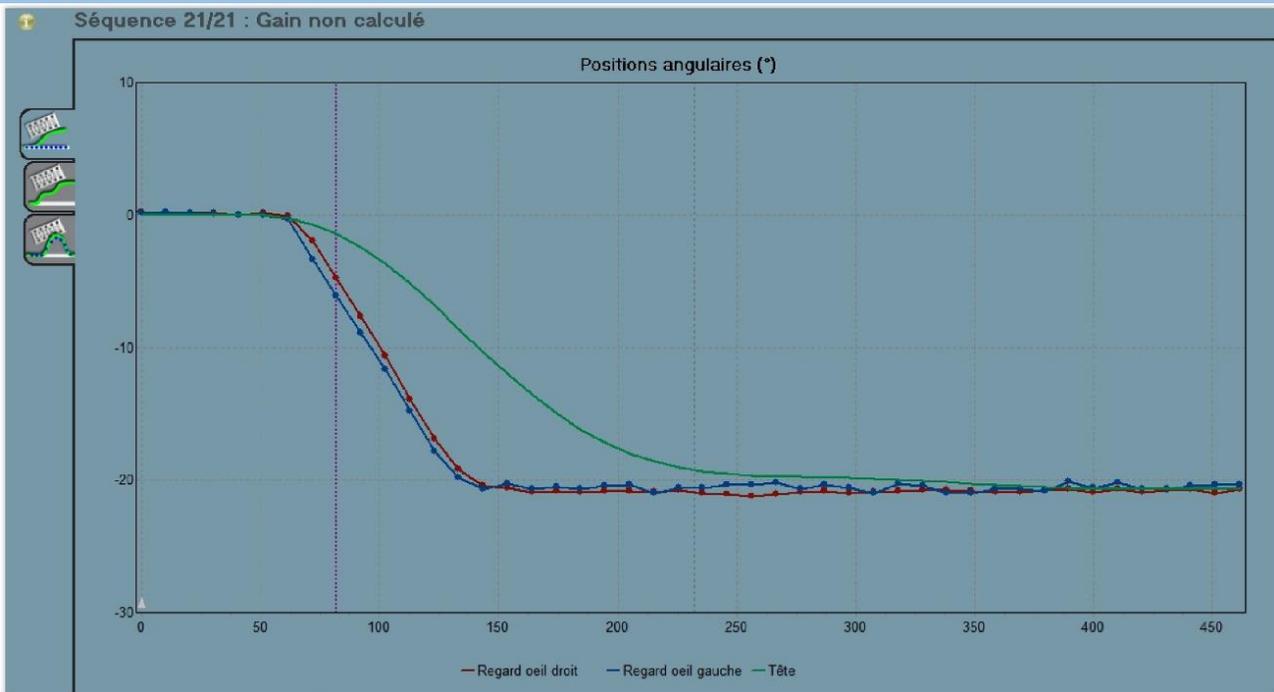
without saccade

position



speed

“When there is no impairment of the vestibular reflex, the graphs produced by the Synapsys VHIT Ulmer system show that the eyes first rest on the initial location of the target, then reacquire the target as it changes location with the movement of the head. This is done by performing a catch-up saccade with a latency of around 150 seconds. With an abnormal reflex, the gaze follows the head motion and stays located on the target until the end of the thrust. There is therefore no saccade, although there is retinal slip during all the head motion. Any residual VOR in a damaged canal will manifest as a saccade.”



position

“Even if the head motion is self-generated and predictive, we see an anticipatory saccade with 80% of head thrusts. There is no retinal slip with a damaged canal. In fact, we see these same anticipatory saccades in both pathological and healthy subjects.”

Active SHIMP

80% anticipatory saccades

speed



20% anticipatory saccades

Active SHIMP
non-predictive

“If the movement is generated by a random direction stimulus, involving either an audible, or visual stimulus in the peripheral visual field, the rate of anticipatory saccades is only 20%. In cases of hyporeflexia, retinal slip therefore occurs with 80% of thrusts, but it can be enhanced by training.”



“Our rehabilitation protocol for peripheral oscillopsia takes account of all these factors. The key is to overcome the inhibition strategies developed by these patients who no longer dare to move their head. Sessions at physiotherapy clinic will first introduce these high-velocity active head motions, preferably in the plane and direction of the damaged canal, then monitor the learning process. The patient must perform these exercises at home, several times a day for no longer than two minutes at a time. At the clinic, the practitioner will then use passive head thrusting in order to encourage the early catch-up strategy of covert saccades. He will also ask the patient to make self-generated thrusts in random directions prompted by audible and visual stimuli.”

REHABILITATION PROTOCOL

- **Remove avoidance strategies** (rapid movements of the head/trunk)
- Introduction of a working protocol with **high-speed** head thrusts :
 - **at the clinic**: eccentric, concentric, with target fixation (HIMP) or target seeking (SHIMP), **passive** in the following planes: **horizontal, sagittal, RALP, LARP**
 - active** in the following planes: **horizontal, sagittal, RALP, LARP**
 - Possible use of VHIT, DVA, helmet with laser pointer. . .
 - **actively at home**: 1 to 2 minutes sequences 8 to 10 times a day :
 - active** in the following planes: **horizontal, sagittal, RALP, LARP**

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Thank you
for
your
attention