Virtual Reality Therapy in Visual Vertigo

Authors

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Vestibular rehabilitation (VRT) is used to manage the symptomatic manifestations of vestibular conditions. Challenges to optimal outcomes of vestibular rehabilitation can be limited by patient compliance and time constraints. The introduction of virtual reality technology can provide interesting interactions for patients thus encourage patients to actively participate in various repetitive rehabilitation exercises and overcoming the aforementioned barriers. Despite this, the efficacy of virtual reality for vestibular rehabilitation remains unclear. Preliminary evidence suggest the benefit of virtual- reality (1). This case which will seek to address the utility of virtual reality.

Abbreiviations

VRT - Vestibular Rehabiliation Therapy
VRHT - Virtual Reality Headset Therapy
vHIT - vHead Impulse Test
VOR - Vestibular Ocular Reflex
SHIMP - Suppression Head Impulse Paradigm
DHI - Dizziness Handicap Inventery
VVAS - Visual Vertigo Analogue Scale
PR Score - Percentage Ratio Score (Saccadic Analysis)

Introduction

A 29 year old male was referred to the service post head injury with a unilateral defecit and presenting visual vertigo . The patient was initially seen 2 years post accident and sponteneous compensation/recovery had not occured. Vestibular Rehabilitation was completed using Virtual Reality headset technology. Outcome measures were completed pre and post vestibular rehabilitation.

Methodology

After 2 weeks of on-boarding with the VRH. The patient was asked to spend 5-10 minutes every day at home completing VRH tasks. VRH was completed utilising the Oculus Rift 2. The tasks are interactions within visually stimulating environments. VRH continued with increasing complexity using a graded approach.

Outcomes were measured pre and post 6 months of VRT. The objective measurements of vHIT and SHIMP were completed. Subjective measures to monitor outcomes included DHI and VVAS.

Results

Initial vHIT and SHIMP identified a unilateral deficit. Post-VRT VOR morphology resulted in gathered and consistent covert saccades. vHIT gains increased (increases of Lateral, 0.1, Posterior, 0.3 and Anterior, 0.2). Overall this reduced asymmetry (Lateral, 9%, LARP, 35%, RALP, 26%). Similarly with SHIMP, the VOR morphology improved with asymmetry significantly decreased and corrective saccades became gathered denoting a significantly reduced PR score (Left improvement, 14%, Right Improvement, 34%).

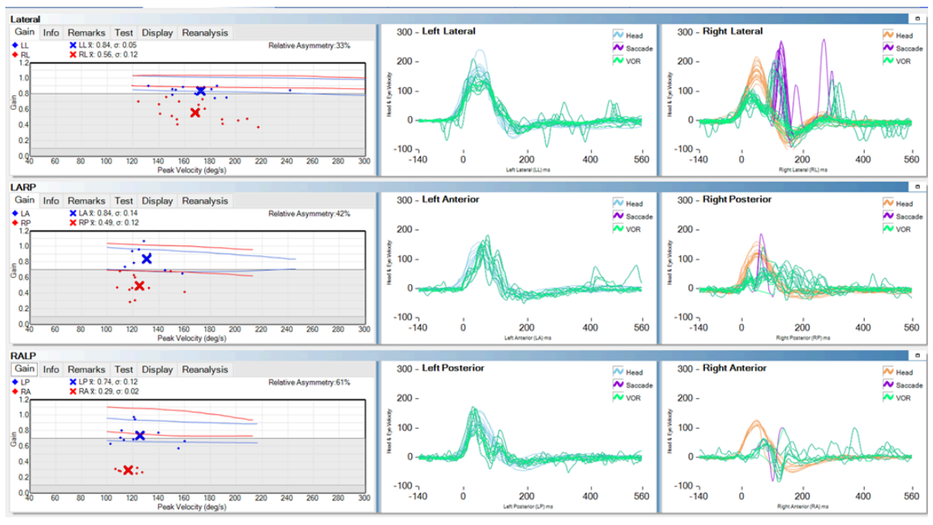
DHI scores improved from 42 to 22 post VRHT.
VVAS scores improved by an average of 6 post VRHT.

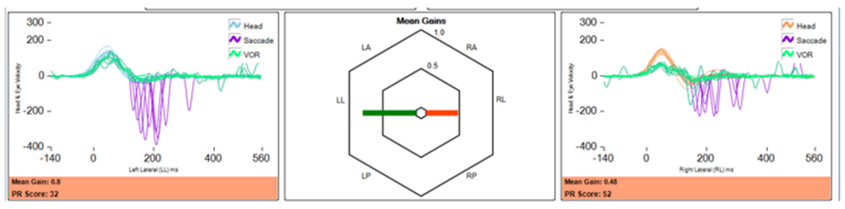
Post VRT patient could tolerate 20 minutes of complex visually stimulating environments with no reported symptoms.

Discussion

In this case patient compliance and time dedicated to VRT was overcome by the use of VRHT. Improvements were recorded in both objective and subjective measurements post VRT with VRHT. Previous studies into Virtual Reality focus on subjective measurements. (2) Interestingly this case indicates that objective measurements may also improve. This study is limited due to it's N number, however expansion of the study is required to statistically measure objective measurement improvement.

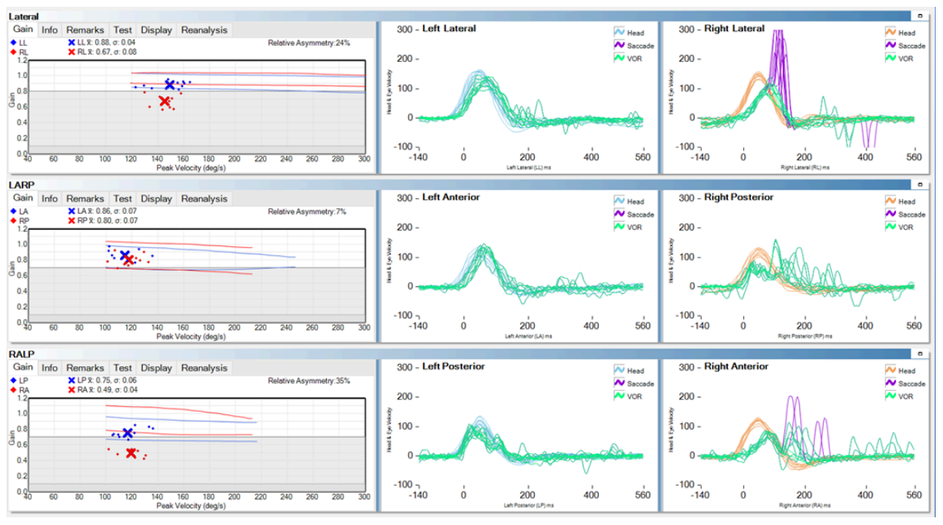
Pre-VRHT: vHIT & SHIMP Results

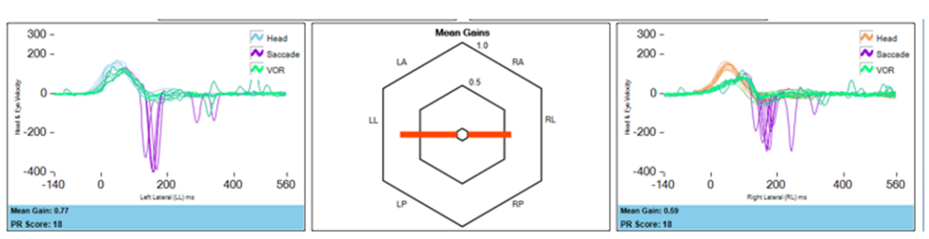




	Left	Right	Asymmetry Ratio
Saccadic Amplitude	294	178	40%
PR Score	32	52	
Saccadic Classification	Scattered	Scattered	

Post-VRHT: vHIT & SHIMP Results





	Left	Right	Asymmetry Ratio
Saccadic Amplitude	308	211	23%
PR Score	18	18	
Saccadic Classification	Gathered	Gathered	

Conclusion

Home-based exercises using VRHT are engaging and interactive. For this reason VRHT overcomes limitations of time constraints and patient compliance. Pre and post objective measurements such as VOR morphology and saccadic analysis may be useful in indicating improvements . Patient subjective reports may be in line with objective outcomes. Further studies are required to evidence this.

Related Literature

(1) Jiao Y, Lin Y, Zhang X, Wu Y, Wang J, Liang Z. Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2020;34(5):447-451. doi:10.13201/j.issn.2096-7993.2020.05.015
(2) Xie, Michael∗; Zhou, Kelvin†; Patro, Nivedh†; Chan, Teffran†; Levin, Marc†; Gupta, Michael K.∗; Archibald, Jason∗ Virtual Reality for Vestibular Rehabilitation: A Systematic Review, Otology & Neurotology: August 2021 - Volume 42 - Issue 7 - p 967-977 doi: 10.1097/MAO.0000000000003155