Vestibular Rehabilitation Therapy in Patients with Visual-Vestibular Mismatch Disorders

Thesis submitted for partial fulfillment of Master degree in Audiology

By

Dina Mohie El-Din Housni

M.B., B.Ch.

Faculty of Medicine - Suez Canal University

Under supervision of

Prof. Dr. / Nadia Mohammed Kamal

Professor of Audiology - ENT Department
Faculty of Medicine - Ain Shams University

Dr/ Hesham Mohammed Taha

Assistant Professor of Audiology - ENT Department
Faculty of Medicine - Ain Shams University

Dr/ Rasha Hamdi Elkabarity

Assistant Professor of Audiology - ENT Department

Faculty of Medicine - Ain Shams University

Faculty of Medicine

Ain Shams University

2014

بسم الله الرحمن الرحيم

صدق الله العظيم

Acknowledgment

First of all, thanks to **GOD** for giving me Serenity, Courage and the Capability to accomplish this work.

Words cannot express how grateful and thankful I am to my supervisor **Prof. Dr. Nadia Kamal,** Professor of Audiology , Faculty of Medicine ,Ain Shams University, for her great support ,encouragement , help ,stimulating ideas and a great deal of knowledge that I couldn't achieve this work without it.

Great thanks and respect for **Dr. Hesham Taha**, Assistant Professor of Audiology, Faculty of Medicine, and Ain Shams University for his great help support and valuable advices that guided me all over the way.

I am deeply thankful and grateful to **Dr. Rasha El-Kabarity, Assistant** Professor of Audiology, Faculty of Medicine, and Ain Shams University for her assistance, patience, encouragement and kind care that kept me on track.

Many thanks to all my professors and colleagues of audiology unit Ain Shams University, for their continuous support and guidance.

A special and deep thanks to **My Parents**, without their efforts, support and encouragement I would never succeed in my entire life.

My deepest gratitude for **My Dear Husband** for his help and Support all the time and special dedication to my beloved daughter **Leen.**

Thanks to **my brother**, my **sister**, my friends and all my family members for support and continuous encouragement.

Finally I would like to thank all patients who participated; I couldn't complete this work without them.

CONTENTS

Chapter 3: Vestibular Rehabilitation and Balance Therapy (VRBT):

LIST OF TABLES

LIST OF FIGURES

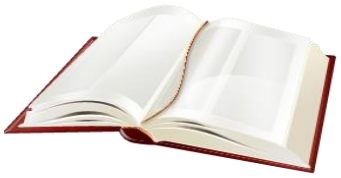
LIST OF ABBREVIATIONS

VVM	Visual –Vestibular Mismatch
VOR	Vestibulo-Ocular reflex
PB	Phonetically Balanced
VVI	Visual-Vestibular Interaction
VRBT	Vestibular Rehabilitation and Balance Therapy
SRT	Speech Reception Threshold
SD	Speech Discrimination
DVA	Dynamic Visual Acuity
MCTSIB	Modified Clinical Test for Sensory Interaction of Balance
FR	Functional Reach
VNG	Videonystagmography
c-VEMP	Cervical Vestibular Evoked Myogenic Potentials
SCM	Sternocleidomastoid Muscle
SCC	Semicircular Canal
SCD	Semicircular Duct
HC	Hair Cell
PCP	Planar Cell Polarity
LPR	Line of Polarity Reversal
K+	Potassium ion
Ca++	Calcium ion
SO	Superior Oblique
IO	Inferior Oblique

IR	Inferior Rectus
LR	Lateral Rectus
SR	Superior Rectus
MR	Middle Rectus
AC	Anterior Canal
PC	Posterior Canal
LC	Lateral Canal
MLF	Medial Longitudinal Fasiculus
ATD	Ascending Tract of Dieter's
BC	Brachium Conjunctivum
VN	Vestibular Nuclei
tVOR	Translational Vestibulo-Ocular Reflex
VSR	Vestibulo-Spinal Reflex
VCR	Vestibulo-Collic Reflex
OPK	Optokinetic
CNS	Central Nervous System
SP	Smooth Pursuit
AOT	Accessory Optic Tract
NAOT	Nuclei of Accessory Optic Tract
MS	Multiple Sclerosis
PET	Positron Emission Tomography
fMRI	Functional Magnetic Resonance Imaging
PIVC	Parieto-Insular Vestibular Cortex
SOT	Sensory Organization Test
CDP	Computerized Dynamic Posturography

HSN	Head Shake Nystagmus
CDVAT	Computerized Dynamic Visual Acuity Test
COR	Cervico-Ocular Reflex
PKC	Protein Kinase C
VRT	Vestibular Rehabilitation Therapy
DHI	Dizziness Handicapped Inventory
ABC	Activity Specific Confidence scale
DGI	Dynamic Gait Index
BBS	Berg Balance Scale
BPPV	Benign Paroxysmal Positional Vertigo

Introduction and Rationale



Introduction and Rationale

The term “visual vestibular mismatch” (VVM) was first used by Benson and King in 1979, the term was used to describe a “motion cue mismatch”.

Present studies stated that VVM is a symptom set that arises as a result of pathology in the balance system, to the point where it can no longer act as the “template” against which other sensory information is compared, this results in an inappropriate reliance on environmental visual cues, even under circumstances in which they are orientationally inaccurate ***(Mallinson, 2011).***

The complaints of VVM include both autonomic and vestibulospinal symptoms that can generate distress which could result in avoidance behavior for some things as shopping malls, 3D movies, passing traffic, trains, flowing water, windshield wipers, striped shirts because they give an illusion of instability or movement **.**Elucidation of these symptoms from a patient requires a comprehensive history to be taken in a non-leading manner ***(Mallinson, 2011).***

Examination of dizzy patients include: office vestibular test battery and specific vestibular laboratory tests which are an important part of the clinical assessment and management of patients with dizziness and other balance disorders ***(Katz and Barin, 2009)***.

Stabilization of the retinal image during movement is necessary for optimal visual performance for an ambulatory human. Visual tracking (pursuit), proprioception, motor preprogramming ,prediction, and mental set (non -visual parametric adjustment) interact synergistically to optimize the gain of the vestibulo-ocular reflex (VOR) to stabilize the retina during head movements and are collectively termed visual vestibular interaction (VVI). Patients with a deficient vestibular system often compensate with other VVI mechanisms. These mechanisms are insufficient for optimal vision at higher rotational frequencies and velocities, and often give rise to symptoms of oscillopsia ***(Clark, 2001).***

Visual vestibular mismatch is difficult to diagnose because of a severe lack of adequate investigation tools, a limited ability to measure degree of injury in these patients, and because there is a wide inter-individual variability between degree of injury and intensity of symptoms ***(Mallinson , 2011).***

For intervention, exercises may be required that optimize the use of the visual system inputs for maintaining equilibrium and gaze stability. These may be incorporated with hand-eye coordination exercises when needed ***(Shepard and Telian, 1996a).***

There are few researches conducted on visual-vestibular interaction disorder and the efficacy of vestibular rehabilitation therapy in these patients. This study will be conducted to evaluate the benefit Of VRBT in patients with VVM of peripheral vestibular lesion in origin.