ROLE OF SENSORIMOTOR STATUS AND BALANCE FUNCTION IN PATIENTS WITH LUMBAR NERVE ROOT COMPRESSION

Thesis

Submitted in Partial Fulfillment of MD Degree in Physical Medicine, Rheumatology, and Rehabilitation

Presented By

Mohamed Amr Mohamed Esmat Elkady

MB., B.Ch., M.Sc. Physical Medicine, Rheumatology & Rehab.

Under Supervision of

Prof. Dr. Mohamed Ragaai El-helow Prof. of Physical Medicine, Rheumatology and Rehabilitation Department

Prof. Dr. Nehal Ibraheem Elsheshtawy
Prof. of Physical Medicine, Rheumatology and
Rehabilitation Department

Prof. Dr. Mohamed Aly Elwy
Prof. of Physical Medicine, Rheumatology and
Rehabilitation Department

Professor Dr. Nadia Mohamed Kamal Professor of Audiology Department

Faculty of Medicine
Ain Shams University

Acknowledgement

Thanks to Allah who helped me to accomplish this work

My deepest and warmest gratitude to my great supervisor Prof. *Dr. Mohamed Ragaai*, Professor of Physical Medicine, Rheumatology & Rehab., Faculty of Medicine, Ain Shams University, who in addition to his valuable guidance and supervision, has provided me with a great deal of support and encouragement.

I would like to express my great appreciation and thanks to *Prof. Dr. Nehal Elsheshtawy*, Professor of Physical Medicine, Rheumatology & Rehab., Faculty of Medicine, Ain Shams University. It was honour to carry out this work under her guidance, encouragement and expert supervision.

The present work could not have been done without the help of *Prof. Dr. Mohamed Elwy*, Professor of Physical Medicine, Rheumatology & Rehab., Faculty of Medicine, Ain Shams University, I will never forget his fruitful support. His bright ideas and remarks together with his sincere meticulous supervision were really valuable to this work.

I am deeply obliged to *Prof. Dr. Nadia Kamal*, Professor of Audiology, Faculty of Medicine, Ain shams University, for here encouragement, excellent guidance and sympathetic attitude.

Also I would like to thank my family for their endless support to me

And last I would like to thank all patients who participated in this work, without their help, this work would never have reached its goals.

List of Contents

	Pag	e
>	INTRODUCTION	١,
>	AIM OF THE WORK	٤, ٤
>	REVIEW OF LITERATURE	,0
>	SUBJECTS AND METHODS	٨
>	RESULTS	٧
>	DISCUSSION	٩
>	SUMMARY AND CONCLUSION	۴٩
>	RECOMMENDATIONS YE	٦
>	REFERENCES YE	٧
>	APPENDIX	۹۰
<u> </u>	ARARIC SUMMARV	

List of Abbreviations

BOS..... Base of support

CDP Computerized dynamic posturography

CGRP Calcitonin-gene related peptides

CNS...... Central nervous system

COG...... Center of gravity

COR...... Cervico-ocular reflex

CS..... Composite Score

CSF..... Cerebrospinal fluid

CT Computerized tomography

DAPRE... Daily adjustable progressive resistive exercise

DCL Directional Control

DISH...... Diffuse idiopathic skeletal hyperostosis

DJD..... Degenerative joint disease

EMG...... Electromyography

EP..... Evoked potential

EPE..... End Point Excursion

FSU Functional spinal unit

Hz..... Hertz

LBP..... Low back pain

LOS.....Limits of stability

LV Lateral vestibulo-spinal tract

MCT Motor control test

MRI Magnetic resonance imaging

MS..... Multiple sclerosis

MTP...... Metatarso-phalangeal

MVL Movement Velocity

MVT Medial vestibulospinal tract

MXE Maximum Excursion Endpoint

NEMG Needle electromyography

NSAID Non-steroidal anti-inflammatory drug

PLD..... Prolapsed lumbar disc

ROM...... Range of motion

ROS Reactive oxygen species

RS..... Reticulospinal tract

RT Reaction Time

r-VOR..... Rotational vestibule-ocular reflex

SCC...... Semicircular canals

SLR...... Straight leg raising

SOM...... Somatosensory

SOT..... Sensory organization test

S P..... Substance P

TENS..... Transcutaneous electrical nerve stimulation

t-VOR.... Translational vestibule-ocular reflex

VCR...... Vestibulo-colic reflex

Vest Vestibular

VIP..... Vasoactive intestinal peptide

VIS...... Visual

VOR...... Vestibulo-Ocular reflex

VRT Vestibular rehabilitation therapy

VSR...... Vestibulo-spinal reflex

WB/S...... Weight bearing/squat

List of Tables

Table	Page
Table (\(\):	Sensory analysis ratios ٤٧
Table (Y):	Causes of LBP due to lumbar root compression
Table (^r):	Signs and Symptoms of Common Disc Lesions
Table (ξ):	Comparison between patients and control groups regarding age
Table (°):	Comparison between patients and control groups regarding gender
Table (\(\gamma\):	Duration of low back pain (LBP) in months in the patients group
Table (^{<i>Y</i>}):	Number and percentage of patients distribution according to their clinical data \\\\\\\\\\\\\\\\\\\\\\\\\\\\\
Table (^):	Mean, standard deviation, T and P value of the isometric strength of tested muscles in pounds for the patients and control groups \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
Table (4):	Correlation coefficient (R-test) between age and duration of low back pain with the isometric strength of the tested muscles

Table (' '):	Mean, SD, T and P value of the isometric strength of tested muscles in pounds between single versus multiple levels of root compression	T 0
Table (' '):	Mean, SD, T, and P value of the vibration sense duration in seconds between patients and control groups	٣٦
Table ('Y):	Correlation coefficient (R-test) between age of patients and duration of low back pain with the vibration sense duration in the tested areas	٣٨
Table (۱۳):	Mean, SD, T and P value of the vibration sense duration in seconds of the tested areas between single versus multiple levels of root compression	٣٩
Table (\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Mean, SD, T and P value of the vibration sense duration in seconds of the tested areas between unilateral versus bilateral sides of root compression	٤٠
	Number, % of patients, and its significance for abnormal sense of movement testing between patients and control groups	٤١
Table (۱٦):	Mean, SD, T and P value of Berg's score between patients and control groups	٤٢

Table (\ \ \ \):	Correlation coefficient (R-test) between age of patients in years and duration of low back pain in months with Berg's scale	٣
Table (\\^):	Correlation coefficient (R-test) between duration of vibration in seconds with Berg's scale	0
Table (۱۹):	Mean, SD, T and P value of the score of Berg's scale between single versus multiple levels of root compression	0
Table (۲۰):	Mean, SD, T and P value of Berg's scale between unilateral versus bilateral sides of root compression	٦
Table (۲۱):	Number & % of pattern abnormality of Sensory analysis in SOT for the patients group	٧
Table (۲۲):	Mean, SD, t, and P value of SOT analysis for patients group versus default norms of the CDP	٩
Table (۲۳):	Correlation coefficient (R-test) between age of patients and duration of low back pain (LBP) with scores of SOT	١
Table (Y ?):	Mean, SD, T & P value of score of SOT for patients with single versus multiple levels of compression	0

Table (۲°):	Mean, SD, T and P value of SOT for patients with unilateral versus bilateral sides of root compression	٦
Table (۲٦):	Comparison of MCT for patients group versus default norms of CDP	٧
Table ([∀] ∀):	Comparison between results of patients group and default norms of the equipment in MCT-Latency Score (in milliseconds)	٨
Table (۲۸):	Number and % of patients with abnormal weight bearing in the 4 different positions of squat	۹
Table (۲۹):	Number and % of patients with abnormal composite score (CS) of LOS parameters	•
Table ("`):	Comparison between patients of group A pre and post-rehabilitation as regards the results of the isometric strength of the tested muscles in pounds	٣
Table (^٣):	Comparison between patients of group B pre and post-rehabilitation as regards the isometric strength of the tested muscles in pounds	٤
Table (^٣ ^٢):	Comparison between patients of group C pre and post-rehabilitation as regards the results of the isometric strength of the tested	

	muscles in pounds	170
Table (٣٣):	Comparison between patients of group A pre and post-rehabilitation as regards the vibration sense testing in seconds	177
Table (\(^\xi\):	Comparison between patients of group B pre and post-rehabilitation as regards the vibration sense testing	177
Table (^{ro}):	Comparison between patients of group C pre and post-rehab. as regards the vibration sense testing	177
Table (٣٦):	Comparison between results of the patients groups pre and post-rehabilitation as regards the Berg's scale	١٦٨
Table (^{٣∨}):	Comparison between pre and post-rehab. mean differential change for Berg's scale in groups A & B	179
Table (٣٨):	Comparison between pre and post-rehab. mean differential change for Berg's scale in groups A & C	١٧.
Table (^{٣٩}):	Comparison between pre and post-rehab. mean differential change for Berg's scale in groups B & C	1 / 1
Table (٤٠):	Mean, SD, t, and P value of SOT of Computerized dynamic posturography	

	(CDP) pre and post-rehabilitation in patients of group A	١٧٢
Table (٤١):	Mean, SD, t, and P value of SOT of CDP pre and post-rehabilitation in patients of group B	١٧٣
Table (٤٢):	Mean, SD, t, and P value of SOT of CDP pre and post-rehabilitation in patients of group C	١٧٤
Table (٤٣):	Comparison between pre and post-rehab. mean differential change for SOT scores in patients of groups A & B	140
Table (٤٤):	Comparison between pre and post-rehab. mean differential change for SOT scores in patients of groups A & C	177
Table (٤°):	Comparison between pre and post-rehab. mean differential change for SOT scores in patients of groups B & C	١٧٧
Table (٤٦):	Comparison between the SOT dysfunctions of all patients in pre and post rehab	1 7 9
Table (ધ∀):	Comparison between the SOT dysfunctions in patients of group A in pre and post rehab	141
Table (ધ∧):	Comparison between the SOT dysfunctions in patients of group B in pre and post rehab	١٨٢

Table (٤٩):	Comparison between the SOT dysfunctions in patients of group C in pre and post rehab ۱۸۳
Table (° ·):	Comparison between Somatosensory (SOM) dysfunction patients pre and post-rehab among all groups
Table (° '):	Comparison between Vestibular dysfunction patients pre and post-rehab among all groups
Table (° ⁷):	Comparison between Visual dependent patients pre and post-rehab among all groups
Table (° ^r):	Comparison between mal adaptive Ankle strategy patients pre and post-rehab among all groups
Table (° [£]):	Comparison between frequencies of pre and post- rehabilitation MCT abnormalities in weight asymmetry in all patients group
Table (°°):	Comparison between frequencies of pre and post-rehab. MCT abnormalities in weight asymmetry among the *patients groups
Table (°\):	Comparison between pre and post-rehabilitation scores of MCT- latency response in patients group A
Table (°∀):	Comparison between pre and post-

	rehabilitation scores of MCT- latency response in patients group B
Table (°∧):	Comparison between pre and post-rehabilitation scores of MCT- latency response in patients group C
Table (° ⁹):	Comparison between pre and post-rehab.for abnormal weight bearing in the positions of squat in all patients
Table ('`'):	Comparison between pre and post-rehab.for abnormal weight bearing in the positions of squat in patients of group A
Table (⁷¹):	Comparison between pre and post-rehab.for abnormal weight bearing in the positions of squat in patients of group B
Table (^{٦٢}):	Comparison between pre and post-rehab.for abnormal weight bearing in the positions of squat in patients of group C
Table (^{٦٣}):	Comparison between pre and post-rehab.for abnormal weight bearing at •° squat in all patients groups
Table (٦٤):	Comparison between pre and post-rehab. for abnormal weight bearing at **.° squat in all patients groups
Table (%):	Comparison between pre and post-rehab. for

	abnormal weight bearing at " squat in all patients group
Table (٦٦):	Comparison between pre and post-rehab. for abnormal weight bearing at ••° squat in all patients group
Table (५५):	Number and % of patients with abnormal Composite score (CS) of parameters of LOS for all patients pre and post-rehab
Table (٦٨):	Number and percentage of patients with abnormal CS of parameters of LOS in patients of group A pre and post-rehab
Table (^{٦٩}):	Number and % of patients with abnormal CS of parameters of LOS in patients of group B pre & post-rehab
Table (Y·):	Number and % of patients with abnormal parameters of LOS in patients of group C pre and post-rehab
Table (Y1):	Number and % of patients with abnormal CS of RT for all patients groups pre and post-rehab
Table (YY):	Number and % of patients with abnormal CS of MVL for all patients groups pre and post-rehab
Table (^V ^r):	Number and % of patients with abnormal