بسم الله الرحمن الرحيم

﴿ قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ

العَلِيمُ الحَكِيمُ ﴾

صدق الله العظيم

سورة البقرة – الآية ٣٢

Normal values of motor nerve conduction velocity in infants and children

Thesis

Submitted in partial Fulfillment of degree of Master of Pediatrics

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2013

To the soul of my father,
to my mother who gives me everything,
to my family who is behind all my achievements and
to all my friends who help me.

Acknowledgement

Praise to Allah, the most gracious and the most merciful who guides us to the right way

I would like to express my deep gratitude to ***Prof . Dr . Atef El Sayed Donia*** *Professor and Head of Pediatrics Department, Faculty of Medicine, Al-Azhar University for his wise instructions,meticulous supervision,valuable experience and continous insistence on perfection to accomplish this work in the best possible image.*

I would like to express my deep gratitude to ***Prof. Dr . Shora Yousef Darwish*** *Professor of neurology Faculty of Medicine Al-Azhar University for his help, greatest support, honest supervision, continuous guidance and his immeasurable efforts, which made the completion of this work possible.*

It is agreat honor to express my deep gratitude and cordial appreciation to ***Prof . Dr Hassan Ali Hassan*** *Professor of pediatrics, Faculty of Medicine ,Al-Azhar University,who gave me much of his effort and close supervision throughout the work.he provide me continuous encouragement and support his generous assistance and meticulous guidance had a pivotal role in the completion of this study. For providing me the experience,cooperation, continuous encouragement.*

I would like to express my deep gratitude to ***Dr . Mahmoud Abd El Moety Monzer*** *Assistant professor of neurology Faculty of Medicine Al – Azhar University for his laborious effort, indispensable help ,to provide continuous guidance and support, without his help this thesis could not have achieved its present form.*

I would like to express my deep gratitude to ***Dr . Mohamed Amin Gebril*** *Lecturer of Pediatrics Faculty of Medicine Al – Azhar University for his patience and willingness to provide continuous guidance and help in this thesis .*

I would like to extend my gratitude to all infant and children and their parents and all stuff members and colleagues in Pediatric and Neurology department, Al- Azher University for their help whish they have offered to me

Last but not least, I owe special thanks and gratitude to all my family for their continuous guidance and constant encouragement

My great appreciation is extended to all those who shared either practically or morally in the accomplishment of this work.

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list of abbreviations

ADM	:	Abductor Digiti Minimi
EDB		Extensor Digitorum Brevis
AMP	:	Amplitude
CNS	:	Central nervous system
CMAP	:	Compound motor action potential
CV	:	Conduction velocity
GMC	:	Ganglion mother cell
LAT	:	Latency
MG	:	Martin- gurber anastomosis
MAP	:	Motor action potential
NAP		Nerve action potential
MCV	:	Motor conduction velocity
MV	:	Mill volt
MS		Millisecond
M/S	:	Meter/second
N	:	Nerve
NCS	:	Nerve conduction study
NCV	:	Nerve conduction velocity
NS	:	Nervous system
PNE	:	Peripheral nervous examination
PNS	:	Peripheral nervous system
SNAP	:	Sensory nerve action potential
TMS	:	Transcutanous magnetic stimulation

INTRODUCTION

Electrodiagnostic studies are a useful method for testing peripheral nerve function. They are comprised of a nerve conduction study, that measures the actual speed of conduction of the nerves and electromyography, which directly assesses the nerve supply to the muscle and the integrity of the muscle **(Slutesky, 2006).**

Nerve conduction studies are the most objective measures used in electrodiagnosis. The accessibility of many peripheral nerves make nerve conduction useful for survey approache to peripheral nerve involvement in generalized diseases, for defining the nature of injury, and for prognosis in focal injuries of peripheral nerve **(Young, 2008).**

These studies assess the ability of peripheral nerve to conduct an electrical impulses. A representative waveform is generated by nerve stimulation and its parameters are evaluated to monitor neuronal function (**Cuccurullo**, **2009).**

NCV is related to the diameter of the nerve and the degree of myelination (presence of myelin sheath on the axon) of the nerve **(Grigg,2007).**

Nerve conduction study help in differentiation between two major groups of peripheral nerve disease demylination and axonal degeneration it helps to delineat the extent and the distribuation of neural lesion **(Awang, et al, 2006).**

❖ **NCS give data on peripheral nervous system (PNS) function which may be used to provide**

1- Diagnosis

2- Description of disease state (old/new, dynamic/static, pathophysiology)

3- Advice on prognosis and management based on tests results and disease detected.

4- Longitudinal monitoring of disease with multiple studies **(Mallik, 2005).**

AIM OF THE WORK

The aim of this work was to assess the normal values of motor nerve conduction velocity of ulnar and peroneal nerves in normal, healthy Egyptian infants and children in relation to age.

ANATOMY &EMBRYOLOGY OF NERVOUS SYSTEM

Development of nervous system

The nervous system is derived from the ectoderm which is the outermost tissue layer of the embryo. In the third week of development the neuroectoderm appears and forms the neural plate along the dorsal side of the embryo. This neural plate is the source of the majority of neurons and glial cells in the mature human. A groove forms in the neural plate and, by week four of development, the neural plate wraps in on itself to make neural tube (**Saladin, 2011).**

The inner portion of the neural plate along the midline is destined to become the central nervous system (CNS), the outer portion becomes the peripheral nervous system (PNS). As development proceeds, a fold called the neural groove appears along the midline. This fold deepens, and then closes up at the top. At this point the future CNS appears as a cylindrical structure called the neural tube, whereas the future PNS appears as two strips of tissue called the neural crest, runnin lengthwise above the neural tube. The sequence of stages from neural plate to neural tube and neural crest is known as neurulation **(Sanes, 2005).**

The ventral part of the neural tube is called the basal plate; the dorsal part is called the alar plate. The hollow interior is called the neural canal. By the end of the fourth week of gestation, the open ends of the neural tube, called the neuropores, is close off (**Gruener**, **2007**).

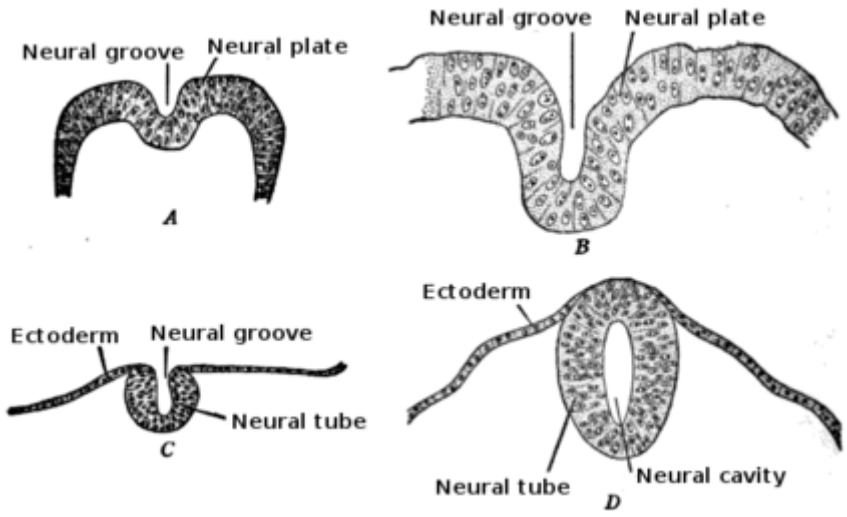

Figure (1): Development of nervous system **(Sanes,2005)**

Neurulation in the normal human embryo.

The stages below refer to specific Carneigie stages of development.

- **Stage 8** - (about 18 postovulatory days) neural groove and folds are first seen
- **Stage 9** - the three main divisions of the brain, which are not cerebral vesicles, can be distinguished while the neural groove is still completely open.
- **Stage 10** - (two days later) neural folds begin to fuse near the junction between brain and spinal cord, when neural crest cells are arising mainly from the neural ectoderm
- **Stage 11** - (about 24 days) the rostral (or cephalic) neuropore closes within a few hours; closure is bidirectional, it takes place from the dorsal and terminal lips and may occur in several areas simultaneously. The two lips, however, behave differently.

- **Stage 12** - (about 26 days) The caudal neuropore takes a day to close

- the level of final closure is approximately at future somitic pair 31
- corresponds to the level of sacral vertebra 2

- **Stage 13** - (4 weeks) the neural tube is normally completely closed

Secondary neurulation begins at stage 12 - is the differentiation of the caudal part of the neural tube from the caudal eminence (or end-bud) without the intermediate phase of a neural plate **(O'Rahilly, 1994).**

Anatomy of nervous system

The nervous system of human is divided into the central nervous system (CNS) and peripheral nervous system (PNS) **(Kandel , 2000).**

In the central nervous system, the brain and spinal cord are the main centers where correlation and integration of nervous information occur. Both the brain and spinal cord are covered with a system of membranes, called meninges, and are suspended in the cerebrospinal fluid; they are further protected by the bones of the skull and the vertebral column (**Gest, 2013**).

The peripheral nervous system (PNS) is a collective term for the nervous system structures that do not lie within the CNS **(Gest, 2013).**