Comparative Study between Early and Delayed Surgical Intervention in Sharp Peripheral Nerve Injuries

Thesis

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By

Mohammed Gamal El Mashad
M.B., B.Ch., MSc.
Ain-Shams University

Under Supervision of

Prof. Emad Mohammed Ghanem
Professor of Neurosurgery
Ain-Shams University

Prof. Khaled Mohammed El Bahy
Professor of Neurosurgery
Ain-Shams University

Dr. Ahmed Darwish Mahmoud
Assistant Professor of Neurosurgery
Ain-Shams University

Dr. Tarek Hamdy El Serry
Assistant Professor of Neurosurgery
Ain-Shams University

Faculty of Medicine – Ain-Shams University
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Mohammed Gamal El Mashad

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List of Abbreviations

Abb.	Full term
AEDs	*Anticonvulsant Drugs*
CMAPs	*Compound Motor Action Potentials*
DRG	*Dorsal Root Ganglia*
EDS	*Electrodiagnostic Studies*
EMG	*Electromyography*
ePTFE	*Expanded Polytetrafluoroethylene*
FLAIR	*Fluid Attenuated Long Inversion Recovery*
HRUS	*High Resolution Ultrasound*
NCS	*Nerve Conduction Studies*
NCV	*Nerve Conduction Velocity*
NGF	*Nerve Growth Factor*
NSAIDs	*Nonsteroidal Anti-Inflammatory Drugs*
PRP	*Platelet-Rich Plasma*
PTB	*Photochemical Tissue Bonding*
RB	*Rose Bengal*
SNAPs	*Sensory Nerve Action Potentials*
STIR	*Short Inversion Time Recovery*
T1W	*T1-weighted*
T2W	*T2-weighted*
TLN	*Terminolateral Neurorrhaphy*

ABSTRACT

Background: Peripheral nerve injury is a dramatic event that significantly affects the daily-living activities of victims sustaining such type of trauma. Most of cases sustaining sharp nerve injury need surgical repair, while patients who was subjected to other mechanism of injury as closed trauma or traction injury could be managed conservatively. So, the debate in sharp peripheral nerve injury is always the timing of intervention.

Purpose: To compare between early and delayed intervention as regard clinical outcome and electrophysiological studies

Patients and Methods: This prospective study was conducted on 30 patients suffering from sharp peripheral nerve injury in the period from January 2013 to July 2017. The patients were divided into 2 groups. Group A had been treated by early surgical intervention within the first 48 hours. Group B were treated by delayed intervention from 3 weeks post injury to 6 months. In case of nerve gap after removing neuroma, sural nerve graft was done to bridge the nerve gap.

Results: Our results show no statistically significant difference in clinical outcome between the 2 groups at short term (3 months) and intermediate term (6 month) follow up.

Conclusion: Immediate repair is a good option for repair of sharp peripheral nerve injury and if it is not possible (cut contused nerve, significant tissue loss or delayed presentation), secondary repair is a valid option for repair with comparable result.

Keywords: *Primary Repair – Secondary Repair - Sharp Peripheral Nerve Injuries – Sural Nerve Graft*

INTRODUCTION

Surgery aimed at repairing damaged peripheral nerves has a long history. Refuting the time-honored nihilism of Hippocrates and Galen that an injured nerve cannot regain function, a few adventurous medieval surgeons attempted to repair severed nerves but the ability of a peripheral nerve repair to restore function was not generally accepted until 1800.

Neurosurgeons, beginning with Harvey Cushing, have had an interest in repairing damaged peripheral nerves. Significant progress in the treatment of peripheral nerve injuries resulted from experience with the numerous injuries that occurred during World Wars I and II ***(Friedman et al., 2009).***

A nerve injury has a severe impact on the individual patient, who may experience a broad spectrum of symptom after injury, including sensory dysfunction, lack of muscle function, pain, allodynia and cold sensitivity. These symptoms, with a profound impact on the patient's global hand and arm function, do not only cause individual suffer to the patient but can also reduce the ability of the patient to enjoy leisure activities and particularly perform their work ***(Dahlin, 2013).***

In contrast to central nervous system, peripheral nerves have the ability of regeneration. This ability has been utilized for a long time in the treatment of injuries of peripheral nerves ***(Matejcik & Penzesova, 2006).***

The traditional treatment for peripheral nerve injuries is repair by using microsurgical techniques, either by primary nerve suture, secondary (delayed) repair or nerve graft, but research to find more successful methods that could improve recovery is ongoing ***(Moore et al., 2009).***

In acute, clean nerve transections, primary repair should be performed as soon as practical. Tissue approximation and alignment will be easier with early surgery. Additionally, biological advantages to rapid repair may include improved neuron survival and decreased fibrosis of the distal stump ***(Isaacs, 2010).***

AIM OF THE WORK

- To construct a prospective registry of patients with sharp nerve injuries describing different prognostic factors based on early and delayed intervention.
- To compare between early and delayed intervention as regard clinical outcome and electrophysiological studies.
- To describe intraoperative findings in both early and delayed groups and to correlate if possible with clinical and electrophysiological outcome.

Chapter 1

ANATOMY

The nervous system is the mechanism through which the organism is kept in touch with its internal structures and external environments and reacts to changes in them.

The central nervous system; the brain and its caudal prolongation the spinal cord; is connected to the periphery by the peripheral nervous system ***(Gardner & Bunge, 2005)***

Peripheral Nervous System

It includes:

- Cranial nerves
- Spinal nerves with their roots and rami
- Peripheral nerves
- Peripheral components of the autonomic nervous system ***(Gardner & Bunge, 2005).***

Nerve Plexuses

- The anterior branches of the spinal nerves form networks (plexuses) in which fibers are exchanged.
- The resulting nerve trunks, which then extend to the periphery, possess a newly organized supply of fibers derived from different spinal nerves ***(Birch, 2011).***

The Brachial Plexus

- It is a complex structure located in the lower half of the lateral neck
- It extends from the cervical spine to the axilla
- It provides motor, sensory, and autonomic innervation to the upper limb, except for the skin of the upper half of the medial and posterior part of the arm, which is supplied by the intercostobrachial nerve.
- The brachial plexus can be divided into:
    - Supraclavicular portion, constituted by roots C5 to T1, the upper, middle, and inferior trunks, and its divisions.
    - Infraclavicular portion, formed by the cords and its terminal branches ***(Di Masi & Bonilla, 2018).***
- The upper limb receives its innervation through the branches of this important plexus.
    - The most proximal muscles are supplied by branches from the rami
    - The intermediate muscles by branches from the trunks and cords;
    - The muscles of the limb itself by branches from the main terminal nerves:
    - Median
    - Ulnar