ORIGINAL RESEARCH PAPER

Physiology

KEY WORDS: neuropathy, nerveconductionvelocity , sepsis, systemic inflammatory response syndrome.

NERVE CONDUCTION STUDY IN CRITICAL ILL PATIENT TO DIAGNOSIS AND PROGNOSIS OF NEUROPATHY IN LOWER LIMB.

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ABSTRACT

INTRODUCTION- Critical care polyneuropathy (CIP) is motor and sensory polyneuropathy developed as a complication of systemic inflammatory response syndrome (SIRS) and multi organ failure (MOF) in intensive care unit (ICU) of both surgical and medical unit after a period of days and weeks. Prevalence of disease not discriminate gender, race, and age. Electrophysiologic investigations is one of the diagnostic test as well as prognostic criteria.

AIMS: To find out relation of nerve conduction velocity, evoke potential abnormalities in cases and controls.

OBJECTIVE: To assess and compare side to side nerve conduction velocity, latency and degree of reversibility of neuropathy in critical ill patients after recovery.

METHOD: The present study was conducted on 40 patients (aged 20-40 years), in department of physiology with collaboration with department of medicine and surgery ICU in JLN medical college and attached hospitals, Ajmer. Nerve conduction velocity and evoke potential recorded. Patient was made to lie down and surface electrodes were fixed over the skin which is on the nerve and supplying muscle, by stimulating the nerve at two different point.

RESULT: Motor and sensory response is reduced in Peroneal and Sural nerve and increases distal latency after one week of admission in ICU. Nerve conduction amplitude is more significant, a positive co-relation found between motor and sensory action potential and neuropathy.

CONCLUSION: Critical illness polyneuropathy are frequent complications that occur in patients in intensive care units, especially in sepsis, systemic inflammatory response syndrome, and/or multiple organ failure. Nerve conduction study is use for diagnostic and therapeutic strategies for treatment of critical illness polyneuropathy.

SIGNIFICANCE: Present Study signifies the importance of nerve conduction studies in early initiation of treatment and recovery of neuropathy in ICU patients.

INTRODUCTION-

Critical illness polyneuropathy (CIP), otherwise known a ICU neuropathy or the neuropathy of critical illness, is the acute or sub acute onset of widespread symmetric weakness in the patient with critical illness, most commonly with sepsis, respiratory failure, multisystem organ failure, or septic inflammatory response syndrome (SIRS). The patient presents with distal extremity weakness, wasting, and sensory loss, as well as paresthesia and decreased or absent deep tendon reflexes. Frequently, CIP is discovered when the mechanically ventilated patient fails to wean from the ventilator; it is possibly the most common neuromuscular cause of prolonged ventilator dependence. The clinical features that distinguish CIP from other neuromuscular disorders (e.g., Guillain-Barré syndrome) are a lack of ophthalmoplegia, dysautonomia, cranial nerve involvement, and normal cerebrospinal fluid analysis. Nerve conduction studies show decreased motor and sensory action potentials. The specific path physiology of critical illness polyneuropathy is unknown; however, it is hypothesized to be related to drug, nutritional, metabolic, and toxic factors; prolonged ICU stay; the number of invasive procedures; increased glucose level; decreased albumin level; and the severity of multisystem organ failure. Medical management of CIP includes supportive and symptomatic care, treatment of the causative factor, and physical therapy. No proven cure exists for CIP; however, an intensive insulin regimen has been associated with a lower incidence of CIP.

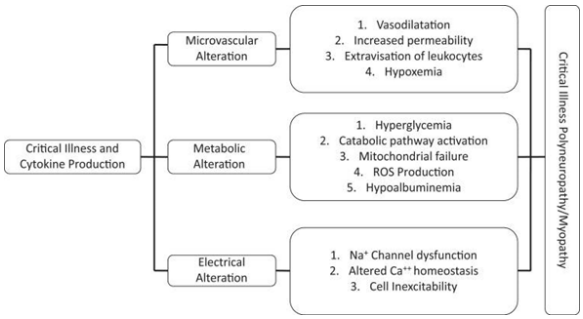
Clinical Features-

Critical illness neuropathy is an acute, axonal polyneuropathy that is dominated clinically by motor signs with weakness, depressed or absent reflexes, and respiratory insufficiency. Sensory loss can be mild or absent clinically, although sensory nerves usually are involved pathologically and on neurophysiologic testing. About one half of the cases can be demonstrated **electro physiologically** before the clinical syndrome is evident. Clinical evaluation is difficult in ICU patient.

Risk factor for critical illness neuropathy

Severe sepsis/septic shock	Age
Multiorgan failure	Female gender
Prolonged mechanical ventilation/bed rest	Severity of illness on admission
Increasing duration of SIRS	Admission APACHE II score
Increasing duration of multiorgan failure	Hypoalbuminaemia
Hyperglycaemia	

Pathophysiology-



Differential diagnosis-

Motor	NMJ	MUSCLE
GBS Amylotrophic scleosis Heavy metal toxicity Vasculitis Sarcoidosis	Myasthenia gravis Lambert-eaton Botulinum toxin Nmj blockade Tetrodotoxin OPC poisioning	Rhabdomylosis Mitrochondrial--myopathy

Diagnosis- clinically evaluate, the patient is critically ill minimum one week or more admitted in ICU (sepsis and multi organ failure, SIRS).

Flaccid weakness of the extremities with loss of tendon reflex Pain, vibration, temperature sensitivity loss in CIP.

Limb weakness or difficulty weaning patient from ventilator after non muscular cause such as heart and lung disease have been excluded

Electrophysiological study-

- Axonal poly neuropathy (both sensory and motor)
- Normal to minimally reduce nerve conduction velocity
- Reduce CMAP amplitude
- Reduce SNAP amplitude
- Electrophysiological studies can be useful in diagnosis of CIP.

AIM AND OBJECTIVES-

The present study aim to correlate neuropathy in CIP and reversibility of neuropathy after recovery from critically illness (due to therapeutic measurement). This study previously not conducts at JLN MEDICAL COLLEGE &HOSPITAL AJMER. So objectives are-

1. To evaluate the nerve conduction abnormalities in patient of CIP.
2. To correlate the conduction deficits with duration and severity of the disease.
3. To detect motor and sensory peripheral nerve conduction abnormalities in critically ill patient compared to controls.
4. To evaluate NCS (nerve conduction study) as diagnosis and prognostic tool for CIP patient.

MATERIALS AND METHODS

- **Source Of Data:** The study will be conducted on 70 subjects coming FROM JLN Hospital ICU in Neurophysiology Lab at JLN Hospital attached to JLN Medical College AJMER.
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- **Method Of Collection Of Data:**

A. Study Design

I. Cross-sectional study

B. Study Period

I. 6 month

C. Place Of Study

I. JLN Hospital attached to JLN Medical College AJMER.

D. Sample Size -A minimum sample size of 70 persons will be studied, out of which a minimum of 35 patients with CIP will be studied. While a total of 35 persons will be taken as control.

Inclusion Criteria

a) Patients who have given written informed consent for NCS.
b) Patients admitted to ICU who develop SIRS, sepsis and multi organ failure.
c) Patients who are within 18-70 yrs age group.

Exclusion Criteria

1. Patients who have not given written informed consent.
2. Patients who have GBS(guillain barre syndrome), porphyria, botulinism, myasthenic-crisis, prolonged blockade due to neuromuscular blocking agent.
3. Patients having other causes of neuropathies like hypothyroidism rheumatoid arthritis, malignancy, megaloblastic anemia, HIV.
4. Family history of neuropathy.
5. Neuropathies associated with toxic agents e.g. métal or Drug.
6. Patients having skin lesion or swelling that would interfere with nerve conduction study test.
7. Previous trauma to the study site.
8. Brain death patient.
9. Non-cooperative patients.

INVESTIGATIONS REQUIRE

1. Complete blood counts.
2. Renal function tests.
3. Liver function test.
4. Electrolytes study.
5. Radio imaging if needed.
6. Acid- base analysis.
7. Biopsy.

Methodology-

Nerve conduction studies (NCSs) will be performed on ICU patient after suspected to muscle weakness and reduce mobility (SIRS, MOF, SEPSIS) and those who give consent to do so by electrophysiological method. The NCS will be performed at room temperature, with normal body temperature, on EMG NCV EP machine by Recorders and Medicare Systems, model RMS SALUS 4C.

Motor and sensory nerve conductions including latency, responses will be recorded. In lower limb Peroneal and Sural nerve will be tested. Latency, Amplitude, and Conduction velocity will be noted and compared with age specific reference data of our electrophysiology laboratory under the Neurophysiology lab at JLN Hospital attached to JLN Medical College AJMER.

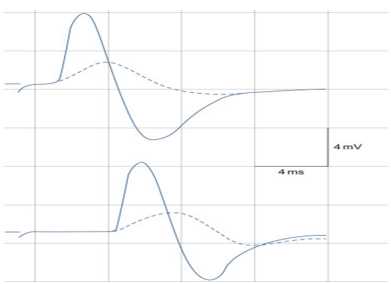
RESULT-

Electro diagnostic studies show increase motor distal latencies and dlow to normal limb conduction velocities, reduced compound muscle action potential amplitudes. Sensory nerve action potentials and F waves are within the range of normal to low. Recovery is usually good. Autopsy studies additive, have shown Wallerian-like degeneration (distal) of motor fibers. These studies establish that this is a distinctive syndrome, distinguishable from poliomyelitis and demyelinating Guillain-Barré syndrome.

Nerve conduction amplitude is more significant, a positive co-relation found between motor and sensory action potential and neuropathy.

CMAP amplitudes are decreased to <80% of the lower limit of normal in >2 nerves
SNAP amplitudes are decreased to <80% of the lower limit of normal in >2 nerves
Normal or near normal nerve conduction velocities

The absence of a decremental response on repetitive nerve stimulation.



Decreases the CMAP amplitude in dotted line

CONCLUSION-

Critically ill patients frequently develop CIP, which delays weaning, compromises rehabilitation, and is associated with increased hospital and ICU stays and increased mortality rates. Until recently, no therapeutic measures had been proven to affect its incidence, and apart from supportive treatment, the only preventive measure was aimed at controlling the most important risk factor, MOF, as best as possible. Recently, intensive insulin therapy significantly reduced the electrophysiological incidence of CIP and the need for prolonged mechanical ventilation in patients in the ICU for at least 1 week. This beneficial effect was present in a surgical as well as a medical population. However, concerns about safety and risk for hypoglycaemia and limitations of diagnostic methods used in these trials have been raised, and these results have not yet been confirmed in a larger population. Concerning the neuromuscular effects of steroids, the evidence remains conflicting. Further research should address these questions and investigate the path physiological mechanisms underlying this important clinical problem.

Significance-

in critical ill patient (both surgical and medical ICU), nerve conduction study is good tool for diagnose as well as prognosis of neuropathy from developed of sepsis, multi-organ failure to recovery of distal axonal degeneration.NCS is additive to rehabilitation and reflect glycemic index, Avoiding hyperglycemia using insulin therapy to maintain strict glycemic control therefore may be beneficial to prevent CIP (it's high level indicate poor prognosis). Electrophysiological abnormalities in the form of spontaneous electrical activity translate into clinical benefits in terms of muscle strength and recovery of neuromuscular function at and after discharge from the ICU.

Limitation:

study was conducted on small sample size in short time duration. For better results large sample size spanned over longer time duration may be taken.

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