

An observation of impact of neurological consultations in intensive care patients: Case series of 23 patients

Kanwalpreet Sodhi, Rupinder Singh Bhatia¹, Siddhartha Garg¹, Anupam Shrivastava

Abstract

Objective: The objective of the present study was to assess the impact of neurological consultation and intervention upon patient outcome in intensive care unit (ICU). **Settings:** A retrospective observational study was conducted in the 24-bedded multispecialty ICU of a 350 bedded tertiary care hospital over 8 months period, from January 2011 to August 2011. Critically ill-patients with varied neurological symptomatology affecting the course of illness and ICU discharge were included. Neurological consult sought for, investigations ordered by the neurologist, interventions carried out, treatment started and the impact of such treatment on the outcome of patients were noted. The length of ICU stay was also noted. **Results:** Over a period of 8 months, there were 864 ICU admissions. On neurological consult, 23 patients had a positive finding affecting the outcome: 5 patients were diagnosed to have parkinson's disease, 4 patients had neuromuscular disease, 9 patients had high creatinine phosphokinase levels, 2 patients had restless legs syndrome and 3 patients were diagnosed to have seizure disorder. **Conclusions:** On being examined and investigated by neurologist, a variety of co-existing neurological disorders could be diagnosed and if managed early, patients had a faster recovery, rapid weaning and early discharge from the ICU.

Keywords: Delayed recovery, difficult weaning, neurological consults, outcome of intensive care unit patients

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Introduction

With advances in critical care, critically ill-patients are facing a spectrum of new complications.^[1] A third of intensive care unit (ICU) admissions have a neurological complication detrimental to outcome and in one of the studies, neurological complications were found in 12% of 175 consecutively studied patients in medical ICU.^[1,2] Patients with such complications have twice the length of stay and are twice as likely to die.^[3] Apart from the neurological complications of critical illness itself, there are neurological manifestations unrelated to critical

care therapy, where a neurological consult could lead to diagnosis of an associated or incidental disease and treatment, thereof, can affect the outcome.

We present a retrospective observational case series of 23 patients admitted in a multispecialty ICU, in whom during the course of illness, a neurological opinion was sought for some abnormal neurological manifestation. We observed the impact of neurological consult upon patient outcome.

Materials and Methods

Study design

After approval by the hospital ethics committee, an observational retrospective study was carried out over 8 months period, from January 2011 to August 2011 in a 24-bedded multispecialty open-ICU of a 350-bedded tertiary care super-specialty hospital, managed by

From: Departments of Critical Care, and ¹Neurology, S.P.S. Apollo Hospitals, Ludhiana, Punjab, India

Correspondence: Dr. Kanwalpreet Sodhi, Department of Critical Care, S.P.S. Apollo Hospitals, Ludhiana, Punjab, India. E-mail: drkanwal2006@yahoo.com

full-timer intensivists. For neurology consults, either of the two on-roll Neurologists' was involved.

All ICU patients in whom a neurological consult was sought for any new neurological signs or symptoms, unrelated to the primary disease for which patient was admitted in ICU and which might be causing delayed recovery were included in the study.

Usual complications of critically-ill such as critical illness neuropathy, critical illness myopathy (CIM), hypoxemic ischemic insults and patients with long-standing neuropathy or myopathy were excluded.

The reason for neurological consult, investigations ordered by the neurologist, interventions carried out, treatment started and the impact of such treatment on the outcome of patients were noted. The time from neurological consult to ICU discharge and length of ICU stay was also noted.

Results

Over a period of 8 months, of 864 ICU admissions, Neurologist opinion was sought for 108 patients on observing a new unrelated neurological problem by the intensivist. Of these, 23 patients could fit into our inclusion criteria. 85 patients having either hypoxic brain insult or critical illness related neurological problems were excluded. The demographic profile, total ICU stay, premorbid illness, admitting diagnosis, reason for neurological opinion, examination findings, investigations ordered by the Neurologist, interventions carried out, patient outcome and the time from consult to ICU discharge are tabulated in Table 1. We divided the study patients into 5 groups based on the diagnosis.

Female:Male ratio was 8:15. The average age was 57.65 years. Average length of ICU stay was 14.30 days. On an average, patients could be discharged from ICU by the 6th day of neurological consult. 19 patients were shifted out of the ICU, of which 18 were subsequently discharged and 1 died in the ward while 4 patients died in the ICU itself.

Discussion

The study of neurological complications in critical care dates back to the work of Peter Safar in the 1960s, but most studies included the neurological complications of critical illness.^[1,2,3,4] We present this case series to highlight the incidental neurological disorders in ICU patients' unrelated to critical illness *per se* and to study the impact of early neurological consult and intervention on the outcome of patients.

Parkinson's disease is often missed by the clinicians because of no diagnostic test. For diagnosis, a specialist must be involved especially in an ICU setting, wherein varied motor and non-motor symptoms often overlap. This insidious onset disease can prolong the morbidity, cause delay in mobilization, dysphagia and delayed responsiveness during ICU stay. In our series of patients, on addition of antiparkinsonian drugs such as levodopa and carbidopa, benefit was observed in the form of improved responsiveness, better functional abilities and early weaning.

Lemaire in a review reported that peripheral neuromuscular disease was responsible for up to 17% of difficult weaning cases.^[5] The underlying muscle weakness in critically ill-patients might be labeled as CIM. Neurologist ought to recognize and differentiate the type of weakness and start appropriate treatment. Thorough examination by the neurologist and neostigmine test led to the diagnosis of myasthenia gravis in our patients. Electrophysiological studies were not carried out because of logistic reasons, but response to anticholinergic drugs was considered diagnostic. Timely institution of treatment led to improvement in muscle power and rapid weaning. Two of our patients had acute neuromuscular junction defects following acute viral illness. All patients in this group had a good outcome except one who died of sepsis.

An editorial by Buckley and Hutchinson in 1995 suggested that the major issue with diagnosing neuroleptic malignant syndrome (NMS) is the vague symptomatology such as fever, diaphoresis, tremor, altered consciousness, tachycardia, blood pressure changes and leukocytosis.^[6] This may be more relevant for an ICU patient where it may be clinically indistinguishable from sepsis, endocrine disorders, poisonings and status epilepticus.^[6] High creatinine phosphokinase (CPK) levels have been associated with trauma, non-traumatic rhabdomyolysis, acute myositis and various drugs. In one patient series, an association of NMS with coexisting illness was recorded in 71.4% of patients.^[7] Similar might have been the case in few of our patients. Rhabdomyolysis has been described as a complication of severe leptospirosis in the literature as occurred in 2 of our patients.^[8] NMS can occur with conventional or atypical antipsychotics and antiemetics, even after a single dose.^[6,7] Three of our patients had high CPK levels related to these drugs, which responded to withdrawal of the offending drug. In our series, one patient had high CPK levels because of the drug interactions between atorvastatin and fluconazole, which normalized on withdrawal of atorvastatin as reported in

Table 1: Patient profile

Age	Sex	ICU stay (days)	Premorbid illness	Admitting diagnosis	Reason for referral	Neurological examination findings	Investigations after referral	Intervention	Days from consult to ICU discharge	Outcome
Group I Parkinsonism										
60	M	18	HTN, CVA	Hip fracture-post hemiarthroplasty, seizures	Seizures, difficult weaning	Marked rigidity of whole body, masked facies	MRI-bilateral PCA infarcts	Levo-carbidopa added	9	Discharge
68	M	20	DM type-2	Acute febrile illness, recurrent pneumonia	Acute delirium, difficult weaning	Vertical gaze with B/L cogwheel rigidity, Suspicion of progressive Supranuclear palsy	MRI-diffuse cerebral atrophy	Levo-carbidopa and tracheostomy followed by early decannulation	15	Discharge
81	F	21	HTN with old MCA and ACA infarcts	Urinary tract infection (<i>E. coli</i>) with sepsis	Rigidity, poor recover	B/L cogwheel rigidity	MRI brain-old infarcts in MCA and ACA region, CSF-Normal	Levo-carbidopa→improved physical activity, rigidity decreased	4	Discharge
56	F	43	Coronary artery disease with dilated cardiomyopathy with old right hemiparesis	Metabolic encephalopathy	Generalized rigidity	B/L cogwheel rigidity	MRI brain-multiple small vessel infarcts present	Levo-carbidopa→rigidity decreased	13	Dead
62	M	8	Old right hemiparesis	Acute febrile illness and encephalopathy	Agitation and diffuse rigidity	B/L cogwheel rigidity	MRI brain-Old left MCA infarct, CSF analysis-normal, CPK-normal	Levo-carbidopa→rigidity improved	7	Discharge
Group II Neuromuscular disorders										
49	M	12	Chronic liver disease with portal HTN with ascites	Sepsis with respiratory failure	Difficult weaning	Waxing and waning course, NM weakness	MRI-normal, CSF analysis-normal, neostigmine test-positive, RNS-positive	Pyridostigmine and steroids→respiratory efforts improved	4	Discharge
42	F	8	No premorbid illness	Febrile illness with respiratory failure	Quadripareisis	Negative H/O insect bite or poisoning, ptosis, partial ophthalmoplegia	Positive RNS and neostigmine test	Pyridostigmine and glucocorticoid→improved muscle weakness and Weaned off	4	Discharge
54	F	14	DM type 2 with HTN with chronic renal failure	Sepsis and respiratory failure	Difficult weaning	NM weakness	MRI brain-normal, neostigmine test-positive RNS test-Decremental Response	Cholinergic drugs and steroids	5	Dead
56	F	12	Hepatitis B positive status	Acute febrile illness and acute NM weakness	Difficult weaning and NM weakness	Neuromuscular junction defects	Neostigmine test-positive, nerve conduction studies-unremarkable, CSF analysis-normal, antiAChE antibodies-negative, RNS-negative, MRI-normal	Pyridostigmine and steroids	8	Discharge

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Table 1: Contd...

Age	Sex	ICU stay (days)	Premorbid illness	Admitting diagnosis	Reason for referral	Neurological examination findings	Investigations after referral	Intervention	Days from consult to ICU discharge	Outcome
Group III High CPK levels										
72	M	21	HTN	Acute febrile illness with ARF with jaundice	Altered sensorium, marked rigidity	NS	MRI-normal, CSF-normal, CPK-19000, Leptospira serology-positive	Bromocriptine and dantrolene	6	Discharge
70	M	17	HTN	Acute febrile illness	Delirium	Muscle rigidity	MRI-normal, CSF-normal, CPK-15000, Leptospira serology-positive	Bromocriptine and dantrolene	7	Discharge
70	M	18	HTN, chronic schizophrenia, on antipsychotic drugs	High grade fever	Marked rigidity and abnormal behavior	NS	MRI-normal, CSF-normal, CPK-90,000	Withdrawal of antipsychotics, addition of bromocriptine and dantrolene	9	Discharge
56	M	10	HTN	Chest pain, acute NM weakness	NM weakness, unremitting fever	Chronic inflammatory demyelinating polyneuropathy, retrospective history taking; Haloperidol intake	CPK-40,000	Haloperidol stopped, bromocriptine and dantrolene started→CPK lowered to 6000, fever subsided	4	Dead
64	F	12	DM type 2	Fever with recurrent vomiting	Altered sensorium	Encephalopathy, metoclopramide intake	MRI-normal, CSF-normal, CPK-70,000	Bromocriptine, dantrolene and withdrawal of antiemetics	5	Discharge
65	M	11	Ischemic stroke with right hemiparesis	Febrile encephalopathy with ARF	Encephalopathy and rigidity	Marked rigidity	MRI-left MCA Infarct, CPK-14,500	Bromocriptine and dantrolene→fever spikes decreased, rigidity improved	6	Discharge
46	M	17	No premorbid illness	Sepsis (Salmonella typhi+) and respiratory failure	Difficult weaning	NS	Neuroimaging-normal, CPK-15,000	Bromocriptine and dantrolene	5	Dead
60	M	24	Old stroke	Fever with ARF, candidemia, on fluconazole	Altered sensorium	NS	Neuroimaging-Normal, CPK-15,000	Withdrawal of atorvastatin→CPK decreased, Improved sensorium	8	Discharge
33	M	4	Chronic alcoholic, opium addict	Binge alcoholism	Altered sensorium	NS	CT head-normal, CSF-normal, EEG-normal, thyroid function tests-normal, CPK~12,000	Bromocriptine and dantrolene	2	Discharge

Contd...

Table 1: Contd...

Age	Sex	ICU stay (days)	Premorbid illness	Admitting diagnosis	Reason for referral	Neurological examination findings	Investigations after referral	Intervention	Days from consult to ICU discharge	Outcome
Group IV Restless legs syndrome										
50	M	12	Autoimmune pancreatitis-on steroids	Altered sensorium, hyponatremia	Altered sensorium and hyponatremia not responding to treatment	Areflexia	MRI-normal, NCV-chronic demyelinating neuropathy, CSF-albumino-cytologic dissociation	Steroids and gabapentin→ hyponatremia improved	3	Discharge
68	F	9	HTN, DM type 2	Fever, headache	Lower limb pains, restlessness	Areflexic NM weakness, history suggestive of abnormal creeping sensations in legs over several years, relieved with massaging	CSF-chronic meningitis	Antitubercular therapy, steroids and gabapentin→ restlessness improved	7	Discharge
Group V Seizures										
36	M	5	Alcoholic liver disease with cirrhosis with portal HTN	Hepatic encephalopathy	Seizures	Alcohol withdrawal syndrome, post-ictal left upper limb weakness	CT head-glioma (right parietal region), repeat CT head-massive hemorrhage into glioma	Levetiracetam	4	Dead
35	F	3	Depression	Multiple somatic complaints	Altered behavior and abnormal movements	Non-convulsive seizures	EEG-generalized ictal activity during altered behavior, CSF-normal, MRI-normal	Midazolam and antiepileptics	1	Discharge
73	M	10	DM with HTN	Right hemiparesis (TIA) with hyponatremia	Chronic symptomatic seizures	Recurrent TIA, ? non-convulsive seizures	MRI-normal, EEG-left temporal run of spikes	Antiplatelets, atorvastatin, antiepileptics	5	Discharge

DM: Diabetes mellitus; HTN: Hypertension; CVA: Cerebrovascular accident; CT: Computerized tomography; MRI: Magnetic resonance imaging; EEG: Electroencephalography; CSF: Cerebrospinal fluid; RNS: Repetitive nerve stimulation; TIA: Transient ischemic attack, NS: Non-significant; NM: Neuromuscular; NCV: Nerve conduction velocity; CPK: Creatinine phosphokinase; ICU: Intensive care unit; PCA: Posterior cerebral artery; B/L: Bilateral; H/O: History of; MCA: Middle cerebral artery; ACA: Anterior cerebral artery; antiAChE: Anti acetylcholinesterase; ARF: Acute renal failure; E. coli: *Escherichia coli*

the literature.^[9] Since statins are commonly prescribed treatment for individuals with hyperlipidemia, caution is advised in co-administration with azoles. All our patients responded to hydration, dantrolene and bromocriptine and had rapid recovery. So in the ICU, NMS should always be considered in differential of uncontrolled fever with rigidity, altered sensorium and fluctuating blood pressure. Furthermore, a detailed history, keeping in mind the offending drugs is a must.

Restless legs syndrome is characterized by an urgency to move the legs and unpleasant sensations in the lower limbs, predominantly at rest and at night.^[10] We encountered two cases who were extremely restless, not responding to benzodiazepines or antipsychotics and confused by the intensivist as ICU delirium. Targeted history taking by the Neurologist suggested the diagnosis and addition of gabapentin improved the restlessness. Early intervention thereby avoided undue sedation and antipsychotics.

Common precipitants of seizures in ICU are hypoxia, ischemia, drug toxicity, narcotic or alcohol withdrawal and metabolic.^[1] Diagnosis of seizure type and cause are important to ensure early appropriate treatment and differentiation from myoclonus and movement disorders. For this, involvement of neurophysician is often required. One of our patients had alcohol withdrawal related seizures. Patients with alcohol withdrawal syndrome can have multiple management issues such as withdrawal symptoms, delirium tremens, Wernicke Korsakoff syndrome, seizures, depression, electrolyte disturbances and liver disorders leading to coagulopathy and intracranial hemorrhage. In our patient, postictal left hemiparesis was an indication for neuroimaging, which revealed right parietal glioma. Coagulopathy led to bleed in the tumor, ultimately causing mortality within 24 h.

Towne suggested that subtle movements of fingers, eyes or lips indicating non-convulsive status may occur in up to 8% of ICU patients.^[11] It should be kept in the differentials whenever there is an abrupt deterioration in conscious level in an ICU patient.^[1] Psychiatric disease is often suspected with such presentation as was the case in both our patients and unnecessary antipsychotic drugs may be prescribed. Electroencephalography confirmed seizure discharges in both our patients who responded dramatically to anticonvulsants and could be shifted out of ICU by day 2 of starting treatment.

Although critical care medicine is fundamentally concerned with the diagnosis and support of failing organ

systems, the characterization of acute neurologic failure in the ICU presents unique challenges. The first neurologic consultation in an ICU is usually requested when the critical care team finds it difficult to wean the patient from ventilator. The evaluation by the neurologist will be beyond the spectrum of critical illness polyneuropathy and myopathy. In our series of patients, it had been observed that on being examined and investigated by neurologist, a variety of co-existing neurological disorders could be diagnosed and managed appropriately and subsequently patients had early weaning and discharge from ICU.

A few limitations of our study must be acknowledged. Being purely an observational study, there are chances of inherent selection bias. No statistical analysis was carried out to determine the impact of neurological consultation on the patient's outcome as we had no control group. While this study does show that neurological consultation improve outcomes, but this needs to be objectively studied and collected with blinded data and well-defined outcomes criteria. For this, further prospective cohort studies comparing outcomes in ICU patients with and without a neurological consultation, need to be done involving a larger number of patients. As this is a small case series, no statement of association or predictive ability can be made.

Conclusions

- Co-existing neurological disorders, in ICU patients if diagnosed and managed early had benefits of early weaning and discharge from the ICU.
- Neurological problems in the ICU may often be misdiagnosed as psychiatric disorders. Neurological consults can prevent unnecessary prescription of antipsychotics.

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