http://www.banglajol.info/index.php/JNINB

Case Series

Journal of National Institute of Neurosciences Bangladesh, January 2017, Vol. 3, No. 1

ISSN (Online) 2518-6612
ISSN (Print) 2410-8030

Electro Clinical Profiles of Motor Neuron Disease and Atypical Motor Neuron Disorders: A Case Series

Bithi Debnath[1], Humaira Rafiqa Quaderi[2], Nazmul Haque[3], AFM Al Masum Khan[4], Meera Momtaz Sabeka[5], Md. Ferdous Mian[6], Md. Nahidul Islam[7], Md. Enayet Hussain[8], Rajib Nayan Chowdhury[9]

[1]Assistant Professor, Department of Paediatric Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; [2]Assistant Professor, Department of Pediatric Neurosciences, Dhaka Shishu Hospital, Dhaka, Bangladesh; [3]Assistant Professor, Department of Paediatric Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; [4]Medical Officer, Department of Interventional Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; [5]Registrar, Department of Neurophysiology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; [6]Assistant Professor, Department of Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; [7]Assistant Professor, Department of Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; [8]Assistant Professor, Department of Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; [9]Associated Professor & Head, Department of Neurophysiology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh

[**Reviewed:** 21 January 2016; **Revised:** 6 March 2016; **Accepted:** 11 December 2016; **Published:** 1 January 2017]

Abstract

Amyotrophic lateral sclerosis (ALS) is the commonest MND phenotype. Although many of the atypical motor neuron disorders share some features with ALS, they often can be distinguished by their clinical and electrophysiologic characteristics. Here we present five different cases with varied clinical findings. All the patients were referred from outpatient department to neurophysiology laboratory where electrodiagnostic (EDX) correlations helped to come to a conclusion. The nerve conduction study protocol for a suspected atypi¬cal motor neuron disorder is the same as that for ALS. Akin to the nerve conduction studies, the EMG evaluation of patients with suspected atypical motor neuron disorders is similar to that of ALS. An extensive study is indicated, often of all four limbs, the paraspinal muscles, and the bulbar muscles to reach a possible diagnosis. History, clinical findings and electrophysiological correlation often help to differentiate these atypical motor neuron disorders. Correct diagnosis is needed for further evaluation and prognosis. In this case series five (5) cases have described who are referred from outpatient department to neurophysiology laboratory for electrodiagnostic (EDX) correlations. [Journal of National Institute of Neurosciences Bangladesh, 2017;3(1): 57-61]

Keywords: Motor Neuron Disease; MND; Atypical Motor Neuron Disorders; Electrodiagnostic test; EDX; Amyotrophic lateral sclerosis; ALS

Correspondence: Dr. Bithi Debnath, Assistant Professor, Department of Paediatric Neurology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; Email: bithidebnath@gmail.com; Cell no.: +8801711236107

Conflict of interest: There is no conflict of interest relevant to this paper to disclose.

Contribution to authors: Bithi Debnath: She took history, did the clinical examination, NCS and EMG. She wrote the article. Humaira Rafiqa Quaderi, Md. Nazmul Haque, Meera Momtaz Sabeka They took history and did the clinical examination, AFM Al Masum Khan, Md. Ferdous Mian, Md. Nahidul Islam, Md. Enayet Hussain, Rajib Nayan Chowdhury: All of them supervised to elicit clinical findings and helped to make a EDX correlations.

How to cite this article: Debnath B, Quaderi HR, Haque MN, Khan AFMAM, Sabeka MM, Mian MF, Islam MN, Hussain ME, Chowdhury RN. Electro Clinical Profiles of Motor Neuron Disease and Atypical Motor Neuron Disorders: A Case Series. .J Natl Inst Neurosci Bangladesh, 2017;3(1): 57-61

Introduction

Motor neuron disease (MND) encompasses a group of rapidly progressive and universally fatal neurodegenerative disorders of the human motor system. Amyotrophic lateral sclerosis (ALS) is the commonest MND phenotype[1].

In addition, the varied clinical presentations of MND also include (i) progressive muscle atrophy (PMA, ~

10% of MND cases), a clinically pure lower motor neuron (LMN) phenotype, (ii) primary lateral sclerosis (PLS, 1-3% of MND cases), a clinically pure upper motor neuron (UMN) phenotype and (iii) progressive bulbar palsy (PBP, 1-2% of MND cases), an isolated bulbar phenotype with relative preservation of spinal motor neurons. More recently, an association between ALS and fronto-temporal degeneration (FTD) has been established[2,3].

There are a heterogeneous group of motor neuron disorders that are rare but nonetheless important to recognize, because they often can mimic the presentation of amyo¬trophic lateral sclerosis (ALS). These often are referred to as atypical motor neuron disorders. Although many of the atypical motor neuron disorders share some features with ALS, they often can be distinguished by their clinical and electrophysiologic characteristics[4]. Multifocal motor neuropathy with conduction block, Kennedy's disease, spinal muscular atrophy (SMA), Monomelic amyotrophy often have predominantly lower motor neuron signs. Positive family history is found in Familial amyotrophic lateral sclerosis, spinal muscular atrophy and hereditary spastic paraplegia. Post-poliomyelitis syndrome occurs in at least one fourth of previously infected patients, usually 25 to 30 years after the attack of acute poliomyelitis4. Despite the clinical heterogeneity, median survival of MND remains three years, although the atypical phenotypes exhibit a longer survival[5]. In this case series five (5) cases have described who are referred from outpatient department to neurophysiology laboratory for electrodiagnostic (EDX) correlations.

Case Presentation 1

A 65 year old man was presented with progressive weakness and wasting of all four limbs with bilateral foot drop for 2 years. Neither the patient had any sensory complaints nor any complaints related to bladder and bowel. The patient also had fasciculation; prominent wasting of muscles of all limbs, exaggerated deep tendon reflexes, both limbs (B/L) foot drop with preserved sensory function. Motor NCS revealed reduced CMAP amplitude of all studied nerves with preserved SNAPs. Needle EMG showed features of denervation and reinnervation of sampled muscle of both upper and lower limbs including bulbar and paraspinal. The findings are consistent with Motor neuron disease their axons or both (ALS).

Case Presentation 2

A 46 year old man was referred with the complaints of weakness and wasting of left lower limb for 15 years. Recently he developed pain and weakness of right lower limb along with deterioration of left lower limb. The patient had history of Poliomyelitis in his childhood. He had distal wasting of lower limbs with reduced deep tendon reflexes. Motor and sensory NCS findings were normal. However EMG showed giant polyphasic, long duration, high amplitude MUAPs with reduced recruitment of sampled muscle of left lower

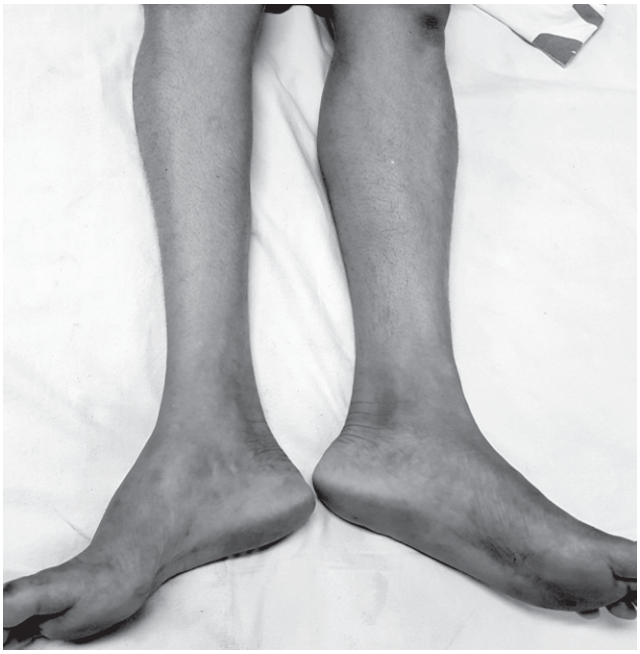

Figure Ia: Muscle wasting in Post-polio syndrome

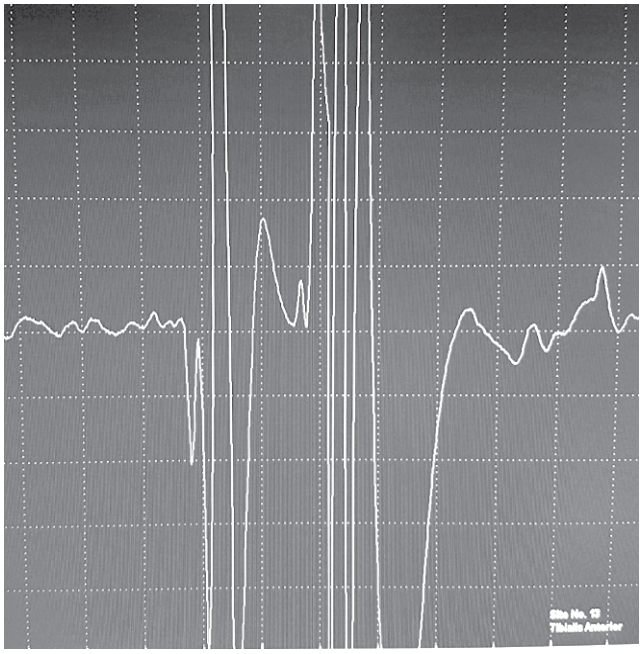

Figure Ib: Giant MUAPs in Postpolio syndrome

limb as well as some of the muscles of right lower limb. These findings were consistent with Post-Polio Syndrome (Figure I).

Case Presentation 3

Two (2) years old developmentally delayed girl of consanguineous parents was referred to neurophysiology laboratory with the complaints of weakness and gradual wasting of all 4 limbs, feeding difficulties and history of repeated respiratory tract infection for 9 months. On examination, the child was well alert but had hypotonia, hypoflexia, symmetrical muscle wasting with intact sensory function. NCS revealed reduced CMAP amplitude in all studied nerves. Needle EMG showed features of denervation and reinnervation with reduced recruitment of the sampled muscle in both upper and lower limbs. These findings were consistent with Disease of motor neuron, their axon or both (Anterior horn cell disease? SMA).

Case Presentation 4

A 60 year old male presented with gradual onset and progressive difficulty in swallowing and nasal intonation of speech for 1 year. The patient also had generalized muscle wasting along with twitching from same duration. On examination, the patient was grossly emaciated having bilateral gynaecomastia, nasal speech, wasted tongue with fasciculation and absent gag reflex. The case also had postural tremor, generalized muscle wasting predominantly involving proximal muscle with flaccid quadriplegia. CK level was moderately elevated. NCS revealed reduced CMAP amplitude in motor nerves and absent SNAPs with neuropathic MUAPs on needle EMG. Kennedy`s disease was diagnosed based on typical history, findings and EDX (Figure II).

Case Presentation 5

A 20 year old male was presented with weakness and wasting of right upper limb for 8 months which was gradually progressing. There was wasted small muscles of hand with preserved deep tendon reflexes and sensory function. On EDX testing, CMAP amplitude was reduced in right median and ulnar nerves with preserved SNAPs. Needle EMG found increased spontaneous activities with neuropathic MUAPs of sampled muscles innervated by C 8-T1. The findings were consistent with segmental anterior horn cell disease affecting the C8-T1 segment on right side (Monomelic Amyotrophy).

Discussion

When evaluating the patient with ALS/MND, the neurologist must consider a number of other motor neuron disorders and related motor syndromes that may have clinical features resembling ALS/MND. In addition, certain motor syndromes, such as monomelic amyotrophy, postpolio muscular atrophy, Kennedy`s disease, Spino mascular atrophy and multifocal motor neuropathy, can clinically mimic ALS/MND. Therefore, not only may the diagnosis of ALS/MND be clinically missed in the early stages, but worse, the patient may be wrongly labeled as having ALS/MND[6].

In this case series, all patients were referred from outpatient department to neurophysiology laboratory where electrodiagnostic (EDX) correlations helped to come to a conclusion. The diagnosis of ALS depends upon the recognition of a characteristic constellation of symptoms and signs[7-11] and supportive

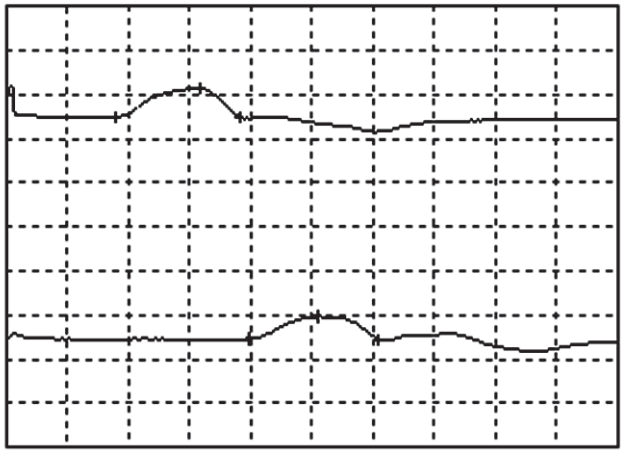

Figure II(a) Reduced Median CMAP amplitude

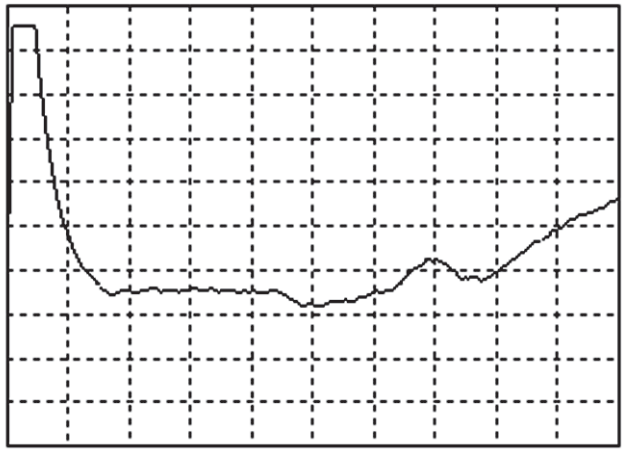

Figure II(b) Absent Ulnar SNAP in Kennedy`s disease

Table 1: Age distribution of the study patients (n=31)

Number	Diagnosis	Predominant clinical feature	EDX findings
Case 1	Amyotrophic lateral sclerosis	Wasting of muscles of all limbs, exaggerated deep tendon reflexes, fasciculation , B/L foot drop	Reduced CMAP amplitude Preserved SNAPs EMG - features of denervation and reinnervation
Case 2	Post-Polio Syndrome	History of Poliomyelitis Recently developed pain and weakness of right lower limb along with deterioration of left lower limb	EMG - giant polyphasic, long duration, high amplitude MUAPs with reduced recruitment of muscle of left lower limb as well as right lower limb.
Case 3	Anterior horn cell disease ? SMA	Developmental delay Parental consanguinity, feeding difficulties, hypotonia, hypoflexia, symmetrical muscle wasting.	Reduced CMAP amplitude Preserved SNAPs EMG-features of denervation and reinnervation
Case 4	Kennedy`s disease	Difficulty in swallowing and nasal intonation of speech, generalized muscle wasting, flaccid quadriplegia, bilateral gynaecomastia, wasted tongue with fasciculation and absent gag reflex	NCS - reduced CMAP amplitude in motor nerves Absent SNAPs Neuropathic MUAPs on needle EMG
Case 5	Monomelic Amyotrophy	Weakness and wasting of right upper limb, wasted small muscles of hand with preserved deep tendon reflexes	ReducedCMAP amplitude Preserved SNAPs Neuropathic MUAPs of muscles innervated by C 8-T1on needle EMG

electrophysiological findings. The combination of lower motor neuron (LMN) weakness and muscle atrophy that crosses both peripheral nerve and myotomal distributions and that is accompanied by upper motor neuron (UMN) spasticity and hyperreflexia in a middle-aged or elderly person is most often due to ALS. There are other potentially treatable disorders, which can mimic the clinical signs, electrophysiologic findings, or both in ALS and its variants like coexistent cervical and lumbar radiculopathy. The motor nerve conduction studies are identical in both, either are normal or show evidence of axonal loss. SNAPs are spared in both case.The only difference is involvement of the thoracic paraspinal muscles in Polyradiculopathy on EMG is rare[4]. Atypical motor neuron disorders often make confusion with MND, radiculopathy, peripheral neuropathy, distal myopathy and many more. The nerve conduction study and EMG protocol for a suspected atypical motor neuron disorder are the same as that for ALS. The most important reason to perform motor nerve conduction studies is to look for CMAP amplitude and conduction block. Sensory nerve conduction studies are always normal in ALS unless the patient has a superimposed disorder like diabetes mellitus. Abnormal sensory conduction studies are often seen in Kennedy's disease. Akin to the nerve conduction studies, the EMG evaluation of patients with suspected atypical motor neuron disorders is similar to that of ALS. An extensive study is indicated, often of all four limbs, the paraspinal muscles, and the bulbar muscles to reach a possible diagnosis[4].

Conclusions

Motor neuron disorders appear to be a clinically heterogeneous disorder with varied clinical presentation encompassing a range of upper or lower motor neuron dysfunction or both. History, clinical findings and electrophysiological correlation often help to differentiate these disorders. Correct diagnosis is needed for further evaluation and prognosis.

References

1. Kiernan MC, Vucic S, Cheah BC, Turner MR, Eisen A, Hardiman O, et al. Amyotrophic lateral sclerosis. The Lancet. 2011;377(9769):942-55
2. Renton Alan E, Majounie E, Waite A, et al. A Hexanucleotide Repeat Expansion in C9ORF72 Is the Cause of Chromosome 9p21-Linked ALS-FTD. Neuron 2011;72:257-68
3. DeJesus-Hernandez M, Mackenzie Ian R, Boeve Bradley F, et al.

Expanded GGGGCC Hexanucleotide Repeat in Noncoding Region of C9ORF72 Causes Chromosome 9p-Linked FTD and ALS. Neuron 2011;72:245-56

4. Preston D C, Shapiro B E. Electromyography and Neuromuscular Disorders Clinical- Electrophysiological Correlations. Third edition 2013;417,432

5. Hardiman O, van den Berg LH, Kiernan MC. Clinical diagnosis and management of amyotrophic lateral sclerosis. Nat Rev Neurol 2011;7:639-49

6. Ashok V, Walter G B. Atypical Motor Neuron Disease and Related Motor Syndromes. Semin Neurol 2001; 21(2): 177-188.

7. Brooks BR. El Escorial World Federation of Neurology criteria for the diagnosis of amyotrophic lateral sclerosis. Subcommittee on Motor Neuron Diseases/Amyotrophic Lateral Sclerosis of the World Federation of Neurology Research Group on Neuromuscular Diseases and the El Escorial "Clinical Limits of Amyotrophic Lateral Sclerosis" workshop contributors. J Neurol Sci 1994;124:96–107

8. World Federation of Neurology Research Group on Neuromuscular Diseases Subcommittee on Motor Neuron Disease. Airlie House guidelines. Therapeutic trials in amyotrophic lateral sclerosis. Airlie House "Therapeutic Trials in ALS"workshop contributors. J Neurol Sci 1995;129:1–10

9. Bradley WG. Overview of motor neuron disease: classification and nomenclature. Clin Neurosci 1995;3:323–326

10. Bradley WG. Recent views on amyotrophic lateral sclerosis with emphasis on electrophysiological studies. Muscle Nerve 1987;10:490–502

11. Eisen A. Amyotrophic Lateral Sclerosis. Cambridge: Cambridge University Press; 1998