

Amyotrophic Lateral Sclerosis - The Challenge of Diagnosis

Fábia Cruz^{1,*}, Diogo Batista², Cátia Pereira³, Vera Durão⁴, Rita Macedo⁵, Richard Staats⁶, Paula Pinto⁷ and Cristina Bárbara⁸

¹ Internal Medicine Resident, Department of Internal Medicine, Hospital Amato Lusitano, ULSCB, Portugal

² Pneumology Resident, Department of Pneumology, Hospital Santa Maria, CHULN, Portugal

³ Pneumology Hospital Assistant, Department of Pneumology, Hospital Santa Maria, CHULN, Portugal

⁴ Pneumology Hospital Assistant, Department of Pneumology, Hospital Santa Maria, CHULN, Portugal

⁵ Pneumology Hospital Assistant, Department of Pneumology, Hospital Santa Maria, CHULN, Portugal

⁶ Pneumology Hospital Assistant, Department of Pneumology, Hospital Santa Maria, CHULN, Faculty of Medicine of Lisbon, ISAMB, Portugal

⁷ Pneumology Graduate Hospital Assistant, Department of Pneumology, Hospital Santa Maria, CHULN, Faculty of Medicine of Lisbon, ISAMB, Portugal

⁸ Pneumology Senior Graduate Hospital Assistant, Department of Pneumology, Hospital Santa Maria, CHULN, Faculty of Medicine of Lisbon, ISAMB, Portugal

*Corresponding author: Fábia Cruz, Internal Medicine Resident, Department of Internal Medicine, Hospital Amato Lusitano, ULSCB, Portugal

Received: September 15, 2022

Published: October 10, 2022

Abstract

Amyotrophic Lateral Sclerosis (ALS) is a progressive, degenerative neuromuscular disease with limited treatment options. The diagnosis of ALS can be challenging, resulting in delays that may compromise optimal management [1]. Non-Invasive Ventilation (NIV) prolongs survival and maintains overall quality of life [2]. An 81-years-old man presented in the emergency department with sudden change in level of consciousness, general weakness, weight loss, muscle atrophy and fatigue for a year and acute respiratory acidemia. During hospitalization the patient started respiratory support with NIV and performed electromyography that revealed motor neuron disease / ALS.

Keywords: Amyotrophic lateral sclerosis; Motor neuron disease; Non-invasive ventilation

Introduction

We report a case of ALS who presented with progressive weakness, weight loss and muscle atrophy upon one year and acute respiratory acidemia. It is emphasized the management of NIV and the challenging of ALS diagnosis.

Case Presentation

81-years-old man with some limitations in daily activities and a previous history of asthma, hypertension, dyslipidemia, and past smoking history (25 pack-years). His chronic medication was salmeterol 50mcg/dose twice a day, telmisartan / hydrochlorothiazide 40/12.5mg per day and rosuvastatin 10mg per day.

He presented in the emergency department with sudden change in level of consciousness, repeated peri-oral movements. According to his family, he was suffering from general weakness, difficulty walking, weight loss and tiredness in last year.

In admission the patient was punctuated 4 from Coma Glasgow Scale, was prostrated, without pain response, eye miosis, positive Babinski reflex bilaterally, bilateral hands muscle atrophy and Dupuytren's contracture. Auscultation revealed bilateral expiratory and inspiratory wheezes.

Arterial blood gas analysis with oxygen therapy 3L/min showed respiratory acidemia: pH 7.145, PaCO₂ 83.3mmHg, PaO₂ 147mmHg, SpO₂ 98%, HCO₃ 21.8mmol/L, Lactates 11.0mg/dl. He started NIV (BiPAP) S/T mode: IPAP 18, EPAP 6, RR 14 breaths per minute, FiO₂ 28%. Blood sample, brain CT scan, echocardiography, chest radiograph and CT scan were normal.

It was assumed central hypoventilation that caused respiratory acidemia with depressed level of consciousness. The patient was then admitted in a respiratory intensive care unit.

During hospitalization in intensive care, the patient responded well to NIV, first continuous and then for periods, with normalization of arterial blood gas analysis and improved level of consciousness. He also presented dysphonia and non-effective cough. He was treated with budesonide-formoterol 2 puffs 12/12h, ipratropium bromide 2 puffs 8/8h, prednisolone 20mg daily for 5 days and respiratory rehabilitation. Electroencephalography reported no epileptic activity.

After 10 days the patient was discharged to pulmonology unit. He was still tired at rest, totally dependent of NIV, with general weakness, difficulty walking and dysphonia. He performed an electromyography (Figure 1) that showed Motor Neuron Dis-

VCM							
Motor Nerve Conduction	Latência (ms)	Amplitude (mV)	Ampl Negativa (mV)	VCM (m/s)	F Mínima	F Máxima	Persistência Fs
Peroneus Motor Left							
Ankle - EDB	6.27	1.02	0.56		62.6	63.4	40.0
Bl. knee-Ankle	14.3	0.87	0.45	39.9			
Peroneus Motor Right							
Ankle - EDB	4.94	2.8	1.99		60.2	61.2	30.0
Bl. knee-Ankle	13.7	3.0	1.54	35.4			
Phrenicus Motor Left							
Neck - Diaphragm	8.65	0.056	0.056				
Phrenicus Motor Right							
Neck - Diaphragm	9.18	0.076	0.053				

VCS			
Sensory Nerve Conduction	Latência (ms)	Amplitude (uV)	VCS (m/s)
Peroneus Sensory Left			
Leg - Dorsum Pedis	2.40	5.7	39.6
Peroneus Sensory Right			
Leg - Dorsum Pedis	2.17	6.1	39.2

Figure 1: Single-fiber electromyography report.

ease/Amyotrophic Lateral Sclerosis with severe respiratory involvement and then started riluzole 50mg per day.

The patient was discharged clinically well from hospital with NIV (BiPAP) S/T mode: IPAP 20, EPAP 4, RR 14 breaths per minute, FiO2 24% per periods during day (3-4 hours) and continuous at night. He remains being followed by Pulmonology and Neurology consultations.

Discussion

Amyotrophic Lateral Sclerosis (ALS) is a degenerative disease of unknown cause that presents motor, bulbar and respiratory dysfunctions, the last of which is the main cause of death [3]. It is a part of a spectrum of disorders that target motor neurons in the cerebral cortex, brainstem, and spinal cord [1].

There is a slight male predominance, with peak incidence between 60 and 75 years. Its onset is often subtle and its course insidious, the typical time to diagnosis is 10–16 months from symptom onset [1].

Patients with ALS ultimately experience a progressive, usually rapid deterioration of these motor neurons, resulting in variable degrees of weakness, spasticity, and muscle atrophy, affecting key functions including limb use/ambulation, speech, swallowing, and breathing. Dysphagia occurs in most ALS patients at some point in their disease course due to weakness and/or spasticity of bulbar musculature. Up to half of patients with ALS will exhibit some degree of frontotemporal cognitive dysfunction, while a much smaller proportion manifests dementia of the frontotemporal type [1].

ALS is largely a clinical diagnosis, defined via the El Escorial and subsequently revised El Escorial/Airlie House Criteria by the following three factors: 1) evidence of Lower Motor Neuron (LMN) degeneration (either on exam or through specialized testing), 2) evidence of upper motor neuron (UMN) disease on exam, and 3) the presence of either of the above in more than one region of the body. In addition, the course must

be progressive with no evidence of a reasonable alternative diagnosis [1,4].

NIV prolongs survival and maintains overall quality of life [2]. Because most of ALS patients die from respiratory failure (including complications of aspiration) that occurs within three years of the first symptom onset, early diagnosis and subsequent referral to an appropriate tertiary center are crucial for timely multidisciplinary care and improved quality of life [1]. Within clinical evaluations that detail mortality, pulmonary function, muscular strength and incapacity, there is the Amyotrophic Lateral Sclerosis Functional Rating Scale (ALS-FRS) [3]. The ALS-FRS is a validated rating instrument for monitoring the progression of disability in patients with ALS. The Revised ALSFRS (ALSFRS-R) retains the properties of the original scale and shows strong internal consistency and construct validity. ALSFRS-R scores correlate significantly with quality of life as measured by the Sickness Impact Profile, indicating that the quality of function is a strong determinant of quality of life in ALS [5].

In this case, the authors present a symptomatic man with progressive muscle degeneration within his first presentation on emergency department and the urgent need for respiratory support. During hospitalization it was attempted to manage for NIV to assure the best quality of his life. Diagnosis was achieved after 12 months of progressive symptoms. NIV became his main respiratory support. The patient fulfilled the three El Escorial / Arlie House Criteria.

Conclusion

We hereby present a clinical case of amyotrophic lateral sclerosis, a progressive and degenerative neuromuscular disease of unknown cause, with limited treatment option. Respiratory dysfunctions are the main cause of death. In this way, early diagnosis is crucial for timely multidisciplinary care and improved quality of life.

Patient's Consent: Written informed consent was obtained for the publication in this case report and accompanying images.

Funding: The authors declare that no funding was received for this article.

Declaration of Competing Interest: None of the authors have any conflicts of interest to disclosure.

Authors Contribution

Fábia Cruz: acquisition of data, drafting the article and literature revision

Diogo Batista: acquisition of data

Cátia Pereira: literature revision

Vera Durão: literature revision

Rita Macedo: critical revision

Richard Staats: critical revision

Paula Pinto: Guarantor

Cristina Bárbara: Guarantor

References

1. Richards D, Morren JA, Piro EP. Time to diagnosis and factors affecting diagnostic delay in amyotrophic lateral sclerosis. *Journal of the Neurological Sciences* 2020;417:117054.
2. Mitumoto H. Non-invasive ventilation and diaphragmatic pacing in ALS. *Lancet Neurology* 2015;14(9):868-869.
3. Guedes K, Pereira C, Pavan K, Valério BCO. Cross-cultural adaptation and validation of als Functional Rating Scale-Revised in Portuguese Language. *Arquivos de Neuropsiquiatria* 2010;68(1):44-47.
4. Brooks BR. El Escorial World Federation of Neurology criteria for the diagnosis of amyotrophic lateral sclerosis. *Journal of the Neurological Sciences* 1994;124:96-107.
5. Cedarbaum JM, Stambler N, Malta E, Fuller C, Hilt D, Thurmond B, et al. The ALSFRS-R: a revised ALS functional rating scale that incorporates assessments of respiratory function. BDNF ALS Study Group (Phase III). *Journal of the Neurological Sciences* 1999;169(1-2):13-21.