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Uncommon H Reflex Abnormalities in Amyotrophic Lateral Sclerosis (ALS): Pilot Study

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Abstract

Introduction: The aim of the current study is to look for uncommon soleus H-reflex abnormalities in patients with amyotrophic Lateral Sclerosis (ALS).

Method/Patients: This is a pilot study. ALS patients whose nerve conduction studies included H-reflex evaluation were recruited in the period between June 2019 to December 2019 from the ALS clinic at the international medical center (IMC) (Cairo, Egypt). All patients included in the study should have normal motor nerve conduction studies (mNCS). Patients with abnormal MNCS, neuropathies, lumbosacral radiculopathy, previous back surgeries are excluded.

Results: Thirteen patients were included in the study. Six ALS patients showed abnormal H-reflex studies (46.2%). Three patients had absent H-reflex and 3 patients had significantly prolonged H-reflex latencies. We compared the mean age and height of patients with abnormal H-reflex studies and patients with normal H-reflex studies, and there was no statistically significant difference.

Discussion: Previous studies have shown that ALS patients may show demyelinating features in their NCS consistent with demyelinating neuropathies. Thus, the presence of prolonged/absent H-reflex in our study could be indicative of the presence of subtle proximal demyelination in ALS. Larger sample is needed to confirm our findings.

Conclusion: Prolonged latency or absence of H-reflex as an only abnormality observed in NCS of ALS patients should be interpreted cautiously as it may reflect unusual segmental demyelination. Larger sample is needed to look for other demyelinating features in ALS and to confirm our results.

Keywords: *H Reflex; ALS; Bulbar; NCS; Demyelination*

Introduction

Although H-reflex has been studied in various UMN dysfunction disorders, yet, its use as a potential biomarker in ALS has not been extensively studied [1]. Amplitude of H reflex has been studied previously in ALS; however, latency of H-reflex has not been looked at.

Aim of the Study

The aim of the current study is to look for uncommon abnormalities of soleus H-reflex in patients with amyotrophic lateral sclerosis (ALS).

Methods and Patients

This is a pilot study. ALS patients whose nerve conduction studies included H-reflex evaluation were recruited in the period between June 2019 to December 2019 from the ALS clinic at the international medical centre (IMC) (Cairo, Egypt). All patients included in the study must have normal motor nerve conduction studies (mNCS). Patients with abnormal MNCS, neuropathies, lumbosacral radiculopathy, previous lumbar surgeries are excluded from the study. This study that was approved by local ethical committee of Neurology department, IMC. Consent was obtained from all patients.

Recordings were performed on Nicolet Viking quest EMG, NCS and EP, 2 channels (Natus; united states) device and responses recorded using surface electrodes. During the examination, the skin temperature at the ankle and wrist was kept above 32C. We used standard silver/silver chloride surface electrodes (10 mm in diameter), with the active electrode placed on the belly of the muscle and the reference electrode positioned on a muscle tendon.

Motor nerve conduction was investigated in the median (recording from the abductor pollicis muscle after stimulation at the wrist, elbow, axilla and erb's point), ulnar (recording from abductor digiti minimi muscle after stimulation up at the wrist, below elbow, above elbow, axilla and erb's point), tibial (recording from muscle abductor hallucis after stimulation behind medial malleous and at popliteal fossa) and peroneal nerves (recording from extensor digitorum brevis muscle after stimulation at ankle, below and above fibular head).

For obtaining H-reflex, the active electrode was placed over the soleus and reference electrode was placed over the Achilles tendon. Stimulation rate was at rate not faster than 0.5 Hz. Duration of stimulus intensity was set at 1 ms. H-reflex of ALS patients in our study has been categorized as being absent/present and latency of the H-reflex has been calculated and categorized as being normal/prolonged.

Statistical methods

The results are expressed as mean ± standard deviation. Statistical significance was calculated using two-sample t-test to determine significant difference between means. For all statistical analysis tests, a probability of $P < 0.05$ was considered statistically significant.

Results

Thirteen ALS patients were included in the study. Only 6 ALS patients showed abnormal H-reflex studies (being absent/prolonged latencies) (46.2%) (Group I) and 7 patients had no detected abnormality (Group II). There was no statistically significant difference between both groups regarding mean age and height (Table 1).

	Group I (6 patients)	Group II (7 patients)	P value
Mean age (± SD) (yrs)	58.8 ± 10.8	58.4 ± 8.7	0.47
Mean height (± SD) (cm)	175.6 ± 3.1	170.3 ± 9.8	0.07

Table 1: *Demographics of group I (patients with abnormal H-reflex) and group II (patients with normal H reflex).*

Three patients had absent H-reflex and 3 patients had prolonged H-reflex latencies. There was no significant side to side difference in H reflex latency. Patients in group I has statistically significant prolonged mean H-reflex latencies (37.1 ms ± 2.6) compared to patients in group II (31.9 ms ± 1.6) (Table 2).

Discussion

H reflex amplitude is a diagnostic tool in upper motor neuron dysfunction; previous studies have shown that there is dysfunction of spinal circuits in amyotrophic lateral sclerosis (ALS) which results in abnormal H/M amplitude [1,2]. In a study, Mazzini and colleagues

	Group I (6 patients)	Group II (7 patients)	P value
Mean H-reflex latency (± SD) (ms)	37.1 ± 2.6	31.9 ± 1.6	0.0002*

Table 2: *Mean latencies of H-reflex in patients of the 2 groups.*
**: Statistically significant.*

[3] showed that mean amplitude of H reflex is an effective tool in evaluating the clinical course of ALS and monitoring medications effect in clinical trials.

To our knowledge, this is the first study looking at abnormalities of latencies of H-reflex among ALS patients. In this cross-sectional study, we looked at uncommon H-reflex abnormalities in terms of absence/presence and abnormal prolonged latency. ALS patients whose nerve conduction studies included H-reflex evaluation were recruited in the period between June 2019 to December 2019 from the ALS clinic at the international medical center (IMC) (Cairo, Egypt). All patients must have normal mNCS. We excluded patients with abnormal MNCS, neuropathies, lumbosacral radiculopathy, previous back surgeries. Thirteen patients were eligible to be included in our study. Only 6 ALS patients showed abnormal H-reflex studies (46.2%); 3 patients had absent H-reflex and 3 patients had statistically significant prolongation of H-reflex latencies. There was no side to side difference in latencies. There was no statistically significant difference between demographics of patients with and without abnormal H reflex.

Although H-reflex is a useful tool for diagnosing lumbosacral radiculopathy [4] we excluded patients with lumbosacral radiculopathy and back surgeries from the study so that we can rule out to a greater extent this probability. Prolonged latency of H-reflex or side-to-side differences may indicate demyelination with significant damage of large nerve axons [5]. On the other hand, absent or decreased amplitude is probably indicative of nerve conduction block [6]. Abnormalities of H reflexes (as absent H-reflex) are frequently noted in early acute inflammatory demyelinating polyradiculoneuropathy (AIDP) [7].

Previous studies have shown that ALS patients may show demyelinating features in their NCS consistent with demyelinating neuropathies [8,9]. Thus, the presence of prolonged/absent H-reflex in our study could be indicative of the presence of subtle proximal demyelination in ALS.

Conclusion

Prolonged latency or absence of H-reflex as an only abnormality observed in NCS should be interpreted cautiously as it may reflect unusual segmental demyelination in ALS. Larger sample is needed to look for other demyelinating features in ALS and to confirm our results.

Funding

We did not receive funds for this project.

Conflict of Interests

None.

Ethical Consideration

- This manuscript was approved from the local Ethical Committee of neurology department, international medical center (IMC) 11/06/2019.
- Consent for participation: All patients signed consents to use their tests in research purposes.

- The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.
- We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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