



Case report

Reversible spontaneous EMG activity during myasthenic crisis: Two case reports

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ABSTRACT

Background: Myasthenia Gravis (MG) is an antibody-mediated autoimmune neuromuscular disorder, clinically presenting with fatigable variable muscle weakness. Typical electrodiagnostic findings are a decremental response to repetitive nerve stimulation with post-exercise facilitation, and motor unit instability expressed as increased jitter on single fibre-EMG. Presence of spontaneous activity on standard EMG is traditionally considered inconsistent with a diagnosis of MG and would direct the differential diagnosis towards a primary denervating or usually inflammatory myopathic process.

Case report

We herein present two patients with progressive severe bulbar symptomatology, whose needle-EMG examinations showed spontaneous activity and led to erroneous initial diagnoses of inflammatory myopathy and anterior horn cell disease respectively. Follow-up neurophysiological investigations, positive anti-AchR titres and good response to IVIg and steroids eventually established the diagnosis of Myasthenia Gravis.

Conclusions: Clinically severe Myasthenia Gravis can potentially present with spontaneous activity on EMG, mimicking acute myopathic or neurogenic processes. This can prove particularly perplexing and cause significant delays in the diagnosis and treatment of a myasthenia relapse.

1. Introduction

Acute-onset bulbar symptoms are not an uncommon concern in everyday emergency neurology practice, with the differential diagnosis including a broad spectrum of neuromuscular disorders. Needle-EMG of clinically affected muscles will help distinguishing neurogenic from myopathic pathology. Abnormal findings on repetitive nerve stimulation (RNS) and single fibre-electromyography (SF-EMG) would point towards a primary neuromuscular junction (NMJ) pathology.

Unfortunately, many factors may complicate the diagnostic procedure. RNS is characterised by low sensitivity, with many false negative results, especially in cases of confined ocular involvement [1]. SF-EMG is the most sensitive amongst all NMJ function tests, including the anti-AchR assay [2,3], but on the other hand lacks specificity, as it can be abnormal in primary neurogenic or myopathic processes as well [4,5]. Even the anti-AchR titre itself is surprisingly not infallibly specific [6]. Further complicating the diagnosis, intermittent muscle fibre blocking in severe NMJ dysfunction may produce a myopathic-like EMG appearance with no histological evidence of a myopathy [7]. Actual

secondary myopathy remains a possibility though, as it has been histologically [8] and electromyographically [9] described in longstanding cases of myasthenia gravis. Finally, coexistence of MG with inflammatory myopathy in the context of a thymoma, has frequently been reported [10–20]. A single case-report has also presented coexisting MG with adult-onset nemaline myopathy [21].

Spontaneous EMG activity is traditionally considered inconsistent with pure NMJ disorders. However there are few reports that disproved that notion on clinical [22–25] and experimental grounds [26]. Besides spontaneous EMG activity is a well-appreciated potential finding in cases of botulism [27,28].

In conclusion, despite the paramount role of neurophysiological investigations in the diagnosis of MG, there seem to be relatively rare exceptions, in which the unexpected presence of spontaneous EMG activity may prove misleading. Lacking appreciation of the above could potentially lead to significant delays in diagnosis and treatment of an MG relapse.

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2. Case reports

2.1. Patient 1

A 66-year-old female patient, with a 3-year history of anti-AChR positive myasthenia gravis in remission, was admitted for investigation of gradually deteriorating fatigable head drop, asymmetrical ptosis, dysarthria and bilateral proximal weakness. On admission RNS of the right ulnar nerve was normal. Needle-EMG showed rapidly recruiting, short duration, low amplitude polyphasic motor unit action potentials (MUAPs) in proximal muscles, as well as complex repetitive discharges in the aforementioned muscles. On that basis, the patient underwent investigation of a new onset proximal myopathy. Blood tests were all within normal limits. Muscle MRI and eventually biopsy of the left vastus lateralis were not supportive of an inflammatory myopathy. On repeat neurophysiological examination, RNS of the median, accessory and facial nerves showed abnormal CMAP decrement (up to 42%) with post-exercise facilitation. SF-EMG in the orbicularis oculi showed increased jitter in 100% of the sampled muscle fibre action potential (MFAP) pairs, with 50% blocking. Similar to the previous test, standard EMG showed myopathy-like features, but also florid spontaneous activity in proximal upper and lower limb muscles. A 5-day course of IV immunoglobulin (IVIg) was administered, leading to significant clinical recovery. A follow-up EMG 5 months later did not show spontaneous activity or any myopathic features. Repetitive nerve stimulation was normal.

2.2. Patient 2

A 74-year-old male patient, with known hypertension but otherwise unremarkable medical history, was admitted due to acute onset dysphonia and type II respiratory failure. A first neurophysiological investigation showed florid spontaneous activity in the bulbar segment, confirmed later with a repeat study, which pointed towards an anterior horn cell disorder. However, a trial of pyridostigmine improved the clinical symptoms and anti-AChR titer proved strongly positive. The patient was started on IVIg and steroids, with gradual improvement of the symptoms. A repeat neurophysiological study was diagnostic of a post-synaptic NMJ disorder, showing a decrement of up to 42% and post-exercise facilitation. EMG at this point was normal. Unfortunately, within a month and after a total of 4 ITU admissions and several complications, the patient died of acute myocardial infarction.

3. Discussion

Diagnosis of MG is usually relatively straightforward and is based on the combination of the typical clinical presentation, the presence of serum autoantibodies (anti-AChR [29], anti-MuSK [30], anti-LRP4 [31,32]) and the typical neurophysiological findings on RNS and the much more sensitive SF-EMG [33] [5]. Standard EMG is usually normal or may occasionally show some myopathic features, which usually reflect individual muscle fibre drop-out due to severe NMJ blocking, rather than an actual myopathy and may impressively normalise after rest [7] or generally restoration of the neuromuscular junction transmission.

Traditionally, spontaneous EMG activity is not expected in NMJ disorders, with the possible exception of botulism, in which spontaneous activity is believed to be reflecting acute toxin-induced en masse muscle fibre blocking and subsequent chemo-denervation [27,28]. However, spontaneous EMG activity has been rarely reported in MG as well. In a small series, published by Maher et al, 3 out of 4 patients with strictly isolated bulbar and respiratory muscle weakness showed florid spontaneous activity on EMG of the diaphragm [22]. Musser et al reported 2 patients with generalised, distally accentuated anti-AChR positive MG and spontaneous EMG activity in distal limb muscles [23]. Pelzer et al reported 2 cases of severe MG with a myopathic EMG

pattern and spontaneous activity, emphasizing the diagnostic difficulties in distinguishing MG from polymyositis [24]. Chroni and Punga described spontaneous activity in severely affected muscles of mice with MuSK + experimental autoimmune MG (EAMG) [26].

Our patients' EMG during the clinical nadir showed spontaneous activity, which we believe that could be solely attributed to the MG relapse itself, reflecting acute severe neuromuscular junction transmission deficit, rather than any superimposed additional myopathic or neurogenic pathology. We assume that muscle fibres suffering acute complete blocking would behave as being essentially denervated, similar to what may occasionally be encountered in cases of botulism. The consequence would be muscle fibre membrane irritability, translated into spontaneous EMG activity. Regarding the myopathic-like MUAPs seen in the first patient, these are unlikely to have been representing actual underlying myopathic pathology, given the unsupportive muscle biopsy and their normalisation after treatment and neuromuscular junction transmission recovery.

Overall, it seems that severe acute neuromuscular junction transmission deficit may present with spontaneous EMG activity, mimicking acute neurogenic or myopathic processes. Given the extreme rarity of this presentation, but also the possible coexistence of MG with an inflammatory myopathy [10–20], eventually precise diagnosis can be probably only established on histological grounds. However, appreciation and increased suspicion of these findings is mandatory, in order to avoid dramatic delays in the management of a myasthenic crisis.

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