Original Article

Optimal Strategy for Repetitive Nerve Stimulation in the Diagnosis of Myasthenia Gravis

Metin Mercan, Vildan Yayla, Binnur Sezikli

Department of Neurology, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Istanbul, Turkey

Abstract

Aim: This study aimed to evaluate the impact of various technical factors on the diagnostic utility of repetitive nerve stimulation (RNS) and propose a standardized electrodiagnostic protocol for myasthenia gravis (MG). **Materials and Methods:** RNS recordings from 67 patients with MG, who demonstrated a ≥10% decrement in the abductor digiti minimi (ADM), nasalis, or orbicularis oculi (OOc) muscles, were retrospectively analyzed. **Results:** Abnormal RNS responses were detected in the nasalis muscle in 59 patients (88.1%) and in the ADM muscle in 27 patients (40.3%). In six (9%) patients, additional recordings from the OOc muscle were required to confirm the diagnosis. In two patients (3%), an abnormal decrement was observed exclusively in the ADM muscle. Stimulation at 3 Hz and 5 Hz elicited decrements more effectively than 2 Hz; however, no significant difference was found between 3 Hz and 5 Hz trains. The highest sensitivity was achieved with post-exercise (PE) recordings at 3 and 4 min, yielding 35.8% at both time points for the ADM muscle and 78.7% and 70.2% for the nasalis muscle, respectively. Moreover, when 3-Hz RNS recordings obtained at baseline and at 3 and 4 min PE from all three muscles were analyzed together, abnormal RNS responses were identified in 65 of 67 patients (97%). **Conclusion:** To improve diagnostic yield, increasing the number of muscles examined – particularly facial muscles – appears to be a key strategy. Accordingly, we recommend performing 3-Hz stimulation trains for each muscle, including one at baseline and two additional trains at 3 and 4 min following exercise.

Keywords: *Decrement, facial muscles, myasthenia gravis, repetitive nerve stimulation*

Submitted: 18-Dec-2025
Revised: 02-Mar-2026
Accepted: 08-Mar-2026
Published: 25-Mar-2026

Introduction

Repetitive nerve stimulation (RNS) is a reliable electrophysiologic method used to detect impaired neuromuscular transmission during the diagnostic examination of patients with myasthenia gravis (MG).[1,2] A decrement of ≥10% in compound muscle action potential (CMAP) amplitude is traditionally considered abnormal.[3,4] However, the diagnostic performance of RNS in patients with MG depends on several factors, such as disease severity and the selection and number of muscles tested.[5-9] Previous studies reported a wide range of RNS sensitivity, varying from 55% to 89% in generalized MG and from 17% to 76% in ocular MG.[7-14] Some investigators proposed that reducing the amplitude cut-off from 10% to 5%–7% might increase or maintain sensitivity with minimal loss of specificity.[9] Nevertheless, substantial decrements may also occur in other neuromuscular disorders characterized by motor neuron degeneration, such as amyotrophic lateral sclerosis.[15-17] Therefore, although lowering the cutoff value can improve diagnostic sensitivity, it may simultaneously compromise specificity. For these reasons, procedural choices play a critical role in the electrodiagnostic evaluation of patients with MG.

Access this article online

Quick Response Code:

Website: www.nsnjournal.org

DOI: 10.4103/nsn.nsn_192_25

Address for correspondence: Dr. Metin Mercan, Department of Neurology, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Bakirkoy 34147, Istanbul, Turkey.
E-mail: dr_metin_mercan@hotmail.com

How to cite this article: Mercan M, Yayla V, Sezikli B. Optimal strategy for repetitive nerve stimulation in the diagnosis of myasthenia gravis. Neurol Sci Neurophysiol 2026;43:43-8.

Various adjunctive techniques have been proposed to enhance the diagnostic performance of RNS testing, including prolonged electrical stimulation, isometric exercise, ischemia induction, and muscle warming.[1,18-20] Among these, low-frequency RNS performed after isometric muscle contraction is the most widely preferred approach due to its rapid application and minimal need for patient cooperation.[2,21,22] However, some authors argued that the increase in diagnostic sensitivity following exercise is modest and that performing RNS on an alternative muscle might yield better results.[23,24] Although 3 Hz is generally regarded as the most appropriate stimulation rate for RNS, several studies suggested that higher frequencies could improve diagnostic efficiency.[25-28] To date, the only formal guideline available for the electrodiagnostic evaluation of MG is that issued by the American Association of Electrodiagnostic Medicine (AAEM). According to these recommendations, RNS should be performed at a stimulation frequency of 2–5 Hz and should include both baseline and post-exercise (PE) or post-tetanic (PT) recordings. Furthermore, stimulus trains should be delivered at regular intervals of 30–60 s and continued for up to 5 min following isometric exercise or tetanic stimulation.[3] However, performing RNS repeatedly and at various frequencies is time-consuming and costly, which can reduce cooperation from both patients and physicians. Accordingly, the aim of this study was to evaluate the impact of muscle selection, stimulation rate, and PE recordings on the detection of abnormal RNS responses, and propose an optimized strategy for use in the electrodiagnostic evaluation of MG.

Materials and Methods

Patient population

Adult patients aged 18 years or older with a diagnosis of MG established based on clinical findings and RNS testing, who were followed at our neuromuscular disease clinic between January 2016 and May 2025, were retrospectively reviewed. Demographic data, clinical variables, laboratory parameters, and electrophysiologic results were assessed. Inclusion criteria required the presence of a ≥10% decrement in at least one muscle, along with available RNS recordings from both the nasalis and abductor digiti minimi (ADM) muscles. All CMAP waveforms in the traces were reviewed through meticulous visual inspection, and patients whose recordings exhibited poor signal quality or significant artifacts were excluded from the analysis. Data from the first available RNS testing that established the diagnosis of MG were collected. Ethical approval was granted by the Ethics Committee of Bakırköy Dr. Sadi Konuk Training and Research Hospital (Approval date: March 2025; Decision no.: 2025-06-15).

Repetitive nerve stimulation studies

RNS recordings were performed with patients lying comfortably in the supine position. The forearm and hand were stabilized on a heavy board, and the hand was placed in a molded support to restrict motion during CMAP recordings. The band-pass filters were set to 20 Hz and 10 kHz. Skin temperature was maintained at 32°C or higher, with hot water bottles used as needed. Treatment with pyridostigmine was discontinued at least 12 h before RNS testing, and no patients were using long-acting formulations. For all stimulus trains, the intensity was set at 25% above the maximal threshold, and each trial consisted of a train of 10 supramaximal stimuli. The peak-to-baseline amplitude of the CMAP was obtained using automated measurements, and percentage changes were computed based on established published methods.[3] A CMAP amplitude decrement of 10% or more was considered abnormal.

All RNS procedures were conducted by the same clinical neurophysiologist (MM) according to a standardized protocol at our institution. During baseline recordings, trains of supramaximal stimuli were delivered at rates of 2, 3, and 5 Hz, with 1-minute rest intervals between each train. For the evaluation of PE exhaustion, 3-Hz stimulus trains were applied at 1 (PE1 m), 2 (PE2 m), 3 (PE3 m), and 4 (PE4 m) minutes after 1 min of isometric exercise. In addition, high-rate stimulation (HRS) at 20 or 50 Hz was given exclusively to the ulnar nerve for a duration of 1 s following baseline recordings but immediately before maximal voluntary contraction (MCV). During the exercise, patients were asked to sustain an MCV, which was monitored using auditory feedback. Surface recordings using a belly–tendon configuration were obtained, initially from the ADM by stimulating the ulnar nerve at the wrist, and subsequently from the nasalis muscle by stimulating the facial nerve at a point anterior and inferior to the tragus of the earlobe.[29,30] If no abnormal decrement was detected in either of these two muscles, low-rate stimulation (LRS) of the orbicularis oculi (OOc) muscle was additionally conducted following the routine protocol.

Statistical methods

The Friedman test and Cochran's *Q*-test were used to compare changes in CMAP amplitude and the frequency of abnormal decrements across different stimulus trains in the ADM and nasalis muscles. *Post hoc* analyses were performed using the Wilcoxon signed-rank test and McNemar test, with Bonferroni correction used for multiple comparisons. The significance levels were set at $P < 0.017$ and $P < 0.005$, as appropriate for the respective *post hoc* comparisons. The McNemar test was used to evaluate abnormal RNS results between baseline and PE recordings, and the agreement between the

diagnostic performance of facial and ulnar nerve RNS was assessed using Cohen's kappa statistics. *P* values under 0.05 were considered significant.

Results

RNS recordings of both the ulnar and facial nerves were analyzed in 67 patients (mean age: 55.8 ± 17.2 years; range: 18–85 years) with MG. Of these, 57 (85.1%) had generalized MG and 10 (14.9%) had ocular MG. Six patients were seronegative; the diagnosis was confirmed in the remaining patients through the presence of anti-AChR (n = 55) or anti-MuSK antibodies (n = 6). Both baseline and PE recordings of the nasalis muscle were available for analysis in 47 patients; however, PE exhaustion was not assessed in 20 patients.

Facial nerve RNS from the nasalis muscle was abnormal in 59 of 67 patients (88.1%), whereas ulnar nerve RNS yielded abnormal results in 27 (40.3%) patients. Additional RNS recordings from the OOc muscle were required to establish the diagnosis in six (9%) patients. Notably, in two (3%) patients, an abnormal decrement was found solely in the ulnar nerve RNS. For the diagnostic concordance between RNS results of the ADM and nasalis muscles, Cohen's kappa values indicated poor agreement (κ = 0.064, P = 0.347). An instance of abnormal decrement in both muscles was identified in 25 patients (37.3%).

During baseline recordings, the mean decrement magnitude in the nasalis muscle was greater at 3 Hz and 5 Hz stimulation compared with 2 Hz, whereas in the ADM muscle, a more pronounced decrement was observed only at 3 Hz. However, no significant difference was found between 3 Hz and 5 Hz stimulations in either muscle [Figure 1]. When comparing the frequency of abnormal decrements across the three LRSs, a statistically significant higher proportion was noted at 3 Hz compared with 2 Hz, and this finding was limited to the nasalis muscle [Table 1]. Furthermore, 11 of 67 patients (16.4%) exhibited abnormal decrements in ulnar nerve RNS performed with HRS. When comparing only the 3 Hz stimulations during baseline and PE recordings, the mean decrement magnitudes at PE2 m, PE3 m, and PE4 m were significantly greater than those at baseline and PE1 m [Figure 2]. The most prominent decrements were recorded at PE3 m and PE4 m in both muscles [Figure 2 and Table 2]. Abnormal RNS responses in PE recordings demonstrated significantly higher detection rates compared with baseline recordings with varying stimulation rates, in both the ADM (40.3% vs. 29.9%, P = 0.016) and nasalis muscles (80.9% vs. 61.7%, P = 0.012). Moreover, a combined analysis of 3-Hz RNS recordings obtained at baseline and at 3 and 4 min PE across all three muscles identified abnormal RNS responses in 97% of the included patients.

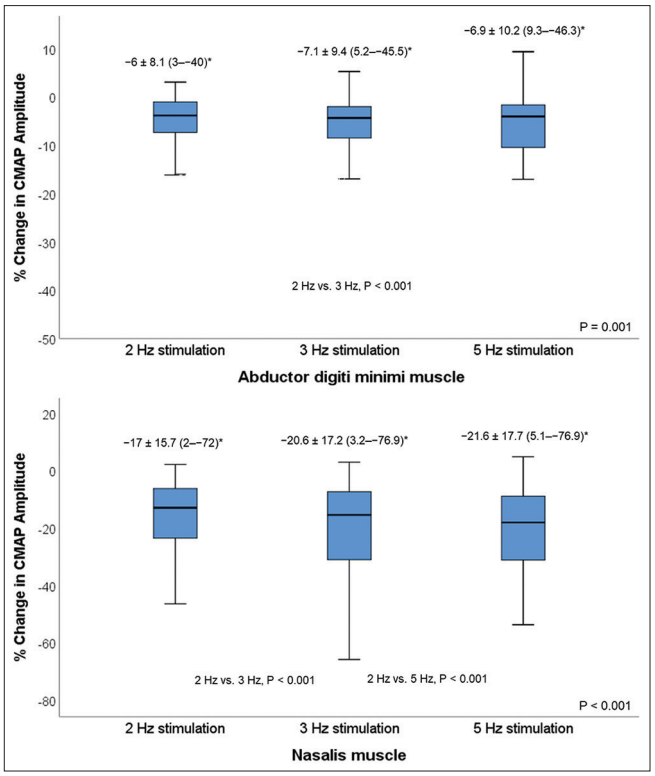

Figure 1: Boxplot representation of decrement magnitudes across different stimulation rates at baseline. Asterisks indicate mean values ± standard deviations; minimum and maximum values are also shown. Statistically significant *post hoc* comparisons are given (P < 0.017)

Discussion

Considerable variability exists in RNS testing protocols among neuromuscular centers,[8,11,14,21,24,28,31] and no universally accepted standard has yet been established. In this context, the present study sought to identify an optimized RNS approach for the electrodiagnostic assessment of MG, focusing on critical technical parameters. PE exhaustion in MG was predominantly observed at PE3 m and PE4 m; stimulation trains performed earlier provided no additional diagnostic value. Using 3 Hz stimulation at baseline, PE3 m, and PE4 m was sufficient to detect abnormal decrements in nearly all patients. Our results also demonstrate that evaluating an additional muscle is more effective than repeatedly stimulating the same muscle at different frequencies. Based on our findings, we recommend that first-line RNS testing should include at least one facial muscle, preferably at a stimulation frequency of 3 Hz, given the relatively high diagnostic yield obtained from recordings of the nasalis muscle. This protocol represents a highly practical and diagnostically efficient approach, performed once at baseline and again at 3 and 4 min PE.

In conventional electrodiagnostic practice, the ADM muscle has commonly been preferred in RNS protocols due to its reliable recording quality and procedural simplicity. However, previous studies reported that the diagnostic sensitivity of RNS testing in the ADM muscle ranges from 14% to 41%, substantially lower than that observed in proximal and facial muscles.[6,7,11,13,23,31-34] Furthermore, RNS recordings from the abductor pollicis brevis muscle showed approximately twice the diagnostic sensitivity of those from the ADM muscle.[33] The diagnostic efficiency of RNS is also significantly influenced by the number of muscles tested, with higher sensitivity observed when recordings are obtained from three or more muscles.[7,13,14,23] In an early prospective study, the combination of RNS recordings from the frontalis and nasalis muscles increased diagnostic sensitivity from 47% to 55% in generalized MG and from 11% to 20% in ocular MG.[10] Consistent with these findings, our results indicate that incorporating RNS recordings from an additional facial muscle yields an added diagnostic benefit in approximately 10% of patients. Moreover, abnormal decrements in the ADM muscle were exceedingly rare when RNS recordings from facial muscles were within normal limits. Collectively, these observations raise important concerns regarding the conventional preference for including the ADM muscle in RNS testing protocols for the diagnosis of MG.

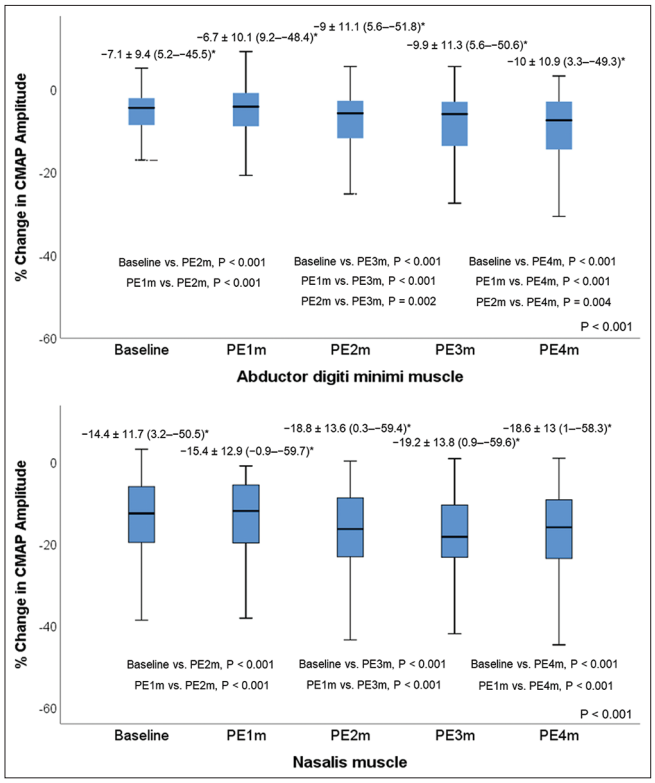

Figure 2: Boxplot representation of decrement magnitudes for 3 Hz stimulations at baseline and post-exercise. Asterisks indicate mean values ± standard deviations; minimum and maximum values are also shown. Statistically significant *post hoc* comparisons are given ($P < 0.005$). PE = Post-exercise

Table 1: Frequency of abnormal decrements at various stimulation rates during baseline recordings

	n	Abnormal decrement (≥10%)			*P*
		2 Hz stimulation, *n* (%)	3 Hz stimulation, *n* (%)	5 Hz stimulation, *n* (%)	
ADM muscle	67	13 (19.4)	15 (22.4)	18 (26.9)	0.121
Nasalis muscle	67	39 (58.2)	46 (68.7)*	47 (70.1)	0.006

*2 Hz versus 3 Hz, P=0.016. Statistical significance was set at P<0.05. For *post hoc* comparisons, significance was adjusted to P<0.017 using the Bonferroni correction. ADM: Abductor digiti minimi, *n*: Number of patients

Several studies involving small patient cohorts examined the optimal stimulation rates for RNS. First, in 1941, Harvey and Masland reported that in patients with MG, a decline in muscle action potential amplitude occurred in response to both low-frequency and high-frequency stimulation trains.[25,35,36] Botelho *et al*. later applied RNS at 3, 10, and 25 Hz in 21 patients with MG, observing the most pronounced decrements at 3 Hz, with three patients exhibiting abnormalities exclusively at 25 Hz. The authors proposed performing RNS at both low and high stimulation rates to enhance diagnostic performance.[25,26] However, subsequent studies demonstrated that abnormal decrements were most frequently observed with LRS, whereas HRS proved largely ineffective in detecting post-synaptic transmission abnormalities.[28,36-38] Similarly, incorporating HRS trains into our RNS protocol did not improve the diagnostic yield for the ADM muscle. In 1971, Özdemir and Young compared RNS recordings from proximal and distal muscles at stimulation rates of 1, 3, 5, 8, 10, 15, and 25 Hz in 30 patients with MG. They reported that abnormal

Table 2: Frequency of abnormal decrements at 3 Hz stimulation during baseline and postexercise recordings

	n	Abnormal decrement (≥10%)					*P*
		Baseline, *n* (%)	PE1m, *n* (%)	PE2m, *n* (%)	PE3m, *n* (%)	PE4m, *n* (%)	
ADM muscle	67	15 (22.4)	15 (22.4)	19 (28.4)	24 (35.8)*	24 (35.8)†	<0.001
Nasalis muscle	47	27 (57.4)	28 (59.6)	33 (70.2)	37 (78.7)*,#	33 (70.2)	<0.001

*Baseline versus PE3m, P<0.005, †Baseline versus PE4m, P<0.005, #PE1 versus PE3m, P<0.005. All other *post hoc* comparisons were not statistically significant. Statistical significance was set at P<0.05. For post hoc comparisons, significance was adjusted to P<0.005 using the Bonferroni correction. ADM: Abductor digiti minimi, *n*: Number of patients, PE: Postexercise

decrements occurred most frequently at stimulation rates of 3 and 5 Hz.[28] In a subsequent study by the same authors, 3 Hz stimulation was identified as the most effective option, with abnormal decrements in the ADM muscle observed at 8 Hz in only two of 80 patients with MG.[5] However, a more recent study involving 15 patients with MG suggested that a 7 Hz stimulation rate yielded higher diagnostic sensitivity compared with 3 Hz.[27] Finally, in a larger cohort study of 140 patients with MG, Oh reported that diagnostic sensitivity was nearly equivalent across stimulation rates of 2, 3, and 5 Hz.[39] In the present study, we found that decrements were more prominent at stimulation rates of 3 and 5 Hz compared with 2 Hz; however, 3 Hz was better tolerated by patients, particularly during facial nerve stimulation.

The decrement observed during LRS typically worsens within a few minutes following MCV or a HRS train – a phenomenon known as PE or PT exhaustion. These phenomena are believed to share common pathophysiologic mechanisms and are thought to represent a component of pathologic fatigue in MG.[18,19,36,38] Numerous studies consistently demonstrated the emergence of a more pronounced neuromuscular blocking effect in stimulation trains administered 2–4 min after exercise.[18,21,22,40] In addition, repeating RNS after exercise in muscles with normal baseline recordings has also been reported to enhance diagnostic yield in approximately 9%–31% of patients with MG.[21,22,41] Nonetheless, debate persists regarding whether such procedures should be routinely incorporated into RNS protocols for the diagnosis of MG. A large retrospective study involving 179 patients with MG suggested that exercise increased the diagnostic sensitivity of ulnar, accessory, and facial nerve RNS in only a small proportion (5%–7%) of patients.[23] Based on these findings, the authors suggested that examining additional muscles might be more informative than allocating time to PE recordings. This approach was further supported by two subsequent studies that reported comparable results.[9,24] However, in our study, PE recordings of the ADM and nasalis muscles increased the diagnostic sensitivity of RNS by 10%–20%. According to our clinical experience, examining PE exhaustion was particularly effective when baseline recordings showed decrements in the 5%–10% range. Therefore, we concluded that PE exhaustion assessment should be incorporated into RNS protocols as a standard strategy.

This study has several limitations. First, due to its retrospective design, RNS recordings were confined to the ADM and facial muscles; other muscle groups were not evaluated. Second, the inclusion criteria required a ≥10% decrement in at least one muscle, which resulted in the exclusion of patients with normal RNS findings. This biased the sample toward positive cases and made it impossible to assess specificity or false-negative rates. Excluding patients with normal RNS, therefore, limits the representativeness of the study population. Finally, the RNS results were not stratified according to MG subtypes, which may limit the generalizability of the findings to specific patient populations.

Conclusion

Optimizing the diagnostic performance of RNS requires careful consideration of various procedural and technical parameters. Most researchers design RNS protocols for the diagnosis of MG in accordance with the standards set by the AAEM. These protocols generally involve acquiring multiple stimulation trains to enhance diagnostic accuracy. However, our results suggest that using different LRS and repeatedly stimulating the same muscle does not improve diagnostic utility. Consistent with previous reports, the most effective strategy for improving the diagnostic yield of RNS testing in MG is to increase the number of muscles examined, particularly the facial muscles. We recommend applying 3 Hz stimulation trains for each muscle – one at baseline and two additional trains at PE3 m and PE4 m – as this protocol proved sufficient for the electrodiagnostic evaluation of MG. In clinical practice, assessment of the ADM muscle using either HRS or LRS may be more valuable for eliminating presynaptic transmission disorders than for detecting postsynaptic neuromuscular junction abnormalities.

Author contributions

Metin Mercan: writing – original draft, conceptualization, investigation, methodology. Vildan Yayla: validation, writing – review and editing, conceptualization. Binnur Sezikli: investigation, visualization, data curation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Desmedt JE, Borenstein S. Diagnosis of myasthenia gravis by nerve stimulation. Ann N Y Acad Sci 1976;274:174-88.
2. Chiou-Tan FY, Gilchrist JM. Repetitive nerve stimulation and single-fiber electromyography in the evaluation of patients with suspected myasthenia gravis or Lambert-Eaton myasthenic syndrome: Review of recent literature. Muscle Nerve 2015;52:455-62.
3. AAEM Quality Assurance Committee American Association of Electrodiagnostic Medicine. Practice parameter for repetitive nerve stimulation and single fiber EMG evaluation of adults with suspected myasthenia gravis or Lambert-Eaton myasthenic syndrome: Summary statement. Muscle Nerve 2001;24:1236-8.

4. Fonseca Â, Almeida M, Duque C, Negrão L, Matos A, Almendra L. Enhancing diagnostic sensitivity in myasthenia gravis: The combined role of CMAP area and amplitude decrements in repetitive nerve stimulation. Clin Neurophysiol 2025;174:169-72.
5. Ozdemir C, Young RR. The results to be expected from electrical testing in the diagnosis of myasthenia gravis. Ann N Y Acad Sci 1976;274:203-22.
6. Oh SJ, Kim DE, Kuruoglu R, Bradley RJ, Dwyer D. Diagnostic sensitivity of the laboratory tests in myasthenia gravis. Muscle Nerve 1992;15:720-4.
7. Bou Ali H, Salort-Campana E, Grapperon AM, Gallard J, Franques J, Sevy A, *et al.* New strategy for improving the diagnostic sensitivity of repetitive nerve stimulation in myasthenia gravis. Muscle Nerve 2017;55:532-8.
8. Oh SJ, Eslami N, Nishihira T, Sarala PK, Kuba T, Elmore RS, *et al.* Electrophysiological and clinical correlation in myasthenia gravis. Ann Neurol 1982;12:348-54.
9. Lamb CJ, Rubin DI. Sensitivity and specificity of repetitive nerve stimulation with lower cutoffs for abnormal decrement in myasthenia gravis. Muscle Nerve 2020;62:381-5.
10. Zinman LH, O'Connor PW, Dadson KE, Leung RC, Ngo M, Bril V. Sensitivity of repetitive facial-nerve stimulation in patients with myasthenia gravis. Muscle Nerve 2006;33:694-6.
11. Zambelis T, Kokotis P, Karandreas N. Repetitive nerve stimulation of facial and hypothenar muscles: Relative sensitivity in different myasthenia gravis subgroups. Eur Neurol 2011;65:203-7.
12. Witoonpanich R, Dejthevaporn C, Sriphrapradang A, Pulkes T. Electrophysiological and immunological study in myasthenia gravis: Diagnostic sensitivity and correlation. Clin Neurophysiol 2011;122:1873-7.
13. Amandusson Å, Elf K, Grindlund ME, Punga AR. Diagnostic utility of repetitive nerve stimulation in a large cohort of patients with myasthenia gravis. J Clin Neurophysiol 2017;34:400-7.
14. Costa J, Evangelista T, Conceição I, de Carvalho M. Repetitive nerve stimulation in myasthenia gravis – Relative sensitivity of different muscles. Clin Neurophysiol 2004;115:2776-82.
15. Zhang D, Zhao Y, Yan C, Cao L, Li W. CMAP decrement by low-frequency repetitive nerve stimulation in different hand muscles of ALS patients. Neurol Sci 2019;40:2609-15.
16. Alanazy MH, Hegedus J, White C, Korngut L. Decremental responses in patients with motor neuron disease. Brain Behav 2017;7:e00846.
17. Watanabe S, Sekiguchi K, Noda Y, Matsumoto R. Clinical utility of repetitive nerve stimulation test in differentiating multifocal motor neuropathy from progressive muscular atrophy. J Clin Neuromuscul Dis 2022;23:175-82.
18. Desmedt JE. Nature of the defect of neuromuscular transmission in myasthenic patients: Post-tetanic exhaustion. Nature 1957;179:156-7.
19. Somnier FE, Trojaborg W. Neurophysiological evaluation in myasthenia gravis. A comprehensive study of a complete patient population. Electroencephalogr Clin Neurophysiol 1993;89:73-87.
20. Gilchrist JM, Sanders DB. Double-step repetitive stimulation in myasthenia gravis. Muscle Nerve 1987;10:233-7.
21. Lo YL, Dan YF, Leoh TH, Tan YE, Nurjannah S, Ratnagopal P. Effect of exercise on repetitive nerve stimulation studies: New appraisal of an old technique. J Clin Neurophysiol 2004;21:110-3.
22. Oh SJ, Nagai T, Kizilay F, Kurt S. One-minute exercise is best for evaluation of postexercise exhaustion in myasthenia gravis. Muscle Nerve 2014;50:413-6.
23. Rubin DI, Hentschel K. Is exercise necessary with repetitive nerve stimulation in evaluating patients with suspected myasthenia gravis? Muscle Nerve 2007;35:103-6.
24. Abraham A, Alabdali M, Alsulaiman A, Breiner A, Barnett C, Katzberg HD, *et al.* Repetitive facial nerve stimulation in myasthenia gravis 1 min after muscle activation is inferior to testing a second muscle at rest. Clin Neurophysiol 2016;127:3294-7.
25. AAEM Quality Assurance Committee American Association of Electrodiagnostic Medicine. Literature review of the usefulness of repetitive nerve stimulation and single fiber EMG in the electrodiagnostic evaluation of patients with suspected myasthenia gravis or Lambert-Eaton myasthenic syndrome. Muscle Nerve 2001;24:1239-47.
26. Botelho SY, Deaterly CF, Austin S, Comroe JH Jr. Evaluation of the electromyogram of patients with myasthenia gravis. AMA Arch Neurol Psychiatry 1952;67:441-50.
27. Sun YT, Lin TS. Is the stimulation frequency of the repetitive nerve stimulation test that you choose appropriate? Acta Neurol Taiwan 2004;13:186-91.
28. Ozdemir C, Young RR. Electrical testing in myasthenia gravis. Ann N Y Acad Sci 1971;183:287-302.
29. Ruys-Van Oeyen AE, van Dijk JG. Repetitive nerve stimulation of the nasalis muscle: Technique and normal values. Muscle Nerve 2002;26:279-82.
30. Oh SJ. Clinical Electromyography: Nerve Conduction Studies. 3rd ed. Philadelphia: Lippincott Williams and Wilkins; 2003.
31. Lee TH, Li Y. Consideration of repetitive nerve stimulation of the median nerve in patients being evaluated for myasthenia gravis. Muscle Nerve 2019;60:658-61.
32. Kennett RP, Fawcett PR. Repetitive nerve stimulation of anconeus in the assessment of neuromuscular transmission disorders. Electroencephalogr Clin Neurophysiol 1993;89:170-6.
33. Pike-Lee T, Higginbotham D, Li Y. Direct comparison of median and ulnar repetitive nerve stimulation in generalized myasthenia gravis. Muscle Nerve 2021;64:490-3.
34. Niks EH, Badrising UA, Verschuuren JJ, Van Dijk JG. Decremental response of the nasalis and hypothenar muscles in myasthenia gravis. Muscle Nerve 2003;28:236-8.
35. Harvey AM, Masland RL. A method for the study of neuromuscular transmission in human subjects. Bull Johns Hopk Hosp 1941;68:81-93.
36. Slomić A, Rosenfalck A, Buchthal F. Electrical and mechanical responses of normal and myasthenic muscle. Brain Res 1968;10:1-78.
37. Mayer RF, Williams IR. Incrementing responses in myasthenia gravis. Arch Neurol 1974;31:24-6.
38. Stalberg E. Clinical electrophysiology in myasthenia gravis. J Neurol Neurosurg Psychiatry 1980;43:622-33.
39. Oh SJ. Distinguishing features of the repetitive nerve stimulation test between lambert-eaton myasthenic syndrome and myasthenia gravis, 50-year reappraisal. J Clin Neuromuscul Dis 2017;19:66-75.
40. Zivković SA, Shipe C. Use of repetitive nerve stimulation in the evaluation of neuromuscular junction disorders. Am J Electroneurodiagnostic Technol 2005;45:248-61.
41. Petretska A, Jarrar R, Rubin DI. Radial nerve repetitive stimulation in myasthenia gravis. Muscle Nerve 2006;33:817-9.