

– Abstract –

Diagnostic Sensitivity of Repetitive Nerve Stimulation Test on Individual Muscles; Analysis of 357 Cases with Myasthenia Gravis

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Objectives : Repetitive nerve stimulation test(RNST) is a useful tool for the diagnosis of myasthenia gravis(MG). It is known that the diagnostic sensitivity is higher in proximal muscles than distal and increased by doing the test on many muscles. To clarify the diagnostic sensitivity on each tested muscle is important for the effort-effect relationship.

Methods : We analyzed data of RNST performed on 5 muscles(abductor digiti quinti, flexor carpi ulnaris, orbicularis oculi, nasalis and trapezius muscles) of 357 MG patients(129 with only ocular symptoms and 228 with generalized symptoms).

Results : The overall sensitivity of RNST in MG was 69.7% with higher positive rate in patients with generalized symptoms(86.4%) than with ocular symptoms only(40.3%). The sensitivity was greater in proximal muscles(orbicularis oculi 59.5%; nasalis 54.5%; trapezius 46.4%) rather than distal ones(flexor carpi ulnaris 34.4%; abductor digiti quinti 28.2%). However, RNST on one or two muscles was not good enough and several muscles had to be tested to increase the diagnostic sensitivity.

Conclusions : The following sequence of RNST may be helpful on the aspect of effort-effect relationship for the diagnosis of MG; Ulnar nerve with 2 muscles(flexor carpi ulnaris and abductor digiti quinti) followed by facial nerve with 2 muscles(orbicularis oculi and nasalis), then accessory nerve on trapezius muscle.

Key Words : Repetitive nerve stimulation test, Myasthenia gravis

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Table 1. Diagnostic Sensitivities of Individual Muscles in Repetitive Nerve Stimulation Test(Previous Reports)

Investigator	Muscle	Sensitivity(%)	No. of Cases
Schumm and Stohr ³	APB	40	30
	TRP	60	30
Ozdemir and Young ⁴	ADQ	59	80
	Deltoid	82	77
	OCU	63	40
Sanders et al ⁵	Total	95	80
	ADQ	32	90
Stalberg ⁶	ADQ	31	74
	Deltoid	65	80
Oh et al ⁷	ADQ	66	103
	ADQ	34	140
Lee et al ⁸	FCU	47	140
	OCU	62	133
	TRP	38	34
Kim et al ⁹	Total	75	142
	ADQ	52	21
	FCU	65	20
	OCU	79	19

ADQ:abductor digiti quinti muscle, FCU:flexor carpi ulnaris muscle, APB:abductor pollicis brevis muscle, OCU:orbicularis oculis muscle, TRP:trapezius muscle.

(repetitive nerve stimulation test, RNS) 1895 Jolly가 (myasthenia gravis) (faradic stimulation) 1941 Harvey Masland (myasthenic syndrome) .¹ 가 가 .² 가 가 .² ,

가 (Table 1). 357

(abductor digiti quinti, ADQ), (flexor carpi ulnaris, FCU), (orbicularis oculi, OCU), (nasalis, NSA) (trapezius, TRP)

2.

1. 1984 1 1998 12 357 (neostigmine test) (acetylcholine receptor antibody, AChR Ab) 가 EMG 1500 (DANTEC) Excel(CADWELL) 'Oh 0.2msec (square wave) (supramaximal stimulation) (compound muscle action potential, CMAP) filter 2~10000Hz, 500~5000 μ V/cm . CMAP 30 1 2, 3, 5 1 3 5~6 CMAP 1 . CMAP

CMAP 4 5 CMAP 2. 10% 357 5 10% 249 69.7% 86.4%, 40.3% (Table 3). 가 (54.5%), (28.2%) (46.4%), (34.4%), 가 (59.5%) SAS 1. (Table 3). 357 가 229 (64.1%) 128 1:1.8 3. 1) 129 228 345 84 (24.3%) 38 (11.0%) 14 (4.1%) (Table 4). 2) 74 (64.9%) 12 (10.5%) 114 , 6 (5.3%) (Table 5).

Table 2. Clinical Characteristics of Observed Myasthenic Patients

Diagnosis	Number	Age ¹	Sex(M:F)
OCU	129	35±18	1:1.2
MG GEN	228	38±14	1:2.4
Total	357	37±16	1:1.8

1. Age±Standard deviation.

MG: Myasthenia gravis.

OCU: Only ocular symptoms, GEN: Generalized symptoms.

Table 3. Sensitivity of Repetitive Nerve Stimulation Test on Individual Muscle

Type	ADQ	FCU	OCU	NSA	TRP	Total
OCU	5/1231(4.1%)	3/123(2.4%)	42/124 [§] (33.9%)	17/64 [‡] (26.6%)	14/85 [†] (16.5%)	52/129(40.3%)
GEN	93/224(41.5%)	121/226(53.5%)	165/224 [§] (73.7%)	80/114 [‡] (70.2%)	101/163 [†] (62.9%)	197/228(86.4%)
Total	98/347(28.2%)	124/349(34.4%)	207/348 [§] (59.5%)	97/178 [‡] (54.5%)	115/248 [†] (46.4%)	249/357(69.7%)

1. Numerator is the number of positive results and denominator is the total tested number.

† : 95% confidence interval, which are compared with ADQ.

‡ : 95% confidence interval, which are compared with ADQ and FCU.

§ : 95% confidence interval, which are compared with ADQ, FCU and TRP.

OCU : Only ocular symptoms, GEN:Generalized symptoms.

ADQ : abductor digiti quinti muscle, FCU:flexor carpi ulnaris muscle, OCU:orbicularis oculis muscle, NSA:nasalis, TRP:trapezius muscle.

Table 4. Comparison of Sensitivity of Repetitive Nerve Stimulation Test between FCU and ADQ

		FCU		Total
		(+)	(-)	
ADQ	(+)	84(24.3%)	14(4.1%)	98(28.4%)
	(-)	38(11.0%)	209(60.6%)	247(71.6%)
Total		122(35.3%)	223(64.7%)	345(100%)

ADQ:abductor digiti quinti muscle

FCU:flexor carpi ulnaris muscle.

Table 5. Comparison of Sensitivity of Repetitive Nerve Stimulation Test between OCU and NSA

		OCU		Total
		(+)	(-)	
NSA	(+)	74(64.9%)	6(5.3%)	80(70.2%)
	(-)	12(10.5%)	22(19.3%)	34(29.8%)
Total		86(75.4%)	28(24.6%)	114(100%)

OCU:orbicularis oculis muscle

NSA:nasalis muscle.

Table 6. Number of Cases with Positive Segmental Result When One Segment is Negative

	Facial n.(+)	Access n.(+)	Ulnar n.(+)
Facial n.(-)	-	6/56 ¹ (10.7%)	3/58 (5.2%)
Access n.(-)	63/132 (47.7%)	-	20/133 (15.0%)
Ulnar n.(-)	88/205 (42.9%)	34/146 (23.3%)	-

1. Denominator is the number that the result of repetitive nerve stimulation for facial nerve was negative when both facial nerve and accessory nerve were tested. Numerator is the number that the result of repetitive nerve stimulation for accessory nerve was positive when test for facial nerve was negative.

(-) : no decremental response on repetitive nerve stimulation test

(+) : decremental response on repetitive nerve stimulation test

Facial n.:repetitive nerve stimulation test on facial nerve (orbicularis ocul and/or nasalis).

Access n.:repetitive nerve stimulation test on accessory nerve (trapezius).

Ulnar n.:repetitive nerve stimulation test on ulnar nerve (abductor digiti quinti and/or flexor carpi ulnaris).

4. 가

가 (quantum) (exocytosis) . (end plate) (EPP, end plate potential) .¹¹ (acetylcholine quanta) 가 . CMAP (safety margin) (decremental response) .¹¹ 가 .^{1,10} 가 (IAS, immediately available store) (mobilization store) (main store) . IAS 가 .¹⁰ 가 (Ca⁺⁺) , .^{2,13}

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