EVALUATION OF BLINK REFLEX IN EARLY DIAGNOSIS OF CRANIAL NERVE NEUROPATHY IN GUILLAIN BARRE SYNDROME

ABSTRACT

Aims: The aim of this study was to test the utility of blink reflex in detecting sub-cranial neuropathy in the early course of Guillain Barre syndrome (GBS)
Study design: The study was a case control study with 5 clinically diagnosed patients of GBS and 5 age and sex matched healthy controls.
Place and Duration of Study: Department of Physiology, Pt. B.D. Sharma, Rohtak, Haryana, India. The duration was six months.
Methodology: A total of 5 patients (4 men, 1 women; age range 9-70 years) clinically diagnosed patients of GBS in 1st week of illness, sent for electro-diagnostic evaluation to the department of Physiology from the department of Medicine were included. Motor conduction studies (median, ulnar, tibial & peroneal), sensory conduction studies (median & sural nerves), F wave studies and blink reflex analysis were carried out on both cases and 5 healthy controls.
Results: Out of the 5 patients, 4 had decreased conduction velocity(CV) & amplitude(A) for median & ulnar nerves while 1 patient had normal CV & amplitude. 3 patients had decrease in CV & amplitude for tibial & peroneal nerves; 1 patient had decreased CV & amplitude for tibial nerve while 1 had conduction block for both nerves. Decreased sensory CV was seen in all 5 patients in the upper limb; while 3 had normal sural nerve CV. 2 patients had decreased sural nerve velocity. F wave was completely absent in 3 patients in the upper limb; in 2 cases it was decreased. In the lower limb, f wave was completely absent. A statistically significant increase in R1 latency of blink reflex was seen in all 5 patients on both right & left sides. Increased latency of R2 (ipsilateral) & R2 (contralateral) were also seen.
Conclusion: The abnormalities of Blink reflex most likely represent demyelination in either the facial and /or the trigeminal nerves reflecting the multifocal nature of demyelination in GBS. So Blink Reflex can be a useful tool for detection of clinically silent cranial neuropathy in GBS.

Keywords: Blink reflex; demyelination;Gullain Barre syndrome, facial nerve.

1. INTRODUCTION

Guillain Barre syndrome (GBS) is an autoimmune mediated demyelinating polyradiculoneuropathy. Males and females are equally at risk. Clinical features include progressive, symmetrical ascending muscle weakness of more than two limbs and areflexia with or without sensory, autoimmune and brainstem abnormalities. Weakness is predominant in leg muscles as compared to arms. Cranial nerve involvement may affect airway and facial muscles, eye movements and swallowing. [1]
Electrodiagnosis plays an important role in early detection and characterization of inflammatory demyelinating polyradiculopathies. [2,3]
Nerve conduction abnormalities become more prominent during the initial weeks of the disease even if patients clinical status is improving. [4,5]
Early nerve conduction findings include abnormal or absent F waves with low compound nerve action potentials, an abnormal upper extremity sensory nerve action potentials combined with normal sural response. [2,3]
Although the cranial nerves are often involved in GBS, the optic nerves are usually spared, presumably they are part of central nervous system. [6]
A few studies have revealed optic nerve involvement and evoked potential abnormalities. [7,8,9,10]

The trigemino-facial or blink reflex is the electrical analog of the corneal reflex. The afferent limb of blink reflex is ophthalmic division of trigeminal nerve and efferent , the facial nerve. Blink reflex differs from direct facial nerve study by evaluating the trigeminal nerve and pons in addition to the facial nerve. [11]

Generalized polyneuropathy may induce bilateral abnormalities of the blink reflex. Its alteration were described in patients with polyneuropathy in 1982 by Kimura. He analyzed the blink reflex obtained from patients from GBS, chronic inflammatory polyneuropathy, Fisher syndrome, hereditary motor and sensory neuropathy, diabetic polyneuropathy. [12]

Blink reflex provides clinically useful information in the assessment of the cranial nerves in polyneuropathies. [13]

2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

The present study was carried out on clinically diagnosed cases of GBS in the 1st week of illness that were sent for electrophysiological studies to the dept. of Physiology from the dept. of Medicine of our Institute which is as tertiary referral facility for large part of north-west India. There was no issue of ethical committee approval during this study as the patients were referred to dept of Medicine of our institute. The study was divided into two groups.

The measurement protocol included newly diagnosed patients of GBS in the 1st week of illness between the age group of 5 years to 70 years and 5 age and sex subjects as control group using RMS EMG EP Mark-II machine Chandigarh.

The parameters considered were divided into:

Motor conduction studies included:- median, ulnar, tibial and peroneal conduction velocities, amplitude and distal motor latencies.

Sensory conduction studies included:- Median and sural nerve conduction velocities, amplitude and latencies.

F wave studies- F wave latency. Prominent slowing of F waves has been reported in GBS where the demyelination may affect the proximal segment of nerve and even the roots which cannot be assessed by routine nerve conduction studies. [14]

Blink reflex:- Subjects were asked to relax in sitting position in a quiet room with eyes open to avoid muscle artifacts. Recording was done simultaneously from both sides.

Blink reflex recording electrodes [15]

- Position of recording electrode- Over orbicularis oculi muscle on the lower aspect of eyelid.
- Position of reference electrode – 2-3 cm lateral to the recording electrode, bilaterally.
- Ground electrode was placed on the chin.

Equipment setup: The recording was done using RMS EMG EPM R2

Filter settings(2-10 Hz), sweep speed recording- 5- 10 msec/div, initial sensitivity – 200 uv/div, stimulation duration/rate- .01 msec/2Hz, interval between successive stimuli was set at least 30 sec to minimize interaction between them, electrical pulse- 100 As, intensity – 15-25mA.

Stimulations were carried out keeping the cathode of the stimulating electrode on the supraorbital notch over the supraorbital nerve on one side and anode was directed laterally.

Recording Potentials:- A two channel recording was performed.

R_1- muscle action potential from the facial nerve. (ipsilateral to stimulated side)

R_{2i} (Ipsilateral)- reflex response from trigeminal nerve input and facial nerve output ipsilateral side.

R_{2c} (contralateral)- Reflex response from trigeminal nerve input.[15] Amplitude was considered an unreliable index and hence of no use in analysis of results.[16] Data were statistically described in terms of Mean± SD and percentages as well as students t test.

3. RESULTS AND DISCUSSION

Conduction velocity and amplitude

1. Decreased conduction velocity and amplitude were seen in 4 patients for both median and ulnar nerves, and one patient had normal CV and amplitude of median and ulnar nerves while in lower limbs, 3 patients had decrease in CV and amplitude for both tibial and peroneal nerves, one had decreased CV and amplitude of tibial only and one had conduction for both tibial and peroneal nerves.

Distal Motor latency (DML)

1. Increased distal motor latency (DML) was seen in 4 patients for both median and ulnar nerves while one had normal DML. In lower limbs, 4 patients had increase in DML for both tibial and peroneal nerves and had conduction block for both tibial and peroneal nerves.

Sensory conduction velocity:

1. Decreased sensory conduction velocity (SCV) was seen in 5 patients. While normal sural conduction velocity was seen in 3 patients and 2 had decreased SCV.

F wave studies:

1. F wave was completely absent in 3 patients in upper limb and all the 5 patients in lower limbs while 2 patients had increased F wave latency in upper limbs.

Blink Reflex

1. Abnormal blink responses were found in all 5 patients studied. There was statistically significant increase in R_1 latency in all 5 patients on both left and right sides as compared to control group.
2. There was also increased in latency of $R_{2(i)}$ and $R_{2(c)}$ on both sides as compared to control group. However, results were not statistically significant.

Discussion-

Electrophysiological hallmarks of early demyelination include prolonged distal motor latencies, prolonged/absent F wave latencies mainly in the lower limbs, slow motor conduction velocities/ conduction block with absent F wave and abnormal upper extremity sensory nerve action potential as compared to the sural nerve. Similar results were recorded in our study. The above results are in tandem with findings of Gordon, Kimura and Geetanjali. [2,14,3]

Prolonged distal motor latencies and prolonged or absent F waves reflect early predilection for involvement of proximal spinal roots and distal motor terminals. Upper limb sensory nerve action potentials (SNAP) particularly of the median nerve can be affected more severely and earlier than those of sural nerve. The explanation of this finding is multi-factorial. Entrapment sites are prone i.e. median nerve in carpal tunnel while reduced SNAP amplitudes can be the result of secondary axonal degeneration and conduction block. [17]

In our study, abnormal blink responses were found in all 5 patients. There was statistically significant increase in R_1 latency on both sides i.e left and right and also increase latency of R_2(ipsi) and R_2(contra). The results were in tandem with Polo et al [18], Neav et al [19] and Ropper etal [21] except that none of the patients had signs and symptoms of facial nerve or trigeminal nerve involvement. This would suggest that blink reflexes might be abnormal in some GBS patients with apparently normal facial strength suggesting subclinical involvement of facial and trigeminal nerves.

Furthermore abnormalities of blink reflexes also correlated positively with prolonged mean summated distal motor latency in this study suggesting that in early acute inflammatory demyelinating polyneuropathy AIDP, distal demyelination occurs in parallel in many nerves. This is similar to studies by Ropper et al.

These abnormalities of blink reflexes most likely represent demyelination in either the facial and or the trigeminal nerves, reflecting the multifocal nature of demyelination in AIDP [20]

Table 1: Electro-diagnostic findings in patients with Guillain Barre Syndrome within 1 week

	Variables	No. of control	No. of patients
1.	Males/Females	5/5	4/1
2.	Age Range	8-60 years	9-70 years
3.	Conduction velocity		
	a.Upper limb- • Normal CV and A • Decrease in both median and ulnar • Conduction block	% 5 (100%) None	% 1() 4(80%) None
	b. Lower limb- • Normal CV and A. • Decrease in both tibial and	5 (100%) -	0 3(60%)

	peroneal. • Decrease in tibial only. • Decrease in Peroneal only. • Conduction block.	- - -	1(20%) 0 1(20%)
4.	Distal Motor Latency- Normal Upper limb – Increase in both ulnar and median nerve. Lower limb- Increase in both tibial/peroneal. Conduction block	5 (100%) - - -	1(20%) 4(80%) 4(80%) 1(20%)
5.	Sensory conduction velocity		
	Upper limb- median nerve Normal less Lower limb- sural nerve Normal less	5 (100%) - 5 (100%) -	- 5(100%) 3(60%) 2(40%)
6.	F wave CV		
	Upper limb Normal less Absent	5 (100%) - -	- 2(40%) 3(60%)
	Lower limb Normal Absent	5 (100%) -	- 5(100%)

Table 2: Blink Reflex (Mean ± Standard deviation)

	Right side blink reflex			Left side Blink Reflex		
	R_1	$R_{2(i)}$	$R_{2(c)}$	R_1	$R_{2(i)}$	$R_{2(c)}$
Cases	12.62 ± 1.306522	37.54 ± 3.292871	35 ± 5.247857	12.56 ± 1.748714	36.22 ± 3.567632	35.38 ± 3.390723
Control	9.72 ± 0.248193	35.46 ± 0.915423	34.62 ± 0.589067	9.78 ± 0.55857	35.22 ± 0.915423	34.46 ± 0.589067
P value	0.005159	0.153242	0.44028	0.022214	0.25307	0.291655

4. CONCLUSION

In this study all 5 patients showed blink reflex abnormalities.

- Both R_1 latency and R_2 (ipsi) and R_2 (contra) were altered but R_1 latency was more affected indicating subclinical involvement of facial nerve, being statistically significant (Table 2). Therefore blink reflex can be useful tool for detection of clinically silent cranial neuropathy in GBS.
- Electrodiagnostic techniques play an important role in the early detection and characterization of inflammatory demyelinating poly-radiculopathy in the first week of symptomology and assume importance in treatment of this syndrome because timely intervention reduces morbidity and disability.

CONSENT

The patients were clinically diagnosed patients referred from the department of Medicine, Pt. B.D. Sharma Post-Graduate Institute of Medical Sciences, Rohtak, Haryana, India for electro-diagnostic evaluation.

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

There was no issue of Ethical Committee approval in this study as the patients were clinically diagnosed patients referred from the department of Medicine, Pt. B.D. Sharma Post-Graduate Institute of Medical Sciences, Rohtak, Haryana, India for electro-diagnostic evaluation.

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