RESEARCH ARTICLE

The study of normative parameters of latencies of blink reflex in population of Central India

Subodh Pandey[1], Rajesh Kumar Paul[1], Sachin Chittawar[2], Tripti Saxena[3]

[1]Department of Physiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India, [2]Department of Medicine, Gandhi Medical College, Bhopal, Madhya Pradesh, India, [3]Department of Biochemistry, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Correspondence to: Rajesh Kumar Paul, E-mail: dr.rajesh_paul@yahoo.com

ABSTRACT

Background: Electrodiagnostic tests play a very important role to assess the functionality of any reflex pathway. To assess the integrity of the loop of trigeminal sensory nerves and facial motor nerves, blink reflex (BR) or corneal reflex assesses the involuntary action of orbicularis oculi muscle. The present study is carried out to record and analyze the BR latencies in healthy subjects. **Aims and Objectives:** The aims of this study were to generate the normal values for BR latencies in healthy subjects at the neurophysiology laboratory at Gandhi Medical College Bhopal. **Materials and Methods:** The study population comprised 50 healthy subjects aged above 18 years. Subjects with a history of demyelinating disorders, head injury, or facial pain were excluded from the study. BR latencies were recorded bilaterally using RMS EMG MKII MACHINE. **Results:** The latencies of R1, R2i, and R2c in BR analyzed for the healthy subjects are as follows 9.98 ± 0.17, 29.54 ± 3.11, and 29.29 ± 2.78 (in ms), respectively. **Conclusion:** In the observation of the present study, R1 was stable and reproducible with a biphasic/triphasic response, whereas R2 responses were polyphasic and varied more from stimulation to stimulation. Thus, normative data were analyzed to serve as normal value for latencies in BR which can be used to compare baseline parameters for BR studies in the neurophysiology laboratory in Gandhi Medical College, Bhopal, in healthy and diseased condition.

KEY WORDS: Blink reflex latencies; Demyelinating diseases; Electrophysiology, Reflex pathway

INTRODUCTION

Electrophysiology has emerged as a savior to assess various neuropathies and cranial nerve anomalies. Fifth and seventh cranial nerves are concerned with sensory and motor control of facial muscles. An electrodiagnostic test to assess the integrity of the loop of trigeminal sensory nerves and facial motor nerves is developed as blink reflex (BR) or corneal reflex which assesses the involuntary action of orbicularis oculi muscle on electrical stimulation. It provides useful information about the reflex arc of BR accordingly neuropathies and brain stem lesion. This study is aimed to generate normative data for latencies of the BR. Thus, generated normative data can then be used to compare the latencies of the BR in diseased conditions such as central craniopathies and central compressive lesions.

The reflex pathway of BR consists of sensory or afferent limb (supraorbital branch of the ophthalmic division of the trigeminal nerve) and motor/efferent limb (motor fibers of the facial nerve). On unilateral electrical stimulation of afferent limb, eye blinks bilaterally eliciting a facial nerve response of its motor fiber bilaterally. The ipsilateral supraorbital nerve stimulates both the main sensory nucleus of V (mid pons) and the nucleus of the spinal tract of V (lower pons and

medulla) in the brainstem. The nerve impulse next reaches the ipsilateral and contralateral facial nuclei through various interneurons, from which the efferent signal travels along the facial nerve bilaterally.[1]

MATERIALS AND METHODS

The study was conducted after approval from the Institutional Ethical Committee (letter no.3809-11/MC/IEC/2018) in the neurophysiology laboratory of the Department of Physiology in collaboration with the Department of Medicine, Gandhi Medical College, Bhopal. Fifty healthy subjects, who fulfilled the inclusion and exclusion criteria and were willing to participate were selected for the study. The procedure of BR was explained, and written consent was taken from all the subjects participating in the study.

Sample Size Calculation

Sampling was done through random selection. The sample size calculation was done by "openEpi" software by considering mean R2i among the study population as SD = 3.11 ms. The sample size was calculated to be 50 at an absolute error of 1% and 95% confidence interval.

Inclusion criteria

The following criteria were included in the study:

Clinically confirmed healthy subjects.

Exclusion criteria

The following criteria were excluded from the study:

Any history of diabetes, hypertension, other endocrine abnormality, demyelinating disorders.

After taking a detailed history and general examination of all the participants, detailed clinical examination, basic anthropometric measurements were done, and vitals were recorded. Blood pressures of all the cases were in the normotensive range.

BR tests were done using the RMS EMG MKII machine.

BR test procedure[1]

Subjects were explained the procedure of the test and were instructed to lie down in a supine position with eyes closed on the examination table in a quiet room with comfortable surroundings.

Recording from both orbicularis oculi muscles was performed simultaneously.

Position of Electrodes: Active electrodes are placed bilaterally inferior to the lower eyelid at mid position over the orbicularis oculi muscle.

Reference electrodes are placed just lateral to the lateral canthus in both sides of the eye.

A ground electrode was placed over the chin.

Reflex's Stimulation: Supraorbital notch over the medial eyebrow. Responses were recorded ipsilaterally and contralaterally.

Sweep speed: Ten ms/division.

Sensitivity: Two hundred μV/division. Motor filter settings were 3 Hz. For each side, 4–6 stimuli were done and superimposed to determine the shortest response latencies.

BR has two components early R1 and late R2. The R1 response usually present ipsilaterally to the side being stimulated and R2 response usually present bilaterally.

Normal R1, R2i, and R2c latencies in milliseconds are as follows:[2]
- Ipsilateral R1 <13 ms, ipsilateral R2 <41 ms, and contralateral R2 <44 ms

Ipsilateral versus contralateral differences, in milliseconds, are as follows:[2]
- R1 <1.2 ms and R2 <8 ms

Statistical Analysis

Data were analyzed by SPSS software, version 16. Result expressed as mean and SD.

RESULTS

BR was studied in 50 healthy subjects with age group 20–50 years (40 female and 10 male). (Mean age 37.7±7.2 years) As shown in Table 1. Basic anthropometric measurements were within normal limits [Table 2]. Normative parameters of latencies of the BR in the Central India population were obtained. The latencies of R1, R2i, and R2c in both eyes were 9.98 ± 0.17, 29.54 ± 3.11, and 29.29 ± 2.78 (ms), respectively [Table 3]. Normative values of latencies of BR R1, R2i, and R2c in various other studies are described in Table 4.

DISCUSSION

The present study carried out on 50 normal healthy subjects to record BR latencies and assesses the integrity of the reflex

Table 1: Age and sex distribution in the study groups			
Age groups (years)	Total	Male	Female
20–30	26	03	23
31–40	12	04	08
41–50	12	03	09

Table 2: Demographic data of study groups							
Number of subjects	Age (years)	Weight (kg)	Height (cm)	RHR beats/min	Blood pressure (mm Hg)		BMI (kg/m²)
					Systolic	Diastolic	
n=50	32.44±8.77	67.7±10.95	157±9.10	78.4±5.62	121.44±6.38	79.08±5.08	24.48±3.72

Table 3: Normal parameters of latencies of blink reflex			
Latency (ms)	R1	R2i	R2c
	9.98±0.17	29.54±3.11	29.29±2.78

Table 4: Normative values of latencies of blink reflex R1, R2i, and R2c in various other studies			
Studies	R1	R2i	R2c
Kakked *et al.*[3]	10.6±1	32±3.6	34±3.5
Pawar *et al.*[4]	10.15±0.42	26.49±4.14	31.02±28.62
Hamadan and Fakri[6]	10.81±1.1	33.2±3.49	34.62±3.28
Medvedeva *et al.*[5]	10.6±0.9	33.1±8.6	34.3±7.9

pathway of trigeminal afferent, facial efferent, and stimulation of orbicularis oculi muscle. Normative parameters of latencies of the BR in the Central India population were obtained that the latencies of R1, R2i, and R2c were 9.98 ± 0.17, 29.54 ± 3.11, and 29.29 ± 2.78, respectively.

A case–control study done by Kakked *et al.* for electromyographic evaluation of BR as a tool for early diagnosis of neurological dysfunction in patients of hypothyroidism in 48 patients with newly diagnosed primary hypothyroidism and 20 healthy controls recorded the mean values of latencies of R1, R2i, and R2c latencies 10.6 ± 1, 32 ± 3.6, and 34 ± 3.5, respectively.[3] Pawar *et al.* (in June 2013)[4] conducted a study on "Usefulness of blink reflex in hypothyroid patients with or without polyneuropathy" on 150 subjects aged 18 years and above (100 controls and 50 cases) and found that the mean values of latencies of R1, R2i, and R2c components in control groups were10.15 ± 0.42, 26.49 ± 4.14, and 31.02 ± 28.62, respectively. A similar study was done by Medvedeva *et al.*[5] on 31 healthy subjects aged 25–60 years found that R1 latency 10.6 ± 0.9, R2i latency 33.1 ± 8.6, and R2c latency 34.3 ± 7.9. Hamdan and Fakhri (in November 2003)[6] conducted a case–control study on BR in thyroid dysfunction and selected 35 volunteers as a control group and found that the mean values of latencies of R1, R2i, and R2c components in control groups were 10.81 ± 1.1, 33.2 ± 3.49, and 34.62 ± 3.28, respectively.

The BR latencies recorded from the present study will serve as standard values for the diagnosis of patients suffering from anomalies of cranial nerve pathway. Well-characterized study subjects and standardized techniques and procedures to measures various parameters of the study improved the precision of the result. Small sample size and recruitment of study subjects from the local area are few limitations of the present study. Increased sample size from a normal healthy population may improve the data for normal BR latencies and thus improve its sensitivity.

CONCLUSION

It is observed in the present study that stable and reproducible wave with a biphasic/triphasic response was R1, and R2 responses were polyphasic and varied more from stimulation to stimulation. Thus, the normative value was obtained can serve as the baseline parameter for the assessment of BR studies in healthy and diseased conditions.

REFERENCES

1. Preston DC, Shapiro BE. Blink reflex. In: Electromyography and Neuromuscular Disorders. 2nd ed., Ch. 5. Philadelphia, PA: Elsevier; 2005. p. 59-62.
2. Daube R, Rubin DI. Clinical Neurophysiology. 3rd ed., Ch. 31. New York: Oxford University Press; 2009. p. 531.
3. Kakked G, Bhatt N, Lakhani J, Prakash S. Electromyographic evaluation of blink reflex as a tool for early diagnosis of neurological dysfunction in patients of hypothyroidism. Ann Neurosci 2013;20:95-8.
4. Pawar S, Udan V, Jain J, Shende V, Singh R. Usefulness of blink reflex in hypothyroid patients with or without polyneuropathy: A case control study. Indian J Physiol Pharmacol 2014;58:56-60.
5. Medvedeva LA, Syrovegin AV, Avakyan GN, Gnezdilov AV, Zagorulko OI. Methods for studying the blink reflex and its normative parameters. Neurosci Behav Physiol 2012;42:1-7.
6. Hamdan FB, Fakhri S. Blink reflex in thyroid dysfunction. J Fac Med Baghdad 2004;46:1-2.