

BLINK REFLEX

Comparison of latency measurements in different human races

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ABSTRACT - The blink reflex latencies and cephalometric indexes were analysed in 30 male volunteers from three different races, 10 white, 10 black, and 10 Oriental. Ages ranged from 15 to 59 years, height from 1,60 to 1,80 m, and weight from 60 to 80 kg. Blink reflexes were obtained after unilateral electric stimulation of the supraorbital nerve for quantitative analysis of 3 responses, early ipsilateral (R1), late ipsilateral (R2i) and late contralateral (R2c), obtained from the *orbicularis oculi* muscle. Cephalometric indexes were calculated by multiplying the ratio between the longer transverse and the longer sagittal head diameters by 100. The R1, R2i and R2c latencies were consistent with other published papers revealing no differences between the different racial groups. The mean of the cephalometric indexes of each group were consistent with respective racial characteristics. This study revealed that there are no differences between R1, R2i and R2c latencies in the 3 different studied races.

KEY WORDS: blink reflex, races.

Reflexo trigêmeino-facial: comparação de medidas de latência em diferentes raças

RESUMO - Latências do reflexo trigêmeino-facial e índices cefalométricos foram analisados em 30 voluntários adultos normais, de 3 diferentes raças, sendo 10 brancos, 10 negros e 10 orientais. Idades variaram de 15 a 59 anos, alturas de 1,6 a 1,8 m e pesos de 60 a 80 kg. Os reflexos trigêmeino-faciais foram obtidos por estimulação elétrica unilateral do nervo supra-orbital e captação nos músculos *orbicularis oculi*, para análise quantitativa de 3 respostas, ipsilateral precoce (R1), ipsilateral tardia (R2i) e contralateral tardia (R2c). Índices cefalométricos foram obtidos multiplicando-se por 100 a razão entre maior diâmetro transversal e maior diâmetro sagital do crânio. As médias dos índices cefalométricos de cada grupo foram compatíveis com as respectivas características raciais. As respostas R1, R2i e R2c não mostraram diferenças de latências estatisticamente significativas entre as 3 diferentes raças analisadas neste estudo.

PALAVRAS-CHAVE: reflexo trigêmeino-facial, raças.

The blink reflex is a very practical reproducible electrical response, that can be used in comparative clinical studies and experimental models¹⁻³. At the beginning of XXth century, there was a dispute about the authorship of the original description of the blink reflex⁴. The first report of the eye closure response to forehead percussion was made by Overend, in 1896⁶. The same reflex, obtained in response to percussion of the lateral supra-orbital region was later described by McCarthy⁷, and is still referred to by his name⁵. The blink reflex physiology began to be

better understood when Kugelberg performed the first electroneuromiograph (ENMG) study of the blink response⁸. In his study, percussion of the glabella region triggered two ENMG responses: an early, short latency response, considered proprioceptive R1, and a late response considered nociceptive R2. Similar recordings were obtained after electrical stimulation of the infra-orbital nerve. The latencies of these responses were longer than those of the miotactic reflexes, and a multisynaptic pathway was thought to carry them, especially R2. Magladery and Teasdall

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found striking similarity between the late responses of both reflexes⁹. Electrical stimulation of the supra-orbital nerve was first employed by Rusworth¹⁰ to obtain a reflex response first named "blink reflex". Blink reflex normative studies were made by many authors^{9,11-13}, although the work of Kimura et al.¹ is still accepted as the standard.

Despite many reports investigating the blink reflex in various neurological syndromes, the normative studies presented so far have not shown data for interracial comparison. We do not know of normative studies comparing the latencies of blink reflex components between different races.

Within São Paulo State, Brazil, there is a large Japanese community, and a large number of Germans, Scandinavians, and Negroes. This made it possible to compare latency measurements of the blink reflex components between three distinct racial groups, in the same laboratory. This was the objective of this study.

METHOD

Normal male volunteers were studied; this avoided errors associated with hormonal influences on nerve conduction studies. The subjects were representative of the three racial groups.

Group I: Ten male volunteers with phenotypic traces, indicating Caucasian origin¹⁴.

Group II: Ten male volunteers with phenotypic traces of the Negro race, without known predecessors from the white race, or evidence of miscigenation¹⁴.

Group III: Ten volunteers with phenotypic traces of the Oriental race, directly descended from oriental parents¹⁴.

Subjects were included with ages ranging from 15 to 59 years, due to the fact that nervous conduction velocities may show a decline over the age of 60. All the subjects had body height between 1.60 and 1.80 metres, and weights ranging from 60 to 80 kg, to minimize anthropometrical influences on latency measurements.

Procedures

Subjects were awake, in dorsal *decubitus*, with room temperatures between 22 and 27°C, in a semi-darkened room. Surface platinum disc electrodes of 0.5 cm diameter were positioned as follows: channel 1, active electrode G1 over the left *orbicularis oculi* muscle, 1 cm below the left lateral epicantal point; reference electrode G2 2 cm behind the left lateral epicantal point; channel 2, symmetrically positioned in relation to the channel 1 electrodes, on the right side. Filter band-pass was set to 20-3000 Hz, sensibility to 200 μ V/cm, and analysis time to 10 m/cm. Stimulation was made with the cathode over the supra-orbital foramen, with single stimuli on each side, consisting of square-wave pulses of 0.2 ms duration and 25 mA intensity. The ground electrode was positioned com-

fortably around the neck. Two recordings were obtained from both sides for each subject, with ten seconds or more between stimuli. All examinations were made using a Sigma model Nihon-Kohden Neuropack apparatus.

The largest cephalic transverse [dT] and sagittal diameters [dS] were measured for each subject. The cephalometric index was calculated by multiplying the ratio of dT/dS by 100.

The data obtained was tabulated for statistical analysis using the Tukey test and correlation analysis.

RESULTS

Table 1 shows the average latencies of components R1, R2i, and R2c for the three different races. These show that the average latencies do not differ between the three races (Tukey test – $p < 0.05$). The average cephalometric indexes showed interracial differences Caucasian, $x = 83.6$; Negro, $x = 76.6$; Oriental, $x = 89.5$. Correlation analysis between cephalometric indexes and average latencies for R1, R2i, and R2c showed a very low value for each determination (R1/CI = 0.0001; R2i/CI = 0.0173; R2c/CI = 0.0014), suggesting negative correlation between the latencies of the components and the cephalometric indexes.

Table 1. Average latencies for R1, R2 ipsilateral, and R2 contralateral and cephalometric indexes in the three different studied races.

	R1	R2i	R2c	CI
Caucasians	9.8 ^a	29.83 ^b	30.56 ^c	83.6
Negroes	9.8 ^a	31.21 ^b	31.29 ^c	76.6
Japanese	9.79 ^a	31.13 ^b	30.27 ^c	89.5

Values in the vertical columns do not show statistical difference, Tukey test $p < 0.05$. CI, cephalometric index.

DISCUSSION

The values of the blink reflex latencies in the 30 studied subjects from the three different races, showed no statistical difference between groups. These results are in agreement with other published normal data^{1,9,11,13}.

Many authors have shown that different physiological status influences the blink reflex latencies. There is great variability in the blink reflex for pre-term infants, neonates, and children of different ages¹⁵⁻²⁰. Other physiological conditions influencing blink responses are: sleep-wake cycles^{19,21-23}, auditory stimulation²⁴, attention and cognitive tests^{25,26}, conditioning stimulation²⁶, and habituation^{27,28}.

At the beginning of this study, we hypothesized that the different morphometric values of the three

ances could influence latencies, due to differences in the length of the afferent-efferent blink reflex pathway. However, statistically significant differences were not observed between Caucasian, Negro, and Japanese, suggesting that the morphometric differences of the cranial vaults do not correspond to different the lengths of the total reflex arc. Supposedly, an increase in the sagittal diameter of the cranial vault could correspond to a similar increase in the afferent volley, as the supraorbital nerve follows a retilinear antero-posterior descending to the brainstem. Likewise, a reduction in the transversal diameter of the cranial vault could be associated with a corresponding reduction of the efferent portion of the arc, as the facial nerve follows a latero-caudal route in a significant segment of its anatomy. In this way, differences between cranial morphometries could be compensated for by opposing elongations and shortenings of the afferent and efferent portions of the reflex arc, thus giving no significant net effect on interracial latencies of the blink reflex components.

CONCLUSIONS

There is probably no correlation between the cephalometric indexes and latencies of the blink reflex components, for adult subjects from the 3 different studied races;

There are probably no differences in latencies of the R1 and R2 blink reflex components between Caucasians, Negroes, and Orientals.

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