Effect of digit ratio on contact heat evoked potentials in China

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To the Editor: Contact heat evoked potentials (CHEPs) has become an important electrophysiologic diagnostic approach for small fiber neuropathy,[1] which is characterized by involvement of myelinated Aδ and unmyelinated C fibers as a result of various etiologies.[1,2] CHEPs are affected by gender, age, body height, and so on.[1,2] The effect of the second to fourth (2D:4D) digit ratio on CHEP parameters has not been investigated. Digit ratio is defined as the length of the index finger dividing the length of the ring finger, which is smaller in men than in women.[3] We aimed to find out whether digit ratio has any role influencing CHEPs, and to strengthen the understanding and improve the methodology of CHEPs.

Healthy participants were recruited and underwent neurological examinations, laboratory examinations, and nerve conduction studies (NCSs). NCSs were performed on bilateral median, ulnar, tibial, fibular, and sural nerves. Eligibility criteria are shown in Supplementary Material [http://links.lww.com/CM9/A832]. Digit ratio was measured by the length of the fingers, i.e., from the bottom crease to the tip of the finger on the palmar surface of hands.

CHEPs were conducted at the following sites: (1) forearm (FA), the upper border of the distal third volar aspect of the right and left FA; (2) Leg (LE), above the lateral malleolus at the upper border of the distal third of the right LE; (3) 7th cervical vertebrae (C7), at the spinous process; and (4) 12th thoracic vertebrae (T12), at the spinous process. For each condition, a series of ten stimuli were given. The interstimulus interval was set to between 10 and 18 s.[2] The N_2 latency, P_2 latency, and N_2-P_2 amplitude were determined by two independent clinicians. Statistical analysis was performed using SPSS 19.0 (SPSS Inc., Chicago, IL, USA). The correlation between CHEP parameters and digit ratio, age, gender, and height was analyzed by using linear regression. A two-tailed P value of < 0.05 was considered statistically significant.

A total of 137 healthy participants were enrolled, with 72 men. The average age was 34 ± 14 years. The results are shown in Supplementary Tables 1 and 2 [http://links.lww.com/CM9/A832]. N_2 latency of the right FA was correlated with age ($t = 2.989$, $P = 0.004$), height ($t = 2.219$, $P = 0.037$), and the right digit ratio ($t = 2.106$, $P = 0.039$). The standard coefficients were 0.720, 0.796, and 237.795, respectively. The linear regression equation was $Y = -42.354 + 0.720 \times \text{age} + 0.796 \times \text{height} + 237.795 \times \text{right digit ratio}$. P_2 latency of the right FA was correlated with the right digit ratio ($t = 2.218$, $P = 0.037$). The standard coefficient was 447.915. The linear regression equation was $Y = 13.583 + 447.915 \times \text{right digit ratio}$. N_2–P_2 amplitude of the right FA was correlated with age ($t = 16.476$, $P < 0.001$). The standard coefficient was −0.904. The linear regression equation was $Y = 191.771 - 0.904 \times \text{age}$. N_2 latency of the left FA was correlated with age ($t = -2.396$, $P = 0.024$). The standard coefficient was 1.192. The linear regression equation was $Y = -428.714 + 1.192 \times \text{age}$. P_2 latency of the left FA was correlated with the left digit ratio ($t = 3.520$, $P = 0.001$). The standard coefficient was 1236.292. The linear regression equation was $Y = -739.764 + 1236.292 \times \text{left digit ratio}$. N_2 latency of C7 was correlated with age ($t = 10.945$, $P < 0.001$). The standard coefficient was 8.980. The linear regression equation was $Y = -203.837 + 8.980 \times \text{age}$. P_2 latency of C7 was correlated with age ($t = 9.689$, $P < 0.001$). The standard coefficient was 11.242. The linear regression equation was $Y = -246.253 + 9.689 \times \text{age}$. N_2 latency of T12 was correlated with age ($t = 10.260$, $P < 0.001$). The standard coefficient was 9.927. The linear regression equation was $Y = -221.157 + 9.927 \times \text{age}$. P_2 latency of T12 was correlated with age ($t = 9.965$, $P < 0.001$). The standard coefficient was 12.502. The linear regression

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equation was $Y = -276.103 + 12.502 \times$ age. N_2 latency of the LE was correlated with age ($t = 11.432$, $P < 0.001$). The standard coefficient was 13.181. The linear regression equation was $Y = -309.588 + 13.181 \times$ age. P_2 latency of the LE was correlated with age ($t = 10.688$, $P < 0.001$). The standard coefficient was 15.375. The linear regression equation was $Y = -354.242 + 15.375 \times$ age. N_2-P_2 amplitudes of the left FA, C7, T12, and the LE were not correlated with digit ratio, age, gender, and height.

The 2D: 4D digit ratio is referred as a marker of the ratio of testosterone and estrogen levels during embryogenesis, which is smaller in men than in women.[3-5] It was considered to be a risk factor for migraine and tension type headache. In the present study, N_2 and P_2 latencies of the right and left FA were correlated with the right and left digit ratio, respectively, but were not correlated with gender. The digit ratio is reported to be negatively correlated with fetal testosterone level and positively correlated with fetal estrogen level.[3] The underlying reason for the conflicting results discovered in this study may be because digit ratio is mainly affected by fetal sex hormones, and established during early embryogenesis[3-5]; on the other hand, the relationships between digit ratio and levels of sex hormones in adults are less clear, as many correlation studies of digit ratio and adult sex steroids have concluded that this association is statistically non-significant.[3-5] This may explain why CHEPs were correlated with digit ratio but not correlated with gender. This study suggests that digit ratio is an influencing factor on CHEPs, which is independent of gender. Larger studies are warranted to confirm this finding and to explore the underlying mechanism.

Declaration of patient consent

The authors certify that they have obtained all appropriate participant consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest

None.

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