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October 3–4, 2024



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**PLANIMETRIC ANALYSIS OF INDIVIDUAL VARIABILITY
AND SEXUAL DIMORPHISM OF THE ORBITAL OPENING**

**ПЛАНІМЕТРИЧНИЙ АНАЛІЗ ІНДИВІДУАЛЬНОЇ
ВАРІАТИВНОСТІ ТА СТАТЕВОГО ДИМОРФІЗМА
ОЧНОЯМКОВОГО ВХОДУ**

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Morphometric studies, which are carried out using computer tomography methods, play an important role in determining the features of certain anatomical structures, including orbit [1].

It has recently been described that aging of the facial bones is mainly a consequence of volume loss and morphological changes in the orbit, midface and mandible [2].

Some scientists believe that age-related changes in the facial skeleton are mainly concentrated in the orbit, upper and lower jaws [3]. They claim that the size of the orbit tends to increase with age. Toothless individuals of both sexes have wider orbit and shorter maxilla and mandible height.

Thus, the problem of studying sexual dimorphism and age-related changes in skull structures, including the orbit, remains relevant.

The aim of the research. Establishing the range of individual anatomical variability of the perimeter and area of the orbital opening depending on gender and craniotype.

Material and methods. The material of the study was 125 CT scans of the head of men and women aged 25 to 85 years without pathology of the bones of the skull, performed using a Neusoft NeuViz 16 Essence 16-Slice CT Scanner System. Visual analysis and craniometric measurements were performed using Vidar Dicom Viewer ver. 3.3.1.9. The main facial index was calculated according to the Garson-Kolman formula.

Results and discussion. In order to carry out a planimetric analysis of the orbital opening, we measured the perimeter and area of the latter by clearly delineating its contour with the help of a continuous closed line, which is a smooth combination of shape curves with different circle radii. The next step was the topological transformation of the closed contour of the orbital opening into a circle, the radius of which can be calculated by the formula $R = \frac{L}{2\pi}$, where L is equal to the length of its perimeter. These steps were taken to increase the indicative visibility of the comparative assessment of sexual dimorphism of the area of the orbital opening.

Previously, all CT images of the head were divided according to the main facial index into three types of structure: euriprosopes, mesoprosopes and leptoprosopes. Further analysis of the range of variability of the area, perimeter and conditional radius of the orbital opening was carried out in accordance with belonging to one of the three types of facial skull structure.

According to the obtained data, the area of the orbital opening in euryprosop males ranges from 901.0 to 1216.3 mm² (on average 1034.2 ± 87.25 mm²) on the right and from 869.1 to 1174.3 mm² (on average 1034, 2 ± 87.28 mm²) on the left. This area is within the girth of its profile contour, the minimum length of which on the right is 106.8 mm, and the maximum is 128.0 mm (on average – 119.4 mm). On the left, this indicator is in the range from 106.8 to 127.4 mm (the average value is 119.4 mm). At the same time, the conditional radius of the contour circle of the orbital opening, both on the right and on the left, ranges from 17.0 to 20.4 (the average value is 19.0).

In euriprosope women, the spread of the values of the area of the orbital opening is in the range from 726.6 to 1144.0 mm² both on the right and on the left (on average – 974.6 ± 91.15 mm² on the right and 974.6 ± 91.14 mm² on the left). The minimum length of its profile contour is 105.0 mm, and the maximum reaches 125.9 mm (on average – 116.3±4.66 mm) on both sides. Accordingly, we find its conditional radius in the interval between 16.7 and 20.0 (on average – 18.5 ± 0.74). It should be

noted that all the above-mentioned indicators of men are significantly different from similar indicators of women.

In mesoprosopes the area, perimeter and conditional radius of the orbital opening of men and women do not have a statistically significant difference. In men, the area ranges from 849.6 to 1250.0 mm² (average value – 1039.1 ± 108.94 mm²) on the right and from 849.1 to 1250.0 mm² (average value – 1039.1 ± 109.00 mm²) on the left. In women this indicator is in the range of 832.2 – 1111.3 mm² both on the right and on the left (average value – 996.8 ± 63.64 mm² on the right and 996.8 ± 63.63 mm² on the left). The arithmetic mean value of the perimeter of the orbital opening of men on the right is 119.8 ± 6.28 mm (ranges from 105.7 to 130.0 mm), on the left – 119.8 ± 6.29 mm (ranges from 105.6 to 130.0 mm). In women, both on the right and on the left, the perimeter varies from 105.4 to 127.7 mm (the average value is 117.5 ± 3.97 mm). The conditional radius of the orbital opening is 19.1 ± 1.02 (from 17.7 to 20.7) in men and 18.7 ± 0.63 (from 17.5 to 20.3) in women on both sides.

The values of the area, perimeter, and conditional radius of the orbital opening also do not differ significantly in males and females belonging to leptoprosops. In men, both on the right and on the left, the range of individual area variability is 878.0 – 1144.6 mm² (with an arithmetic mean of 1032.8 ± 100.03 mm² on the right and 1032.7 ± 99.93 mm² on the left). In women, the area is equal to 1032.4 ± 80.97 mm² (ranges from 914.7 to 1152.0 mm²) on the right and 1032.3 ± 80.82 mm² (from 914.7 to 1151.5 mm²) on the left. The perimeter of the orbital entrance of men is 118.5 ± 4.35 mm (with a range of 112.3 – 124.9 mm) on the right and 118.5 ± 4.31 mm (from 112.3 to 124.8 mm) on the left. For women on the right this indicator is 119.1 ± 3.66 mm (from 112.7 to 123.0 mm), on the left – 119.0 ± 3.64 mm (from 112.7 to 122.9 mm). The conditional radius of the orbital opening of men is 18.9 ± 0.68 on the right and 18.9 ± 0.67 on the left (varies between 17.9 to 19.9 on both sides); in women – 19.0 ± 0.61 (from 17.9 to 19.6) both on the right and on the left.

Conclusions

1. The range of variability of the area, perimeter, and conditional radius of the orbital opening of people depending on the craniotype and gender was established. A reliably significant difference between the above indicators was determined, namely, their increase in men compared to women, who belong to euriprosopes.

2. No statistically significant differences in the arithmetic mean values of the investigated indicators of the right and left orbit were found.

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