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COMPLEX USE OF ANTHROPOMETRIC AND DERMATOGLYPHICAL METHODS IN IDENTIFICATION OF AN UNKNOWN PERSON

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Summary. Identification of an unknown person is an issue that is relevant today. The integrated use of simple, accessible, reliable methods provided by the requirements of DVI-interpol, allows the use of artificial neural networks to identify an unknown person, which is important in cases of mass deaths, mass graves and more. The article presents a method of conducting a comprehensive study of the human phenotype in order to further identify it.

Keywords: identification of an unknown person, anthropometry, dermatoglyphics.

Introduction. The practice of identifying local armed conflicts in the world (Turkish invasion of Cyprus, 1974, Croatian War, 1991-1995, Russian-Georgian War, 2008, Environmental Protection in Donbas 2014-2022) provides for further identification of victims of war, in particular, in natural and mass burials. According to DVI-interpol, personal identification should include at least three generally accepted reliable methods, the main of which are anthropometry, dermatoglyphics, dental status studies and genetic identification [1, 2].

Research results. Height (body length) is proposed to be measured using the method of R. Martin. Other important anthropometric parameters (torso length, shoulder width, foot and hand length, arm and leg length, head circumference) should be measured with a centimeter tape, and transverse and longitudinal head diameters, forehead height, face height, upper and middle face width, chin diameter, bigonial width and height of the nose – caliper. [3]

The following anatomical landmarks should be used for measurement:

- vertex – the highest point of the parietal area in the median plane;
- suprasternale – located on the middle edge of the jugular notch of the sternum;
- pubic point (symphysion) – located on the upper edge of the pubic symphysis;
- shoulder point (akromion) – located on the lower edge of the shoulder blade;
- end point (akropodion) – the most protruding point at the end of the first or second toe;
- heel point (pterion) – the most protruding point on the heel;
- finger point (daktilon) – located at the end of the third finger;
- stylon – located at the distal end of the radial bone;
- spinal point (trochanterion) – the most protruding and top point on the greater vertebra of the femur;
- eurion – the furthest points from the median plane on the lateral surfaces of the head (may be on the parietal or temporal bones);
- glabella – the most distant anterior point of the frontal bone in the median section;
- occipital point (opistokranion) – the furthest point from the glabella on the occipital bone in the median plane;
- trichion (located on the midline near the border of hair growth on the forehead);
- chin point (gnathion) – the lowest point on the lower edge of the lower jaw in the median plane;
- fronto-molar-orbital point (fronto-malare-orbitale) – a point at the intersection of the outer edge of the orbit with the fronto-temporal suture;
- orbital point – the lowest point of the lower edge of the orbit;

- zygion point – the most prominent dosing point on the zygomatic arch;
- mandibular point (gonion) – located on the outer edge of the mandible at its intersection with the bisector of the angle formed by tangents to the lower edge of the body and the posterior edge of the branch;
- nasion point (nasion) – is at the intersection of the median plane with the nasopharyngeal suture;
- subnasale – a point at the intersection of the nasal septum with the lower lip in the median plane. [4]

Determine the following somato- (fig. 1) and craniometric (fig. 2) parameters:

- height (body length) – the distance from the apex (vertex) to the plantar surface of the foot;
- torso length – the distance between the suprasternale and symphysion points;
- shoulder width – the distance between the shoulder points (akromion);
- foot length – the distance between the end and heel points (akropodion and pterion);
- brush length – the distance between the finger (daktilon) and styloid (stylon) points;
- arm length – the distance between the finger (daktilon) and shoulder (akromion) points;
- leg length – the distance between the trochanterion and the sole.

Based on the obtained anthropometric parameters, the following indices were calculated:

- relative torso length index (RDI): RDI=trunk length/height×100;
- Relative Shoulder Width Index (RWI): RWI=Shoulder Width/Height×100;
- longitudinal-transverse index of the head (PzPPG): PzPG=longitudinal diameter of the head/ transverse diameter of the head×100;
- transverse longitudinal head index (PPPG): PPPG=transverse head diameter/longitudinal head diameter×100;
- facial index (FAD): BF=total face height/maximum face width×100.

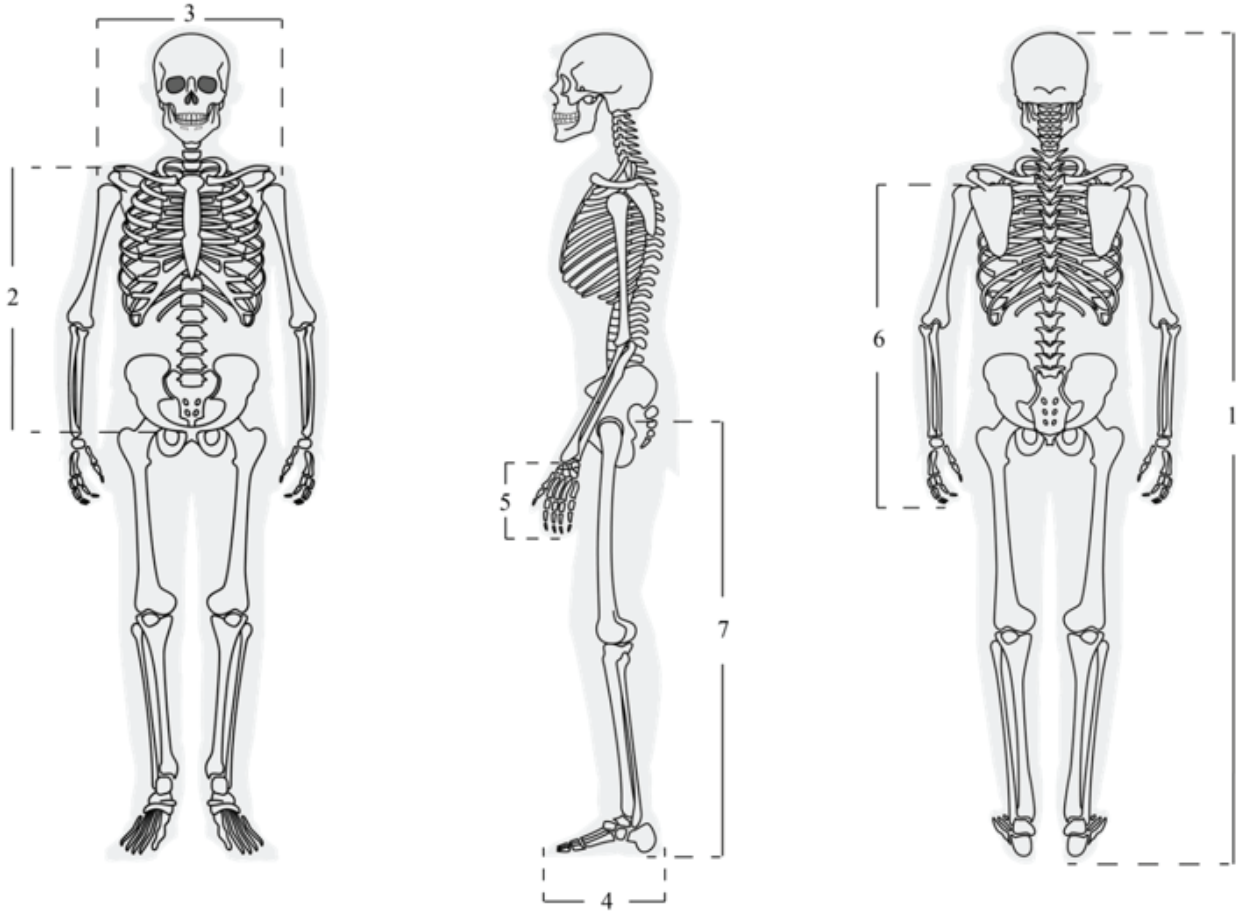

Fig. 1. Scheme for measuring somatometric parameters (according to N.M. Kozan, 2018): 1 – height (body length); 2 – length of the torso; 3 – width of shoulders; 4 – length of the foot; 5 – the length of the brush; 6 – arm length; 7 – leg length.

These indices allow to differentiate somato- (brachy-, meso-, dolichomorphy), craniotype (brachy-, meso-, and dolichocranium) of subjects, as well as facial type (eri-, lepto- and mesorosopia).

Anthropometric research data were processed by the method of variational-statistical analysis in the generalized sample and in the segments divided by sex and ethno-territorial affiliation.

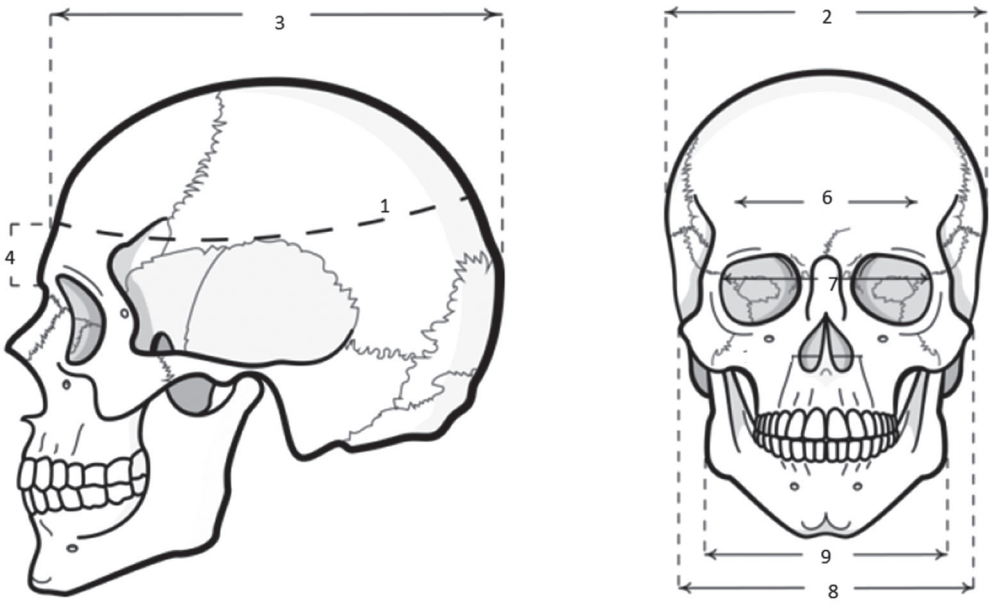

Fig. 2. Scheme for determining craniometric parameters (according to N.M. Kozan, 2018): 1 – head circumference – horizontal circle through eurion points; 2 – transverse diameter of the head – the distance between the points eurion; 3 – longitudinal diameter of the head – the distance between the points glabella and opistokranion; 4 – forehead height – the distance between the points glabella and trichion; 5 – face height – the distance between the points glabella and gnation; 6 – upper width of the face – the distance between the points fronto-malare-orbitale; 7 – average width of the face – the distance between the points of the orbitale; 8 – zygomatic diameter – the distance between the points zygion; 9 – bigonial width – the distance between the points of the gonion; 10 – nose height – the distance between the points nasion and subnasale.

Dermatoglyphs of the hands and feet can be obtained in two ways: classic with the use of printing ink and using different types of scanners. In particular, by scanning with the Futronic's FS80 USB 2.0 scanner. using the improved Fingerprint identification algorithm (FIA). [5]

Futronic's FS80 USB 2.0 reads fingerprints using advanced CMOS optical sensor technology to capture high-quality fingerprint images. The scanner can capture almost without distortion of gray fingerprint images on a computer for 100 ms, which allows you to use this product for any application that requires fingerprint identification.

The fingerprint scanner window is protected by 14 mm thick glass. It is much more reliable than any semiconductor fingerprint sensor.

The finger is illuminated by 4 infrared indicators, the light intensity is automatically adjusted depending on the condition of the finger (wet, dry, dirty, etc.) to optimize the quality of the captured image of the fingerprint.

The scanner has a built-in special electronic circuit for live finger detection (LFD). With the appropriate software on the computer, the user can select the LFD function to detect only the «live» fingers. Finger simulators made of silicone rubber, film, etc. will be rejected. The LFD function is included in the standard software of all Futronic products (fig. 3).

Image quality is improved in order to obtain reliable data for further statistical processing. Researchers solve data processing problems in different ways, but in most cases, this stage is reduced to filling the database (array) of data, its structuring and formalization with further processing in programs for statistical analysis.

Fig. 3. Dermatoglyphs obtained with the Futronic's FS80 scanner.

Conclusions. Comprehensive methods of anthropometric and dermatoglyphic research will improve the quality of forensic identification examinations and optimize the efforts of experts in the study of victims of mass deaths.

Prospects for further research. The development and improvement of comprehensive research in the forensic identification of unknown persons will help expand the list of identification methods DVI-interpol.

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КОМПЛЕКСНЕ ВИКОРИСТАННЯ АНТРОПОМЕТРИЧНОГО ТА ДЕРМАТОГЛІФІЧНОГО МЕТОДІВ ПРИ ІДЕНТИФІКАЦІЇ НЕВІДОМОЇ ОСОБИ

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Резюме. Ідентифікація невідомої особи – питання, що є актуальним на даний час. Комплексне використання простих, доступних, достовірних методів, передбачених вимогами DVI-Interpol, дозволяє з застосуванням штучних нейронних мереж ідентифікувати невідому особу, що важливо у випадках масової загибелі людей, братських поховань тощо. У статті представлена методика проведення комплексного дослідження фенотипу людини з метою її подальшої ідентифікації.

Ключові слова: ідентифікація невідомої особи, антропометрія, дерматогліфіка.

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