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CLASSIFICATION OF MAXILLARY FRACTURES

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Annotation. The article is devoted to a review of literary sources, which classify fractures of the upper jaw. According to scientific research, the classifications developed by clinicians are mainly given. Existing forensic classifications do not fully reflect damage options and expert aspects. A variety of injuries of the upper jaw, dictates the need for a single forensic medical classification, embodying all the necessary qualifying criteria.

Key words: fractures of the upper jaw, classification, criteria, forensic medical examination.

Аннотация. Статья посвящена обзору литературных источников, в которых приведены классификации переломов верхней челюсти. По данным научных исследований в основном приведены классификации, разработанные клиницистами. Существующие судебно-медицинские классификации не в полной мере отражают варианты повреждений и экспертные аспекты. Разнообразие повреждений верхней челюсти, диктует необходимость принятия единой судебно-медицинской классификации, воплощающую в себя все необходимые квалифицирующие критерии.

Ключевые слова: переломы верхней челюсти, классификация, критерии, судебно-медицинская экспертиза.

Due to the increasing impact of exogenous factors, a rise in the incidence of injuries among the population has been observed. In medical practice, fractures of the maxilla account for 2–8% of facial bone fractures. In recent decades, however, these figures have increased to 8–10% [17, 21, 26]. At present, taking into account the use of modern diagnostic technologies, the classification proposed by R. Le Fort (1901) is applied in medical practice to determine the types of maxillary fractures. Le Fort experimentally described various types of fractures that he identified [19, 22, 29]. According to R. Le For's description, the fracture lines pass as follows:

Upper (Le Fort I) — through the nasal bones, the frontal process of the maxilla, the orbital floor, and then through the frontozygomatic suture to the pterygoid processes of the sphenoid bone;

Middle (Le Fort II) — through the nasal bones, the frontal process of the maxilla, the orbital floor, the zygomatico maxillary suture, and then to the pterygoid processes;

Lower (Le Fort III) — runs parallel to the base of the alveolar process [18, 24, 28]. It should be noted that the simplest and briefest, but at the same time quite complete, is the classification of gunshot wounds to the upper jaw proposed by Ya.M. Zbarzh (1965), which reflects the direction of the wound channel and its depth (of course, relative), the nature of the damage and functional insufficiency:

I. By direction and depth of the wound channel:

1) through (transverse, oblique, longitudinal);

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2) blind;
3) tangential.
II. By the nature of the damage:
1) without significant defect of soft and bone tissues;
2) with significant defect of soft and bone tissues;
3) non-penetrating;
4) penetrating into the oral cavity, nose, maxillary sinus and skull; 5) with displacement of fragments.
III. By functional feature:
1) without impairment of functions;
2) with impairment of functions:
a) speech, chewing, swallowing;
b) breathing, hearing; c) vision [10].

This classification was used in clinical practice with modifications and additions. G. Schröder (1916) described type II (when the fracture lines pass through the zygomaticomaxillary suture) as type I, and type I as type II.

Wassmund M. (1927) proposed variants similar in clinical course to Le For fractures of types 1 and 2. These fractures differ in that the nasal bones are not involved in the movements, as the fracture line runs from the superior margin of the pyriform aperture to the inferomedial angle of the orbit (the so-called "medial oblique line") and then follows the lines described for types 2 and 3 maxillary fractures. This means that the nasal bones are not damaged. Wassmund 1 is a Le For 2 fracture, but without damage to the nasal bones. Wassmund 2 is a Le For 1 fracture, but without damage to the nasal bones. In 1931, B.B. Brandsburg described his classification of maxillary fractures, which classified fractures of the body of the maxilla into one group and combined fractures of the body and processes into another.

R. Duchange (1925) allowed for the possibility of partial fractures in the anterior and lateral sections without disrupting the connections between the maxilla and other facial bones, along with Guerin-type fractures.

V. Kazanyan distinguished: a) simple fractures of the alveolar process; b) partial fractures of the maxilla; c) fractures with perforation; d) fractures of the entire maxilla; d) fractures with bone loss.

A. Mcindoe (1941) divided facial fractures into two groups: sagittal (frontal) and transverse. The first group has three subgroups:

1) when the external nose is pressed into the nasal cavity with disruption of the nasal septum, without disruption of dental occlusion or transverse fractures of the alveolar processes;

2) when the entire central block of the face, located above the alveolar process, is damaged, involving the zygomatic and ethmoid bones;

3) when the area of damage extends to the anterior cranial fossa.

The second group also has three subgroups:

1) when there is a fracture of only the zygomatic arch, which can be displaced into the maxillary sinus;

2) when there is a fracture of the zygomatic bone with its penetration into the sinus with a wide divergence of the frontozygomatic suture;

3) when, in addition to the above-mentioned injuries, there is a fracture of the coronoid or articular process of the mandible.

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In 1942, Erich proposed a classification that combined fractures of the maxilla with other bones of the midface, distinguishing between: 1) transverse fractures of the maxilla with complete separation of the jaw bones from the rest of the skull; 2) pyramidal fractures extending upward through both maxillary sinuses to the ethmoid region and the base of the nose; 3) transverse facial fractures passing through the base of the nasal and ethmoid region and across the orbits to the zygomatic arches [5].

G.Kh. Karpilov (1948) divided all injuries of the maxilla into zones: dental, in which mainly the alveolar process is damaged; rhinological, when the nose and its paranasal sinuses are involved in the injury; rhino-ophthalmological, when the orbital region is involved in the injury [12]. I.G. Lukomsky (1943) classified three groups of fractures: alveolar process; suborbital (periorbital), the zone of which passes through the maxillary sinuses; subbasal (subcranial), in which the maxilla is separated from the base of the skull [14].

Based on the severity of the condition, a classification was created by N.N. Lozanov and I.M. Utrobin (1945), who distinguished four groups of injuries: relatively mild injuries (minor disfigurement and minor functional disorders); moderately severe injuries (major disfigurement with minor functional disorders and vice versa); severe injuries (major disfigurement and significant functional disorders, but partially correctable); very severe injuries (functional disorders and disfigurement that cannot be corrected) [9,13].

V. Yu. Kurlyandskiy, having modified the classification of Lukomskiy, proposed his own classification (1947, 1962). Group 1 - fractures of the alveolar process within the dental arch in the presence of teeth on the fragments:

a) fracture of the alveolar process within the dental arch (partial);

b) complete bilateral fracture of the alveolar process with or without a bone defect.

Group 2 - suborbital fractures:

a) fracture within the dental arch with opening of the maxillary sinus and defect of the palate;

b) unilateral fracture with opening of the maxillary sinus and defect of the palate;

c) bilateral fracture with opening of the maxillary sinus;

d) perforated fracture.

Group 3 - subbasal fractures:

a) avulsion of the jaw;

b) crushing of the entire upper jaw.

Group 4 - fractures of individual bones of the facial skeleton:

a) fracture of the nasal bones;

b) fracture of the zygomatic arch [5].

Although P.Z. Arzhantsev et al. (1975) distinguished five types of fractures of the upper part of the facial skeleton: the first is a fracture of the zygomatic bone; the second is a fracture of the nasal bones; the third is a fracture of the alveolar process; the fourth is a fracture in the suborbital zone; the fifth is a subbasal fracture at the junction of the maxilla and zygomatic bone with the rest of the bones of the skull [16].

At the same time, B.D. Kabakov and V.A. Malyshev (1981) distinguished the following localizations of fractures of the bone structures of the midface: fracture of the alveolar process; penetrating damage to the wall of the maxilla; transverse fracture of the maxilla; sagittal fracture of the maxilla; suborbital fracture of the maxilla; suborbital fracture in combination with a fracture of one or both zygomatic bones; subbasal fracture [15]. Among modern classifications, the classification of Yu.A. Nikanorov et al. (2004) is well known. It is based on the TNM system

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proposed by oncologists, as well as the classification of fractures of the zygomatic complex "1-5 SPO" proposed by V.A. Malanchuk (1984). To designate the bones of the midface, a letter designation is used: maxillary bone - M (maxillae), zygomatic bone - Z (zygomaticus), nasal bones - N (nasis). The nature of the fracture line and localization are also specified by letter and numerical indices: comminuted fracture - f (fragmentation), open fracture - o (open), closed fracture - cl (closed), presence of displacement - i (interposition), left-sided fractures - s (sinister), right-sided - d (dextra). The presence of a fracture of the body and processes is also indicated by an index: body - c (corpus), process - p (processus) [6, 7].

The classification of non-gunshot fractures of the maxilla and their complications proposed by Timofeev A.A. (1998) is widely used.

I. Isolated fractures of the maxilla.
1. Fractures of the body of the maxilla:
1) unilateral (sagittal)
2) typical (according to the classification of Lefort, Wassmund),
3) combined,
4) atypical;
2. Fractures of the processes of the maxilla:
1) alveolar,
2) frontal,
3) palatine.
3. Comminuted fractures (body and processes).
II Combined fractures of the maxilla:
1) with craniocerebral injuries;
2) with damage to other bones;
3) with injury to soft tissues.
III Complications of maxillary fractures:
1) early complications (injury and displacement of the eyeball, damage to blood vessels and nerves, subcutaneous emphysema of the face, meningitis, etc.); 2) late complications (paresis and paralysis of the facial muscles, ptosis, osteomyelitis, sinusitis, facial deformation, etc.) [2, 8].

Atypical fractures of the maxilla may also be detected, which do not fit into the previously described patterns [20]. Fractures of the maxillary processes are observed: alveolar (part of the process with several teeth breaks off), frontal (usually unilateral), and hard palate (occurs when falling on a protruding object) [23].

Comminuted fractures of the anterior wall of the maxillary bone may also occur [25, 27].

G.A. Pashinyan et al. (2001) examined the main types of maxillary fractures. However, they note that these injuries can be more varied in nature and be accompanied by impaired respiratory, swallowing, speech, oral hygiene, and other functions. The maxillary bones are connected to the cranium, so maxillary fractures are often associated with damage to the membranes and substance of the brain. This demonstrates the complexity of expert evaluation of this type of maxillofacial injury and the need for their separate, specialized study [11].

Bayramkulova A.M. (2005) analyzed the forensic medical examination reports on maxillary fractures in living individuals and followed Le Fort's classification. In their conclusion, they noted that given the significant number of cases of craniofacial trauma, including maxillary fractures, their complexity, and the severity of harm caused to the health of victims, significantly greater attention should be paid to both the quality of medical documentation and the preparation

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of forensic medical reports. This is significant due to legal needs, which require an accurate and objective presentation of expert information [3].

Avdeev A.I. and Kompanets N.Yu. (2016), analyzing data on victims with craniofacial trauma, identified three groups of combined injuries: severe facial injuries combined with mild TBI; injuries to the facial skeleton combined with severe TBI; and injuries to the facial area of varying severity without signs of TBI [1]. Despite the numerous proposed classifications, in practice, the classification of R. Le Fort (1901) is most often followed, according to which maxillary fractures are bilateral and symmetrical [4].

Thus, there are currently a variety of classifications of maxillary fractures, mostly developed by clinicians. Existing forensic classifications do not fully reflect injury patterns and expert assessments. The diversity of maxillary injuries dictates the need to adopt a unified forensic classification that encompasses all the necessary criteria.

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