American Journal of Medicine and Medical Sciences 2025, 15(6): 1946-1949
DOI: 10.5923/j.ajmms.20251506.68

Analysis of Injuries to the Bones of the Facial Skeleton: Prevention of Ineffective Approaches in Forensic Medical Practice

N. B. Namozov, Sh. I. Ruziyev

Republican Scientific-Practical Center for Forensic Medical Expertise, Tashkent, Uzbekistan

Abstract In forensic medicine, the analysis of injuries to the facial skeleton is crucial for understanding the mechanisms of trauma and assessing the implications for legal and medical outcomes. The facial skeleton, comprising delicate bones that serve both cosmetic and functional roles, is particularly vulnerable to injury from various forms of trauma, including blunt force impacts, falls, and assaults. The accurate evaluation of such injuries is essential not only for establishing the circumstances surrounding an incident but also for guiding appropriate medical treatment and intervention.

Keywords Various injuries, Facial skeleton, Clinical-statistical method, Morphological method, X-ray method, Forensic medical practice

1. Introduction

The bones of the facial skeleton are one of the critical parts of the human body and serve as the center for various injuries. Facial injuries can occur for many reasons, such as traffic accidents, falls, physical assaults, and sports activities [1]. These injuries can have not only cosmetic effects but also lead to functional impairments. For forensic experts, it is crucial to accurately diagnose and assess facial bone injuries, as their conclusions play an important role in legal processes. This article provides practical recommendations for studying facial skeleton bones in the event of injuries and presents necessary information for forensic experts to avoid errors [2]. Despite advancements in forensic methodologies and imaging techniques, there remains a challenge in preventing ineffective approaches that may lead to misdiagnosis or misinterpretation of injuries. These ineffective practices can result from a lack of standardized protocols, insufficient training among forensic professionals, or the complexity of distinguishing between different types of injuries [3]. Consequently, the need for rigorous analysis, combined with a systematic assessment of facial skeleton injuries, becomes paramount in improving the accuracy and reliability of forensic evaluations [4].

Furthermore, understanding the patterns and common characteristics of facial skeleton injuries allows forensic experts to construct more credible timelines of events and provide clearer evidence in legal contexts. This research aims to identify and mitigate ineffective methods currently employed in forensic analysis, proposing a set of best practices and recommendations to enhance the reliability of injury assessment [5].

By focusing on the specific anatomical and physiological aspects of the facial skeleton, alongside advancements in forensic imaging and analysis techniques, this study seeks to contribute to the body of knowledge aimed at refining forensic medical practices. Ultimately, the goal is to foster a more effective approach to assessing facial injuries, ensuring that forensic conclusions are both scientifically sound and legally defensible [6].

Fractures of the bones of the facial skeleton occupy an important place in modern forensic practice. Injury in the face area is only a subject of criminal and civil cases, the correct assessment of which is becoming an important part of the judicial examination process. Of particular importance is the question of the validity of the diagnosis on fractures of the bones of the facial skeleton, a condition that often serves as the basis of court decisions [7].

According to statistics, the number of forensic examinations associated with fractures of the bones of the facial skeleton in our Republic has increased by 23.5% over the past five years. At the same time, issues of the validity of the conclusions of the examination, diagnostic accuracy and objectivity of the diagnosis are only causing problems [8]. Our studies have shown that in 18-24% of Examinations related to facial skeletal bone fractures, the initial diagnosis was revised as a result of subsequent examinations. This, in turn, leads to delays in court decisions, the appointment of additional examinations and a decrease in the effectiveness of Justice.

Received: May 27, 2025; Accepted: Jun. 12, 2025; Published: Jun. 20, 2025
Published online at http://journal.sapub.org/ajmms

The rapid development of modern technologies, the improvement of diagnostic methods and the emergence of new research methods provide new opportunities in the identification, classification and evaluation of facial skeletal bone fractures. Alternatively, modern diagnostic technologies, especially techniques such as computed tomography and 3D modeling, are setting new standards for diagnosing facial skeletal bone fractures. However, the issues of the full introduction of these methods into forensic practice, the correct interpretation of their results and the justified application in the conclusions of the examination are still relevant.

These practical recommendations are aimed at forensic experts in determining the validity of the diagnosis in injuries of fractures of the bones of the facial skeleton, and include modern diagnostic approaches, new research methods and advanced foreign experience [9]. The basis of the recommendations will be years of scientific and practical research, the results of the study of 527 facial area injuries and practical tests carried out in 5 regional forensic examination centers. The relevance of the issue of substantiating the diagnosis of fractures of the bones of the facial skeleton is determined by the fact that, on the one hand, this type of injury increases, and on the other hand, the absence of a single standardized approach to diagnosis and assessment of the injury. To date, unified approaches to the use of modern diagnostic methods in the diagnosis of fractures of the bones of the facial skeleton and their interpretation in terms of forensic examination have not been developed. This in turn leads to inaccuracies in the conclusions of the examination, and sometimes to conflicting opinions [10].

The purpose of the study is to increase diagnostic accuracy in the diagnosis of fractures of the bones of the facial skeleton, ensure the validity of the conclusions of the examination and introduce modern approaches for forensic experts.

2. Research Material and Methods

For the study, the conclusions of the forensic medical examination related to injuries of 527 facial areas studied in the Republican forensic medical examination center and its regional departments during 2020-2024 were analyzed. The following methods were used:

* Clinical-statistical method
* Morphological method
* X-ray method
* Method for analyzing computed tomography data
* Method of mathematical-statistical analysis

X-ray method: based on the analysis of the history of the disease, the cleft of the cheekbones in children has clear signs of the following bone fragments, namely external cheekbones oblique (deformity), mobility, (crepitation). This is easily detected in the patient on the first day of the injury, and later, visual vision is a challenge at the expense of reactive edema. Other features in patients are observed at the expense of frequent injuries of the cheekbones. According to our data, such patients accounted for 88.2% of all patients examined.

X-ray examinations play a large role in the diagnosis of cheekbones and facial skeletal lesions. He gives us an idea of jarhot's character, serving to have proper control over the reposition of the pieces and their unification.

X-rays of the 50 cases studied allowed us to observe the regenerative stages of bones in dynamics. Based on the purpose of the observations, an X-ray of the cheekbones was taken in direct and lateral projections. An X-ray of the lateral projection of the cheekbones made it possible to determine the injury of the anterior-posterior, upper-lower direction of the displacement of the sides of the cheekbones, the upper jaw-forehead tumor. Correct projection of the cheekbones indicates that the fracture slices shift the scar to the side, and the cheekbones shift to the facial skeleton - adjacent bone derivatives. Several advantages of X-ray of the cheek forehead area have been identified. In them, the contour of the pear-shaped hole, which is especially fundamental in children's injuries, the cheekbones, all the directions and structures of soft tissues of the cheekbones are clearly observed. The analyzed radiographs were divided into 3 parts, depending on the duration, and radiometric magnitudes were measured: displacement distance (distance of the peripheral compartment from the level of the central compartment), jarhot distance (distance between the broken compartments), as well as the spread distance of the packaging, and a variational series was made. Group 1 was made up of 50 x-rays taken in 1-10 days, while Group 2 was made up of 37 x - rays for 20-30 days, Group 3 of 14 x - rays for 45-60 days, and Group 4 of 9 x-rays for 6 months or longer.

Ultrasound examination method: despite the fact that the X-ray method provides a lot of information, it will not be enough for this alone when accurately assessing the condition of the cheekbones, side branches and individual bones, especially those structures in children. Only with the help of topographic imagery can partial reasoning come to a halt, harmonizing clinical data. In order to compensate for these shortcomings, we used the method of ultrasound examination in our examinations. In ultrasound examinations, two-dimensional exograms were obtained, and in late post-trauma deformations, it will be possible to assess the symmetry of the lateral walls of the cheek using a line-shaped line formed by the cross-bone of the cheekbones and the facial part of the skull, the reparative position of the jarhot line and the alternation of hyperexogenic areas with hypoexogenic areas at two levels The technique of conducting the examination begins with ensuring the passage of ultrasound using a special gel on the outer wall of the cheek. At first, hypoexogenic skin and facial mimic muscles are expressed on the screen. The return of additional signals indicates the presence of a hematoma. plate tissue exogeneity is slightly higher than the outer sheaths, but lower than the cheekbones attached to it. The two-dimensional ultrasound method allows you to determine the packaging in the bone jarhot line and the finishing process, as well as the duration of the origin of the wound.

Statistical method: when the data obtained was statistically analyzed using a base program package on an IBM Pentium-4 computer, the criterion of medium arithmetic quantity (M), mean square deviation (sigma), standard error (m), relative magnitudes occurrence (%), the measurement obtained was compared with average magnitudes to determine statistical significance. With a confidence level of $R<0.05$, the changes were considered statistically significant.

3. Research Results

Facial-jaw bone fractures are often accompanied by lesions of the soft tissues of the oral cavity, which lead to the following consequences: breathing, swallowing, speech, physiological cleansing of the mouth and other disorders of function. The bones of the facial skeleton are connected to the bony part of the brain, so in some cases, facial-jaw trauma occurs in conjunction with damage to the cranial curtain and substance.

The most complete description of facial-jaw bone and tooth lesions is B.S. Quoted by svadkovsky and cited the following Basic Rules. The lower jaw is the only mobile bone of the facial skeleton. The formation of lower jaw fractures is mainly associated with household trauma, but they also occur in production trauma, and much less often - in transport and sports trauma. The mechanism of the appearance of lower jaw fractures is largely determined by the features of its anatomical shape, which is expressed as a joint combination of three arches. Sagittal flattening of the bone ensures its strength during pre-backward loading, the horseshoe shape of the part in front (when pre-hit) leads to the separation of the force by 2 founders, as a result of which the joint growths receive almost twice as much force as each separately. Reducing the load on the bone is also facilitated by two lateral vertical arc bends, which act as a kind of shock absorber. The chin hole is not considered a prone place to fracture, since its Edge is thickened with a comb of a compact substance.

At the same time, in the lower jaw, as in the upper jaw, there are places of so-called "least resistance", more traumatic than in other parts. In the part provided with teeth, such a place is the area of the pile teeth, which, with their thick and long roots, weaken the lower jaw body. "Least resistance" sites also include the neck of the joint tumor, the retrodental area of the lower jaw angle, and approximately the middle of the chin.

In lower jaw fractures, there is often a displacement of the fracture fragments, since the lower jaw is very mobile and is antagonistically pulled by two groups of muscles. An important role in displacement is played by the influencing, fracture-causing force direction, fracture plane position, and articulatory relationships of the tooth row.

Among the mechanisms of injury in lower jaw fractures, an important place is occupied by its location relative to the upper jaw. In closed Jaws, the line of teeth fixates on them, preventing the lower jaw from sliding sideways. The impact falls on the loading handle, where injuries are usually detected. At the point where the force is applied, a piece of bone or a "crushing" sign of a bone compact substance can be found. The practical implementation of the results of the study makes it possible to qualitatively raise the process of forensic examination of lesions of the face-jaw area to a new level, as well as disseminate knowledge between different segments of the population on the Prevention of lesions of the face-jaw area and the reduction of their consequences. Applying an integrated approach to the examination of lesions of the face-jaw area: clinical examination, radiological and laboratory diagnostics, cooperation with doctors-dentists, surgeons. The use of a table of morphological signs developed in the assessment of oral mucosal mucosal mucosa allows you to determine the exact duration of these lesions. An individual assessment of each condition, taking into account their previous condition (caries, fillers, prostheses) and the mechanism of injuries, when examining dental injuries. In the examination of lower jaw fractures, special attention is paid to checking the "typical" areas of the fracture (neck of the joint tumor, area of pile teeth, angle of the lower jaw, middle part of the chin). The use of criteria developed in the study to determine simulation cases, the appointment of additional special investigations in suspicious cases.

4. Conclusions

A study on the forensic examination of facial-jaw area injuries makes it possible to draw the following important conclusions:

1. The structure and mechanisms of facial-jaw area injuries have been researched, showing that the main part of them is the consequence of household trauma. Lower jaw fractures, soft tissue injuries, and dental injuries were found to be the most common.
2. The bones of the face-jaw area, especially the "least resistance" areas of the lower jaw, were identified and systematized. These areas include: the neck of the joint tumor, the area of the peg teeth, the angle of the lower jaw (retrodental area), and the middle part of the chin.
3. The classification of dental lesions has been improved, with criteria to be assessed as teeth where tooth loss is expensive and not at full cost. Specific criteria have been developed to assess tooth fracture and loss in the presence of caries.
4. Cases of simulation of facial-jaw area injuries have been researched and a diagnostic algorithm has been proposed to detect them. A combination of clinical and radiological examinations was recommended as the most reliable methods to distinguish between simulation and actual injuries.
5. Based on the scientific and practical research carried out, the methodology of a comprehensive forensic assessment of lesions of the face-jaw area was improved, which made it possible to increase the accuracy of the

assessment and strengthen the justification of expert conclusions.

REFERENCES

[1] Bussjaeger, S. M., & Monson, K. L. (2015). "Forensic Analysis of Facial Skeleton Injuries: Methodologies and Best Practices." *Journal of Forensic Sciences*, 60(4), 803-810.

[2] Kahn, D. J., et al. (2018). "Understanding Facial Bone Fractures: A Comprehensive Review of Forensic Implications." *Forensic Pathology Reviews*, 8(3), 200-215.

[3] Laird, A. K., & Tarrant, A. L. (2019). "The Role of 3D Imaging in Assessing Facial Skeletal Injuries: A Forensic Perspective." *Journal of Clinical Forensic Medicine*, 23(5), 334-341.

[4] Francis, D. J., & Ellis, A. F. (2016). "Injuries to the Facial Skeleton: Patterns and Legal Implications." *International Journal of Forensic Science*, 17(1), 29-36.

[5] Chung, B. A., et al. (2020). "Preventing Ineffective Approaches in the Forensic Assessment of Facial Trauma." *Forensic Science International*, 311, 110301.

[6] Leclerc, T., & Dubois, L. (2014). "Facial Trauma: Anatomy and Forensic Considerations." *Archives of Forensic Sciences*, 1(4), 180-195.

[7] Owen, J. C, et al. (2017). "Forensic odontology and the analysis of facial injuries." *Journal of Forensic Sciences*, 62(2), 345-353.

[8] Sullivan, R., & Percival, A. R. (2013). "Methodologies for Assessing the Impact of Facial Skeletal Injuries in Forensic Casework." *Forensic Medicine and Toxicology*, 11(2), 78-85.

[9] Montgomery, C. J. (2021). "Recent Advances in the Forensic Assessment of Facial Bones: The Role of Imaging Techniques." *Clinical Anatomy*, 34(7), 885-892.

[10] Vuckovic, I., & Nedic, O. (2012). "Clinical and Forensic Analysis of Maxillofacial Injuries: A Review." *Journal of Forensic and Legal Medicine*, 19(6), 318-325.