

FORENSIC MEDICAL EXAMINATION IN NON-FATAL LARYNGEAL TRAUMA

Olkhovsky V.O., Gubin M.V., Grygorian E.K.

Kharkiv National Medical University

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Abstract

Victims with non-fatal laryngeal trauma become the object of forensic medical evaluation of the severity of bodily injuries in alive persons, carried out during pre-judicial and judicial investigation. The purpose of the study was to provide morphological and clinical analysis and characteristics of bodily injuries in cases of blunt laryngeal trauma in forensic medical examination of alive persons, to determine ways to improve the effectiveness of forensic medical diagnosis of the specified injury. **Subjects and Methods.** The study involved morphological and clinical analysis of 47 forensic medical expert conclusions in the leading forensic medical examination institution of Kharkiv region. **Results.** Frequency and types of blunt traumas of the larynx at examination of alive persons were determined. Specific features of forensic medical expert evaluation of bodily injuries severity in alive persons with blunt traumas of larynx were determined. Severe bodily injuries were defined in 3 cases (6.4 % of cases) of laryngeal traumas with the development of mechanical asphyxia. Moderate bodily injuries were determined by experts in 9 cases (19.1 % of cases) of blunt traumas of the larynx, accompanied by fractures of its cartilage; in 4 persons (8.5 % of cases) of blunt traumas of the larynx, accompanied by hematoma, edema of soft tissues of the larynx; in one case of blunt laryngeal trauma with acute edema, its second-degree stenosis. Mild bodily injuries which caused short-term disorder in 25 persons (53.2 % of cases) and mild bodily injuries which caused slight transitory effects in 4 persons (21.1 % of cases) were determined by experts in forensic medical examination of blunt laryngeal trauma with the development of acute posttraumatic laryngitis. The study implied elaboration of methods and an algorithm for improvement of forensic medical diagnostics in this type of injuries. **Conclusions.** Medico-legal diagnosis of blunt laryngeal trauma can be associated with underestimation and overestimation of the severity of bodily injuries by experts, which requires further research in the field of establishing unbiased expert diagnostic criteria for assessing such injuries.

Keywords: *criteria of diagnosis, forensic medical examination, expert conclusion, laryngeal trauma.*

Introduction

Laryngeal traumas are characterized by open and closed injuries, such as stabbed, incised, stabbed-incised wounds, ruptures of organ walls, fractures and dislocations of laryngeal cartilages frequently accompanied by life-threatening signs and require an accurate medico-legal evaluation

[1–4]. Such consequences of laryngeal traumas, as its stenosis and phonation dysfunction, result in loss of the working capacity [3, 5]. At the same time, victims with non-fatal laryngeal injuries become the object of forensic medical evaluation of the severity of bodily injuries in alive persons, carried out during pre-judicial and judicial investigation [6, 7].

Determination and substantiation of medico-legal diagnostic criteria is regarded as an actual and perspective direction of scientific research in forensic medicine, which would allow to objectively and comprehensively define the kind of trauma, the mechanism of its development and

Corresponding Author:

Mykola Gubin MD, PhD, Associate Professor
of Prof. M.S. Bokarius Department of Forensic
Medicine and Medical Law,
Kharkiv National Medical University, Ukraine.
E-mail: n-gubin@ukr.net

to estimate the severity of bodily injuries in each particular case [8–10]. "Rules for forensic medical assessment of bodily injuries severity" [11] (the Order of the Ministry of Health of Ukraine No.6 as of 17.01.1995) do not contain, and, probably, should not contain the full list of diagnostic criteria for definition of clinical features in each possible damage. They also do not contain the optimum list of diagnostic tests which should be carried out for an objective estimation of the severity of bodily injuries. It leads to underestimation of severity of bodily injuries by practical forensic medical experts, especially by those with little practical experience, resulting in appointment of a repeated forensic medical examination, usually by a medical expert board.

A review of literature [12–15] on examination of alive persons, written by leading scientific forensic medical physicians, shows that there have been no thorough scientific studies on determination and substantiation of diagnostic criteria for medico-legal estimation of the severity of bodily injuries in laryngeal injuries. Besides, closed non-fatal blunt laryngeal injuries are the most difficult for expert evaluation, which is related to the variety of their complications and consequences.

2. Purposes, subjects and methods:

2.1. Purpose – was to provide morphological and clinical analysis and characteristics of bodily injuries in blunt laryngeal trauma in forensic medical examination of alive persons, to determine ways to improve the effectiveness of forensic medical diagnosis of the specified injury.

2.2. Subjects & Methods

The materials were the conclusions of forensic medical examination on blunt laryngeal trauma (BLT) in alive persons that were conducted with our participation at Kharkiv Regional Bureau of Forensic Medical Examination (KRBFME) in 2005–2018. Moreover, the study involved assessment of archival expert conclusions for the specified period of time at the Department of Forensic Medical Examination of Victims, Accused and Other Persons of KRBFME. In total, 47 cases of forensic medical examination of BLT were processed retrospectively.

The study implied the following methods: registration method, the data were written on a specifically designed registration card that included a list of relevant morphological and clinical features; standard methods of the descriptive statistics; morphological method, the nature of the damage was determined; clinical, dysfunction of larynx, duration of impairment was analyzed;

forensic medical examination, severity of bodily injuries was evaluated by experts.

During examination, oral consent was obtained from all victims. The written consent from victims during forensic medical examinations should not be provided, according to the regulatory documents governing their performance. This study is permitted by the ethics and bioethics commission of Kharkiv National Medical University.

Conflict of interests. There is no conflict of interests.

3. Results and discussion

The study showed that in annual quantity of traumas of the neck BLT occupies 0.6% of expert examinations at the Department of Forensic Medical Examination of Victims, Accused and Other Persons of KRBFME. At the same time, 24 expert examinations (51.1% of cases), including laryngeal injuries, included male patients, and 23 expert examinations (48.9% of cases) female patients. Besides, 18 patients (38.3% of cases) were of working age (20–50 years old). As for the mechanism of development, 25 patients (53.2 % of cases) received shock blow by blunt solid objects onto the neck (more often, blows by fingers of arms, clenched into a fist, and other blunt solid objects), in 20 patients (42.6 % of cases) compression of the neck by arms, in 2 patients (4.3% of cases) compression of the neck by arms and a loop. In general, low incidence of BLT in victims was confirmed by few, and in some cases durable, up to several decades, cases of such injuries, by individual authors [1, 2, 6]. At the same time a fourfold prevalence of such injuries in males was observed, which differs from our observations.

The character of damages detected during forensic medical examination was as follows. In 42 patients (89.3% of cases) ecchymosis, grazes, specifying the place of traumatic force, were detected on the neck. Two patients (4.3% of cases) had strangulation mark and grazes on the neck. In 3 patients (6.4% of cases) no visible damages were found on the neck, which complicated medico-legal examination.

Damages of the larynx in victims were as follows: all the victims had symptoms of acute post-traumatic laryngitis of varying severity. Thus, 9 patients (19.1% of cases) were found to have hemorrhages and edema in vocal cords, their mobility impairment in phonation, hyperemia, edema of mucous membranes in the epiglottis.

Fractures of laryngeal cartilage, either cricoid or thyroid, or of both laryngeal cartilages were

diagnosed in 9 patients (19.1 % of cases). At the same time, one patient had hematoma on the right half of the neck and first-degree stenosis of the larynx. In two cases, the larynx was deformed due to its cartilage integrity disruption. Two patients (4.2% of cases) were found to have disruption of thyroid-hypoglossal membranes integrity, edema, hemorrhages in vocal cords, loss of their mobility in phonation, hemorrhage of the mucous membrane. One patient (2.1% of cases) had a fracture of the left superior horn of thyroid cartilage with a shift, and edema of soft tissues in the area of the thyroid cartilage.

Moreover, 15 patients (31.9% of cases) had hematoma and edema of soft tissues of the larynx. Five patients (10.6% of cases) were found to have narrowing of the larynx, due to life-threatening swelling of soft tissues. One patient (2.1% of cases) had hematoma, edema of soft tissues in the region of arytenoid cartilages and vocal cords with vocal dysfunction. One patient (2.1% of cases) had hematoma, acute edema of the larynx, second-degree stenosis of the larynx with dysfunction of its neuromuscular apparatus, hemorrhage in the epiglottis and in the parapharyngeal fat.

There was a case of BLT that deserves special attention: a 6-year-old girl received an injury by a compression of the neck by the loop and arms in which, besides the ligature mark and grazes on the neck and acute posttraumatic laryngitis, experts also diagnosed signs of mechanical asphyxia. She was found to have a gradually progressing dysfunction of the central nervous system, resulting from cerebral circulation disruption in the pool of the right middle cerebral artery. The first symptoms in the form of clonic convulsions appeared in 2 days after the injury, and, in 15 days tetraparesis developed. As an outcome of the trauma, the girl had left-sided hemiparesis.

In 3 patients (6.4% of cases), one with fractures of the laryngeal cartilage and one with acute posttraumatic laryngitis, BLT was complicated by the development of perichondritis of its cartilages. In 4 patients (8.5 % of cases) BLT resulted in acute posttraumatic laryngitis, chronic laryngitis, and in 4 patients (6.4% of cases) BLT with hematoma of the larynx was associated with posttraumatic paresis of laryngeal muscles.

It is noteworthy that in the medical documentation given to experts and accordingly in expert opinions the emphasis is not always placed on the type of inflammatory process in the larynx (catarrhal, purulent, purulent-necrotic).

In fractures of laryngeal cartilages, the character of fracture, presence and degree of fragments shift are not emphasized. Also, the emphasis is not placed on presence and character of luxations of laryngeal cartilages most commonly observed in cricoarytenoid joints and rarer in cricothyroid joints. Insufficient diagnosis of cartilage damage in cases of BLT is also indicated in some studies [6, 7]. The character of the specified changes can influence the severity of bodily injuries. Computed tomography, which can detect damages of laryngeal cartilages, is not always included in diagnostic procedures performed as a part of examination. At the same time, the importance of computed tomography in such cases is emphasized both in the scientific work of clinicians and forensic medical experts [3, 8]. In certain examinations, no additional tests, including those determining the degree of laryngeal dysfunction, were performed. Advising otolaryngologists, was involved only in one case in performing primary examinations and in 2 cases in examination provided by medical expert board.

In medico-legal expert examination the severity of bodily injuries in BLT was defined as follows: severe bodily injuries, by

"life-threatening" criterion according to the "Rules", were defined in 3 cases (6.4% of cases) of laryngeal traumas with the development of mechanical asphyxia.

Moderate bodily injuries, by "impairment duration" criterion of more than 21 days, according to the "Rules", were estimated by experts in 9 patients (19.1% of cases) with BLT accompanied by fractures of its cartilage; in 4 patients (8.5% of cases) of BLT accompanied by hematoma, edema of soft tissues of the larynx; one case of BLT was accompanied by acute edema, second-degree stenosis of the larynx, neuromuscular apparatus dysfunction, hemorrhages in the epiglottis and parapharyngeal fat. The duration of impairment, defined in these examinations, was confirmed by results of objective methods of examination and time course of pathological changes. In our opinion, the full duration of impairment and outcomes of larynx traumas are considered only in these examinations.

Mild bodily injuries, which caused short-term impairment of more than 6 days and less than 21 days, were defined in 25 patients (53.2% of cases). In these cases, BLT was accompanied by acute posttraumatic laryngitis, which in 6 cases was associated with hemorrhages in vocal cords, in 10 cases with posttraumatic hematoma of the

larynx. Besides, only in 23 cases the severity of injury corresponded to these criteria and the "Rules", and in 2 cases it did not because the patients were treated for more than 21 days. In our opinion, when treatment of patients with acute posttraumatic laryngitis took longer than 21 days, the experts should have performed additional medico-legal diagnosis and estimated the outcome correctly. And, probably, the severity of bodily injuries would be qualified as moderate.

Mild bodily injuries which caused slight transitory effects, lasting not more than six days, were established by experts in 4 patients with BLT (21.1 % of cases), with the development of acute posttraumatic laryngitis, wherein, in 3 cases it was accompanied by hemorrhages in vocal cords, and in one case by perichondritis of laryngeal cartilages. In these examinations experts did not have enough information about outcomes of laryngeal injury necessary for medico-legal evaluation of bodily injury severity. Additional control diagnostic tests were not conducted by experts during examinations as well. In these cases, because of the absence of information on trauma outcomes and impossibility to perform additional tests by experts it was necessary to refuse from defining the severity of bodily injuries.

In 2 patients (4.3% of cases) with BLT experts have refrained from evaluating the severity of bodily injuries because of the unbearable outcome of trauma with the development of acute posttraumatic laryngitis, hyperemia, edema of the mucous membrane of epiglottis and vocal cords.

Along with some contradictions in forensic medical expert opinions on the forensic medical evaluation of BLT severity, as shown by the review of special literature [7, 10, 15], the views of forensic scientists on the application of certain qualifying signs from normative documents also differed. In particular, there were contradictory views on what kind of BLT should be considered as a life-threatening.

The results of our study allowed us to develop an algorithm-program for carrying out scientific research on determination and substantiation of

medico-legal diagnostic criteria of BLT severity which contains the following stages:

- assessment of presentation and outcomes of laryngeal traumas according to the "Rules". The conducted assessment helped to identify medico-legal diagnostic criteria of BLT severity;
- determination of BLT incidence, its presenting signs and outcomes based on the assessment of archival medico-legal records;
- comparison of the data received following the assessment of medico-legal archival records with clinical findings. Interpretation of the received data;
- carrying out forensic medical examination simultaneously with comprehensive clinical examination of the patients;
- substantiation of medico-legal diagnostic criteria for determination of the severity of bodily injuries in BLT.

Conclusions

1. Accurate medico-legal diagnostic criteria for blunt laryngeal traumas have not been defined so far, which occasionally leads to arbitrary interpretation of the "Rules" by experts, in definition of the severity of bodily injuries.

2. Non-life-threatening blunt laryngeal traumas prevail in medico-legal practice in examination of alive persons and require careful medico-legal estimation of outcomes and consequences that can cause difficulties for medico-legal experts.

3. In certain examinations experts underestimated severity of bodily injuries while determining blunt laryngeal traumas, and in some other examinations severity was overestimated.

4. During medico-legal examination, the complex of modern examination methods for definition of the character and outcome of blunt laryngeal traumas was not used by experts to the full extent.

5. It is necessary to perform further research in the field of medico-legal analysis of all possible clinical and morphological signs, outcomes of laryngeal traumas, in order to determine and substantiate diagnostic criteria for defining the severity of bodily injuries.

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