



MODERN CRITERIA FOR THE FORENSIC DIAGNOSIS OF SUDDEN INFANT DEATH

Ruziev Sh.I.

MD, Professor of the Department of Forensic Medicine and Pathological
Anatomy. Tashkent State Pediatric Institute

Kadyrov S.K.

Assistant Professor of the Department of Forensic Medicine and
Pathological Anatomy. Tashkent State Pediatric Institute

Kamalova M.I.

MD, Associate Professor of the Department of Human Anatomy
Samarkand State Medical University

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ABSTRACT

The sudden death of a child is a tragic event that requires a thorough and comprehensive forensic investigation. The deaths of children, which occurred unexpectedly in apparently healthy children, cause not only deep grief among relatives, but also a lot of questions from the investigating authorities and society as a whole. An integrated approach to the forensic medical assessment of such cases is a prerequisite for establishing the true cause of death, differentiating between natural and violent causes, as well as for accumulating data that will help prevent similar cases in the future.

Introduction. The sudden death of a child is one of the most difficult and tragic cases in forensic medical practice. Defined as the unexpected death of an apparently healthy child, it requires a special, methodologically sound approach to the investigation. Despite the relative rarity of such cases, they have high social significance and often cause resonance both in the professional community and in society as a whole.

The forensic medical assessment of cases of sudden death of children is fraught with a number of difficulties, ranging from the need for a thorough analysis of the circumstances of the incident, ending with the use of specialized laboratory research methods. An integrated approach to such an assessment involves the integration of classical sectional research methods with modern high-tech diagnostic methods, as well as interdisciplinary interaction between specialists of various profiles.

A special place in the structure of sudden infant mortality is occupied by sudden infant death syndrome (SIDS), which remains an exceptional diagnosis and requires differential diagnosis with a wide range of pathological conditions, including hereditary diseases of the cardiovascular system, metabolic disorders, infectious processes and violent death. The latter



circumstance is of particular importance, given the legal aspects and possible legal consequences.

The urgency of this problem is due not only to the need to establish the true cause of death in each specific case, but also to the opportunity to develop effective prevention strategies based on the accumulated data, which ultimately can contribute to reducing child mortality.

The sudden death of a child is one of the most difficult problems in forensic medical practice, combining medical, social and legal aspects. Sudden infant death is traditionally understood as the unexpected onset of death of an apparently healthy child, in which the medical history and initial examination do not reveal an adequate cause of death. This problem is particularly important in the context of the need for differential diagnosis between natural causes of death and possible cases of violent death or death due to improper child care. Sudden infant death syndrome (SIDS) remains one of the leading causes of post-neonatal infant mortality in developed countries, despite a significant decrease in the incidence of such cases due to preventive programs in recent decades. At the same time, SIDS is a diagnosis of exclusion, which can be established only after conducting a full range of diagnostic studies and excluding all other possible causes of death.

Modern forensic diagnostics of sudden infant death is based on a multidisciplinary approach that includes not only traditional morphological research methods, but also a wide range of additional laboratory and instrumental methods. The use of molecular genetic, immunohistochemical, virological and other high-tech research methods has significantly expanded the possibilities of postmortem diagnosis and made it possible to identify previously unidentified causes of death.

In recent years, there has been a significant development in understanding the pathogenesis of sudden infant death. Modern concepts consider SIDS as a result of the interaction of genetic, environmental, and age-related factors (the so-called "triple risk model"). Specific genetic markers associated with an increased risk of sudden death have been identified, including mutations in genes responsible for the functioning of the heart's ion channels, metabolic processes, and the functioning of the central nervous system.

The development and implementation of uniform standardized criteria for the diagnosis of sudden infant death is of crucial importance not only for the correct forensic assessment of specific cases, but also for the accumulation of reliable epidemiological data necessary for further improvement of prevention methods. In addition, correct diagnosis ensures social justice for the families of deceased children and helps to prevent unfounded accusations in cases of natural death.

This article presents an analysis of modern criteria for the forensic diagnosis of sudden infant death, taking into account the latest scientific evidence and international recommendations, and summarizes practical experience in applying an integrated approach to the investigation of such cases.

An integrated approach to the forensic medical assessment of cases of sudden death of children is a prerequisite for establishing the true cause of death, ensuring justice and developing effective preventive measures. Modern research methods, including molecular genetic technologies, expand the possibilities of diagnosis, but the key factor remains a



systematic approach with a thorough analysis of all aspects of the case and interdisciplinary interaction.

The sudden death of a child is one of the most difficult problems in forensic medical practice, combining medical, social and legal aspects. Sudden infant death is traditionally understood as the unexpected onset of death of an apparently healthy child, in which the medical history and initial examination do not reveal an adequate cause of death. This problem is particularly important in the context of the need for differential diagnosis between natural causes of death and possible cases of violent death or death due to improper child care. Sudden infant death syndrome (SIDS) remains one of the leading causes of post-neonatal infant mortality in developed countries, despite a significant decrease in the incidence of such cases due to preventive programs in recent decades. According to world statistics, the incidence of SIDS varies from 0.1 to 0.8 cases per 1,000 live births, with the highest incidence at the age of 2-4 months.

The urgency of the problem is also emphasized by the fact that SIDS is a diagnosis of exclusion, which can be established only after conducting a full range of diagnostic studies and excluding all other possible causes of death. This requires special care and methodological rigor in forensic medical research, as well as the use of modern high-tech diagnostic methods.

The modern concept of SIDS pathogenesis is based on a multifactorial model known as the "triple risk model", according to which sudden death occurs when three groups of factors coincide: 1) the child's innate vulnerability (genetic, epigenetic factors); 2) a critical period of development with increased susceptibility to stressors; 3) exposure to exogenous stressors (sleeping on the stomach, overheating, secondhand smoke, etc.). This concept defines the need for a comprehensive approach to diagnosis, including an assessment of all potential risk factors.

In recent years, there has been a significant development in the methods of forensic diagnosis of sudden infant death. Along with traditional morphological research, molecular genetic, immunohistochemical, and toxicological methods are increasingly being used to identify previously unidentified causes of death. Special attention is paid to genetic testing to identify mutations associated with channelopathies and cardiomyopathies that may underlie fatal arrhythmias.

The introduction of standardized research protocols, such as the International Standardized Autopsy Protocol for Sudden Unexpected Infant Death, improves the quality of diagnosis and comparability of data from various centers. These protocols provide not only a detailed morphological examination, but also a thorough analysis of the circumstances of death, the collection of medical and social history, as well as a wide range of laboratory tests.

The forensic diagnosis of sudden infant death has not only medical, but also important social significance. Accurate determination of the cause of death prevents unreasonable suspicions about parents or guardians, promotes psychological adaptation of the family after a tragic loss and provides the basis for adequate genetic counseling in cases of hereditary pathology. This article presents an analysis of modern criteria for the forensic diagnosis of sudden infant death, taking into account the latest scientific evidence and international recommendations. The article considers the features of an integrated approach to the study of



such cases, including basic and additional diagnostic methods, differential diagnosis algorithms, as well as promising areas of development in this field of forensic medicine.

Conclusions: Further improvement of research protocols, standardization of approaches and the introduction of new diagnostic methods will improve the accuracy of forensic medical assessment of cases of sudden death of children and help reduce the frequency of such tragic events in the future.

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