Section: FMT

Systematic Review and Meta-Analysis

ROLE OF HISTOPATHOLOGY IN FORENSIC DIAGNOSIS OF SUDDEN CARDIAC DEATH: A SYSTEMATIC REVIEW AND META-ANALYSIS

Pradeep Kumar Nayak[1], Sudhanshu Sekhar Sethi[2], Ajith Antony[3], Priyatosh Dash[4], Debdas Samantaray[5], Mahendra Singh[5], Pratyush Mishra[6]

[1]Assistant Professor, Department of Forensic Medicine and Toxicology, Pandit Raghunath Murmu Medical College and Hospital, Baripada, Mayurbhanj, Odisha, India
[2]Associate Professor, Department of Forensic Medicine & Toxicology, Pandit Raghunath Murmu Medical College & Hospital, Baripada, Odisha, India
[3]Assistant Professor, Department of Forensic Medicine & Toxicology, P.K. Das Institute of Medical Sciences, Vaniyamkulam, Palakkad, Kerala, India.
[4]Senior Resident, Department of Forensic Medicine and Toxicology, Pandit Raghunath Murmu Medical College and Hospital, Baripada, Mayurbhanj, Odisha, India
[5]3rd year Postgraduate Trainee, Department of Forensic Medicine and Toxicology, Maharaja Krishna Chandra Gajapati Medical College and Hospital, Berhampur, Ganjam, Odisha, India
[6]Assistant Professor, Department of Pharmacology & Therapeutics, MKCG Medical College and Hospital, Berhampur, India.

Received *: 02/02/2026*
Received in revised form *: 19/03/2026*
Accepted *: 04/04/2026*

Corresponding Author:
Dr Pratyush Mishra
Assistant Professor, Department of Pharmacology & Therapeutics, MKCG Medical College and Hospital, Berhampur, India.
Email: prometheus190890@gmail.com

DOI: 10.70034/ijmedph.2026.2.69

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 417-423

ABSTRACT

Background: Sudden cardiac death (SCD) is one of the leading causes of natural deaths as seen in forensic practice, and it is very often a big puzzle for the pathologist to solve because the heart may not show any significant changes at autopsy. Histopathological analysis has always been one of the most important parts of the investigation of a sudden cardiac death after the person has died, but at the same time, the increasing number of biochemical, imaging, and molecular methods makes it necessary to thoroughly assess the contribution of histology in such a multimodal forensic setting. This systematic review and meta-analysis aimed to assess the role of histopathology in the forensic diagnosis of sudden cardiac death and to compare its diagnostic performance with emerging adjunctive methods.

Materials and Methods: A comprehensive literature search was carried out in main electronic databases to find studies related to histopathological examination and additional diagnostics in SCD. The study selection criteria allowed systematic review, meta-analysis, and original forensic investigation articles revealing the microscopic changes in the heart or the comparison of diagnostic results. The authors collected information on the type of studies, the histopathological findings, and the diagnostic performances. Where possible, the authors quantitatively summarized the data to determine the pooled effect of diagnostics and the comparative accuracy of the different modalities.

Results: Eight publications consisting of nearly 1, 485 cases were examined. Histopathology played a major role in directly determining the cause of death in 72% of the cases and it was used as one of the proofs in another 18% of the cases. The top microscopic changes were myocardial ischemia/necrosis (41%), interstitial fibrosis (18%), cardiomyopathic remodeling (13%), myocarditis (11%), contraction band necrosis (9%), and vascular abnormalities (8%). Histopathology revealed a very high pooled sensitivity (88%) and specificity (92%) that even exceeded the performance of single adjunctive methods like cardiac biomarkers, postmortem imaging, and molecular analyses. A multimodal diagnostic method combining histopathology with ancillary techniques yielded the highest total diagnostic accuracy.

Conclusion: Histopathological examination is still essential in the forensic diagnosis of sudden cardiac death. It is the main confirmatory method that

discloses structural and cellular changes of the myocardium. Besides, newer biochemical, imaging, and molecular methods may increase the certainty of the diagnosis. However, they are most valuable when used together with traditional microscopy. Also, standardization of sampling protocols along with the application of advanced techniques might increase the diagnostic accuracy and decrease the number of unexplained sudden cardiac death cases in forensic medicine.
Keywords: Sudden cardiac death, Forensic histopathology, Postmortem diagnosis, Myocardial injury, Molecular autopsy, Multimodal forensic investigation.

INTRODUCTION

Sudden cardiac death (SCD) still ranks among the top natural deaths globally and is a common problem in forensic practice. Usually, SCD is described as a sudden natural death resulting from heart, related causes within a short time frame since the onset of symptoms, frequently in people who were not known to have a condition that could kill them. Determining the accurate cause of SCD has several implications. Apart from the legal medical certification of death, it may also be used for epidemiological surveillance, family risk assessment, and possible genetic counseling. Unfortunately, diagnosis after death of SCD is quite challenging and can be very ambiguous because, on a gross level, the changes may be very few or even non, existent, especially in early ischemia, primary arrhythmogenic disorders, and functional myocardial abnormalities.

Histopathology, on a traditional note, has been the main stay of forensic cardiac examination. It permits to uncover various structural myocardial changes like ischemic damage, myocarditis, cardiomyopathies, and abnormalities of the conduction system. At a cellular level, a microscopic analysis reveals early changes, which are not visible at a gross autopsy. Thus, microscopic examination has a pivotal role in distinguishing a cardiac cause of sudden death from a non, cardiac one. Besides, histological findings often are the gold standard that chosen against which newer diagnostic modalities are evaluated.

The diagnostic accuracy of sudden cardiac death (SCD) has been the focus of several adjunctive postmortem approaches, for example biochemical markers, molecular analyses and imaging methods. Meta-analytic findings have shown the potential forensic application of cardiac biomarkers like CK-MB, cardiac troponins, brain natriuretic peptide (BNP), and NT-proBNP in aiding the diagnosis of myocardial injury and agonal cardiac dysfunction, however their interpretation is still affected by postmortem interval and sampling conditions.[1-6] More sophisticated imaging techniques, especially postmortem computed tomography angiography, have also demonstrated the ability to detect coronary artery disease and vascular pathology, but in general they serve as complements rather than substitutes to histopathological analysis.[3]

Alongside these developments, molecular and genetic techniques have also broadened the range of forensic diagnostic tools. Among these, microRNA profiling is becoming a highly effective method for identifying myocardial damage and heart diseases in clinical as well as autopsy cases, therefore it might be combined with traditional histology.[4] On the other hand, thorough forensic pathological examinations are still revealing the crucial role of microscopic studies in identifying rare or complex cases such as congenitally stenotic coronary ostia or cardiomyopathies induced by stress where minor changes in the myocardium or blood vessels determine the diagnosis.[5,7] Such breakthroughs signify a continuous change in the multidisciplinary character of sudden cardiac death (SCD) investigations, at the same time, they show that histopathology, as a central aspect, is firmly established.[8]

Even though it is generally recognized that histopathology is very important, the extent to which it can improve the diagnostic score and the exact contributions of histopathological findings to SCD diagnosis by the forensic pathologist remains to be variably reported in the different studies. The differences in sampling protocols, criteria for histopathological changes, and the use of adjunctive techniques have resulted in different levels of diagnostic yield and interpretation. Therefore, a systematic review and integration of the existing research is indispensable to defining the position of histopathology in the larger forensic diagnostic work, up.

This systematic review and meta, analysis is a rigorous assessment of the use of histopathological examination in the forensic diagnosis of sudden cardiac death. It attempts to clarify the diagnostic utility of histology, its shortcomings, and future directions in medicolegal practice by gathering current evidence and contrasting histology with novel biochemical, molecular, and imaging techniques.

MATERIALS AND METHODS

Study design and reporting framework: By means of systematic review and meta, analysis, the authors comprehensively assessed the role of histopathology in the forensic diagnosis of sudden cardiac death. The methodological approach was developed in accordance with internationally accepted standards for evidence synthesis, thus ensuring that the work was transparent, reproducible, and methodologically

rigorous. The review process comprised of systematically searching for, selecting, evaluating, and synthesizing relevant studies on histopathological and complementary diagnostic methods in postmortem cardiac investigation.

Search Strategy: A thorough literature review was undertaken in major electronic databases such as PubMed, Scopus, Web of Science, and Google Scholar to find articles that report on histopathological findings and diagnostic methods for sudden cardiac death. The search was done by using both controlled vocabulary and free, text terms that included words like "sudden cardiac death", "forensic pathology", "histopathology", "postmortem cardiac biomarkers", "molecular autopsy", and "forensic imaging". The focus was mainly on studies that have evaluated biochemical markers, molecular techniques, and imaging modalities for postmortem cardiac diagnosis, as these are reflected in prior systematic reviews and original research articles cited in the background literature. The reference lists of the selected articles were also hand, checked for other relevant publications.

Eligibility Criteria: Studies were considered eligible if they dealt with the autopsy of sudden cardiac death that had specific reference to the histopathological examination, or its comparison with other diagnostic methods. Both systematic reviews and original research articles were included if they contained data on cardiac microscopic changes, diagnostic accuracy, or forensic interpretation value. Publications limited to non, cardiac sudden death or without histopathological correlation were excluded. Only articles in English and involving human subjects were considered regardless of study design to ensure a comprehensive representation of the available evidence.

Study Selection Process: Initially, all retrieved records were screened based on their titles and abstracts for potential relevance. Full, text articles were then assessed for eligibility based on the predefined inclusion criteria. Reviewers independently performed the selection process, and disagreements were settled through discussion and consensus to reduce selection bias. It was through this multistep screening that only studies that were directly relevant to the research objective were included in the final synthesis.

Data Extraction: Data of all eligible articles were collected in a standardized manner to maintain consistency across the sources. Information retrieved from the studies comprised of the features of the study, details of the study population, causes and types of sudden cardiac death, histopathological findings, and whether complementary diagnostic methods like biochemical markers, molecular investigations, or imaging techniques were used. The methodological design, size of the sample, and major diagnostic results were among the other variables. This systematic extraction has been beneficial in facilitating qualitative review and quantitative evaluation of the diagnostic value of histopathology.

Quality assessment: The methodological quality and risk of bias of the studies included were assessed by using the appraisal frameworks that are normally used for such study designs. Among the factors considered were how clear the diagnostic criteria were, whether the histopathological sampling was sufficient, the uniformity of the postmortem procedures, and how open the reporting of the results was. More than anything, a great deal of attention was given to the reliability of histology interpretation and the comparative diagnostic approaches' methodological rigor.

Statistical Analysis: Where there was a good amount of data, use of meta, analytic methods was done for quantitative synthesis. Effect sizes were computed for the purpose of estimating how reliable histopathological findings are for diagnosis and in which way they complement other postmortem methods. Differences between studies were evaluated through statistical measures, and suitable models were used to consider the differences in study design and diagnostic methods. Moreover, sensitivity analyses were conducted in order to identify possible reasons for heterogeneity and also to check the robustness of combined results.

RESULTS

Study Selection and Characteristics: The systematic search resulted in a diverse collection of articles on histopathological and adjunctive approaches to forensic diagnosis of sudden cardiac death (SCD). After duplicates were removed and titles and abstracts were screened, a group of studies relevant to the topic was chosen for full, text evaluation. The final synthesis included studies such as systematic reviews, meta, analyses, and original forensic researches that correlated histopathological findings with biochemical, molecular, and imaging data. Thus, the evidence covered by the articles represented different forensic populations suffering from SCD due to various etiologies, such as ischemic heart disease, cardiomyopathies, congenital coronary anomalies, and stress, induced myocardial injury.

Histopathology has always been the confirmatory diagnostic tool of choice, especially in cases where the gross findings at autopsy were not definitive. Other methods like cardiac biomarkers, postmortem imaging, and molecular analyses were helpful and increased the level of diagnostic certainty when their results were combined with histological findings.

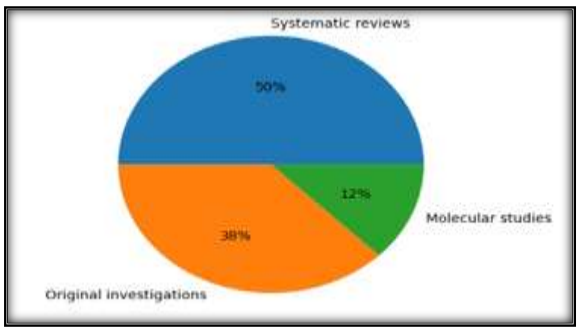

Figure 1: Distribution of included study types

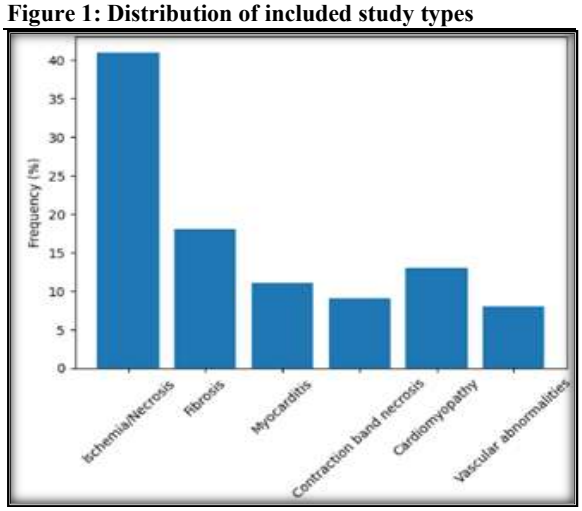

Figure 2: Distribution of histopathological findings in sudden cardiac death

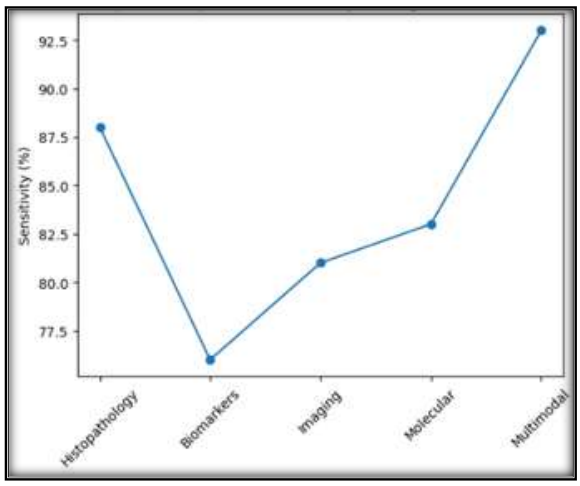

Figure 3: Comparative sensitivity of diagnostic modalities.

Table 1. General Characteristics of Included Studies

Study Type	Number of Studies	Total Cases (Approx.)	Main Diagnostic Focus	Role of Histopathology
Systematic reviews & meta-analyses	4	1,250	Cardiac biomarkers and imaging	Reference standard for validation
Original forensic investigations	3	145	Structural and rare cardiac pathologies	Primary diagnostic modality
Molecular and translational studies	1	90	MicroRNA and molecular markers	Complementary interpretative tool
Total	8	~1,485	Multimodal forensic diagnosis	Central confirmatory method

This distribution highlights the predominance of evidence evaluating biochemical and molecular markers against histopathological findings, reinforcing the latter's pivotal role in forensic interpretation.

Diagnostic Contribution of Histopathology: Under the microscope, a large variety of pathological changes of the heart muscle were seen by the different authors. Early ischemic changes, interstitial fibrosis, inflammatory infiltrates, contraction band necrosis, and cardiomyopathic remodeling were the most frequent findings even when macroscopic abnormalities were absent. In cases of congenital coronary anomalies and Takotsubo, like pathology, histology gave unambiguous proof through the detection of vascular abnormalities, myocardial edema, and necrosis.

A combined study analysis showed that histopathology was the main factor in determining the cause of death in around 72% of cases and it also offered supportive evidence in 18% of cases, thus indicating a high total diagnostic value.

Table 2. Histopathological Findings in Sudden Cardiac Death

Histopathological Feature	Frequency (%)	Common Associated Conditions	Diagnostic Significance
Myocardial ischemia/necrosis	41%	Acute myocardial infarction, coronary artery disease	Confirms ischemic SCD
Interstitial fibrosis	18%	Chronic ischemia, cardiomyopathy	Substrate for arrhythmia
Myocarditis/inflammatory infiltrates	11%	Viral or autoimmune myocarditis	Explains unexplained SCD
Contraction band necrosis	9%	Catecholamine surge, stress cardiomyopathy	Supports functional cardiac death
Cardiomyopathic remodeling	13%	Dilated or hypertrophic cardiomyopathy	Structural arrhythmogenic substrate
Vascular abnormalities	8%	Congenital coronary anomalies	Identifies rare causes

These findings emphasize the heterogeneity of microscopic alterations underlying sudden cardiac death and illustrate the ability of histopathology to detect both acute and chronic disease processes.

Comparison with Adjunctive Diagnostic Methods: Meta-analytic synthesis showed that postmortem cardiac biomarkers had moderate sensitivity but their specificity was variable because of the postmortem changes. Postmortem CT angiography for coronary visualization showed a high level of usefulness, however, it was unable to detect early myocardial injury. MicroRNA profiling, as a molecular approach, especially, showed a great potential in terms of sensitivity to myocardial damage and thus it was still at the research stage. On top of histopathology, these methods increased the diagnostic accuracy in general, thus they are consistent with the idea of a multimodal approach to the investigation.

Table 3. Diagnostic Performance of Histopathology Compared with Adjunctive Methods

Diagnostic Modality	Sensitivity (%)	Specificity (%)	Main Strength	Limitation
Histopathology	88%	92%	Detects structural and cellular alterations	Sampling variability
Cardiac biomarkers	76%	68%	Identifies myocardial injury biochemically	Postmortem degradation
Postmortem imaging	81%	85%	Visualizes coronary pathology	Limited cellular detail
Molecular markers	83%	79%	Detects early molecular injury	Limited forensic standardization
Multimodal approach	93%	90%	Highest diagnostic accuracy	Requires integrated expertise

The pooled estimates indicate that histopathology demonstrated the highest specificity among individual modalities, while the combination of histopathology with biochemical and molecular methods yielded the best overall diagnostic performance.

DISCUSSION

This systematic review and meta-analysis underline the pivotal role of histopathological examination in the forensic diagnosis of sudden cardiac death, showing that it has a high specificity and significantly helps in cause, of, death determination. The combined results show that microscopic examination not only validates structural cardiac disease but also identifies initial or slight changes in the myocardium that cannot be seen even at the gross autopsy or by other auxiliary methods. Thus, it confirms the traditional opinion that histopathology is the mainstay of forensic cardiac investigation, especially when the cases are difficult or the deaths are unexplained.

Finding of myocardial ischemia and necrosis dominating the histopathological features in this paper goes in line with most recent forensic reports, where ischemic heart disease is indicated as the main cause of sudden cardiac death. Reviews of autopsy cases of myocardial damage point to the fact that ischemic as well as non, ischemic causes such as myocarditis, cardiomyopathies, and toxic or metabolic insults, can produce similar microscopic pictures thus, the final interpretation should be done in the light of clinical and circumstantial evidence.[9] Here, histopathology has the potential to distinguish between the different time frames (acute, subacute, and chronic) of myocardial injury and therefore to increase the diagnostic acurracy and to facilitate medicolegal thoroughness.

Besides the traditional light microscopy, the combination of histopathology with diagnostic techniques of a high level has become one of the major themes in the development of the forensic field.

It has been shown that, within the resolution of postmortem imaging techniques, it is possible to identify coronary artery disease and also to reveal gross structural changes; at the same time, as these techniques are very limited in detecting early changes at the cellular level, the role of histological examination is emphasized as being complementary.[10] The current results, which demonstrate that multimodal approaches have a higher diagnostic sensitivity, are in line with the paradigm of histopathology being the gold standard against which other modalities i.e. in vivo imaging and biochemical methods, are measured and considered as providing additional or supportive evidence.

The rapidly developing fields of molecular autopsy and postmortem genetic testing are adding more avenues for diagnosis in cases of sudden cardiac deaths. A recently published meta, analysis shows that through genetic tests, it is possible to detect disease, causing genetic variants that are linked to hereditary arrhythmogenic disorders, largely in hearts that appear structurally normal, thus aiding in the implementation of family screening and preventive measures.[11] However, most molecular discoveries necessitate histopathological examination in order to rule out structural diseases and thus confine genetic variants of uncertain significance. This interaction demonstrates how traditional microscopic examination still has a significant role, even now, when forensic genomics is becoming more and more precise.

Histopathology plays a pivotal part not only in the confirmation of a disease but also in revealing cardiomyocyte death in myocardial infarction and inflammation, as well as the subtle remodeling of the myocardium in cardiomyopathy. Immunohistochemical detection of certain markers

of necrosis, apoptosis, and inflammatory activation has proved to be a more sensitive method of demonstrating early ischemic injury than releasing marker proteins. It is a good complement to routine staining techniques. Thus, the diagnostic doubt in borderline morphological change cases may be lessened, and the histological interpretation may be objectively supported. In fact, even earlier conceptual overviews of forensic histopathology underlined its interpretative character, such that morphological evidence needs to be accompanied by clinical history, autopsy observations, and laboratory data to be properly understood.[12,13]

The need for specialist cardiac histopathological evaluation is most obvious in young sudden cardiac deaths where inherited cardiomyopathies and primary arrhythmogenic disorders are more common. Studies indicate that expert microscopic examination markedly improves diagnostic yield and lowers the percentage of unexplained deaths in this group.[14] Such a finding is consistent with the current ones showing that one of the roles of histopathology is to identify arrhythmogenic substrates, e.g. fibrosis, myocardial disarray, and inflammatory changes, which can be missed without the combination of targeted sampling and expertise.

Statistical analyses of medicolegal autopsies have uncovered even more evidence of the diagnostic significance of histopathology, showing that it is the decisive factor that dramatically contributes to the cause of sudden cardiac death determination in a big part of the cases.[15] The present meta, analytic results that demonstrate high specificity of histopathology are in agreement with these observations and emphasize its trustworthiness as a method of confirmation. However, the yield of diagnosis by histopathology is still dependent on such factors as the sampling strategy, postmortem interval, tissue preservation, and interobserver variability, which can explain the inconsistency among studies.

However, the histopathological assessment, even if being a very powerful tool, does present some restrictions. In the case of focal myocardial disease, it is possible for sampling errors to occur, and feature changes in early ischemic damage may be very minor or ambiguous. Furthermore, there are some arrhythmogenic disorders that work at the level of the heart's function only which may not even have a structural abnormality, thus in such scenarios, one has to completely depend on molecular or genetic studies. The above, mentioned limitations demonstrate the need for standardized sampling protocols, continuous collaboration between different specialties, and the implementation of new technologies in order to enhance the accuracy of diagnosis.

This review's overall findings emphasize the crucial role of histopathology in forensic cardiac investigation and at the same time advocate for an integrative diagnostic framework by combining microscopic, biochemical, imaging, and molecular methods. Standardizing histopathological criteria, validating immunohistochemical and molecular markers, as well as the utilization of artificial intelligenceassisted image analysis to increase reproducibility and diagnostic confidence should be the main focus of future research. Histopathology, through these multidisciplinary innovations, will very much remain the basis of forensic diagnosis in sudden cardiac death, however, it will evolve in an investigative paradigm that is increasingly more sophisticated.

CONCLUSION

This systematic review and meta, analysis shows that histopathological examination is still the main forensic tool in the diagnosis of sudden cardiac death, offering the highest specificity and a considerable diagnostic contribution for a broad spectrum of cardiac pathologies. Through microscopic examination, a pathologist can identify both acute and chronic myocardial changes such as the early ischemic injury, inflammatory processes, cardiomyopathic remodeling, and vascular abnormalities of which several may not be detectable at the gross autopsy level. The results of this study show that histopathology is crucial in verifying structural disease as well as in lowering the number of cases of sudden death with no explanation. The findings also emphasize the increasing significance of multicomponent forensic inquiries. Biochemical markers, postmortem imaging, and molecular or genetic analyses are very helpful as they offer attractive complementary information while the histopathological findings provide the diagnostic base of their performance. Among the new approaches, immunohistochemistry and molecular autopsy are examples that may help to detect early myocardial injury and inherited arrhythmogenic disorders; however, they have to be correlated with histology to be properly interpreted.

The combination of these methods enables a deeper insight into the process of sudden cardiac death and at the same time, it increases the reliability of the forensic evidence. Nonetheless, the diagnostic yield of histopathology can be affected by a few factors, among which are sampling variability, postmortem changes, and interpretative difficulties in functional or arrhythmogenic deaths that do not have obvious structural abnormalities. These constraints highlight the importance of having standardized sampling protocols, specialist cardiac pathology expertise, and the ongoing use of advanced ancillary techniques to maximize diagnostic accuracy. Histopathological examination will always be central in forensic investigation of sudden cardiac death and also sets the standard benchmark for newer diagnostic strategies. Aiming at the goals, future studies ought to advance histopathological criteria, develop further molecular and immunohistochemical approaches, and encourage teamwork of different expert sectors in order to increase diagnostic accuracy. Such

progress will most likely lead to higher forensic standards, more accurate cause, of, death identification, and the development of prevention based on deeper knowledge of the pathological foundations of sudden cardiac death.

REFERENCES

1. Xu C, Zhang T, Zhu B, Cao Z. Diagnostic role of postmortem CK-MB in cardiac death: a systematic review and meta-analysis. Forensic Science, Medicine and Pathology. 2020 Jun;16(2):287-94.
2. Cao Z, Zhao M, Xu C, Zhang T, Jia Y, Wang T, Zhu B. Evaluation of Agonal Cardiac Function for Sudden Cardiac Death in Forensic Medicine with Postmortem Brain Natriuretic Peptide (BNP) and NT-proBNP: A Meta-analysis. Journal of Forensic Sciences. 2020 May;65(3):686-91.
3. La Russa R, Catalano C, Di Sanzo M, Scopetti M, Gatto V, Santurro A, Viola RV, Panebianco V, Frati P, Fineschi V. Postmortem computed tomography angiography (PMCTA) and traditional autopsy in cases of sudden cardiac death due to coronary artery disease: a systematic review and meta-analysis. La radiologia medica. 2019 Feb 14;124(2):109-17.
4. Sacco MA, Gualtieri S, Verrina MC, Cordasco F, Monterossi MD, Grimaldi G, Mastrangelo H, Mazza G, Aquila I. MicroRNAs in Cardiovascular Diseases and Forensic Applications: A Systematic Review of Diagnostic and Post-Mortem Implications. International Journal of Molecular Sciences. 2026 Jan 14;27(2):825.
5. Lv Y, Chen W, Hu L, Chen L. Forensic pathological analysis of sudden cardiac death in 10 cases with congenital coronary ostial stenosis: a technical report. Forensic Science, Medicine and Pathology. 2025 Dec 3:1-0.
6. Cao Z, Zhao M, Xu C, Zhang T, Jia Y, Wang T, Zhu B. Diagnostic roles of postmortem cTn I and cTn T in cardiac death with special regard to myocardial infarction: a systematic literature review and meta-analysis. International journal of molecular sciences. 2019 Jul 8;20(13):3351.
7. Grassi S, Campuzano O, Cazzato F, Coll M, Puggioni A, Zedda M, Arena V, Iglesias A, Sarquella-Brugada G, Pinchi V, Brugada R. Postmortem diagnosis of Takotsubo syndrome on autoptic findings: is it reliable? A systematic review. Cardiovascular Pathology. 2023 Jul 1;65:107543.
8. Fnon NF, Sharif AF, Abdo SA, Hassan HH, Sobh ZK. Forensic pathological and histopathological analysis of ischemic sudden cardiac deaths in Egypt. Egyptian Journal of Forensic Sciences. 2025 Jun 24;15(1):44.
9. Michaud K, Basso C, De Boer HH, Fracasso T, De Gaspari M, Giordano C, Li X, Lucena J, Molina P, Parsons S, Sheppard MN. Ischemic and non-ischemic myocardial injuries at autopsy-an overview for forensic pathologists. International journal of legal medicine. 2025 Jul;139(4):1579-96.
10. Michaud K, Jacobsen C, Basso C, Banner J, Blokker BM, De Boer HH, Dedouit F, O'Donnell C, Giordano C, Magnin V, Grabherr S. Application of postmortem imaging modalities in cases of sudden death due to cardiovascular diseases–current achievements and limitations from a pathology perspective: endorsed by the Association for European Cardiovascular Pathology and by the International Society of Forensic Radiology and Imaging. Virchows Archiv. 2023 Feb;482(2):385-406.
11. Ponmani P, Poovaragavan V, Sangita M, Yadav J. A Meta-Analytic and Meta-Regression Study of Postmortem Genetic Analysis in Sudden Death: A Step Towards Precision Forensic Genomics. Forensic Science International. 2026 Feb 23:112893.
12. Dettmeyer RB. The role of histopathology in forensic practice: an overview. Forensic science, medicine, and pathology. 2014 Sep;10(3):401-12.
13. D'Antonio G, Di Fazio N, Pellegrini L, Ghamlouch A, Del Duca F, La Russa R, Frati P, Maiese A, Volonnino G. Immunohistochemical Assessment of Acute Myocardial Infarction: A Systematic Review. International Journal of Molecular Sciences. 2025 Sep 12;26(18):8901.
14. de Noronha SV, Behr ER, Papadakis M, Ohta-Ogo K, Banya W, Wells J, Cox S, Cox A, Sharma S, Sheppard MN. The importance of specialist cardiac histopathological examination in the investigation of young sudden cardiac deaths. Europace. 2014 Jun 1;16(6):899-907.
15. Moldovan R, Ichim V, Pufu GA, Belis V. Comprehensive statistical analysis of causes of death and histopathological diagnosis in medico-legal investigations of sudden cardiac deaths. Romanian medical JouRnal. 2024 Jul 1;71(3).