

# Autopsy Findings of Myocardium in Correlation with Coronary Arteries in Cases of Sudden Cardiac Deaths

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## Abstract

**Background:** The most common autopsy findings in cases of sudden and unexpected deaths are cardiac wall and coronary artery changes. Therefore, cardiac autopsy is conducted to study various histomorphological changes in normal and diseased heart, as it remains the main diagnostic tool.

**Aims:** The aim of the study is to find the changes in cardiac wall as well as coronary arteries in all postmortem received hearts in different age groups.

**Materials and Methods:** A retrospective study of 216 postmortem hearts received from August 2020 to February 2022 in the Department of Pathology, GMERS Medical College, Sola, and Sola Civil Hospital, Ahmedabad.

**Results:** There are discrepancies in findings of heart wall in correlation with coronary artery findings. The age group of 3–39 years shows 9 discrepancies (9%), age group of 40–59 shows 6 discrepancies (7.4%) while there is no any discrepancy in the age group of 60–99.

**Conclusion:** During macroscopic and microscopic examination of a postmortem hearts, it is particularly important to discover the causes of the wall and artery changes effectively for the proper identification of cause of the death.

**Key words:** Autopsy, Cardiac wall, Coronary artery

## INTRODUCTION

Cardiovascular disease continues to be the most common cause of sudden and unexpected deaths.<sup>[1]</sup>

Despite advances in therapy, mortality rates remain high, with annual rates of 10–20% in patients with moderately severe-to-severe failure. Sudden unexpected death constitutes 30–50% of all deaths.<sup>[2]</sup>

Therefore, cardiac autopsy is conducted to study various histomorphological changes in normal and diseased heart, as it remains the main diagnostic tool.<sup>[3,4]</sup>

Coronary artery disease, ischemic heart disease, cardiomyopathy, valvular heart disease, and congenital heart disease can be the possibilities of sudden cardiac death. These diseases are frequently concealed and discovered with postmortem by means of a thorough macroscopic and microscopic investigation.<sup>[5,6]</sup>

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## MATERIALS AND METHODS

The study was done from August 2020 to February 2022 in the Department of Pathology, GMERS Medical College, Sola, and Sola Civil Hospital, Ahmedabad.

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This study included a total of 216 postmortem hearts received in the department of pathology.

### Inclusion Criteria

All postmortem hearts received in the pathology department were included in the study.

### Exclusion Criteria

All postmortem hearts which were autolyzed ( $n = 22$ ) were excluded from the study.

The following variables were considered: Sex, age, medical history, and autopsy findings to macroscopic and histological evaluation of the heart. The autopsies were performed according to standard techniques. In all subjects, the heart was dissected and grossed following standard autopsy protocol.

Heart tissue sections were processed and stained with hematoxylin and eosin and reviewed by pathologist.

For sake of analysis, patients were divided in the age groups of <2 years, 3–39 years of young adults, 40–59 years group of middle-aged adults, and 60–99 years group of old adults.

## RESULTS

A total of 216 postmortem hearts were received in autopsy section of pathology department, out of which 22 autolyzed postmortem hearts were excluded from the study.

The hearts of remaining 194 postmortem hearts were examined and taken into consideration.

As Table 1 shows, age group 3–39 years comprise maximum number of autopsies ( $n = 90$ ) followed by age group 40–59 years ( $n = 81$ ) and lastly age group 60–99 years ( $n = 23$ ).

**Table 1: Age group wise distribution**

Age group	No. of autopsies (%)
3–39	90 (46.39)
40–59	81 (41.75)
60–99	23 (11.85)
Total	194

**Table 2: Findings in heart wall according to age group**

Age group	Fibrosis	Myocardial infarction	Old myocardial infarction	Hypertrophic cardiomyopathy (hocm)	Carditis	Rheumatic heart disease (rhd)	Discrepancy in findings of cardiac wall in correlation with coronary arteries	Normal	Total
3–39	1	13	10	6	12	1	9	38	90
40–59	1	37	11	8	2	0	6	16	81
60–99	1	11	5	2	2	0	0	2	23

As per Table 2, there are discrepancies in findings of heart wall in correlation with coronary artery findings. The age group of 3–39 years shows 9 discrepancies (9%), age group of 40–59 shows 6 discrepancies (7.4%) while there is no any discrepancy in the age group of 60–99.

Among nine cases of discrepancies in the age group of 3–39 years, there are five cases in which coronary arteries show mild atherosclerosis while heart walls show change of myocardial infarction. There are four cases in which there are no significant findings in coronary arteries still heart wall shows changes of myocardial infarction.

Among six cases of discrepancies in the age group of 40–59 years, there are four cases in which coronary arteries show mild atherosclerosis or normal histology while heart walls show change of myocardial infarction. There are two cases in which coronary arteries show severe atherosclerosis still there are no changes in cardiac wall.

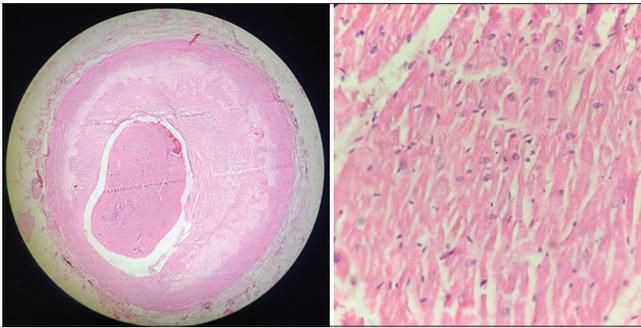
In the age group of 60–99 years, there are not any discrepancies in findings of heart wall in correlation with coronary arteries.

## DISCUSSION

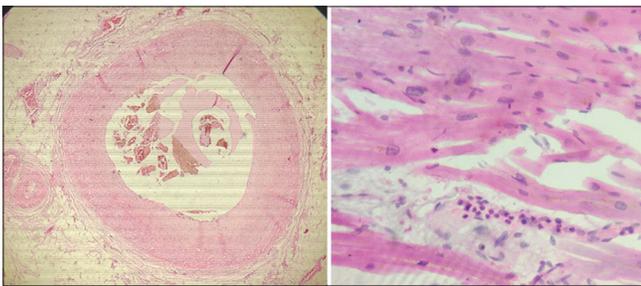
The objective of this study is to correlate heart wall and coronary arteries findings. Our study reports on the largest autopsy cohorts of individuals with sudden death due to myocardial infarction in which the postmortem was performed following a standardized protocol. Most deaths occurred at rest, although almost half of the decedents reported cardiac symptoms.

Apart from myocardial infarction, other findings are myocardial fibrosis, hypertrophic cardiomyopathy, myocarditis, old healed myocardial infarction, and rheumatic heart disease. There are also cases in which there is no significant coronary artery or heart wall changes.

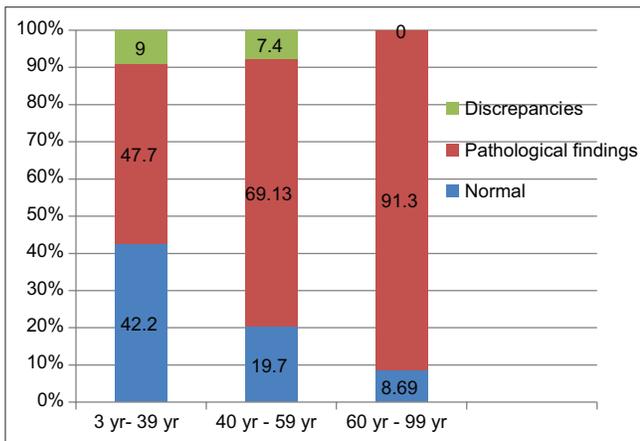
In the age group of 3–39 years, there are 38 cases (42.2%) in which heart shows normal histology, while the age group



**Figure 1: Normal cardiac wall findings with severe coronary artery atherosclerosis**



**Figure 2: Changes of myocardial infarction in cardiac wall with normal coronary artery**



**Graph 1: Age group wise distribution of cardiac wall findings**

of 40–59 years shows 16 and age group of 60–99 years shows two cases of normal cardiac histology. In these cases, cause of death can be homicidal, due to respiratory failure, poisoning, genetic anomalies, severe infections, or malignant diseases.

In our study, the age group of 3–39 years suggests more discrepancies in heart wall corresponding to coronary artery findings (Graph 1).

The pathogenetic mechanism of myocardial infarction with normal coronary artery remains unknown. It has been concluded that coronary artery spasm may initiate myocardial infarction but only in one-third of such

patients. Spasm associated with alcohol intake as well as prothrombotic state and endothelial damage related to cigarette smoking may be mechanisms leading to myocardial infarction in these cases.

There are few cases in which we found that there is severe atherosclerosis in coronary arteries but still there are no significant changes in cardiac wall. By taking a history of such cases, we have found that these decedents had a history of COVID-19 months ago.

A study by Roshdy *et al.*<sup>[7]</sup> highlighted that the most important finding is the intracardiac, coronary arterial, and venous thrombosis which may be explained by COVID-19-associated coagulopathy. Myocardial ischemia can be aggravated by preexisting coronary artery disease and myocardial supply-demand mismatch.

Figures 1 and 2 show discrepancy in cardiac wall in correlation with coronary artery.

## CONCLUSION

Myocardial infarction without significant coronary artery changes is a syndrome with several causes. An accurate and appropriate diagnostic work-up is essential for early identification of cause in each individual patient, and in young population, it is necessary to know avoidable and treatable causes for the prevention of cardiac wall changes.

During macroscopic and microscopic examination of a postmortem hearts, it is particularly important to discover the causes of the wall and artery changes effectively for the proper identification of cause of the death.

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