

# Postmortem Study of Histopathological Lesions of Heart in Cases of Sudden Death - Incidental Findings.

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## ABSTRACT

**Background:** According to the World Health Organization, definition of sudden death is of death within 24 hours from the onset of symptoms, but this time is too long for many clinicians and pathologists: some of them accept death only within one hour from the onset of illness. We aim to determine the histopathological lesions of heart in cases of sudden death. **Methods:** The study was conducted in the department of Pathology, Government Medical College, Patiala. Heart specimens were collected from 160 cases as part of examination of multiple viscera, over a period of three years from 2013-2017. Only those cases which were well preserved were taken up for study. Sections from representative area were submitted for processing, sectioned and stained with Hematoxylin and Eosin stain. **Results:** Out of a total of 160 cases, 79 cases showed atherosclerosis, 58 cases showed features of myocardial hypertrophy, myocardial infarction was found in 29 cases, 4 cases showed fatty streaks and 2 cases each showed myocarditis and cardiomyopathy. In 40 cases, there were no remarkable changes. **Conclusion:** It was concluded that myocardial infarction due to atherosclerotic ischaemic heart disease is probably the commonest diagnosis made in majority of cases of sudden death subjected to medicolegal autopsies. Histopathological findings must be evaluated with great attention to identify cause in cases of sudden death.

**Keywords:** Sudden death, Atherosclerosis, Myocardial infarction, Medicolegal autopsy

## INTRODUCTION

According to the World Health Organization, definition of sudden death is of death within 24 hours from the onset of symptoms, but this time is too long for many clinicians and pathologists, some of them only accept death within one hour from the onset of illness

Although extracardiac causes may be involved in this process, it is assumed that causes of sudden natural death (SND) are mainly related to cardiovascular events. Most common definition of Sudden Cardiac Death (SCD) is any near instantaneous, electrically based cessation of cardiac output in individuals with otherwise uncompromised circulatory function.<sup>[1]</sup> Incidence of sudden cardiac death (SCD) has been steadily increasing all over the world particularly in the urban population during last five decades. In India, studies have reported increasing Coronary heart disease (CHD) prevalence over the last 60 years, from 1% to 9%-10% in urban

populations and <1% to 4%-6% in rural populations.<sup>[2]</sup>

It is a very difficult and challenging task for the forensic physician, conducting the autopsy, to ascertain cause and nature of death in a previously healthy individual.<sup>[3,4]</sup> One difficulty which is mostly encountered in sudden unexpected deaths, whether cardiac or no cardiac, is the lack of precision of collecting antecedent factors involved within the 24-hours duration prior to death.<sup>[5]</sup>

The main objective of a medicolegal autopsy is to determine cause and manner of death and these autopsies help to reveal important data for public prosecutors.

Ischemic heart disease is the leading cause of death worldwide for both men and women. Many times it has been seen that when gross pathology could not help to evaluate the cause of death, the histology came forward to rescue the situation and a conclusive opinion could be given on the involved cardiac pathology.<sup>[6,7]</sup>

## MATERIALS AND METHODS

The present study was a retrospective study carried out in the Department of Pathology, Government Medical College, Patiala during the period of three years from 2013 - 2017 . Only those cases which

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were well preserved were taken up for study. Total of 160 specimens of heart from medicolegal autopsies were included in the study. Detailed history and post-mortem findings of all cases were collected.

The post-mortem gross examination of the heart included measurement of the thickness of the walls of the left and right ventricles and the interventricular septum. The weight of heart was recorded. The valves were checked for stenosis and calcification. The ascending aorta was checked for dilatation, thickening or atherosclerotic change. Regions of either old or recent myocardial ischemia were checked and their location and size were noted. Finally, the coronary arteries were examined using regular sections every 4-5 mm. Their course was traced along with any thickening, atheromatous lesions and stenosis.

For the histopathological examination of the heart, representative sections were taken from the right and left ventricular walls, the interventricular septum, as well as multiple sections from the coronary vessels. In addition, sections were taken from any regions with suspected pathological lesions.

All sections were stained with routine Haematoxylin and Eosin staining and examined under light microscope. The findings of the examination were recorded and analysed.

## RESULTS

**Table 1: Age wise incidence of all the cases**

Age group (years)	No. of patients	Total (%)
0-10	02	1%
10-20	00	0%
21-30	23	14%
31-40	27	17%
41-50	39	24%
51-60	38	24%
61-70	22	14%
71-80	08	5%
81-90	01	1%
Total	160	100%

**Table 2: Sex wise distribution of all the cases**

	Male	Female	Total
No.	101	59	160
Percentage	63%	37%	100%

**Table 3: Histopathological findings**

Histopathology	No. of cases	Percentage
Atherosclerosis	79	49%
Myocardial hypertrophy	58	36%
Myocardial infarction	29	18%
Fatty streaks	4	2%
Myocarditis	2	1%
Cardiomyopathy	2	1%
Unremarkable changes	40	25%

**Table 4: Type of coronary vessels involved in 79 cases of atherosclerosis**

LCA	RCA	LADA	Total
48 (60%)	12 (15%)	19 (25%)	79

**Table 5: Number of coronary vessels involved in 79 cases of atherosclerosis**

Three	Two	Single	Total
02 (3%)	12 (15%)	65 (82%)	79

**Table 6: Atherosclerosis with secondary changes in coronary vessels**

Findings	No. of cases (79)	Percentage
Atherosclerosis only	53	67%
Atherosclerosis with calcification	21	27%
Atherosclerosis with haemorrhage	02	2%
Atherosclerosis with thrombosis	03	4%

**Table 7: Types of myocardial infarction**

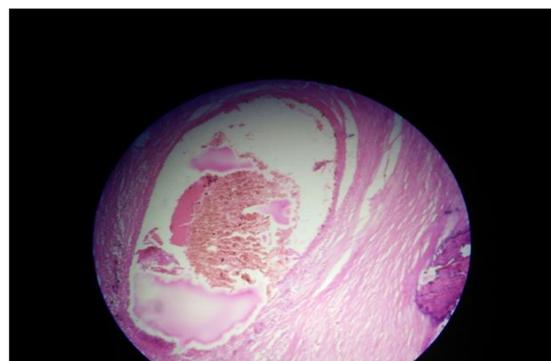
Myocardial infarction	No. of cases (29)	Percentage
Old showing fibrosis	27	93%
Recent evidence	2	7%

**Table 8: Types of myocardial hypertrophy (out of 58 cases)**

Myocardial hypertrophy	No. of cases
LVH	50 (86%)
RVH	2 (4%)
LVH+RVH	6 (10%)

**Table 9: Two cases of cardiomyopathy**

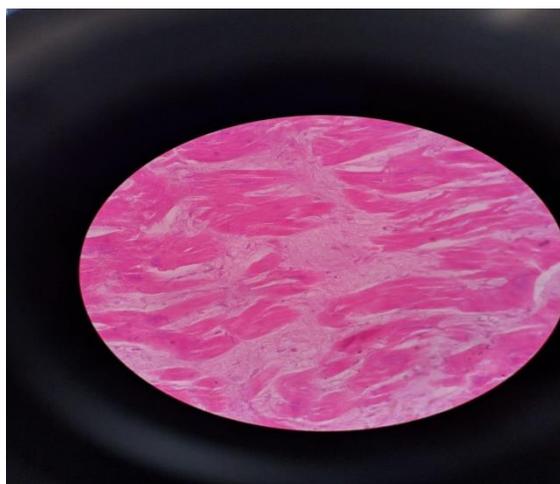
Type of cardiomyopathy	No. of cases
Dilated	1
Restrictive	1



**Figure 1: Photo micrograph showing complicated atheromatous plaque with narrowing of lumen with haemosiderin laden macrophages and calcification (H and E stain, 100x)**



**Figure 2: Photo micrograph showing hypertrophy of myocytes with fibre thickening and change of the nuclei from spindle to "box-car" like. (H and E stain, 400x)**



**Figure 3: Photo micrograph showing a well healed myocardial infarct with replacement of necrotic fibres by fibrosis (H & E stain, 400x)**



**Figure 4: Cut section of the left ventricular wall showing increased thickness**

## DISCUSSION

In a significant proportion of sudden cardiac deaths (SCDs), the pathologist may observe findings that are relatively common in the general population, or findings that partially fulfil diagnostic criteria for structural cardiac disease, leaving uncertainty about causality and management of surviving relatives.

In the present study, maximum number of cases were seen in age group 41-50 (24%) years. Similar findings were reported by Joshi C,<sup>[8]</sup> Ramazan Karanfil et al.<sup>[9]</sup> and Stavroula A et al.<sup>[10]</sup>

In adults, sudden cardiac death (SCD) is a complication and often the first clinical manifestation of ischaemic heart disease. With decreasing age of the victim, the non-atherosclerotic causes of sudden cardiac death like congenital coronary arterial abnormalities, premature coronary artery disease, cardiomyopathies, mitral valve prolapse and myocarditis become increasingly probable.

In the worldwide, sudden cardiac death occur dominantly in males. In present study also, males were 63% while 37% were females. The male dominance was reported by other authors also. Joshi C,<sup>[8]</sup> reported 85.21% males and 14.78% females, Ozdemir B et al,<sup>[11]</sup> reported 73% males and 27% females Men are at significantly increased risk of

myocardial infarction than women, however the differential declines with advancing age. Women are protected against myocardial infarction during the reproductive years. The decrease of oestrogen following menopause can permit rapid development of coronary artery disease and ischaemic heart disease is the overwhelming cause of death in elderly women.<sup>[14]</sup>

Coronary atherosclerosis was most common histopathological finding in the present study in 67% of cases. Similar findings were reported by Joshi C,<sup>[8]</sup> (65%), Karanfil R et al.<sup>[9]</sup> (75%) and Drory Y et al.<sup>[12]</sup> (58%). In more than 90% of cases, the cause of myocardial ischaemia is reduction in coronary blood flow due to atherosclerotic coronary arterial obstruction.<sup>[15]</sup> Atherosclerosis with calcification was present in 27% cases in this study, whereas with thrombosis was present in 4% of cases. Joshi C,<sup>[8]</sup> reported calcification in 17% cases and thrombosis in 5% cases. Ozdemir B et al,<sup>[11]</sup> reported coronary thrombosis in 4.8% cases. Patients with advanced coronary atherosclerotic calcification appear to be at increased risk for coronary events. Thrombus formation is the most feared complication of atherosclerosis and may partially or completely occlude the lumen.<sup>[16]</sup>

In the present study, major blockage was noted in left coronary artery (LCA) 48 cases (60%), left anterior descending artery (LADA) 19 cases (25%) and right coronary artery (RCA) 12 cases (15%). Rao DS,<sup>[5]</sup> reported 24 (11.8%) cases with major blockage in both main coronaries, in 87 (42.6%) cases in LADA and in 18 (51.5%) cases in RCA.

The next common lesion in present study was myocardial hypertrophy in 36% cases. In literature, myocardial hypertrophy was reported by Ozdemir B et al.<sup>[11]</sup> (17%), Joshi C,<sup>[8]</sup> (52%) and Karanfil R et al,<sup>[9]</sup> (66%).

Out of 58 cases of myocardial hypertrophy, 86% showed LVH, 4% showed RVH and 10% showed LVH+RVH as compared to 37%, 2% and 61%, respectively in a study by Joshi C.<sup>[8]</sup>

Myocardial infarction was present in 18% cases, similar findings were reported by Joshi C,<sup>[8]</sup> (28%), Ozdemir B et al.<sup>[11]</sup> (26%).

In the present study, recent myocardial infarction was seen in 7% cases of infarction and old myocardial infarction with fibrosis in 93% of myocardial infarction as compared to 45% and 55%, respectively in a study by Joshi C.<sup>[8]</sup> Rao DS,<sup>[5]</sup> reported 24.0% recent and 27.0% old infarcts.

In present study, myocarditis was found in 1% of cases in contrast to 9% cases in a study by Joshi C,<sup>[8]</sup> Ozdemir B et al.<sup>[11]</sup> (7%).

## CONCLUSION

In present study, it was concluded that the most frequent lesion in the study of histopathological lesions of heart was atherosclerosis. Atherosclerosis

was the main cause of myocardial infarctions and sudden death. In sudden deaths, cause of death can be determined by autopsy but routine autopsy procedure is not sufficient and underscores the need for accurate interpretation of autopsy findings in cases of SCDs. So in medicolegal autopsies, especially for sudden death, it is proposed that every possible organ must be sampled for histopathological examination and must be evaluated with a multidisciplinary approach (scene investigation, medical history, biochemical, microbiological, toxicological, etc.). When sudden death occurs in adults and elderly persons, coronary atherosclerosis is the usual cause, but in young sudden death may occur due to congenital and acquired cardiovascular diseases. Molecular studies are required for these cases.

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