



CORONARIES AND MYOCARDIAL CHANGES IN SUDDEN CARDIAC DEATH OF YOUNG PATIENTS – AN AUTOPSY STUDY

Pathology

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ABSTRACT

Sudden cardiac death refers to an unexpected natural death due to cardiac causes occurring within a short time frame, often within an hour of symptom onset. The incidence of SCD in young adults is increasing, significantly impacting families and society. While coronary heart disease, cardiomyopathies, and congenital anomalies contribute to SCD, the exact pathological mechanisms remain underexplored. Autopsy studies improve understanding of myocardial and coronary changes. **Objectives-** To analyses coronary and myocardial changes in young SCD patients, to study the grading of atherosclerosis in relation to myocardial infarction and to determine the male-to-female ratio in SCD cases. **Methodology-** A retrospective cross-sectional autopsy study was conducted at BJGMC Pune, from January 2023 to 2025. Autopsy reports of individuals aged less than 35 years who succumbed to SCD were analyzed. Data collection included patient

ventricular surface fat and thickness of fat at base of right coronary artery, apparently dominant artery, coronary atherosclerosis, thrombosis, occlusion and its site from origin of vessel, state of coronary ostia, recent/old infarcts along with their size and location.

The coronary arteries examined by senior pathologist by taking transverse cuts at 2-3 mm intervals. The lesions of atherosclerosis were visually graded as (by the guidelines of White and Edwards's method¹¹):

- **Grade I** - Artery appeared grossly normal but had microscopic findings of atherosclerosis.
- **Grade II** - Thickening of vessel wall with 25 to 50% narrowing of lumen.
- **Grade III**- Thickening of vessel wall with 50 to 75% narrowing of lumen.
- **Grade IV** - Thickening and calcification with more than 75% narrowing of lumen.

Coronary artery dominance was also be noted by checking the origin of posterior descending branch from either right or left artery. Representative sections were taken from all coronary arteries. The hearts opened by modified Virchow's method following the direction of blood flow were investigated. All the chambers were washed off any blood clots and examined for any pathology of valves or endocardium. Thickness of ventricular walls and interventricular septum were also measured.

The sections were taken from coronaries, ventricles and the areas of infarct. These were stained with haematoxylin and eosin and were examined under light microscope.

All the data from autopsy reports and pathology department were collected, including every above parameter.

Statistical Analysis: Data was tabulated and documented properly in Microsoft Excel. Then a descriptive analysis was performed by a statistical software SPSS version 11.0 and graphs, pie charts and other data handling figures will be drawn by Microsoft Excel 2013.

Pearson Chi-square tests or if any cell data value was <5, Fishers exact tests was used to analyze the differences in the proportions of the main pathogenic causes and the differences in the distributions of pathological changes in the 3 branches of coronary artery and other important arteries according to age

Myocardium Hypertrophy and 13 cases involving myocarditis. 16 patients also had cardiomyopathy. Anterior wall (24 cases) and lateral wall (23 cases) had maximum number of infarcts present, most of which were acute infarct (24 cases).

DISCUSSION

In our study, all cases of sudden cardiac deaths below the age of 35 years from the month of January 2023 to the month of January 2025 were included and a total of 132 cases were studied. Maximum number of cases were of the age group 30-35 yrs (37.8%). The proportion of males (73%) in study was significantly higher than that of females (27%). The same proportion was revealed in various studies^[12-14] of sudden cardiac deaths conducted across globe, indicating that it is more common in males as compared to the females.

Majority of the victims had LAD (left anterior descending) involvement (106 cases) followed by RCA (Right coronary artery) (96 cases) and LCx (left circumflex artery) (84 cases). Various other studies^[15] also revealed maximum involvement of LAD, indicating its important role in cases of SCD (sudden cardiac deaths). Triple vessel disease was most common cause and various studies also indicated the same pattern of involvements.^[16-21] Most frequent percentage occlusion were 60% followed by 40%. Similar study^[22] reveals the same occlusion pattern in young adults.

Coronary atherosclerosis has been the main culprit of SCD. Most common grade of atherosclerosis was Grade 2 followed by Grade 1 and Grade 4. Similar study^[23] also reveals same pattern. Examination of myocardium in cases of sudden coronary deaths revealed changes of myocardial infarction, including 24 cases of Acute MI and 13 cases of Healed MI. Anterior wall was most common site of infarct (24 cases) followed by lateral wall (23 cases) and posterior wall (12 cases), with least cases in interventricular septum (5 cases).

A wide variety of non-atherosclerotic related cardiac diseases have also been associated with SCD including cardiomyopathies (16 cases), coronary artery diseases (8 cases), myocarditis (13 cases) and pericarditis (8 cases), also presented in other few studies^[1, 23]. Even though disease can be attributed to coronary heart disease or structural heart disease, many cases of SCD remain unexplained indicating

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