



SPECTRUM OF HISTOPATHOLOGICAL FINDINGS IN THE HEART IN CASES OF SUDDEN DEATH: AN AUTOPSY STUDY IN A TERTIARY CARE HOSPITAL

Histopathology

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ABSTRACT

Sudden death in adults without any past history of chronic illness are increasing world over and is an issue of concern for medical professionals. World health organization defines sudden death as "death within 24 hours from the onset of symptoms". This study was planned to observe various histomorphological cardiac changes in patients on autopsy who died with sudden death of cardiac etiology. A total of 100 autopsy cases were analysed. Gross and microscopic findings on H&E stained sections were studied in detail. There was male predominance among the cases studied and the maximum number of deaths were seen in the age group 41-50 years. Incidence of sudden death was predominant in rural population (58%) as compared to urban population. Coronary atherosclerosis was most common histopathological finding in the present study seen in (55%) of cases followed by myocardial hypertrophy (40%) of cases and myocardial infarction (17%) cases. Grade IV lesions (34.5%) were most commonly found based on The Modified AHA Classification of atherosclerosis. Non atherosclerotic conditions associated with sudden death seen were myocarditis (2%), cardiomyopathy (2%) and metastases (1%). No specific findings were found in 38 cases. Histopathological studies provide the most accurate clues to a better understanding of human cardiovascular diseases. Atherosclerosis was the main cause of myocardial infarctions and sudden death in adults and its grading is the need of the hour to estimate the disease burden.

KEYWORDS

Autopsy, Sudden death, Heart, Histopathology

INTRODUCTION

Sudden cardiac death (SCD) is progressively threatening the lives of young people throughout the world and is an issue of concern for medical professionals. Incidence of sudden cardiac death has been steadily increasing all over the world.^(1,2) The annual incidence of SCD is three to four times higher in men than in women.⁽³⁾ As per World Health Federation 35% of all deaths are caused by cardiovascular disease in India.

World Health Organization has defined sudden death as death occurring within 24 hours from the onset of symptoms. According to other authors death within 1 hour or less from the onset of symptoms is sudden death. The occurrence of sudden death presents a great challenge to the general autopsy pathologist and cardiac autopsy is the main diagnostic tool to study various histomorphological changes in normal and diseased heart. 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. These autopsies may be a valuable source for epidemiological information in addition to providing valuable information to the deceased's immediate family.⁽⁴⁾

MATERIAL AND METHODS

This prospective study was carried out in the Department of Pathology Government Medical College Amritsar, tertiary care center. A total of 100 autopsy cases were analysed with history of sudden cardiac death. The heart was fixed in 10% formalin, weighed, externally examined and was dissected within 12-24 hours of fixation using standard autopsy protocol for heart grossing.

Autolysed samples were excluded from the study. For the histopathological examination of the heart, representative sections were taken from the anterior, lateral and posterior left ventricular wall, sections from right ventricular wall as well as multiple sections from the coronary vessels.

In addition, sections were taken from any regions with suspected pathological lesions. All sections were routinely processed and stained with Haematoxylin and Eosin staining.

RESULTS

Table 1: Association Of Sudden Death Cases With Age And Gender

AGE GROUP (in years)	MALES		FEMALES		Total
	Urban	Rural	Urban	Rural	
16-20	4	0	3	1	8
21-30	11	5	2	2	20
31-40	8	12	0	0	20
41-50	6	10	0	7	23
51-60	4	8	0	5	17
61-70	2	4	2	0	8
>70	0	2	0	2	4
Total	35	41	7	17	100
p-value	0.070		0.016*		

Table 2: Spectrum Of Histopathological Findings In The Heart

Pathological findings	Frequency (N)	Percentage (%)
Cardiomyopathy	2	2.0
Granulomatous Myocarditis	1	1.0
Myocardial Hypertrophy	40	40.0
Lymphocytic Myocarditis	1	1.0
Metastasis	1	1.0
Myocardial Infarction	17	17.0
Coronary Atherosclerosis	55	55.0
No specific finding	38	38.0

Table 3: Atherosclerosis Cases-grading According To Modified Aha Classification

Atherosclerosis Grade	No. of cases	Percentage (%)
Grade I - Isolated intimal foamy cells (minimal change)	0	0
Grade II - Numerous intimal foamy cells in layers (fatty streaks)	2	3.6
Grade III - Pools of extracellular lipids without a well defined core (preatheroma)	17	30.9
Grade IV - Well defined lipid core with luminal surface covered by normal intima (atheroma)	19	34.5
Grade V - Lipid core with fibrous cap with or without calcification (fibro-atheroma)	4	7.2
Grade VI - Fibro-atheroma with cap defects hemorrhage and thrombosis	4	7.2
Grade VII - Calcification prominent	9	16.3
Grade VIII - Fibrous change prominent	0	0
TOTAL	55	100

Table 4: Association Of Atherosclerosis With Gender

Gender	ATHEROSCLEROSIS		Total	P value
	PRESENT	ABSENT		
Male	43	33	76	0.572
Female	12	12	24	
Total	55	45	100	

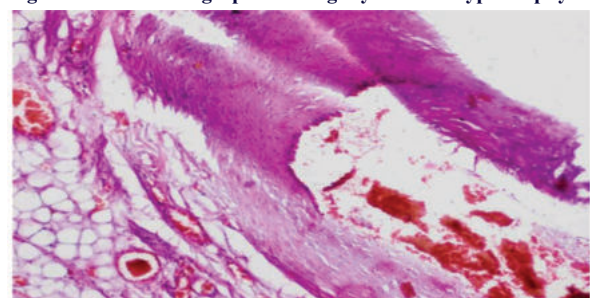
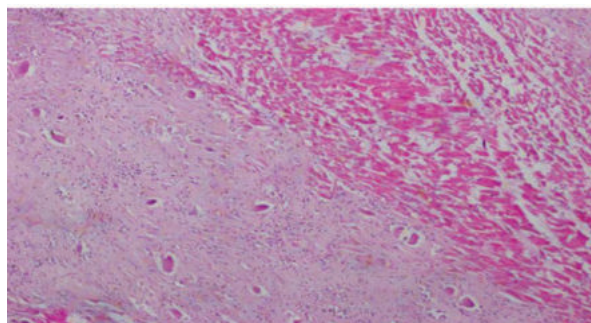
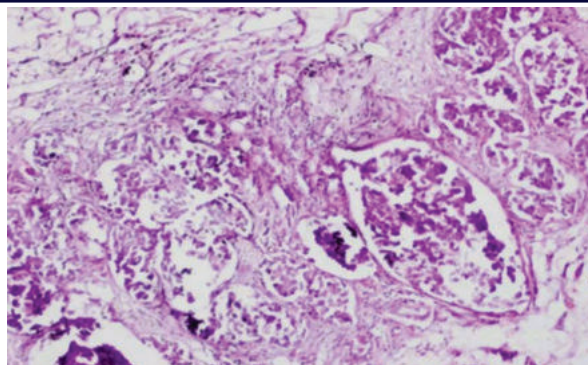
Table 5: Association Of Atherosclerosis With Age

Age Group in years	ATHEROSCLEROSIS		Total	P value
	Present	Absent		
16-20	1	7	8	0.032*
21-30	8	12	20	
31-40	10	10	20	
41-50	16	7	23	
51-60	13	4	17	
61-70	4	4	8	
>70	3	1	4	
Total	55	45	100	

* : statistically significant

Table 6: Distribution Of Heart Weight Among Study Subjects

WEIGHT (in gms)	MALES		FEMALES		TOTAL
	URBAN	RURAL	URBAN	RURAL	
150-300	15 (48.3%)	10 (22.2%)	8 (72.7%)	3 (23.07%)	36
301-450	13 (41.9%)	23 (51.1%)	3 (27.2%)	9 (69.2%)	48
451-600	02 (6.45%)	9 (20%)	0	1 (7.69%)	12
>600	01 (3.22%)	3 (6.6%)	0	0	4
TOTAL	31	45	11	13	100

**Figure 1: Gross Photograph Showing Myocardial Hypertrophy****Figure 2: Microphotograph of coronary artery showing Atheromatous Plaque demonstrating fibrous cap and central necrotic core (H & E 40x)****Figure 3: Granulomatous Myocarditis (H&E 10x)****Figure 4: Metastatic Deposits In Left Ventricle (H&E40x)**

DISCUSSION

Histopathological examination of heart plays an important role in determining whether death is attributable to a cardiac disease or to other cause, to determine the nature of cardiac disease, whether the mechanism was mechanical or arrhythmic and to rule out the possibility of trauma or any other unnatural cause.⁽⁵⁾ As there is no valid method of sampling of living population, It was therefore considered that death suspected due to cardiovascular pathology, probably provide the best sample of the living population for studying cardiovascular diseases.

In the worldwide, sudden cardiac death occur predominantly in males. In present study also, predominance of males 76% over females 24% was observed with the Male: Female Ratio being 3.2:1. Association between histopathological findings in the heart with gender showed statistically significant results (0.018). Similar male predominance was reported by other authors also. Joshi C, reported 85.21% males and 14.78% females, Ozdemir B et al, reported 73% males and 27% females respectively in their studies.^(6,7) This emphasizes that males are at a greater risk for heart diseases as compared to females. In the present study age ranged from 16 to 90 years. Maximum number of deaths were seen in the age group of 41-50 years (23%) and least deaths were seen in age group above 70years (4%). Similar findings were reported by Karanfil R et al, (41-50 years) and Joshi C (41-60years).^(8,6)

The heart weight is the first and important piece of information that indicates cardiac pathology and most reliable single measurement at autopsy. In the present study when heart weights were distributed with demographics of the study subjects, rural population had higher heart weight as compared to urban population. This was further intensified by the fact that cases of hypertrophy were more common in rural population as compared to urban population. Similar findings were reported by Borah et al in their study where prevalence of Left ventricular hypertrophy was significantly higher in rural areas as compared to urban areas respectively.⁽⁹⁾

In comparison of histopathological findings in this study, coronary atherosclerosis was most common finding present in 55 out of 100 cases. Similar findings were reported by Garg S et al in which 78 cases showed atherosclerosis out of a total of 141 cases.⁽¹⁰⁾

In the present study among the atherosclerosis cases studied maximum cases belonged to the age group of above 35yrs and a significant p value (0.036) was observed when association of atherosclerosis was done with age indicating increased risk of atherosclerosis with advancing age.

The Modified AHA Classification of atherosclerosis based on morphological descriptions was used in this study since it offers better categorization of atherosclerotic lesions.

Grade IV lesions (34.5%) were more common than grade III (30.9%) which is similar to study conducted by Harveen B et al grade IV (59.1%) and grade III (30.9%) respectively.⁽¹¹⁾ Agale SV et al reported more number of cases in Grade III (34.68%) followed by Grade IV (19.23%).⁽¹²⁾

In the present study histological evidence of myocardial infarction was present in 17 (17.0%) cases, similar to study conducted by Garg S et al (14.1%) cases but less than study conducted by Verma R et al which reported ischaemic heart disease in (34.6%) cases.^(10,13)

The next common lesion in present study was myocardial hypertrophy seen in 40% of cases.

Out of 40 cases of myocardial hypertrophy, 87.5% showed Left Ventricular Hypertrophy, 5% showed Right Ventricular Hypertrophy and 7.5% showed both Left and Right Ventricular Hypertrophy as compared to 37%, 2% and 61%, respectively in a study by Joshi C.⁽⁶⁾

Non atherosclerotic conditions associated with sudden death included myocarditis (2%), cardiomyopathy (2%), which was comparable to the study conducted by Ladich E et al.⁽¹⁴⁾

Cardiovascular diseases constitute the most common cause of sudden death. Undoubtedly, correlation between antemortem clinical history and postmortem findings provides the best chance of elucidating the true nature of the cardiac pathology present and its functional consequences when trying to understand an individual's sudden cardiac death.

The strength of this study lies in grading of occlusion of coronaries according to modified AHA classification. This classification defines intermediate lesions which are the indicators of future burden of disease.

The present study also highlights the need for appropriate risk screening and intervention strategies beginning at younger ages both in urban as well as rural population.

The finding of a hypertrophied heart at postmortem opens the doors to a potentially inherited cardiovascular disease and first-degree family members should be referred for clinical/genetic counselling.

CONCLUSION

To conclude, Autopsy studies play a vital role in unraveling the spectrum and occurrence of cardiovascular diseases. In sudden cardiac deaths, the cause of death can be determined by autopsy but we need to thoroughly examine and sample the heart for histopathological examination. Histopathological studies provide the most accurate clues to a better understanding of human cardiovascular diseases with a multidisciplinary approach (scene investigation, medical history, biochemical, microbiological, toxicological, etc.). Atherosclerosis was the main cause of myocardial infarctions and sudden death in adults but in young sudden death may occur due to congenital and acquired cardiovascular diseases. With the cardiovascular disease attaining pandemic proportions, the study of atherosclerosis and its grading is the need of the hour to estimate the disease burden. Preventive measures need to be implemented in order to control the rising rates. Awareness regarding the risk factors, preventive measures, lifestyle modifications and interventions should be made available.

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