Section: Pathology

Original Research Article

AN AUTOPSY STUDY OF HEART IN CASES OF SUDDEN DEATH-AN INSTITUTIONAL EXPERIENCE

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Abstract

Background: Sudden death may be due to cardiac or extra-cardiac causes. Ischemic heart disease (IHD) following coronary atherosclerosis is the most common cause of cardiac deaths world wide. There was a decline in the CVD mortality between 1990 and 2015 in most of the high-income and middle-income countries. But atherosclerosis affects the Indian population at a younger age. Tamil Nadu is one of the southern states in India at an advanced level of epidemiological transition. Ischaemic heart disease was the leading cause of years of life lost due to premature mortality in Tamil Nadu in 2016. Our hospital caters health care needs of people belonging to poor and moderate income group living in urban area, where on an average 200 sudden deaths occur per year. Hence it is prudent to establish cardiac cause in sudden deaths by autopsy and histomorphological analysis which will help in reducing the number of sudden deaths. The aim of this study is to evaluate heart in cases of sudden death by autopsy and histomorphology. **Materials and Methods:** A total of 96 Cardiac specimens from cases of sudden death received during one year period were studied. Gross and histopathological examination were done. The findings were recorded and analysed. **Result:** Out of the 96 hearts studied 73 (76.04 %) were from males and 23 were from females (23.96 %). A majority were between the ages 31-40 years (25 %) followed by 41-50 years (21.88 %).In total 96 hearts 85 had atherosclerosis (88.54 %) . LAD involved in majority of atherosclerosis [47 case] (55.29 %). In atherosclerotic hearts ,1-25 % blockade was seen in at least one of the major coronary arteries in as many as 65 cases (76.47 %). In 11 hearts which had no evidence of atherosclerosis, 2 had microscopic features suggestive of myocarditis (2.08 %), one had HOCM (1.04 %). **Conclusion:** This study revealed that the most common finding in cases of sudden death reported in this part of our country was atherosclerosis and most of the deceased were in their productive age group which was also shown by epidemiological studies which underscores the need of prevention of sudden cardiac death in the form of life style modification and early detection and treatment of risk factors.

INTRODUCTION

Sudden death may be due to cardiac or extra-cardiac causes. World Health Organization defines sudden death as death occurring within 24 hours from the onset of symptoms.[1] Ischemic heart disease (IHD) following coronary atherosclerosis is the most common cause of cardiac deaths worldwide.[2] Although there was a decline in the Cardio Vascular Disease (CVD) mortality between 1990 and 2015 in most of the high-income and middle-income countries, trend was not similar in low-income countries. Atherosclerosis affects the Indian population at a younger age than in other ethnic groups with more advanced lesions.[2] CVD accounted for 28% of the deaths in India. Tamil Nadu is one of the southern states in India at an advanced level of epidemiological transition. Ischaemic
heart disease was the leading cause of years of life lost due to premature mortality in Tamil Nadu in 2016.[3] In our hospital which caters health care needs of people belonging to poor and moderate income group living in urban area, we get an average of 200 sudden deaths per year. Hence, it is prudent to establish cardiac cause in sudden deaths by autopsy and histomorphological analysis which will help in reducing the number of sudden deaths. The aim of this study is to evaluate heart in cases of sudden death by autopsy and histomorphology.

MATERIALS AND METHODS

This is a descriptive cross-sectional study conducted in Department of Pathology, Government Kilpauk Medical College, Chennai for a period of six months from March 2023 to August 2023. This study was approved by Institutional Ethical Committee of our institution. (IEC Protocol No 937/2023 dated 01-06-2023). A total of 96 Cardiac specimens from cases of sudden death received during this period were studied. Detailed medical history and post mortem findings were reviewed. The gross examination of the heart included measurement of the thickness of the walls of both ventricles, weight of heart, stenosis and calcification of valves, atherosclerotic changes of aorta; coronary ostia; coronary vessels, location and size

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of regions of either old or recent myocardial ischemia if any.

For the histopathological examination of the heart, representative sections were taken from the right and left ventricular walls, aorta, coronary vessels, coronary ostia and any regions with suspected pathological lesions.

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

RESULTS

In our study, a total of 96 cases of sudden death were studied. Out of these 96 cases, 73 (76.04 %) were from males and 23 females (23.96 %). A majority were between the ages 31-40 years (25 %) followed by 41-50 years (21.88 %). [Table 1 & 2] A total of 41 hearts had Left Ventricle hypertrophy[LVH] (42.71 %), 18 hearts had both ventricles hypertrophied (18.75 %). In remaining 37 hearts, there was no hypertrophy (38.54 %) [Tab 3]. In 63 hearts (65.63 %), there were fatty streaks in the aorta. There was evidence of old myocardial infarction in four hearts. In one patient, there was Hypertrophic Obstructive Cardiomyopathy [HOCM]. There was calcification in 15 vessel walls (17.65 %). The specimens were sectioned and studied after routine processing. In total 96 hearts,85 had atherosclerosis (88.54 %), [Figure 1 to Figure 5] of which all three -Left anterior descending artery (LAD), left circumflex artery (LCX) and right coronary artery (RCA)- involved in 27 cases (31.76 %), two vessels in 14 cases (16.47 %), single coronary vessel involved in 21 cases (24.71 %) along with aorta . LAD involved in majority of atherosclerosis [47 cases] (55.29 %). In atherosclerotic hearts (85 cases), 1-25 % blockade was seen in at least one of the major coronary arteries in as many as 65 cases (76.47 %) and 76-100 % blockade was seen in only 8 cases (9.41 %). In 23 hearts, only aorta showed atherosclerosis (27.06 %). In remaining 11 hearts which had no evidence of atherosclerosis, 2 had microscopic features suggestive of myocarditis (2.08 %), one had HOCM (1.04 %) [Figure 6] and no significant pathology noted in 8 cases (8.33 %) [Table 4].

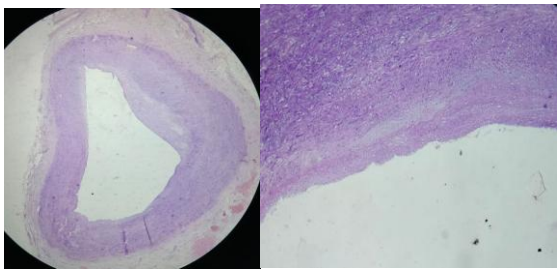

Fig 1 Type 1 Atherosclerosis – Scanner View
Fig 2 Type 2 Atherosclerosis - Scanner View

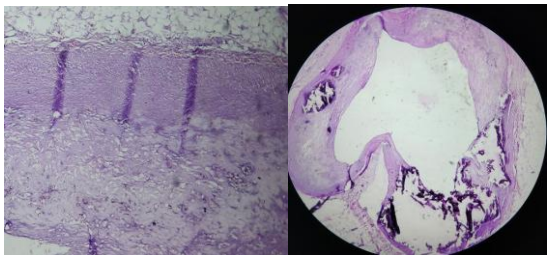

Fig 3 Low power Microscopic Image of Type 4 Atherosclerosis
Fig 4 Type 7 Atherosclerosis – Scanner View

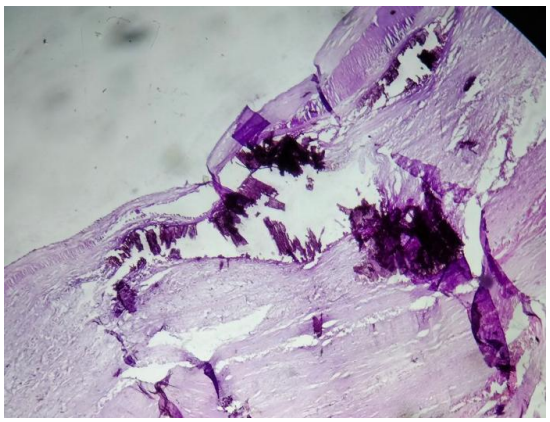

Fig 5 Type 7 Atherosclerosis- High Power View

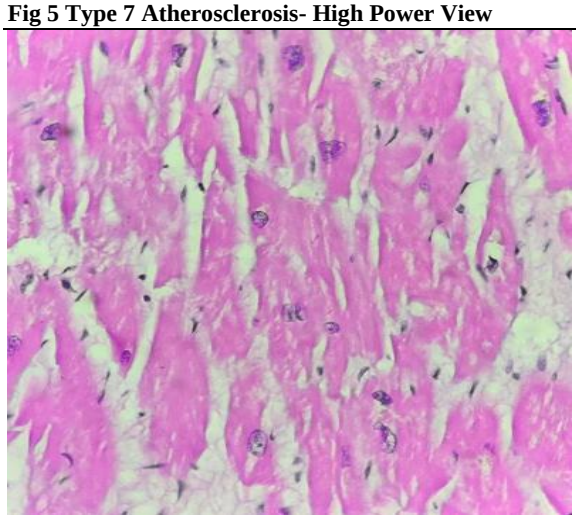

Fig 6 HOCM -High Power View

Tab 1 Age Distribution		
Age Group in Years	No of Cases	Percentage of Cases
0-10	4	4.17 %
11-20	3	3.13 %
21-30	17	17.7 %
31-40	24	25 %
41-50	21	21.88 %
51-60	14	14.59 %
61-70	7	7.3 %
71-80	5	5.2 %
81-90	1	1.04%

Tab 2 Gender Distribution		
Gender	No of Cases	Percentage of Cases
Male	73	76.04 %
42Female	23	23.96 %

Tab 3 Myocardial Hypertrophy		
LVH	41 cases	42.71 %
Both LVH & RVH	18 cases	18.75 %

Tab 4 Histopathological Spectrum of Cases			
S No	Diagnosis	No of cases	Percentage
1.	Atherosclerosis	85	88.54 %
2.	Myocarditis	2	2.08 %
3.	Cardiomyopathy	1	1.04 %
4.	No Specific Finding	8	8.33 %

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Tab 5 Histological Grade of Atherosclerosis (AHA Guidelines)		
Grade	No of Cases	Percentage of Cases
I	4	4.71 %
II	42	49.41 %
III	9	10.59 %
IV	10	11.76 %
V	2	2.35 %
VI	3	3.53 %
VII	15	17.65 %

Tab 6 Extent of Vessel Blockade		
Blockade	No of cases	Percentage
1-25 %	65	76.47 %
26-50 %	7	8.24 %
51-75 %	5	5.88 %
76-100 %	8	9.41 %

DISCUSSION

The cardiac autopsy is important to study the pathological lesions in the heart. We have evaluated all gross and microscopic findings in these cases. The youngest patient in this study was 6 months and the eldest patient was 83 years old. This is similar to the study by Shubhangi V. Agale et al.[4] Majority of cases were in the 4th and 5th decades. This finding is similar to studies by Shubhangi V. Agale et al, Chandrakala Joshi et al and Ding et al.[4-6] In our study, there was male preponderance (76.04 %) and the male to female ratio was 3.17:1 but other studies have higher male to female ratio like in study by Shanti et al,[7] the male to female ratio was 10.5:1 and in the study by Ding et al it was 5:1.

In our study on gross examination, left ventricle alone was hypertrophied in 41 cases (42.71 %) and both ventricles were hypertrophied in 18 cases (18.75 %). Myocardial hypertrophy was also reported by Shanthi et al,[7] Cristina Basso et al,[8] and Bora et al,[9] in their studies. In this study, a wide spectrum of cardiac pathology was seen including atherosclerosis, myocarditis, cardiomyopathy and myocardial infarction. Among these the commonest pathology encountered was atherosclerosis (85 cases) [88.54 %]. This was similar to other studies Shubhangi V Agale et al,[4] Bora et al,[9] and Porwal et al.[10]

In this study atherosclerosis was graded using American Heart Association Classification (Box 1). Grade II was most common in this study 49.41 % of cases [Figure 1 & Table 5] Triple vessel involvement was common (31.76 %) similar to the studies by Marwah et al,[11] and Porwal et al,[10] where three vessel involvement was seen in 52% and 40% respectively. LAD was the most commonly affected coronary artery (55.29 %) followed by RCA and LCX. This was similar to autopsy study by Garg et al,[12] and Porwal et al,[10] In our study myocarditis was noted only in 2 cases out of 96 hearts studied (2.08 %) which was similar to the study by Waller et al. in 1992,[13] whereas Shubhangi V Agale et al,[4] (6.92 %), Kramer et al,[14] (29%) and Drory et al,[15] (22%) had shown higher incidence. We had evidence of old myocardial infarction in 4 cases and acute myocardial infarction in only 2 cases (2.08%). This was comparable to Shubhangi V Agale et al4 and Garg et al,[12] But Marwah et al,[11] 14 cases (7%) Porwal et al,[10] 19 cases (18.44%) and Gohel et al,[16] 25 cases (25%) cited high incidences. The low incidence of acute myocardial infarction in our study may be attributed to sudden death which occurred before the appearance of gross or light microscopy findings and very small infarcts which were overlooked on gross examination.

No specific findings on gross or microscopy were seen in 8 (8.33%) cases similar to Ding et al,[6] In the whole study, only one Sudden Infant Death was studied and there was no evidence of congenital anomaly noted.

CONCLUSION

This study revealed that the most common finding in cases of sudden death reported in this part of our country was atherosclerosis and most of the deceased were in their productive age group which was also shown by epidemiological studies. This observation underscores the need of prevention of sudden cardiac death in the form of life style modification like physical activity, cessation of smoking, abstinence from alcohol, balanced diet, avoiding mental stress and early detection and treatment of diabetes and hypertension.

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