



AN ANALYSIS OF VARIOUS HISTOPATHOLOGICAL FINDINGS IN HEART – AN AUTOPSY STUDY

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ABSTRACT

Cardiovascular diseases are the number one cause of death globally. 13% natural deaths are of cardiac origin. **Aim:** An autopsy study of heart was conducted to observe various histopathological cardiac changes, and to determine the cause of death in a situation of unexplained sudden death. **Study design:** Prospective study conducted for a one year period from March 2019 to February 2020 in the Department of Pathology, Madurai Medical College, Madurai. Histopathological examination of heart was done and the findings were documented. **Observation and results:** Out of 195 cases studied, 109 cases (55.8%) show atherosclerosis, followed by Hypertensive heart disease was found in 64 cases (32.8%) and ischemic heart disease in 50 cases (25.6%). 4 cases of cardiomyopathy were found. **Conclusion:** Autopsy studies have been essential for advancing our knowledge and establishing the exact cause and manner of death.

KEYWORDS : Autopsy, Heart, Atherosclerosis, IHD

INTRODUCTION

Cardiovascular diseases are the number one cause of death globally. Most cases of natural death will involve what is known as "sudden cardiac death." SCD is defined as death due to cardiac causes that occur within one hour of onset of symptoms. Approximately 50% of all cardiac deaths are sudden in onset¹. SCD with negative toxicological and pathological findings are termed as Sudden arrhythmic death syndrome.

Unexplained sudden death occurring in an individual older than one year of age is defined as Sudden unexplained death syndrome. Many believe that autopsies should be done when there is uncertainty towards cause of death. It helps in evaluating the presence and extent of human disease in patients. The use of appropriate microscopy in these cases will assist the pathologist in identifying the disease process and any other underlying medical condition that may exist.

Two of the major objectives of the autopsy are the establishment of final diagnoses and determination, whenever possible, of the cause of death. Autopsy provide a unique opportunity for physicians to correlate their physical and laboratory findings with the pathologic changes of disease. In essence, the autopsy is a "gold standard" for evaluating the accuracy of diagnosis and the outcome of therapy. Through autopsy findings, pathologists alert hospital infection control committees of possible contagion. Thus the autopsy provides critical data for medical quality assurance and, ultimately, quality improvement.

13% natural deaths are of cardiac origin. Histologic sampling of the myocardium may reveal an acute infarct or an old scar that may have resulted in dysrhythmia. Histology may also demonstrate hypertensive changes in the vasculature of the kidney or cerebrum, or may reveal stigmata of healing from ischemic injuries in the heart, such as multifocal interstitial fibrosis, in the absence of gross findings². Coronary artery disease is the most common cause for sudden cardiac death in western world and responsible for 75-80% of cases. Cardiomyopathy and genetic causes account for the rest of the cases.² In India the incidence of ischemic heart disease has increased to about 10%.¹⁴

The most common etiology for the non ischemic SCD is related to cardiomyopathy caused by obesity, alcoholism and fibrotic cardiomyopathy⁴. Coronary spasm is also a cause for cardiac

arrest, mostly in male smokers with minimal or no preexisting coronary artery disease⁵.

Autopsies of deceased athletes most often reveal structurally normal heart in 25 % of cases, coronary artery anomalies in 11% of cases, myocarditis in 9% of cases and arrhythmogenic right ventricular cardiomyopathy 5%, aortic dissection 5% and hypertrophic cardiomyopathy in 8% of individuals³. There are number of underlying factors responsible for cardiovascular disease. This Study was conducted in our institution to know about the morphological alteration in the heart that leads to the death of the victim.

MATERIALS AND METHODS

The present study was a Prospective study conducted from March 2019 to February 2020 one year period in the Department of Pathology, Madurai Medical College, Madurai. Autopsy Heart specimens were received from Forensic Department of Madurai Medical College and from other peripheral hospitals for histopathological examination in a situation of unexplained cause of death or sudden death were included in the study.

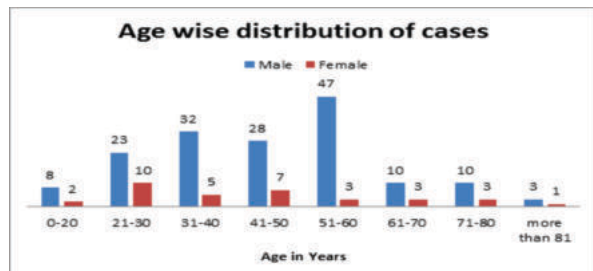
All specimens fixed in formalin were included in the study. The specimens were weighed and grossing done using inflow outflow method and in some cases short axis method⁷. Measurement of thickness of right ventricle, left ventricle and interventricular septum and valve orifice were done. Bits were taken from right ventricle, left ventricle and interventricular septum , aorta and coronary arteries. If any other morphological changes noted, bits were taken from the representative area also. All sections were stained with Haematoxylin- Eosin and histopathological findings were recorded.

OBSERVATION AND RESULTS

Total number of specimen received during the study period was 332 and among them 202 were heart specimens. 7 specimens showed autolytic changes and excluded from the study. Histopathological analysis was done in 195 cases in which 161 were from male and 34 were from female patients. Male predominance was noticed which accounts for 82% with a male female ratio of 4:1.

Age ranges from 11- 85 were observed in the present study. 51- 60 years (50 cases) were the common age group followed by 31-40 years (37 cases). Under 20 years of age 10 specimens

were received. Age group between 31-60 years constitute 62.56% of cases. The youngest age which showed cardiac lesion was 17 years old male. Age wise distribution of cases in our study was shown in Diagram 1.



Histopathological examination from Specimens of 26 cases showed no gross or microscopic abnormality in the heart. Atherosclerosis was the commonest lesion found in 109 cases (55.8%) followed by hypertensive heart disease in 64 cases (32.8%). Various histopathological changes found in this study were shown in Table 1.

Causes	Number	Percentage
Atherosclerosis	109	55.8%
Hypertensive change	64	32.8%
Acute myocardial infarction	37	19%
Ischemia with healed infarct	13	6.6%
Cardiomyopathy	4	2%
Myocarditis	1	0.5%
Pericarditis	2	1%
Myxoma	1	0.5%
No change	26	13.3%

Atherosclerosis of aorta and any one of the coronary artery was the commonest lesion found in 109 cases. Among this coronary artery atherosclerotic plaque with calcification was noted in 34 cases. Rupture of atheromatous plaque with superadded thrombi with more than 50% occlusion of lumen were seen in 34 cases (Figure 1&2). 17 cases show atheromatous plaque with occlusion of lumen but no morphological changes in the myocardium indicates that the death of the patient may be within few hours of symptoms.

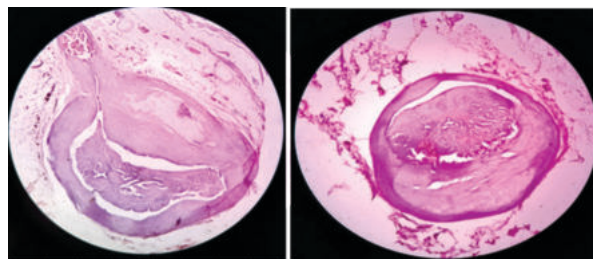


Figure 1: Atherosclerosis with calcification and thrombi (H&Ex400)

Figure 2: Atherosclerotic plaque obliterating the lumen (H&EX 400)

64 hearts (32.8%) show hypertensive changes and the second most common pathology found in heart. The heart size is enlarged with left ventricle wall thickness more than 1.5 cm. Microscopic picture shows myocyte hypertrophy with rectangular hyperchromatic nuclei- Box- car nuclei³[Figure 3] Ischemic heart disease which account for the 25.6% of the cases (50 cases) was the third common pathology.

Among this 37 hearts (74%) show features of acute myocardial infarction (Figure 4,5) and 13 hearts (26%) show old infarct with fibrosed scar in the myocardium (Figure 6). The youngest victim is 20 years old with acute myocardial infarction in myocardium and thrombus occluding left anterior descending coronary artery. Cardiomyopathy was found in 4 (2%) cases. One male of 17 years old show features of hypertrophic cardiomyopathy. Grossly the heart was enlarged with left ventricle thickness more than 3 cm and septal thickness of 2cm

with obliteration of left ventricle outflow tract. Histopathology showed myocyte disarray, hypertrophied myocytes with collagen bands and hyperchromatic pleomorphic nuclei. 2 cases showed features of arrhythmogenic right ventricular cardiomyopathy. The right ventricle wall thickness is increased with pericardial fat. Microscopically mature fat cell infiltration of wall is seen with reduced thickness of myocardial fibres. One heart shows features of ischemic heart disease with dilated chambers and thin wall thickness reported as dilated cardiomyopathy.

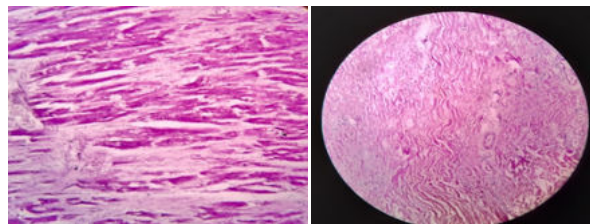


Figure 3 : Hypertensive change- Myocyte hypertrophy with interstitial fibrosis (H&EX400)

Figure 4: Acute myocardial infarction-wavy fibers with lymphocyte and macrophage infiltration (H&EX 400)

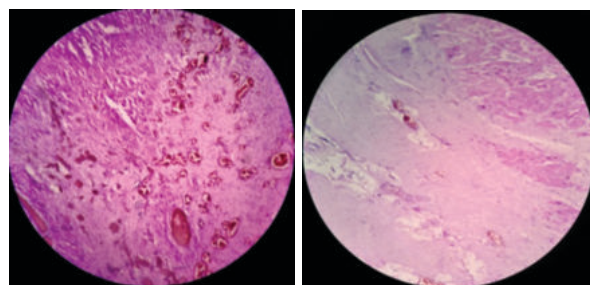


Figure 5 : Acute myocardial infarction-myonecrosis with granulation tissue. (H&EX 400)

Figure 6: Old myocardial infarct (H& E X 400)

Myocarditis was reported in one heart specimen. Histopathology revealed dense lymphocytic infiltration around the normal myocardial fibers. Among two cases of pericarditis, one heart show features of fibrinous pericarditis and the other heart show features of granulomatous (Tuberculous) pericarditis. 54 years old male heart show a grey white tumor with myxoid areas measuring 4 x 2cm attached to the right atrial septum extending into the right ventricle. On histopathology few stellate cells with oval nuclei are seen in a myxoid material.

DISCUSSION

Autopsies provide the chance to study the pathogenesis of different human disease processes and their influence on other organs in the human body. Studies have documented that fundamental nature and stages in the progression of atherosclerotic disease of aorta and coronary vessels was studied only through autopsy. For studying the cardiovascular disease autopsy plays a very significant role.

In the present study 82% were male and denotes that male are at increased risk of developing cardiac pathology when compared to female (18%) with a male female ratio of 4:1. Shilpa et al¹⁰ also had male (76%) predominance in her study. The age group most commonly affected was from 51-60 years. Age between 41-60 years constitute 43% of deaths in this study which correlates with the study by Joshi et al. 31-40 years of age show 19% of total deaths, a worrisome result is emphasizing increasing cardiac deaths in younger age group. In our study the youngest victim was 17 year old male,

who died after cycling to school showed hypertrophic cardiomyopathy.

Atherosclerosis in the aorta and coronary vessels was the common pathological finding seen in (109 cases) 55.8% of heart. Studies by Joshi et al⁵ 64% and Shilpa et al¹³ 55.3%, Vijay Dhankar et al¹⁵ 61.5% and Saloni et al¹⁴ had shown similar findings. Among this atherosclerotic plaque with calcification with less than 50% narrowing of lumen was noted in 24 cases. Rupture of atheromatous plaque with superadded thrombi with more than 50% occlusion of lumen were seen in 34 cases (31%). But Nisha et al⁸ had reported more than 50% reduction of lumen in 62.5% of cases and Shilpa et al¹³ reported 5.3%.

The microscopic feature suggestive of Ischemic heart disease was found in 25.6% (50 cases) in the present study which was correlating with the study by Joshi et al 27.5%. Whereas study by Nisha et al⁸ showed 15.8% and Shilpa et al¹³ had 14.1% (20 cases) of myocardial infarction changes. The variation may be due to microscopic picture in relation to onset of symptoms and time of death.

Myocardial hypertrophy with features suggestive of hypertensive heart disease reported in 32.8% of cases. Joshi et al⁵ had 52% of cases and Shilpa et al¹³ had 7% of cases with cardiac hypertrophy.

Cardiomyopathy was seen in 4 cases (2%) in our study. Corrado et al¹ in his study stated that arrhythmogenic right ventricular cardiomyopathy is the leading cause of sudden death in athletes¹. Harmon et al⁵ found that autopsies of deceased athletes revealed 5% of ARVC and 8% of HCM⁵. The most common cause of non ischemic sudden cardiac death are currently cardiomyopathy related to obesity, alcoholism and fibrotic cardiomyopathy⁴.

Pericarditis was reported in 1% of cases in the present study Joshi et al had similar incidence 0.86%. Whereas shilpa et al¹³ reported 2.8 % of pericarditis cases. Among this one case was tuberculous pericarditis along with features of miliary tuberculosis.

Myocarditis was seen in 0.5% cases in our study. But other authors have higher incidence of myocarditis in their study. Joshi et al⁶ 9%, Shilpa et al¹³ 3.5 %, Vijay et al¹⁵ 5.76% reported respectively.

CONCLUSION

Autopsy studies have been essential for advancing our knowledge and establishing the exact cause and manner of death. The vast spectrum of lesions which can be diagnosed on histopathological examination after autopsy helps in studying the epidemiology, pathophysiology and management modalities of many diseases. In essence, the autopsy is a "gold standard" for evaluating the accuracy of diagnosis and the outcome of therapy.

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