



A HISTOPATHOLOGICAL ARRAY OF CARDIAC LESIONS ON AUTOPSY

Vijay Dhankar	Specialist and Head, Department of Forensic Medicine, Dr B.S.A. Hospital and Medical College, New Delhi.
Pratima Khare	Consultant, Department of Pathology, Dr B.S.A. Hospital and Medical College, New Delhi.
Aditi Rawat	Senior Resident, Department of Pathology, Dr B.S.A. Hospital and Medical College, New Delhi.
Renu Gupta*	Senior Specialist and Head, Department of Pathology, Dr B.S.A. Hospital and Medical College, New Delhi. *Corresponding Author

ABSTRACT **BACKGROUND:** Cardiovascular diseases are the leading cause of death in the world. Many pathologies are picked up only on histomorphological evaluation after a meticulously done autopsy, hence establishing the cause of death.

AIMS & OBJECTIVES: The aim was to study the histomorphological patterns of cardiac lesions on autopsy.

MATERIAL & METHODS: 52 cases which showed changes in heart on histopathology from a total of 408 cases were analysed retrospectively for age and sex distribution, clinical details and various types of lesions on histopathology.

OBSERVATIONS & RESULTS: Atherosclerosis was the most common finding seen in 61.5% of cases. Rare and incidental findings on histomorphology such as Giant cell myocarditis, Electrocutation, metastatic carcinoma and tuberculosis were also seen.

CONCLUSION: The study describes different types of lesions seen on histopathology in the heart. Incidental lesions noted helped in inferring the cause of death.

KEYWORDS : Autopsy; histopathology; Heart.

INTRODUCTION

The term autopsy is derived from ancient Greek word *autopsia*, means "to see for oneself", *autos* ("oneself") and *opsis* ("eye")¹. Autopsy remains one of the most useful and precise tools in establishing diagnosis of diseases. A well performed autopsy is important for diagnosing most medical conditions. Cardiovascular diseases are a leading cause of death in the world and have now become the leading cause of morbidity in India². Many cardiac pathologies are concealed and found incidentally on histomorphological evaluation of samples sent after postmortem examination. The vast spectrum of lesions which can be diagnosed on histopathology after autopsy can help in studying the epidemiology, pathophysiology and management modalities of these diseases.

AIM – To study the histomorphological patterns of cardiac lesions on autopsy that are important in determining the direct and indirect causes of death.

MATERIAL AND METHODS

A retrospective study of 408 consecutive medico-legal autopsy specimens was undertaken over a period of three and a half years from January 2015 to June 2018 in the Department of Pathology, Dr BSA Hospital, New Delhi. These autopsies were performed by a forensic expert. 350 cases out of these 408 cases were analysed in which heart specimen or tissue bits from heart were sent for histopathological examination. In the rest of 58 cases cardiac tissue was not received. The samples were received in 10% formalin as fixative. The samples were sent with history and clinical details. The tissue pieces were measured and 4mm to 5mm thick sections were taken for routine processing for histopathology. The heart specimens were measured, weighed and inspected externally for any discoloration, infarcts, rupture, or any other abnormality. Then the heart was dissected as per inflow outflow technique. Vessels were examined for any hardening, thickness, blockage, plaques. Valves were examined for any hardening, vegetation or thrombi. Sections were taken from representative areas, such as walls of ventricles, atria, Aorta pulmonary trunk, mitral and tricuspid valves and the three coronary arteries for routine histopathology processing. All the histology sections were stained with Haematoxylin and Eosin stain for microscopic examination. The microscopic findings were recorded. These findings could not be correlated with gross findings as in many of the cases only tissue bits were available and gross findings were not provided by the forensic expert.

OBSERVATIONS & RESULTS

A total of 408 autopsy specimens were received in the Pathology Department. 39 cases out of these 408 cases were ill preserved and completely autolyzed to yield any findings. Another 58 cases did not include heart tissue. A total of 259 cases showed a completely unremarkable cardiac histomorphology. 52 cases showed some kind of pathological features microscopically and have been taken for this study.

Table 1 - Age and sex distribution of cases analysed (n = 52)

Age Groups	Females (%)	Males (%)	Total (%)
0-20 Years	01(1.9)	05(9.6)	06(11.5)
21-40 Years	05(9.6)	17(32.7)	22(42.3)
41-60 Years	06(11.5)	11(21.1)	17(32.7)
61-80 Years	02(3.8)	05(9.6)	07(13.4)
	14(26.9)	38(73.07)	52

260 specimens were from deceased male subjects and 148 were from females. Of the 52 cases with some sort of cardiac pathology 38 were males and 14 were females. In the male group majority of the cases (17 cases) were in the age group of 21-40 years followed by 41-60 year age group (11 cases), whereas in females majority of the cases were in 41-60 years age group (6 cases). [Table 1]

Table 2 - Clinical Features

Sl.No.	Clinical details	No. of Cases
1.	Brought Dead	40(76.9%)
2.	Cardiovascular symptoms (who died during treatment for cardiac illness)	5(9.6%)
3.	GIT Symptoms	1(1.9%)
4.	Seizures	1(1.9%)
5.	Respiratory symptoms, tuberculosis	1(1.9%)
6.	Post partum illness	1(1.9%)
7.	Known case of Cancer	1(1.9%)
8.	Undocumented history	2(3.8%)
	Total	52

These cases presented with a variety of symptoms pointing towards cardiac or other organ/ system involvement [Table 2]. 40 out of 52 cases were brought dead or found dead following a collapse or an uncommon preceding event. The second most common subset of cases (5 cases) had symptoms related to heart disease such as chest pain, dizziness, breathlessness etc. and died during treatment. There was

one case each with gastrointestinal symptoms, tuberculosis, seizure disorder and malignancy undergoing treatment.

Table 3 - Various lesions seen on microscopy

Sl. No.	Lesions	No. of Cases
1.	Atherosclerosis	32 (61.53%)
2.	Myocarditis	3 (5.76%)
3.	Myocarditis-Giant Cell Type	1(1.9%)
4.	Fibrosis	5(9.6%)
5.	Myocyte necrosis	2(3.8%)
6.	Rupture / laceration of myocardium	5(9.6%)
7.	Cardiomyopathy	1(1.9%)
8.	Electrocution	1(1.9%)
9.	Squamous cell carcinoma	1(1.9%)
10.	Tuberculosis	1(1.9%)
	Total	52

On microscopy we came across a wide spectrum of histopathological findings. [Table 3]

Atherosclerosis either in coronary vessels and / or in great vessels was seen in 32 cases and was the most common finding. Atherosclerotic plaques were seen as sub-intimal collections of foamy macrophages, few lymphocytes, cell debris and cholesterol clefts. Some of the plaques were totally fibrotic and calcified. In 11 out of 32 cases aorta also showed atherosclerotic plaques.

Five cases showed fibrosis and scarring. Fibrosis could be due to healed myocardial infarction, myocarditis or any other previous pathology.

Four cases were documented as myocarditis (Fig 1). In three cases myocardium showed infiltration by chronic inflammatory cells such as lymphocytes, histiocytes, plasma cells and occasional eosinophils. Focal areas showed replacement fibrosis also. One of the four cases showed presence of chronic inflammatory cells along with granulomas and giant cells in the myocardium and vessel walls in the myocardium. These cases showed extensive areas of fibrosis and extension of inflammation into the pericardium also. This case was diagnosed as Giant Cell Myocarditis (Fig 2) with pericarditis.

Two cases showed necrosis of myocytes with infiltration of neutrophils and hemorrhage. Five cases showed laceration and rupture of myocardium and showed presence of blood in the pericardial cavity during autopsy. The cause of death was labelled as cardiac tamponade. Microscopically myocardium showed myocyte necrosis, inflammatory cell infiltrate and hemorrhage at the site of rupture.

An interesting and uncommon entity showing myocardial changes due to electrocution was also encountered in our study. Features seen were distended lightly staining fibres alternating with hypercontracted darkly staining myocardial fibres. Few fibres showed enlarged squared up nuclei in myocytes. (Fig 3)

A single case of cardiomyopathy was seen wherein the microscopy showed focal interstitial fibrosis with lymphocytes, macrophages and mast cells. Myocytes showed nuclear enlargement and thinning of fibres.

Another case of interest in the series was that of squamous cell carcinoma which showed nests of atypical squamous cells in the myocardium. This patient was a known case of Cancer undergoing treatment. (Fig 4)

A case of disseminated tuberculosis involving myocardium was also seen. Myocardium showed presence of epithelioid cell granulomas with caseous necrosis. However acid fast bacilli were not seen (Fig 5).

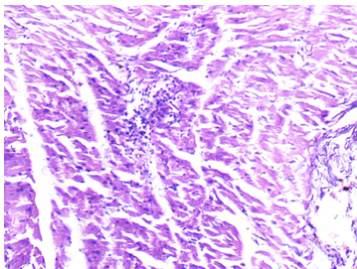


Figure 1: Myocardium showing inflammatory cells in the interstitium.

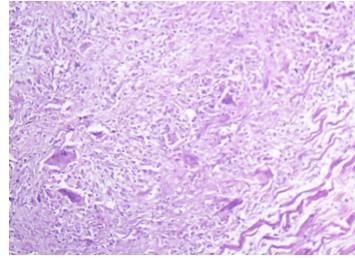


Figure 2: Giant cells and Lymphocytes infiltrating the Myocardium.

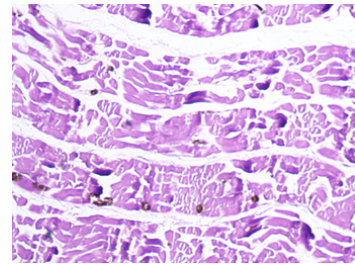


Figure 3: Lightly stained distended myocardial fibres alternating with darkly stained hypercontracted fibres.

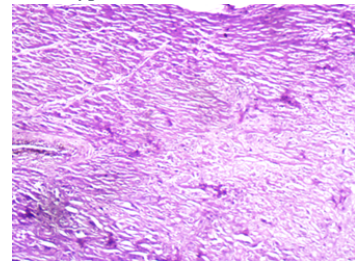


Figure 4: Atypical squamous cells infiltrating in between the myocardial fibres.

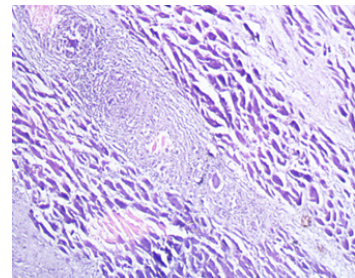


Figure 5: Epithelioid cell granulomas with necrosis.

DISCUSSION

Postmortem examination with relevant history, clinical details and histopathological examination of heart can help in establishing whether the cause of death was related to cardiovascular disease or not. Autopsy is the only way to study the morphological features of heart which is not possible in the living and to correlate it with the clinical diagnosis.

In this study 39 cases out of a total of 408 cases were autolysed. This is a major pitfall seen in many studies which hampers in knowing the cause of death. These cases were excluded from the study. Heart was not sent in 58 cases and 259 cases did not show any abnormality in cardiac tissue. 52 cases (12.74%) out of 408 cases had some sort of abnormality in the heart and were included in the study.

Out of 52 cases with cardiac changes in histopathology 38 (73.0%) cases were males and 14 (26.9%) were females. Majority of the cases (17 cases) were seen in the age group 21- 40 years in males followed by 41 - 60 age group (11 cases). Whereas in females 6 cases were in age group 41- 60 years and 5 cases in age group 21-40 years. However, the mean age of cardiovascular changes seen in this study was similar in both males and females, being 40.7 years and 40.9 years, respectively. In a study conducted on 200 cases for a period of two and a half years by Marwah et al¹ also showed that histopathological changes in heart

were more common in males (92%) than in females (8%) with maximum number of cases being in 41-50 years age group. Garg et al⁴ in their study of 141 cases over a two years period also had most of the cases (48.9%) with cardiovascular deaths in the age group 41- 60 years.

On microscopy varied lesions were seen. Atherosclerosis was the most common finding either in coronary arteries or aorta. 32 cases (61.5%) out of a total of 52 cases showed atherosclerosis. Similar findings have been reported by Garg et al (55.3%), Chandrakala Joshi (64%) and Ekta Rani et al (77.3%) have shown atherosclerosis to be the commonest finding in their studies^{4,5,6}

Patchy areas of fibrosis of myocardium were seen in 5 cases. The fibrosis could be because of old healed infarction or inflammatory causes. 2 cases showed necrosis of myocytes which again could be due to myocardial infarction. We also came across 5 cases having either laceration due to trauma or rupture of myocardium. One case was due to blunt trauma having a laceration at the apex of heart. In the other 4 cases there was transmural rupture of ventricular wall with coronary artery atherosclerosis. The rupture could be due to myocardial infarction as there was myocyte necrosis, hemorrhage and inflammation at the site of rupture. In all the 5 cases there was hemopericardium with cardiac tamponade. Therefore 6 (11.53%) cases showing myocyte necrosis and 4 showing ventricular wall rupture could have been due to acute myocardial infarction. Incidence of Myocardial Infarction in various studies have been variable. Garg et al reported 20(14.1%) out of total of 141 cases where as Marwah et al had seen 14 (7%) out of a total of 200 cases in their studies^{4,5}. Though death due to rupture of myocardium leading to hemopericardium post acute myocardial infarction is rare⁷ but incidentally we had 4 cases in our series. Ventricular septal rupture after myocardial infarction is increasingly rare in the percutaneous coronary intervention era but mortality remains high⁸.

There were 4 cases (7.69%) of myocarditis out of which 1 case showed features of Giant Cell myocarditis and the other three cases had features of non-specific myocarditis. Incidence of myocarditis is low and Giant Cell myocarditis is even rarer. Only 1.02 % of all autopsy cases were diagnosed as myocarditis. Okada et al⁹ showed 409 (0.11%) cases of idiopathic, nonspecific, interstitial, or viral myocarditis and 25 cases (0.007%) as giant cell myocarditis in their study where they analysed 377,841 autopsy records for Japan from year 1958 to 1977.

We came across one case of electrocution. Little is known about the morphological changes in the heart in electrocution. Differing anatomical alterations are described¹⁰. Well documented effects are acute myocardial necrosis, ischemia with or without necrosis, heart failure, arrhythmias, hemorrhagic pericarditis and non-specific electrocardiogram changes. In our case patient probably died of electric shock and was brought dead.

Other rare lesions such as metastatic squamous cell carcinoma and tuberculosis were also a part of this study. Cardiac metastases are seen only in 9% of autopsy where primary tumor is found¹¹. Cardiac tuberculosis is extremely rare, mostly involving myocardium and pericardium. We came across 1 case of tuberculosis involving myocardium and pericardium. Rose et al came across only 19 cases of cardiac tuberculosis at autopsy over a 27 year period¹².

One known case of dilated cardiomyopathy was also seen which showed histo-morphological features of cardiomyopathy. Data on incidence and prevalence of the disease is ambiguous due to geographic variations, patient selection and diagnostic criteria adopted. Incidence of the disease discovered at autopsy was estimated at 4.5 per 100,000 per year in study by Rakar et al¹³.

CONCLUSION

The study describes the histopathology of cardiac lesions on autopsy. Most common finding in the study was atherosclerosis. Autopsy studies help in detection of unexpected and unknown pathologies which can help formulate better management strategies for patients with similar clinical backgrounds.

REFERENCES

1. Sulegaon R, Kulkarni D, Chulki S. Medicolegal autopsies - Interesting and incidental findings. *Int J Forensic Sci Pathol.* 2015;3(8):156-60.
2. Prabhakaran D, Jeemon P, Roy A. Cardiovascular Diseases in India : Current Epidemiology and Future Directions. *Circulation.* 2016;133(16):1605-20.

3. Marwah N, Sethi B, Gupta S, Duhan A, Singh S. Histomorphological spectrum of various cardiac changes in sudden death: An autopsy study. *Iranian J of Pathol.* 2011;6(4):179-186.
4. Garg S, Hasija S, Sharma P, Kalhan S, Saini N, Khan A. A Histopathological analysis of various heart diseases: an autopsy study. *Int J Res Med Sci.* 2018; 6(4):1414-18.
5. Joshi C. Postmortem study of histopathological lesions of heart in cases of sudden death -An incidental findings. *J Evid Based Med Healthc* 2016; 3(6), 184-188.
6. Ekta Rani, Kumar S, Mehroliya V. Morphological Patterns in Heart Diseases-An Autopsy Study. *Int. J of Current Advanced Research.* 2017; 06(08): 5391-5393.
7. Das A, Biswas S, Bandyopadhyay C, Bhattacharya c, Dalal D. Sudden death due to ventricular free wall rupture following acute myocardial infarction: a rare one. *J Indian Acad Forensic Med.* 2013; 35(3):291-292.
8. Jones BM, Kapadia SR, Smedira NG, Robich M, Tuzcu EM, Menon V, Krishnaswamy A. Ventricular septal rupture complicating acute Myocardial infarction: A contemporary review. *Eur Heart J.* 2014 Aug 14;35(31):2060-8.
9. Okada R, Wakafuji S. Myocarditis in autopsy. *Heart Vessels Suppl.* 1985;1:23-9.
10. Fineschi V, Di Donato S, Mondillo S, Turillazzi E. Electric Shock: Cardiac effects of nonfatal injuries and postmortem findings in fatal cases. *Int J Cardiol.* 2006; 111(1):6-11.
11. Bussani R, De-Giorgio F, Abbate A, Silvestri F. Cardiac metastases. *J Clin Pathol* 2007; 60(1):27-34
12. Rose AG. Cardiac tuberculosis. A study of 19 patients. *Arch Pathol Lab Med.* 1987; 111(5):422-6.
13. Rakar S, Sinagra G, Di Lenarda A, Poletti A, Bussani A, Silvestri F, Camerini F and the Heart Muscle Disease Study Group. Epidemiology of dilated cardiomyopathy A prospective post-mortem study of 5252 necropsies. *Eur Heart J.* 1997;18(1):117-123