

HISTOPATHOLOGICAL SPECTRUM OF UNCOMMON LESIONS IN HEART AND AORTA: A REVIEW OF 19 AUTOPSY CASES

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Abstract

Background: Cardiac lesions are responsible for approximately 60-70% of sudden deaths. Histopathological examination of heart on autopsy plays an essential role in determining the cause of death. Hence, the present study was undertaken to study the histopathological spectrum of uncommon lesions in the heart and blood vessels that arise from heart, which either proved to be a primary or contributory to the cause of deaths in clinical autopsies. **Method:** This prospective study was conducted in the Department of Pathology of a Tertiary care hospital over a period of one year from Jan 2020 to Dec 2020. During the study period, a total of 19 cases with uncommon lesions in heart and aorta were studied. The available clinical data had been collected from hospital records in these clinical autopsy cases. Cases of myocardial infarction were excluded. **Results:** Out of 19 cases, 11 cases were found in the age group of 15-40 years and 8 cases were of 40-50 years. Among 19 cases, 9 (47.4%) were inflammatory lesions, 4 (21.1%) cases of degenerative changes like fatty infiltration of heart, 2 cases of neoplastic etiology and one case each of aneurysm of sinus of Valsalva, mural thrombi in heart, myocardial hypertrophy and one case of aortic dissection. **Conclusion:** In the present study, inflammatory lesions (myocarditis and tuberculous myocarditis) was the commonest histopathologic finding followed by fatty infiltration of the heart. Other lesions like aortic dissection and aneurysm of sinus of Valsalva were the uncommon lesions seen in our study.

Thus, histopathology in autopsy plays a vital role in the study of some of the rare cardiac lesions contributing to the knowledge of pathology.

Keywords: Histopathology; Cardiac lesions; Autopsy; Neoplastic; Myocardial hypertrophy

Introduction

Cardiovascular diseases (CVD) are the leading cause of death worldwide with an incidence of 60-70%. Now CVD have become the leading cause of morbidity in India.¹ In the Indian setting, epidemiological and socioeconomic factors are found to strongly influence cardiovascular morbidity as well as mortality.² However, in the study of the clinical data, many of the deaths have been found due to CVD either as acute or chronic diseases. The scenario is not different when clinical autopsies are conducted to derive the cause of death in sudden unexplained hospital deaths. The heterogenous lesions of the layers of heart, valves, and the vasculature of the heart along with the lesions of blood vessels arising from the heart are found to be direct cause or contributory to the cause of death.³

Many at times, sudden hospital deaths have been proved to be due to cardiac causes in histopathological studies in clinical autopsies later. 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.⁴ Hence the present study was conducted to study the histopathological spectrum of uncommon lesions in the heart and blood vessels that arise from heart which either proved to be a primary or contributory to the cause of deaths in clinical autopsies.

Materials and methods

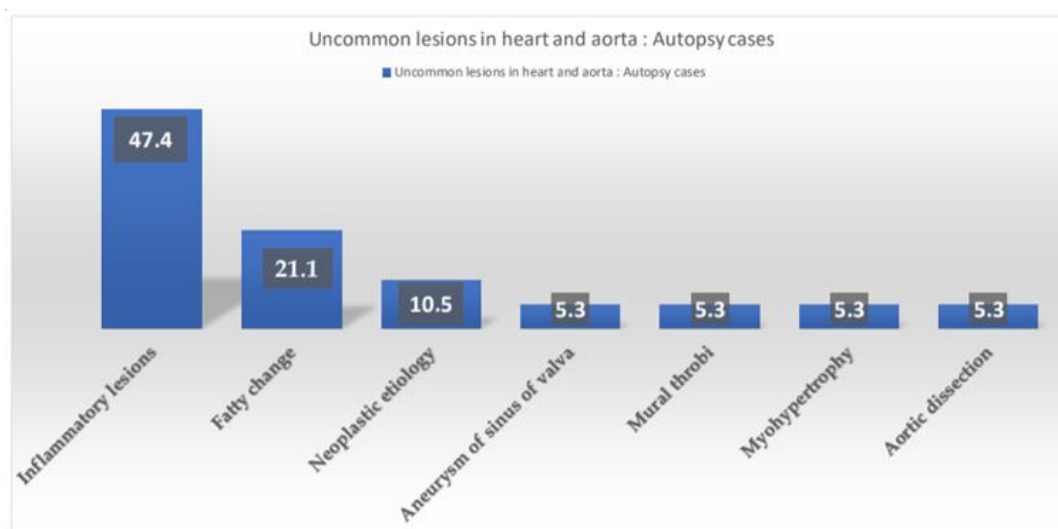
This prospective study was conducted in the Department of Pathology, at Tertiary care Hospital over a period of one year from Jan 2020 to Dec 2020. During the study period, a total of 19 cases with uncommon lesions in heart and aorta were analysed and studied. A detailed gross, microscopic and histopathological examination was done. Cases of myocardial infarction were excluded. The available clinical data has been collected from hospital records in these clinical autopsy cases.

Results and Discussion

During the study period of one year, a total of 19 cases with uncommon lesions in heart and aorta were studied. The uncommon lesions in heart and aorta: autopsy cases are shown in table 1. Eleven cases were found in the age group of 15-40 years and eight cases were of 40-50 years. Out of 19 cases, maximum i.e., 9 cases (47.4%) were inflammatory lesions – 2 cases of tuberculous myocarditis. Cases of degenerative changes like fatty infiltration of heart, 4 cases (21.1%) and 2 cases of neoplastic etiology - atrial myxoma and metastasis to the heart (10.5%). One case each of aneurysm of sinus of Valsalva, mural thrombi in heart, myocardial hypertrophy and one case of aortic dissection.

Table 1: Heterogenous Lesions in Heart and Aorta

Sr no	Lesion	Number of cases	Percentage
1	Inflammatory lesions	9 cases	47.4%
2	Fatty change	4 cases	21.1%
3	Neoplastic etiology	2 cases	10.5%
4	Aneurysm of sinus of Valsalva	1 case	5.3%
5	Mural thrombi in heart	1 case	5.3%
6	Myocardial hypertrophy	1 case	5.3%
7	Aortic dissection	1 case	5.3%

**Bar diagram 1: Heterogenous Lesions in Heart and Aorta**

The uncommon lesions in heart and aorta are compared with other studies as shown in table 2.

Table 2: Heterogenous lesions in heart and aorta compared with other studies.

Title	This study	P Khare <i>et al.</i> ¹⁵	R Verma <i>et al.</i> ¹⁶
Total duration of the study	One year (Jan 2020-Dec 2020)	Three and half years (Jan 2015-June2018)	Five years (2011-2016)
Total number of autopsy cases	19	408	1052
Myocarditis	7	3	16
Tuberculous myocarditis	2	1	7
Malignancies	2	1	4
Fatty change	4	-	23
Myocardial hypertrophy	1	-	48
Aortic dissection	1	-	5
Other cases	Sinus of Valsalva, Mural thrombi	Rupture, electrocution, cardiomyopathy, fibrosis	Ventricular hemorrhage, electrocution, cardiomyopathy

A) INFLAMMATORY LESIONS:

- Tuberculous myocarditis and
- Inflammatory lesions – myocarditis

1) Tuberculosis in heart

Tuberculosis is still an important health problem especially populous countries like India. Even though health burden of tuberculosis is enormous, the tuberculosis of few organs in body like thyroid, heart, pancreas, and skeletal muscle was very rare.⁵ The earliest case of myocardial tuberculosis was reported in 1664 by a Turkish physician, Maurocordat⁶ and second report in 1761 by Morgagni.⁷ TB of the heart is mainly the result of dissemination from lesions elsewhere in the body. The pericardium is seen most commonly involved in cardiac tuberculosis.⁵ Prevalence of the reported isolated myocardial tuberculosis is very low, and it usually occurs in conjunction with pericardial involvement.⁶ Tuberculous involvement of myocardium is infrequent.⁷ The myocardium can be affected by direct spread from mediastinal lymph nodes or tuberculous pericarditis - as part of miliary tuberculosis/ as a result of retrograde lymphatic and hematogenous spread.^{6,7}

In the hematogenous phase of dissemination of primary TB, any and every tissue and organ in the body is liable to seeding by mycobacteria.⁷ Myocardial TB is often not diagnosed during life, but if suspected the diagnosis can be established by an endomyocardial biopsy.

Due to lack of awareness of rare lesions like myocardial tuberculosis and no specific symptomatology, ante-mortem diagnosis of the lesion is not seen. Under the influence of widespread and highly effective screening, diagnosis, and domiciliary treatment in RNTCP, incidence of tuberculosis is slashing down.

In conclusion, although myocardial involvement by tuberculosis is rare, it should be suspected as a cause of congestive heart failure in any patient with features suggestive of TB.

The three histological types of myocardial TB are as follows –

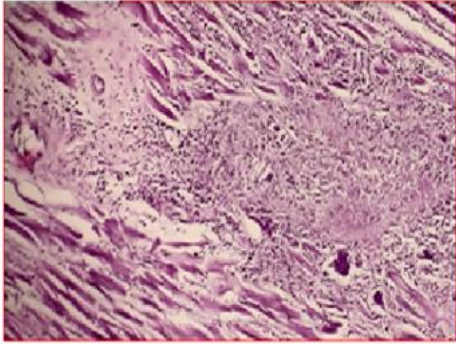
- Nodular tubercles (tuberculomas) of the myocardium, varying “from pea to egg size” with central caseation usually affecting the right side of the heart, particularly the right atrium.
- Miliary tubercles of the myocardium complicating generalised miliary disease.
- Uncommon diffuse infiltrative type, usually associated with tuberculous pericarditis, in which the myocardium is diffusely infiltrated by granulation tissue containing giant cells, endothelial cells and lymphocytes.^{6,7}



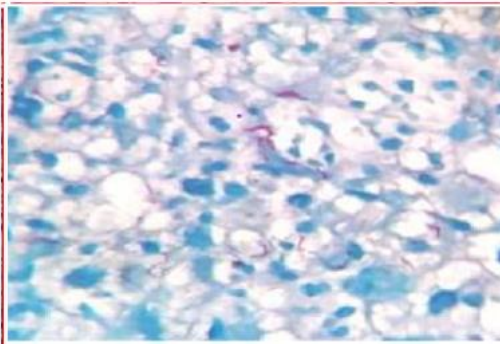
Dissected Heart- Diffuse Grey white areas seen in subpericardial region of left ventricle expanding into myocardial wall

Figure 1: Tuberculosis in Heart: Gross

LOW POWER



Z-N Staining showing acid fast bacilli

**Figure 2: Tuberculosis in Heart: Microscopy****2) Inflammatory lesions – Myocarditis**

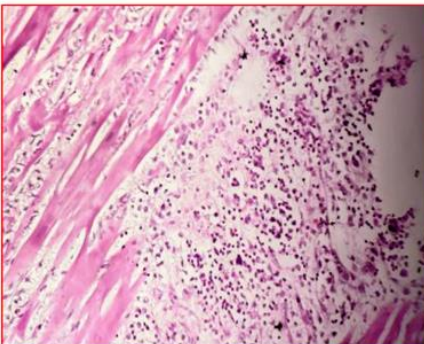
Myocarditis is generally defined as the presence of an inflammatory infiltrate with adjacent myocyte injury. The infiltrate is lymphocyte predominant, particularly with viral infections but it can be even mixed.⁸ Autopsy studies report a frequency of myocarditis ranging from 0.11 to 5.5% in the general population.⁹ With recent pandemic of SARS Covid 19 virus, these autopsy findings are seen with rising trend.⁸ Cardiac comorbidity and standard coronary risk factors (e.g., obesity, diabetes, and hypertension) are associated with adverse outcomes among patients with COVID-19.¹⁰

The “Dallas criteria” defines acute myocarditis as “an inflammatory infiltrate associated with myocyte necrosis or damage not characteristic of myocardial ischemia”. Borderline myocarditis requires a less intense inflammatory infiltrate with no light microscopic signs of myocyte destruction [10]. Autopsy findings of myocarditis cannot be taken as conclusive evidence of SARS Covid 19 solely, rather it signifies an immune response to the inciting acute or chronic inflammatory cause.⁹

Inflammatory lesions – viral myocarditis

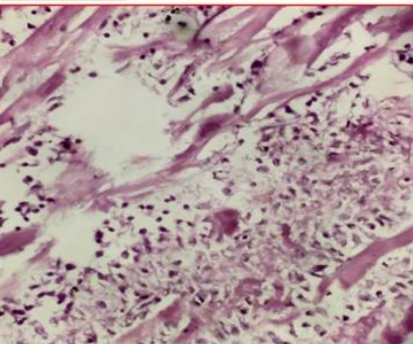
A lesion of myocarditis that is sufficient to cause cardiac dysfunction is expected to be diffuse or multifocal with a significant amount of infiltrate and myocyte injury. It is found that many elderly hearts contain small collections of tissue lymphocytes physiologically with their advancing age. These small foci of inflammatory cells without associated necrosis are NOT considered as sufficient evidence of myocarditis. There is a chance of identifying one of these sites on any random section and these should not be overcalled as myocarditis.⁸

Low power



Lymphocytic myocarditis

High power



Lymphocytic myocarditis with associated myocyte necrosis

Figure 3: Inflammatory lesions - myocarditis - Microscopy

B) CARDIAC ADIPOSITY (FATTY HEART)

The human heart contains varying amounts of fat deposits. Physiological cardiac fat can be separated into two compartments: extrapericardic and intrapericardic. Cardiac physiological fat predominantly occurs in the RV and is present in more than 50% of healthy elderly. The degree of fat in the RV increases with age and is considered as part of the aging process. Fat in the pathological myocardium is known to be seen in patients with various heart diseases, such as: healed myocardial infarction, right ventricular arrhythmogenic dysplasia and some cardiomyopathies.¹¹

Myocardial fatty infiltration is often associated with myocardial atrophy and usual finding even with sudden cardiac death. It is not an accompanying pathologic change of aging and coronary arteriosclerosis.¹² The areas of fat/adipocytes collection in heart will not be widespread and rather will be seen focally. On gross examination, due to alternate bands of grey, white, and yellowish areas, the appearance of tigroid heart is seen.

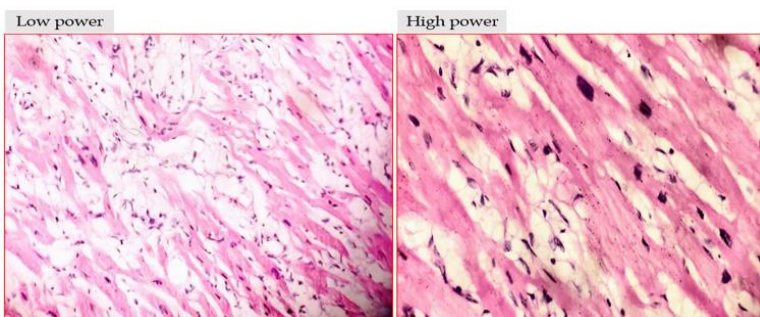


Figure 4: Fatty heart: Microscopy

C) NEOPLASTIC LESIONS:

- Atrial myxoma and
- Metastasis to the heart

1) Atrial myxoma

Primary cardiac tumors are found in 0.1% of total cases on autopsy and mostly reported cases are the atrial myxomas. Myxoma is a “benign tumor” that arises in any of the cardiac chambers and can be uni/bilateral, but almost 75% occurs in the left atrium. Their variable spectrum of clinical presentations includes – 30% cases presenting neurological signs and ischemic stroke being most common.¹³ Atrial myxoma accounts for only < 1% cases of ischemic stroke in young. Transesophageal echocardiography is best diagnostic modality and surgical resection is mainstay of the treatment in such cases.^{13,14} Cardiac myxoma is a rare benign neoplasm of the heart. Historically myxomas were incidental findings during autopsies. However improved imaging techniques made these diagnoses possible in living patients. Cardiac myxomas may occur both sporadically (90%) and in a familial context (10%), often in the clinico-pathological picture of the Carney complex.¹³ Many of the patients affected by myxomas are asymptomatic, when symptoms are present, they are often nonspecific and hard to decipher, especially when referring to sporadically occurring heart myxomas.¹⁴

However, these tumors are mostly pedunculated and solitary. They arise primarily adjacent to the lamina of the fossa ovalis and develop in the left atrium in 75% of cases, followed by the right atrium (18%), the right and left ventricles (3% in each), and the valves (1%).^{13,14} Multiple myxomas represent 5% of the cases and half are of bilateral origin.¹³

Diagnostic criteria =

- Lepidic cells (tumor cells) in myxoid stroma
- Tumor cells are polygonal / stellate myxoma (lepidic) cells with abundant eosinophilic cytoplasm, indistinct cell borders, oval nucleus with open chromatin and indistinct nucleolus.
- Arranged in cords, nests, rings around blood vessels.

Abundant mucopolysaccharide (myxoid) ground substance containing chondroitin sulfate and hyaluronic acid. Neither frank mitotic activity nor necrosis in the lepidic cells of myxoma. Secondary changes - Fibrosis (41%), calcification (20%), ossification (8%), extramedullary hematopoiesis (7%).

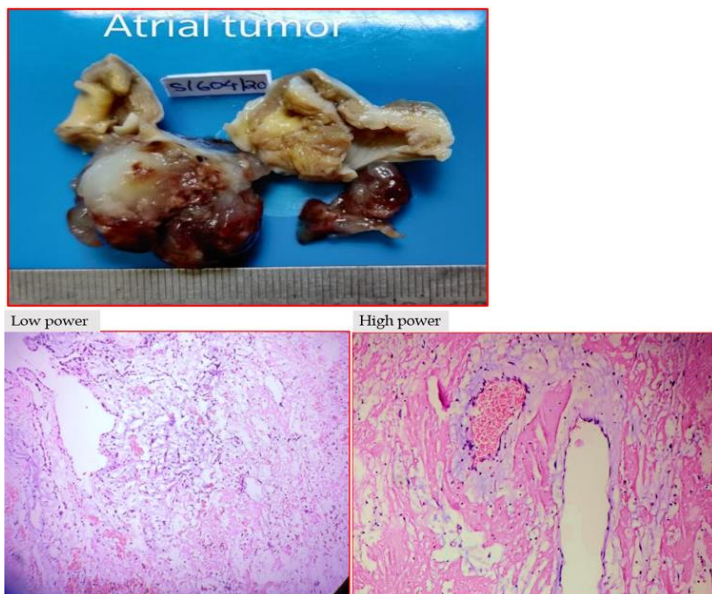


Figure 5: Atrial tumor (myxoma): Gross and Microscopy

2) Metastasis to Heart

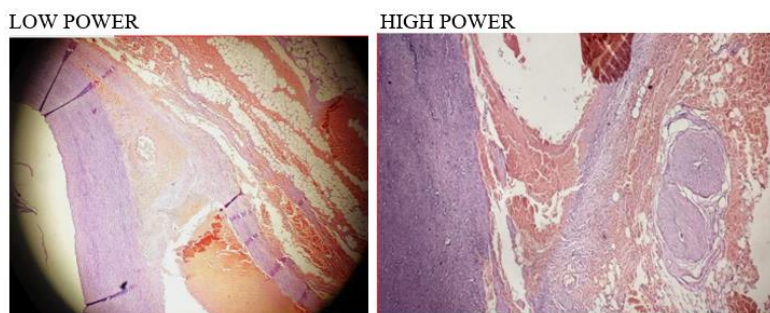
Primary cardiac tumors are rare - generally between 0.01% and 0.1% on postmortem analysis.^{15,16} The frequency of secondary metastatic tumors to the pericardium, myocardium is between 0.7% and 3.5% at autopsy in the general population and up to 9.1% in patients with known malignancies. Spread by the hematogenous route generally gives rise to myocardial or endocardial metastasis. Spread by the lymphatic route will often result in pericardial and epicardial tumor involvement. Most cardiac metastases are clinically silent and are diagnosed only on postmortem.¹⁵

Tumors can reach the heart via 4 pathways: 1) hematogenous spread, 2) lymphatic spread, 3) transvenous extension, and 4) direct extension.¹⁵ The pericardium is the most frequently involved site of cardiac metastasis.^{15,16} The pericardial metastasis is usually silent, but it may manifest as pericarditis, pericardial effusion, or even as cardiac tamponade.¹⁵

One case was diagnosed on histopathologic study incidentally. No clinical history or supporting investigation reports were available. Gross examination revealed a small grey, white patch measuring 2x2 cm on anterior aspect of left ventricular pericardial surface. Cells in clusters with pleomorphic, hyperchromatic nuclei were seen in a focus.

D) AORTIC DISSECTION

Aortic dissection (AD) is characterized by diverse clinical manifestations, conclusive diagnosis can be made only at autopsy [16]. Most common location of AD is ascending aorta; followed by descending, root, and arch. Coronary ischemia and AI were the most frequent causes of death in those without rupture. Hypertension, predisposing factor to AD, plays the most significant role and thought to be responsible for the initial intimal tearing.¹⁷



Hemorrhage is seen in all Layers of aorta

Figure 6: Aortic dissection: Microscopy

In a span of a year, current study was directed towards the uncommon lesions in heart and major vessels arising from heart. The studies, to compare with our study available, were only few and those were directed towards variety of lesions in the heart on autopsy. Even then, these studies mentioned tuberculous myocarditis, metastasis to the heart as rare lesions. Some of the studies available online showed the results stating the same views as rare lesions. In the present study, over a period of one year, the various uncommon lesions studied were seen to be contributing to the cause of deaths of these cases. Tuberculous myocarditis and pericardial metastatic lesions were among the rare lesions that were seen in our study. Even other lesions like aortic dissection and aneurysm of sinus of Valsalva were the uncommon lesions seen in our study. The lesions like lymphocytic myocarditis/pericarditis were mentioned as uncommon lesions in various studies but under the influence of recent Covid 19 pandemic, those cases were on the rising trend.

Conclusion

In the present study, inflammatory lesions (myocarditis and tuberculous myocarditis) were the commonest histopathologic finding followed by fatty infiltration of the heart. Other lesions like aortic dissection and aneurysm of sinus of Valsalva were the uncommon lesions seen in our study. Thus, histopathology in autopsy plays a vital role in the study of some of the rare cardiac lesions contributing to the knowledge of pathology.

Although, histopathology would not have been necessary for some of these conditions during a lifetime but an incidental finding in autopsy has unveiled the histo-pathological changes that help in the understanding of disease processes which are otherwise rare for a pathologist to encounter in the day-to-day specimens. Further retrospective and prospective studies are needed to provide an insight into the true prevalence of diseases or lesions.

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