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Original Research Article

# Histomorphological Pattern of Heart in Autopsies- A Four Years Retrospective Study in a Tertiary Care Hospital of Karnataka

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**Conflict of interest: Nil**

**Abstract**

**Background:** Medical autopsies conducted in hospitals are an important tool for education and quality assurance. It has been observed that in many instances gross pathology alone could not help to decide the cause of death, histopathology can conclusively opine the involved cardiac pathology. Hence this study was done to study various histomorphological changes in autopsied heart specimens and also to study association of acute coronary events with myocardial infarction.

**Methodology:** A retrospective study of 38 cases of heart specimens was conducted in the Pathology department of SSIMS&RC, Davangere, and four years period. Aims: To study the histomorphological changes in autopsied heart specimens and categorize the lesions. Post-mortem analysis of heart is the irreplaceable method to study detail changes in healthy or unhealthy heart. Materials and Methods: Specimens received from the Forensic Medicine and Toxicology Department were examined macroscopically and dissected according to Virchow's method. Representative tissue bits were processed by automated machine and Hematoxylin and eosin-stained sections were studied under light microscopy.

**Results:** About 27 cases were male and eleven were female. Maximum (26.31%) number of cases were seen in 4th decade. Abnormal findings on heart autopsy were non-significant relation between heart weight with age, atheromatous changes on aorta (50%), Ischemic Heart Disease (71.05%), myocardial infarction (15.79%) and Rheumatic heart disease (7.88%).

**Conclusion:** The study presented perturbing high prevalence of atherosclerosis with predominant involvement of double coronary vessels. In envenomation microscopically heart showed myocarditis, thrombosis, infarction, anaphylactic reaction. Conclusions: Histomorphological study of heart in medico legal autopsies may quite often tell natural disease pathology and its relative impact towards death.

**Keywords:** Autopsy, Heart, Histomorphology, Atherosclerosis, Ischemic Heart Disease.



## Introduction

Cardiovascular diseases (CVDs), comprising of coronary heart disease (CHD), Rheumatic heart disease (RHD), cardiomyopathy and other heart diseases are the foremost cause of death and 80% of the load occur in developing countries. [1] During 2011, in India among non-communicable diseases CVD was the most common cause of death (24%) with highest prevalence in southern region of the country. [2] In 90% of cases, the origin of ischemic heart disease (IHD) or coronary artery disease (CAD) is due to diminished coronary blood flow secondary to obstructive atherosclerotic vascular lesions. [3] In India, due to health transition CHD is more prevalent among illiterate and low socioeconomic groups. [4] Study found that in urban India, 41% of male and 37% of female deaths are due to CVD, while in rural India CVD is responsible for about 25% and 22% for

male and female deaths respectively. [5] In India, Rheumatic heart disease (RHD) is rampant among young population; occurrence of coronary artery disease in a group of patients with rheumatic heart disease undertaking valve surgery is 12.2%. [6] An autopsy is a medical technique that involves thorough examination on a body after death, to evaluate disease or injury that may be present and to determine the cause and manner of a person's death. A medicolegal autopsy is defined as an autopsy that is performed pursuant to the provisions of a medical examiners or coroners act of a state. [7,8]

The objectives of the present study were:

1. To study the histomorphological changes in autopsied heart specimens.

2. To categories these lesions.

**Materials and Methods**

This is a retrospective study, conducted in the department of Pathology of SSIMS&RC, Davangere over a period of four years from 2011 to 2014 after taking Institutional Ethics Committee approval. Thirty-eight specimens of heart, sent for histopathological examination from the forensic department were included in this study. Heart specimens were sent either as a part of study of multiple viscera, or only the heart with suspected pathology was sent. Relevant clinical data were obtained from request forms and hospital records. After adequate formalin fixation specimens were examined externally to note the pericardium, great vessels, size, weight, fat deposition, course of coronary arteries, thickening of coronaries, scars etc. Specimens were examined grossly and dissected inflow-outflow/ Virchow method of cardiac dissection as described in autopsy practice of Ludwig.[8] Great vessels and coronary arteries were carefully examined for any thickening, yellow streaks, frank plaque or calcification. All the chambers were washed off any blood clots and examined for any pathology of valves or endocardium. Photographs were taken at the time of dissection time if any lesions were found.

**Exclusion Criteria:** poorly conserved or mostly autolysed specimens

Representative tissue bits from atriums, ventricles, cardiac valves, coronary arteries and pathological areas were processed in Leica TP-1020 automatic tissue processor and 5µm thick sections (by Leica RM 2255 automated microtome) were stained with Hematoxylin and eosin and examined under light microscopy. The data was studied for age, sex and predominant cardiovascular cause of death, various macroscopic and microscopic findings. Data analysis was prepared by Microsoft office 2013 Excel and presented in the form of tables.

**Results**

The present study was performed on thirty-eight specimens of hearts, obtained for medicolegal autopsies.

**Age and Sex Distribution:** The ages ranged from 3 years to 75 years with mean ±SD of 42.71±18.06 years. Majority of cases were seen in the age group 31-40 years i.e., 10 cases (26.31%).

Total three (7.88%) cases belonged to pediatric age group and four cases crossed average life expectancy of Indian population, i.e., 65 years. Males were affected more frequently (27 cases, i.e., 71.04%) than females (11 cases, i.e., 28.96%) with Male -female ratio being 2.45:1. Mean age of male population in our study was 48.22 years and that of the female population was 29.18 years [Table 1].

**Table 1: Age and sex distribution of cases (M=Male, F=Female)**

| Age groups (year) | 1-10 | | 11-20 | | 21-30 | | 31-40 | | 41-50 | | 51-60 | | 61-70 | | 71-80 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No of Cases | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| (Total 38) | 0 | 2 | 0 | 2 | 3 | 3 | 9 | 1 | 3 | 1 | 7 | 2 | 2 | 0 | 3 | 0 |

In nine autopsy cases clinical cause of death were unknown. Rest of the cases clinical causes of death were due to chest pain, AMI, RHD, CVA, Road traffic accident (RTA), poisoning, snake bite, scorpion bite, physical assault etc. Among them more prevalent causes of death were acute myocardial infraction (AMI) in 4 cases, snake bite and RTA, both were in three cases. We came across nine post mortem cases where death was reported on toxicological ground [Table 2].

**Table 2: Deaths on toxicology ground**

| Cause of death | Number (%) |
|---|---|
| Snake bite | 3 (7.88%) |
| Scorpion bite | 2 (5.25%) |
| Poison | 4 (10.53%) |

Among three snake bite autopsies, one was a three-year kid with unremarkable finding, other two were adults showed healed infract and thrombosis of the ventricle. All snake bite cases, kidneys showed acute tubular necrosis like change.

**Sex and Weight Distribution:** Seven heart specimens among men were ≤ 350 grams and 2 specimens in females were more than 300 grams.

**Table 3: Heart weight and sex-wise distribution of the specimens**

| Heart Weight (grams) | Males | Females | Total |
|---|---|---|---|
| ≥199 | 0 | 5 | 5 |
| 200-249 | 5 | 3 | 8 |
| 250-299 | 10 | 1 | 11 |
| 300-349 | 5 | 0 | 5 |
| ≤350 | 7 | 2 | 9 |

Among all cases half of the cases (19 cases, 50%) on macroscopic and microscopic examination, in both showed atheromatous plaques, fatty streaks on aorta, among them 14 (36.83%) were male. A wide spectrum of histomorphological changes was observed, most common (27/38) (71.05%) being ischemic heart disease (IHD) including features of chronic IHD (25.5%), myocardial infarction (MI) (7/38) (15.79%) [Table 3].

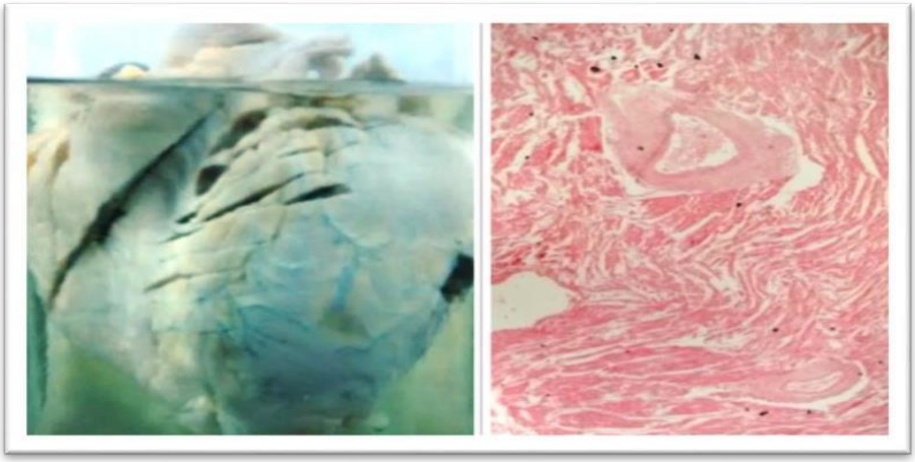

**Figure 1: Gross coronary artery dissection with microphotograph of coronary artery thrombosis**

In present study three cases (7.88%) of chronic rheumatic heart disease (RHD) was observed in elderly age group who had MacCallum plaque, fish mouth mitral valve stenosis, neovascularisation of valve leaflet. Two cases showed thickening of aortic valve [Fig 1].

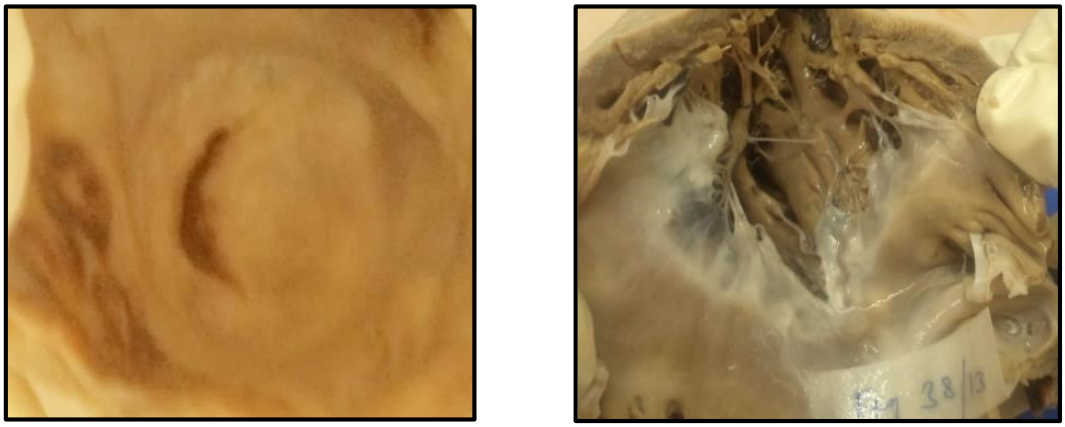

**Figure 2: Rheumatic heart disease –mitral valve**

Artificial mitral valve with right atrium suture granuloma was seen in a 59 year old male patient; other associated finding was IHD change in aorta and left coronary arteries. Septic thromboembolism was noticed in two cases [Fig 2 & 3].

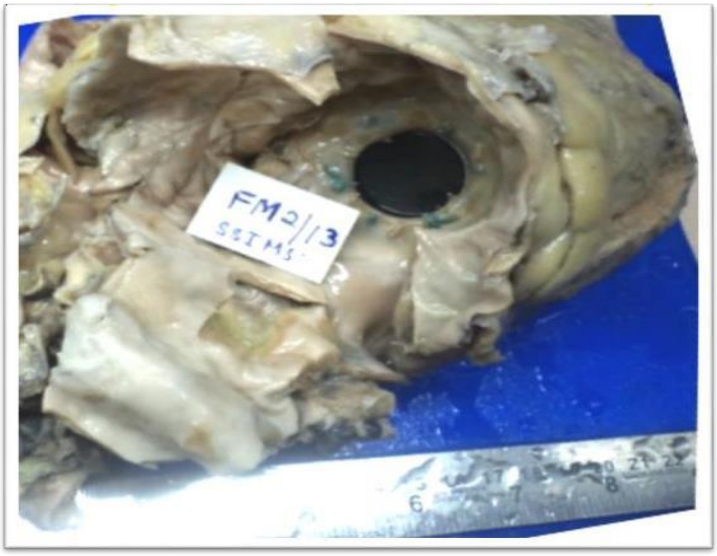

**Figure 3: Prosthetic mitral valve**

## Discussion

In the present study majority of cases were recorded in the age group of 31-40 years (10 cases, 26.31%) followed by 51-60 years (9 cases, 23.67%); this finding is similar to other Indian studies conducted by Qureshi et al (21%,28%), Keche et al, Kasthuri et al. [9,10,11] Low mortality rate was observed in the extreme of age groups; in a study by Quershi et al only 3% and 1% cases were reported in minimum and maximum age groups respectively. [9]

Among those 38 cases 71.04% were male similar to studied done by Bhargava et al (74.8%), Quershi et al (82%), Singh et al (85%). [12,9,13] Only nine patients (23.67%) died due to direct cardiological causes while in a study by Marwah et al most common cause of death was cardiological (53.5%). [14] Marwah Nisha et al observed in their study that in males, weight of heart was found to increase till sixth decade and declined thereafter while in females no exact pattern was observed. In the present study there was no proportionate change of cardiac weight with increase of age. The maximum weight of 500 grams was observed in a 22-year female while 60 years female heart weighed 280 grams. [14] No congenital anomaly was found in the autopsy heart among pediatric cases and also the microscopic examination of heart and vessels was unremarkable. In death due to venomous animal heart microscopy showed inflammation, edema, thrombus and features of anaphylaxis.

In a study by Marwah et al a varied pattern of histomorphological changes was detected, most common being ischemic heart disease (IHD) (36%) including elements of chronic IHD (25.5%), acute myocardial infarction (MI) (7%) and acute on chronic IHD (3.5%). Our study reported 71.05% occurrence of IHD cases. [14] Atherosclerosis of coronary vessel involvement in single vessel and double vessel were seen in six (6/38, 15.79%) and four (4/38, 10.53%) cases, respectively. On the contrary, Quershi et al study mentioned almost equal events of occurrence of single and double coronary vessel atherosclerosis. [9] In the current study, myocardial infraction accounted for death in six cases (15.79%), while study by Udhreja et al on-heart autopsies in Surat reported 5.2% cases death related to myocardial infraction. [15] In an African study by Ogeng'o et al, 18.7% deaths were related to myocardial infraction. [16]

Acute myocardial infarction (AMI) is an uncommon complication of snake bite with few reported cases in literature. The direct cardiotoxicity of snake venom can result in myocarditis and myocardial necrosis. Chakrabarti et al (Kolkata) published a case report of haematuria and subsequently AMI in a 35-year-old farmer following Russell's viper bite. [17] In our study, two scorpion bite autopsies exhibited blood clot in cardiac chambers with microscopic finding of myocarditis, edema and thrombosis. Antigenic complex of scorpion venom can elicit coronary spasm, myocardial ischemia (due to release of thrombogenic peptides, amine chemical mediators of inflammation), myocarditis, anaphylactic reaction. In the medical literature, there is scarcity of study regarding scorpion envenomation and cardiac pathology. [18] Among four autopsies due to poisoning, we find increase epicardial fat, fatty streaks, atherosclerotic plaques on great vessels and left coronary artery. In poisoning heavy metals are known to cause cardiovascular disease, atherosclerosis. In our study due to lack of clinical and toxicological analysis, we could not conclude the definite cause of death. [19] Among the three patients with finding of chronic RHD, MacCallum's plaque and stenosed mitral valve were present; findings were consistent with Deshpande et al study. [20]

## Conclusion

India is facing a health transition with expanding burden of ischemic heart diseases, which have touched epidemic magnitudes among Indians. The study showed high prevalence of atherosclerotic or fatty streak change in coronary blood vessels and aorta which may lead to IHD, myocardial infarction and relative occurrence was more in males as compared to females. In developing country RHD is a common prevalent disease and usually presents with mitral valve pathology. This study highlights the importance of lifestyle modification and screening of cardiovascular risk factors on a regular basis.

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