

Original Research Article


An autopsy study on various dissection techniques of the heart

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Abstract

Background: Autopsy serves as a gold standard for the clinical diagnosis of cardiac arrest, which is important for quality assurance.

Materials and methods: 44 medico legal cases of suspicious/ sudden deaths were examined by using various dissection techniques of the heart to identify the cause of death in a 2 year period. The main objective was to know the cause of death by correlating with the past history by the previous reports of the patients, the clinical diagnosis, photographic records, gross study of the heart and Histopathological examination and confirmation. The various methods used are inflow-outflow method; short axis method; window method; Valve plane method; Four chamber cut methods, etc. Different methods are used for different conditions of the heart, e.g., cardiomyopathy, valvular diseases, ischemic heart diseases etc.

Results: In the present study males outnumbered the females constituting 26 and 18 respectively. At autopsy majority of the cardiac deaths were confirmed as ischemic heart disease by the short axis dissection method. One case of myocarditis identified with Inflow-Outflow method, one case of restrictive cardiomyopathy dissected with four chambered cut method. 1 case of replaced prosthetic valve dissected with valve-plane method. In three cases cause of death is not identified.

Conclusion: Cardiac autopsy is backbone in diseases like Ischemic heart disease and cardiomyopathy etc. Its role in medico-legal case importance cannot be excluded.

Key words

Autopsy, Dissecting methods, Ischemic heart disease.

Introduction

Traditionally Autopsy serves as gold standard for unexplained deaths and as quality control of clinical trial cardiac dissection methods are best learned from personal communications and experience rather than from books or journal articles [1, 2]. The prosector should proceed systemically first with a chosen technique but be flexible whenever and wherever necessary. The prosector must look, feel and probe before cutting and must open the heart in a manner that best displays lesions and causes the least amount of destruction to valves, vessels or conduction system.

Having completed the external examination, the prosector holds the heart in one hand, while using a knife-preferably a long, thin, pointed and very sharp knife held in the other hand-to open the heart chambers. Scissors should not be used for this purpose because their blades crush tissue and leave jagged cut edges that are neither photogenic nor precisely radial.

The various techniques for the dissection of heart are:

- Inflow – outflow method
- Short axis method
- Window method
- Valve plane method
- Four chamber cut method

Different methods are used for different conditions of the heart, e.g., cardiomyopathy, valvular diseases, ischemic heart diseases etc. [2-4].

Other methods are LUMB and HARDY, Partitioned, Mullers, Grants, Unrolling, Rudriagoel and Reiner [4, 5].

Materials and methods

44 hearts of unexplained death were received in the department of pathology, Kakatiya Medical College for over a period of 2 years. All the specimens were fixed by the Heart lung method in 10% Formalin. Various methods of dissection

were done to know the cause of death. The received Gross specimens are inspected properly and histopathological report is given, after taking proper history and noting down the relevant points.

Materials used in study

- 10% formalin
- Graded glass
- Wooden cones
- Ruler or strings
- Weighing machine
- Tissue capsules
- Disposable gloves
- Probes
- Scalpel
- Cutting knives
- Blunt ended scissors
- Forceps plain & toothed
- Slides
- H&E Stain, Masson's trichrome stain and elastic stain
- Photography
- Lead pencils
- Paper towels

Inflow-outflow method

First open Superior vena cava up to Inferior vena cava. Valves are cut between their commissures. Then open right ventricle inflow tract to right apex and right outflow tract to pulmonary arteries. Open left atrium extending into appendage. Left ventricular inflow tract to left apex and left outflow tract bending pulmonary artery ventral and cutting through the left coronary artery. Technique of this method can apply in autopsy in any heart disease. Inflow – Outflow method preserves the conduction system and allows prompt gross diagnosis and selection of microscopic sections [2-4].

Short-axis method

By placing diaphragmatic side of the heart on paper towel and perform cuts parallel to the atrio-ventricular groove. Continue “slicing” until the left anterior papillary muscle is visible. Then go back and continue inflow-outflow method.

Technique of this method can apply in myocardial infarction.

Window method

In this method initially dissecting of the Coronary vessels followed by the displaying of the Ventricles, Outflow tracts and Atria as well as the valves. This method can be applied in previous heart surgery, Display of known malformations [2, 5].

Valve-plane method (base –of-heart method)

In this method, initially Dissecting Coronary vessels and removal of Atria and Great vessels followed by the opening of Ventricles, then continued with Short-axis method is followed. This technique can be applied in Valvular disease as well as in their Repair and Replacement.

Four chamber cut method

In this technique the diaphragmatic side of the heart is placed on a paper towel. Then one firm cut in the plane which opens both atriae and ventricles is done. Technique of this method can apply in Cardiomyopathy. Then Microscopic sections may be chosen in the exact transverse or longitudinal orientation best suited to the histology of any hollow viscus [3-5].

Dissecting coronary vessels

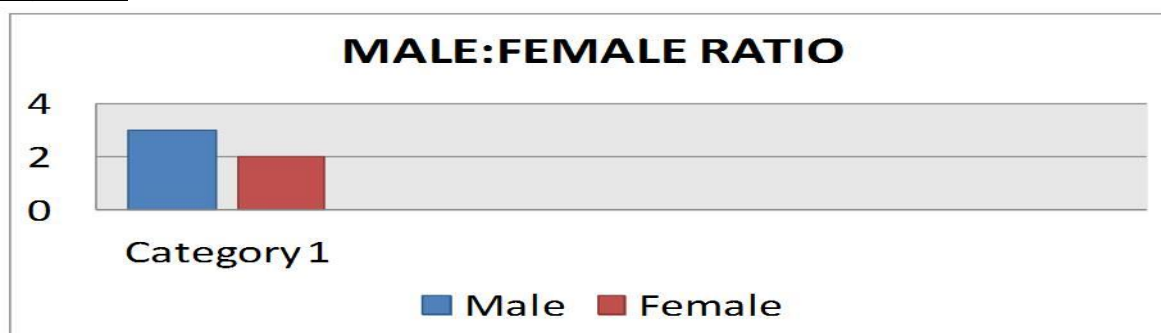
The position of coronary orifices should always be checked. A malleable blunt- ended probe 2-3 mm in diameter can be used to find the orifices. The simplest way to proceed is to cut cross sections across the coronary arteries of 3 mm intervals starting close to the aorta. If the lumen appears pin point, stenosis of the blood vessels has to be considered.

Naked eye examination of multiple cross sections will show the presence or absence of thrombus. Pathologist should comment on the following features in histopathology report of coronary arteries. Atheroma - degree of occlusion; Thrombus - Age, assessed by presence of canalization, fibrosis etc. underlying vascular pathology other than atheroma, such as arteritis or phlebitis, Intimal thickening - Purely fibroblastic or lipid-rich as in atheroma [4, 5].

Results

44 cases of sudden deaths of medico legal cases were autopsied for cause of death by dissecting hearts using various dissection techniques. Male to Female ratio was 3:2 Constituting 26 and 18 respectively (**Figure – 1 to 11**).

Figure – 1: Male to Female ratio.



Discussion

The heart-lung block is fixed by formalin perfusion,

The heart is examined after 24 hours so that the anatomy is well preserved. In the present study, out of 44 cases 38 cases are of Ischemic heart

disease (IHD) and were identified with short-axis method. One case of Myocarditis identified with the inflow-outflow method; one case of Restrictive cardiomyopathy was identified with the four-chamber cut; 1 one case of Replaced prosthetic valve was identified with the valve-plane method and 3 cases no cause of death was identified even after autopsy [3-5].

Figure - 2: Graphic representation of number of different cases.

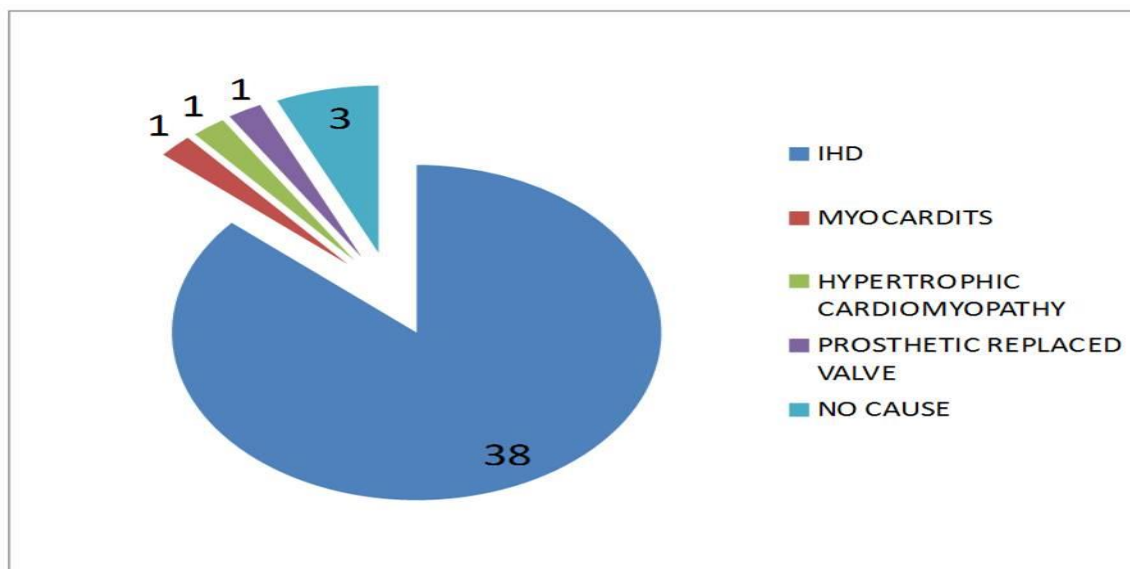
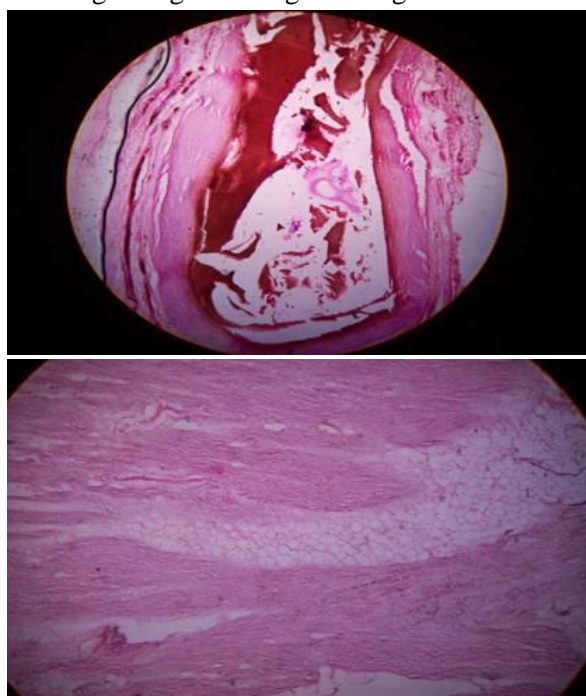


Figure – 3, 4: F/19 Years, ?suspicious death. Adipose tissue in between cardiac muscle fibers showing changes of long standing anemia

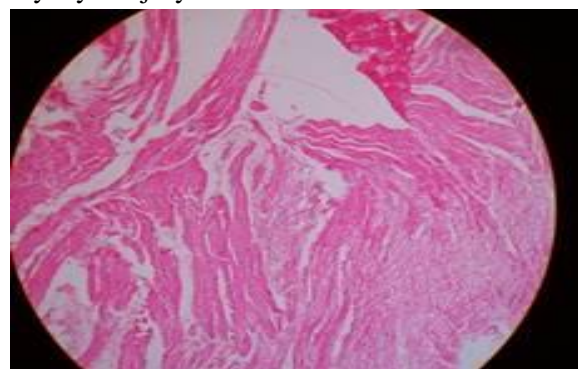


Age ranges from 19 to 60 years, majority belong to the age group above 4 years. Of 44 hearts, Males outnumbered the females with the number of 26 and correlates with the increased number of ischemic heart disease in the males. Valvular heart disease is noted in the female.

Advantages of various dissecting methods are Easy techniques and are useful when there are

short of hands. Less time consumption, can be photographed. Minimize the destruction of tissue. Dissection technique can be planned and altered according to the clinical and gross findings.

Figure - 5: F/35 Years ?suspicious death. COPD with RDS. Myocarditis - with mononuclear inflammatory cell infiltrate and associate myocyte injury.



Disadvantages: More time consuming for interdepartmental consultation. Some of the lesions may be missed if we use only one method.

Conclusion

Cardiac autopsy is backbone in diseases like Ischemic heart disease and cardiomyopathy etc. [5]. Its role in medico-legal case importance cannot be excluded. Autopsy pathologists should

think over various dissection techniques of heart with new autopsy discoveries giving as much as possible information to clinicians, geneticists and families in both medico-legal and non medico-legal cases. Following advanced molecular genetics innovation further studies can be done by employing full barrage of other histochemical, immunohistochemical and molecular diagnostic techniques in examination [5].

Figure - 6: M/37 Years, ?suspicious death. Hypertrophic cardiomyopathy - On cross section, the ventricular cavity loses its usual round to ovoid shape and may be compressed into a "banana like" configuration by bulging of ventricular septum into the lumen.



Figure - 7: M/37 Years, ?suspicious death, hypertrophic cardiomyopathy - HPE: Demonstrating disarray, extreme hypertrophy, and characteristic branching of myocytes with interstitial fibrosis.



Figure - 8: M/45 years, suspecting accident, heart attack, heart disease, myocardial infarction-gross showing red blue hue caused by stagnated, trapped blood.



Figure - 9: M/45 Years suspecting accident, heart disease, heart attack, myocardial infarction-HPE: Demonstrated elongated cardiac myocytes with loss of striations and nuclei also interstitial edema with scattered neutrophils.

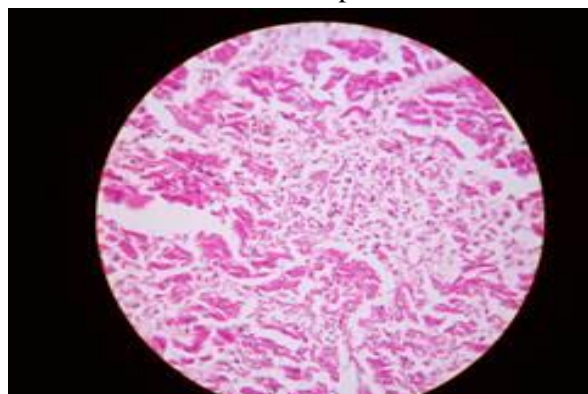


Figure - 10: M/60 Years, Prisoner died due to ill health, ?Heart disease/ ?Heart attack. Narrowing of left anterior descending artery.

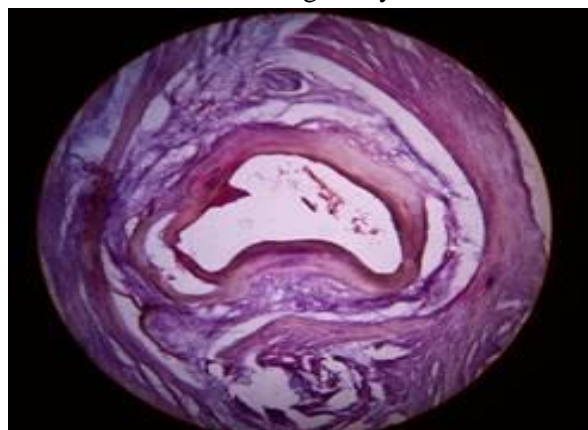


Figure - 11: M/55 Years died due to? Sunstroke. HPE-Thrombus occupying entire lumen of the vessel in left coronary artery



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