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Research Article

Role of Histopathology On Autopsy Study: An Audit

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Abstract: The aim of present study is to determine the age and gender distribution of the deceased individuals and compare histological and necropsy diagnosis of different organs. Fifty-one cases of death that underwent pathological autopsies in the AJIMS hospital were reviewed. The autopsy records, clinical case notes, gross specimens and histopathological slides were retrieved. The results were analyzed according to age, gender and cause of death. The frequencies of discordant versus concordant diagnoses were compared using Mcnemar's test and Weighted kappa statistics. The age and gender wise distribution of cases showed that the incidence of death was higher in fourth and fifth decades of life (23.52%). Our study showed that in maximum cases pathology was detected in cardiovascular system (78.43%) followed by respiratory system (74.50%). Atherosclerosis with narrowing of coronary arteries observed during autopsy in 47.50% of cases and confirmed by histopathology in 50% of cases. Pneumonic changes observed in lungs (36.84%) cases, confirmed by histopathology in 26.31%. Pulmonary edema was noticed during autopsy in 23.68% cases and tuberculous changes in lungs observed in 10.52% cases, confirmed by histopathology in 15.78% cases in each of both conditions. Post autopsy examination of tissues should be continued if the resources are available because there can be discordance between macroscopic and microscopic diagnosis. Histopathological examination did not affect the legal status in the cases studied. However it facilitated detection of incidental or co- existing disease in the deceased individual in a forensic autopsy.
Keywords: Autopsy, Histopathology, Audit.

INTRODUCTION

The autopsy is for long been regarded as the 'gold standard' as the most important tool for retrospective quality assessment of clinical diagnoses as well as a key education tool [1]. Two major types of autopsy are commonly described namely: hospital or clinical and medico-legal or coroner's autopsy. The benefits of autopsy include, evaluating the accuracy of diagnosis and the outcome of therapy. Findings on autopsy can enable the pathologist to alert the infection control unit of a hospital on possible nosocomial infections especially contagious infections; the pathologist can also identify a hereditary condition that would require genetic counseling. Autopsy also provides accurate data for the determination of insurance benefits and workers compensation and the identification of environmental hazards. Findings at autopsy also generate vital statistics needed for research as well as the provision of materials for the teaching of anatomy, histology and pathology. Medico-legal investigation of death focuses on the establishment of the cause of death, the time and the circumstances of death. This audit was performed to determine the effectiveness of histological sampling of forensic post-mortem cases based on a review of one and half year's data.

The aim of the audit is to determine the age and gender distribution of the deceased individuals and to compare histological and necropsy diagnosis of different organs. To ascertain in which organ systems histology contributed to the macroscopic examination and when the use of histology resulted in a change of the interim cause of death.

MATERIAL AND METHODS

Fifty-one cases of death that underwent pathological autopsiesin the A.J. Institute of Medical Science and Research hospital during January 2013 till June 2014 (One and half year data) were reviewed. The autopsy records, clinical case notes, gross specimens and histopathological slides were retrieved, whereever available. The results were analyzed based on provisional reports (gross findings only) and the final reports (after histological examination).

Statistical Analysis

Values are expressed as ranges and percentages. The frequencies of discordant versus concordant diagnoses were compared using the

Mcnemar's test and weighted kappa statistics. $P < 0.05$ is considered as significant.H_0: Null hypothesis states that, there is a significant difference in the findings of macroscopic and microscopic assessment of lungs, liver and kidney.

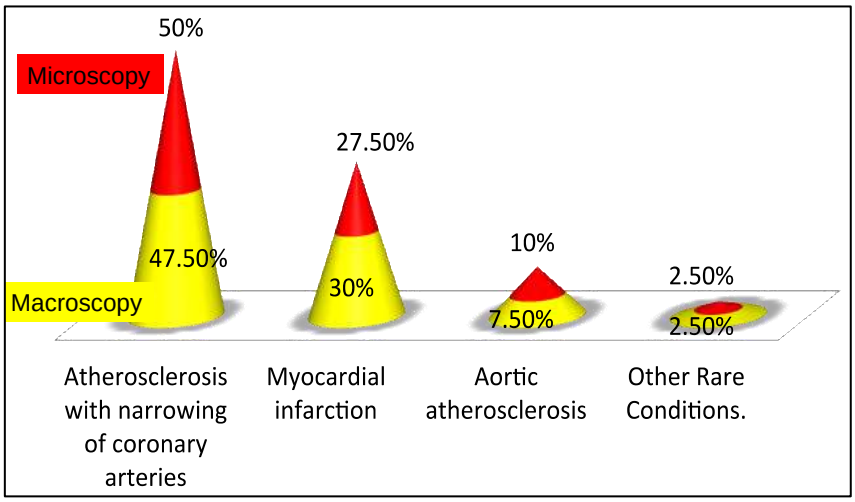
RESULTS

Table-1: Distribution Of Cases According To Major System Involved.

Systems Involved	Number Of Cases
Cardiovascular System	78.43%
Respiratory System	74.50%
Renal System	66.66%
Hepato Biliary System	65%

Table-2: Effect of histopathology examination on cause of death

	Cause of Death	No. of cases
After Autopsy	Apparent	46 (90.19%)
	Not Apparent	5 (9.81%)
After Histopathology Examination	Discrepancy Found	2 (3.92%)
	Discrepancy not Found	49 (96.07%)
Total		51 (100%)

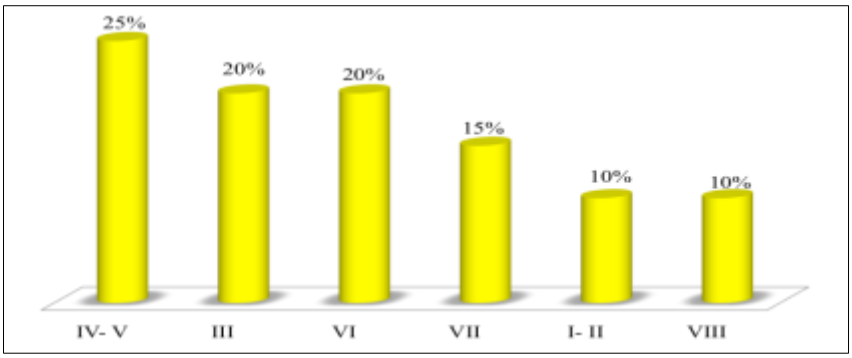


Graph-1: Cardiovascular System (Concordance between macroscopic and microscopic evaluation) P< 0.05 (statistically significant)

Other Rare Conditions include Right coronary artery aneurysm with thrombosis and Apical endomyocardial fibrosis.

Table-3: kappa analysis table of categorised coronary artery narrowing comparing macroscopic to microscopic visual assessment. (mild:0-49%narrowing,severe-75%-100% Narrowing). K=0.79 (Substantial agreement).

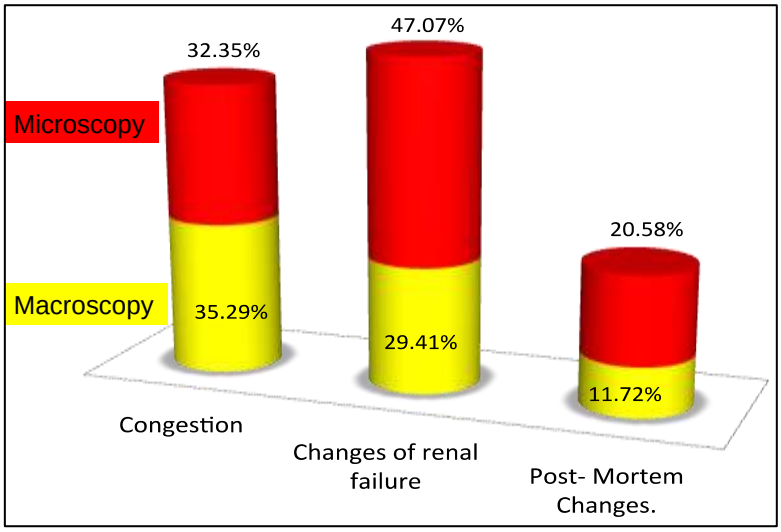
Macroscopic assessment	Microscopic assessment	
	Mild stenosis	Severe stenosis
Mild stenosis	6 (30%)	1 (5%)
Severe stenosis	1 (5%)	12 (60%)
Total no. Of cases- 20	7	13



Graph-2: Categorization of coronary atherosclerotic plaque based on modified AHA (American Heart Association) classification

Table-4: Respiratory system (Discordance between macroscopic and microscopic evaluation)P< 0.05 (statistically significant)

Pathology observed	Macroscopy	Microscopy
Pneumonia	36.84%	26.31%
Pulmonary edema	23.68%	15.78%
Congestion	21.06%	18.42%
Tuberculosis	10.52%	15.78%
Emphysema	5.27%	13.15%



Graph-3: renal system- kidney (Discordance between macroscopic and microscopic evaluation)P< 0.05 (statistically significant)

Table-5: Hepato biliary system- (liver- Discordance between macroscopic and microscopic evaluation) P< 0.05 (statistically significant)

Pathology observed	Macroscopy	Microscopy
Fatty change	33.33%	42.42%
Congestion	30.30%	24.24%
Cirrhotic change	15.15%	21.21%
Necrosis and Inflammation	12.12%	6.07%
TB liver	6.07%	3.03%

Uncommon Conditions

Some of the rare uncommon conditions included in this study under Cardiovascular system were-

- A case of sudden death with thromboembolism due to a thrombus in the left ventricular apex, showed on microscopy as a case of apical endomycardial fibrosis- Figure1
- A case of right coronary atherosclerotic aneurysm- Figure5

- Associated lesions in one of the cases in the brain- IIIrd ventricular neurocytoma- Figure8

Fig-1: (AT22/13-HEART):Near the apex of ventricular septum there is a attached thrombus m/s 2x0.5 cms (arrow).Myocardium at site of attachment shows greywhite area involved entire thickness upto pericardium. Left myocardium m/s 1.5cm in thickness. Right side of heart - normal

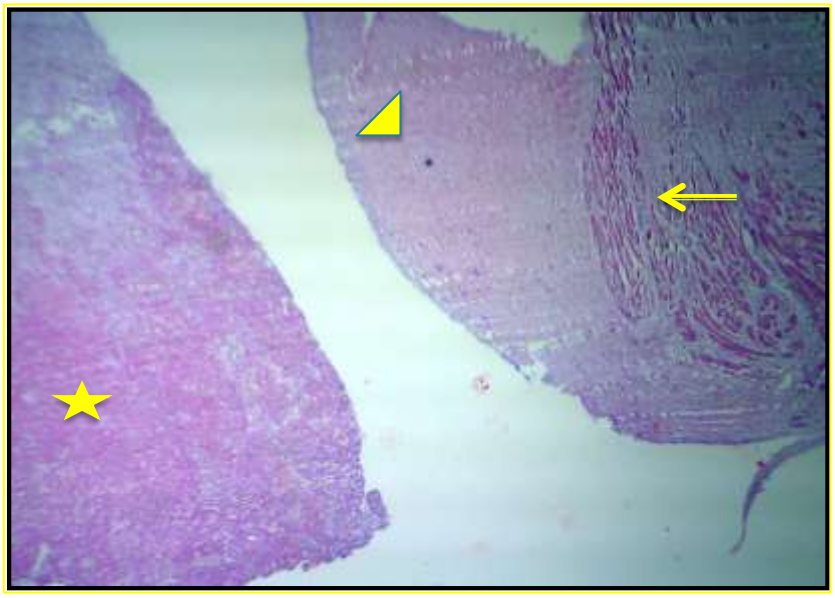


Fig-2: (H&E-10X):Sub endocardial fibrosis (arrow head), Myocardial fibrosis (arrow) ,Thrombus on the myocardium (star).

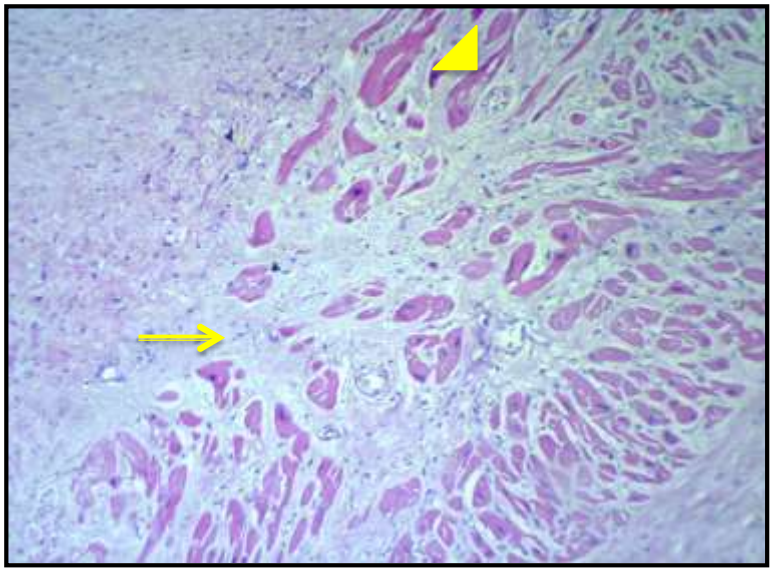


Fig-3: H&E 10X shows Fibrosis of the left apical myocardium (arrow) and Hypertrophic cardiac muscle (arrow head).

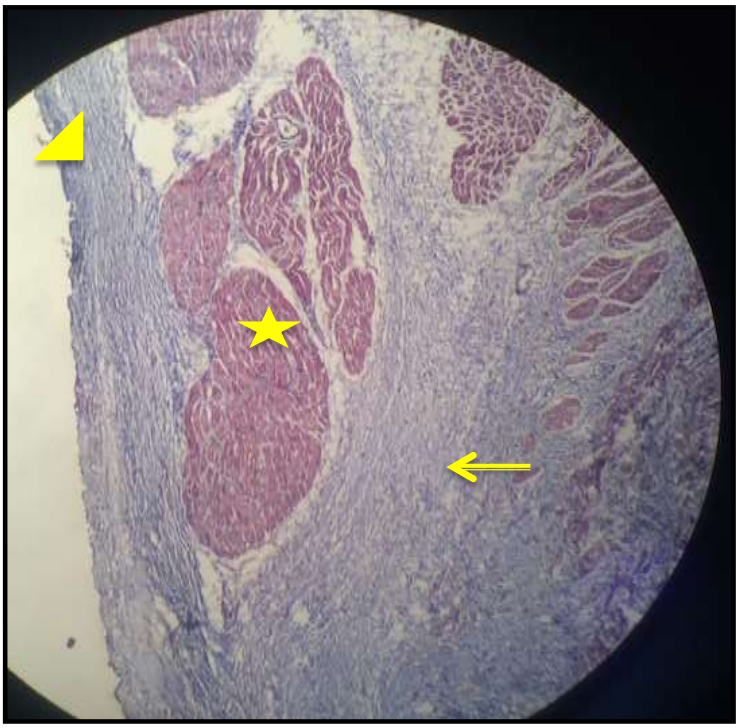


Fig-4: Masson trichrome (10X) shows Endocardium(arrow head), Hypertrphic cardiac muscle (star), Fibrosis of the left apical myocardium (arrow).

Fig-5: Gross: AT 30/14- Aneurysm of the right coronary artery.

Fig-6 H&E (4X): Dilated portion of the rt. Coronary artery (arrow) with attached thrombus (arrow head). Inset shows normal rt. Coronary artery for comparison.

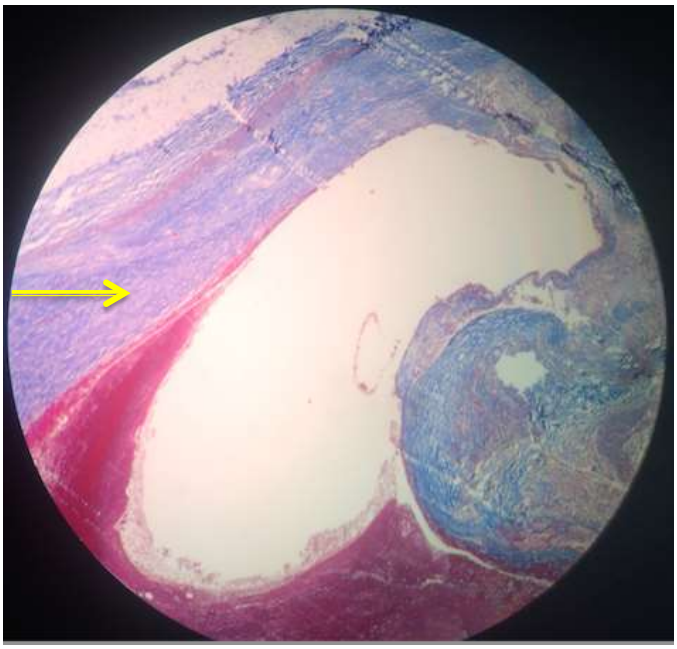


Fig-7: Masson trichrome (10X): Aneurysm of the rt. Coronary artery shows Fibrosis of the Tunica intima (arrow).

We also wish to heighlight Incidental finding of Central Neurocytoma of the IIIrd ventricle of the Brain in 27years old male patient, who collapsed and died during work due to acute coronary syndrome.

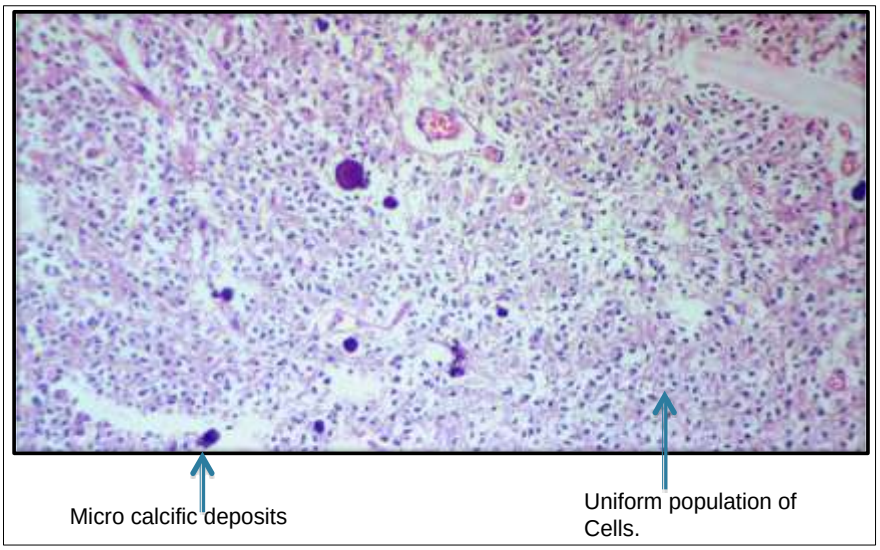


Fig-8 (H&E-10X): Nodular lesion on the floor of the 3rd ventricle showing uniform poulation of cells with round to slightly lobulated nuclei and fine chromatin seen in a fibrilliated matrix. Microcalcified deposits are seen. However mitosis and atypical features not seen.

IHC MARKERS: Synaptophysin- Strongly positive, **MIB**- Negative.

DISCUSSION

Hospital- based medical autopsies are a well-established tool for education and quality assurance[1,6]. Medicolegal autopsies are commonly conducted in cases of sudden and unexpected deaths primarily to establish the cause of death in cases where such deaths have occurred in apparently healthy individuals under suspicious circumstances. The outcome may quite often reveal some natural disease, the presence of which may trigger issues like association of the disease with trauma, work, crime etc. and its relative contribution towards death[2,4].

The purpose of the audit was to ascertain in which organ systems histology contributed to the macroscopic examination and the audit was intended to be a catalogue of histological diagnoses and the causes of death to determine a reasonable strategy for histological sampling of post-mortem cases.

Age and sex wise distribution of cases showed that the incidences were higher in Males as compared to female during 4thand 5thdecades of life, similar to others[1,7,8]. In maximum cases major pathology was detected in Cardio-Vascular System (78.43% cases) followed by Respiratory System (74.50% cases) as compared to other systems, which was also mentioned by other authors[1,7,8].

We reviewed the histopathological findings of four major viscera (Heart, Lungs, Liver and Kidneys) and compared the results with gross anatomical findings of autopsy examination, showed the morbid anatomical features observed in viscera during autopsy examination were also noticed in the majority of the cases during histopathology examination. Table-2 showed that during autopsy forensic expert could reveal the cause of death in 90.19% cases by combining effects of history, inquest papers and postmortem examination of the deceased while in 9.81% cases the cause of death could not be revealed by all efforts during autopsy. After comparison of histopathology report with gross findings of autopsy no discrepancy was found regarding the apparent cause of death in 96.07% while in only 3.92% of cases some discrepancy was found.

In our study there was a substantial agreement between the visual estimate of the degree of coronary artery narrowing made at the time of the post-mortem compared with a visual estimate of the narrowing of the microscopic section (weighted Kappa=0.79). Our study is comparable to study done by Neil et al in 2006[3,4]. The heart was the organ with most frequent diagnostic agreement, and interestingly, with the least diagnostic refinements after histological examination. One possible explanation for this finding is that heart is frequently affected by vascular disorders, leading to acute or chronic ischaemic or haemorrhagic changes that are usually obvious macroscopically. This is in high agreement with those found by others[5,6].

There can be a high degree of discordance between the macroscopic and microscopic diagnosis of the lungs, particularly, the diagnosis of pneumonia can be elusive. A study done by Mangal et al in 2007 also reported almost similar conclusion in his study[2,3].

This study is also comparable to Bernadi et al., in 2005[5].

Few studies have addressed the issue of diagnostic changes after histological examination in different organs at necropsy[5]. We found that histological analysis has a major impact on previously performed gross diagnosis. The frequency of gross versus histological discrepancies was 38.23% for the lungs, 30.30% for the liver, and 26.47% for the kidneys. In the liver and lung, histological analysis helped to refine the gross diagnosis in 18.8% and 15.2% of cases, respectively. For the kidneys, the final diagnosis could only be achieved through histological analysis in 8.82% of the diagnoses. This is well supported by other authors also[2,5].

There is some discussion as to the necessity of histological sampling in routine necropsies. Histological sampling obviously increases costs[9] and turnaround times, and cosequently, some pathologist believe that histology may not always be necessary[10]. However, recent guidelines for necropsy practice do recommend histological sampling of all mojor organs to confirm the macroscopic diagnosis, refine the cause of death, assist in clinical audit, and aid in the training of pathologist[11,12].

We found that the lung was the organ where most diagnostic discrepancies or refinements occurred after microscopic examination. Indeed, pathologists who routinely perform necropsies will appreciate that the difficulties in rendering accurate diagnoses based on the macroscopic appearances of the lungs are not trivial. There are some entities that may be similar at gross examination, such as bronchopneumonia[13] and diffuse alveolar damage. Other authors have previously reported some of the difficulties in gross examination of the lung, especially concerning the diagnosis of brochopneumonia and acute pulmonary infections[14]. Our results showed a similar degree of discordance between gross and microscopic findings to that reported by Hunt et al[13] when checking the diagnosis of bronchopneumonia-26.31%. This is particularly important because the lungs are often pathologically altered at necropsy. In our study, the lungs were considered to be normal in only 9.80% of the total number of necropsies (74.50%).

We made similar observations like macroscopic and microscopic discrepancies in other organs, such as the liver and kidney. Idalini et al,[15] in his study, compared macro and micro diagnoses in 100 necropsies and found that most of the discrepancies occurred in the same organs that we describe—the lung, kidney, and liver. It may be difficult to distinguish a benign from a malignant nodule in a cirrhotic liver by means of macroscopic examination only, and microscopy is essential to refine the diagnosis of the hepatopathies. Similarly, for the kidneys, microscopic examination is mandatory to diagnose and classify a glomerulopathy, for instance.

Table-5: Discordance between macroscopic and microscopic evaluation

	Present study-2014	Bernadi et al-2005 [5]	Neil et al-2006[3]	Mangal et al-2007[2]
Heart (coronary artery atherosclerosis)	13.5%	22.56%	30.43%	17.14%
Lungs	38.23%	38.7%	40.2%	37.77%
Liver	30.30%	35.1%	34.8%	30.40%
Kidney	26.47%	30.3%	31.26%	28.67%

In a small number of cases the diagnosis could only be achieved through microscopic analysis, with the highest frequency in the kidneys 8.82% followed by liver 6.06%.

Rare and associated conditions encountered were complications of right coronary artery aneurysm, apical endomyocardial fibrosis andan accidental finding in a person with acute coronary syndrome associated with central neurocytoma of the third ventricle.

We also found Renal changes with Kimmelstiel wilson lesions in diabetic nephropathy patient, who expired due to acute myocardial infarction.

CONCLUSION

Even in the era of high-tech medicine, the autopsy remains an important tool for quality assessment of clinical diagnoses. This study highlights the lung was the organ where most diagnostic discrepancies or refinements occurred after microscopic examination and heart is considered as the least organ of discrepancy.

Histological analysis has a major impact on previously performed gross diagnosis at necropsy, especially in the heart, lungs, liver and kidneys. Adequate sampling and histological analysis are important for necropsy quality.

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