



Audit Of Histopathological Examination In Medico-Legal Autopsies In A Tertiary Care Hospital - A 3-Year Retrospective Study

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Abstract

Introduction: Requisitions for getting a Histopathological examination (HPE) by the autopsy surgeon are increasing, and sending organs for HPE in the absence of gross anatomical findings on postmortem examination is a routine procedure to look for the cause of death in such cases. **Aim:** To determine if HPE helps frame the cause of death. Does HPE modify the already given preliminary cause of death (COD) by the autopsy surgeon? Does the HPE report changes the case's legal status, or is it causing an extra burden (human resources and financial) on the State's resources? **Materials and methods:** The authors observed that the viscera report takes up to 5-7 yrs to reach the forensic expert for a subsequent opinion. Hence, the authors chose a retrospective period of 2012 to 2014 for the study, conducted at Government Medical College and Hospital, Chandigarh, India. HPE was done in 495 cases out of 2248 autopsies, and the authors analyzed gross and histopathological findings of different internal organs. **Results:** In 447 cases, no definite COD was found on gross external or internal examination, but in 48 cases (9.7%), preliminary COD was obtained. On HPE, COD was ascertained only in 130 patients (29%, n=447). HPE confirmed the already diagnosed "cause of death" in 37 cases (77 %, n=48), but a discrepancy in the "cause of death" was observed in 11 patients (23 %, n=48). **Conclusion:** Overall, HPE revealed the cause of death in 26% of cases. In 10 % of cases, the preliminary COD is confirmed by HPE. In 36% of cases, the HPE has helped arrive at the cause of death. HPE is neither a futile exercise nor is putting a burden on State. Except in one case, HPE has kept the legal status of the case the same.

Keywords: Medico-legal autopsy, Histopathology Examination (HPE), Cause of Death (COD), chemical analysis of viscera

Introduction

Autopsy in India is usually carried out for medico-legal purposes more than clinical or pathological ones. The Forensic Pathology Committee of the College of American Pathologists, in their "Standards for the Practice of Forensic Pathology," proposed that it is the pathologist's discretion to send various samples for examination [1]. According to the Forensic Autopsy Performance Standards of the

National Association of Medical Examiners (NAME), [2] if no gross anatomic cause of death is found at autopsy, then only the forensic pathologist shall perform the HPE. However, India has no guidelines or directions for medico-legal cases where HPE is requested. In most medico-legal autopsies, the Cause of Death (COD) is either known or readily ascertained by the Forensic Expert. Still, in some

cases, the cause of death is not apparent, and it is in these cases that histopathological examination (HPE) is needed to find out the COD. Sometimes HPE is sent to confirm the interim cause of death. Some institutions in the USA perform routine sampling of standard sets of tissues during post-mortem. However, in the College of American Pathologists, the decision to retain tissue for histology depends on the pathologist's experience, the objectives of post-mortem examination, the practices followed in the institution, and the future use of the tissues for anatomical or research purposes [3].

In India, most of the centers refuse to perform HPE on account of facilities not being available. In centers where facilities are available, samples are taken from the dead body and sent to the pathology department, and the forensic expert generally withholds the cause of death. The reports from the pathology department usually come within a month. Pathologists should strive to get the maximum amount of information from HPE in the most cost-effective manner [4]. Gupta *et al.* [5] and Jani *et al.* [6] have suggested a more judicious use of HPE in medico-legal cases rather than practicing defensive medicine of sending HPE in all cases subjected to post-mortem examination. Molina *et al.* [7] reviewed and examined different internal organs in 189 routine forensic cases and reported that only 1 out of 189 studied cases affected the cause of death. In contrast, in another study, in no case was the manner of death affected by HPE [8]. The usefulness of HPE is debatable, with opposing views on its requirement or redundancy. It necessitates an audit of HPE cases to determine the futility and rationale for conducting HPE in medico-legal autopsies. In a study by Kumar A *et al.* on unknown dead bodies, in 35% of the unidentified dead bodies, a request for HPE was made by the autopsy surgeon [9]. In another study to determine the COD in unknown dead bodies HPE was requested in 39% of cases [10]. **Material and Method:** This retrospective study was conducted in a tertiary care hospital from 1st January 2012 to 31st December 2014 in Government Medical College and Hospital, Chandigarh, India. The authors observed that the viscera report takes up to 5-7 yrs to reach the forensic expert for a subsequent opinion. Hence, the authors chose a retrospective period of 2012 to 2014 for the study. The study aimed to determine whether all histopathological examination helps reach a

particular cause of death. Other study objectives were to determine whether the HPE report changed the interim cause or manner of death. And also, to determine if the histopathological examination is causing an extra burden on human resources (autopsy surgeon, pathologist, police official). Consecutive autopsy cases in which the forensic expert requested histopathology examination were taken for the study. The viscera preserved in 10% formalin was submitted to the Department of Pathology for further processing. In every case, the following demographic data were obtained: age, gender, the role of histology, primary organ system in which the fatal pathology is located, cause of death, and manner of death. The routine procedure of viscera collection, comprising six significant organs, e.g., Brain, Heart, Lungs (left & right), Liver, Kidneys (left & right), and spleen, was followed and viscera was sent for HPE. In some cases, uterus, along with suspected products of conception, were sent for HPE. Histopathology findings were studied and compared with the gross results of the respective organs noted by the forensic expert during the autopsy.

Observations and Results:

Profile of cases: Tissues for HPE were retained in 495 cases (22%) of the total 2248 cases during the period under study. Out of the 495 cases, 404 (81.5%) cases were of males, and the rest 91 were of females. Age-wise distribution of cases (Table 1) shows that preserving viscera for HPE was higher in the 3rd, 4th, and 5th decades of life. Case-wise distribution (Table 2) of the presentation of the patients to the hospital. About 2/3rd of the person were either brought dead or presented as poisoning cases/ unconscious patients. Out of 495 cases, 137 (27.6%) patients had an external antemortem injury over the body.

Gross and Microscopic findings (Table 3 & 4): "No abnormal findings" was most commonly noted on gross or microscopic examination, suggesting limited use of histopathological examination. Congestion was the most common gross abnormal finding, while edema of the lungs and acute tubular necrosis of the kidney was the most common abnormal findings in microscopic examination.

Cause of death: The organ system involved (Table 5) as per the final cause of death. The most common organ system attributing to the cause of death is the

cardiovascular system, followed by the respiratory system in the cases under study.

Relevance of histopathological examination: In about 48 cases (9.7%, n= 495), the histopathology examination was done to

1. confirm or add to the already diagnosed "cause of death" or
2. Support the preliminary COD.

Amongst this group, HPE confirmed the cause of death in 37 cases (77 %, n=48), while a discrepancy

in cause of death was observed in the rest 11 cases (23 %).

In about 447 cases (90.3%, n=495), "no definite opinion regarding the COD" was ascertained at the time of the autopsy. Out of these cases, the COD was unascertained in 317 cases (64%, n=495). The definite "cause of death" was given in only 130 autopsies (26%, n=495) after receiving reports of histopathological and viscera examination for toxicological analysis (Table 6).

Table 1: Age-wise distribution of cases in which Histopathological Examination requested

Age Group	2012 (n= 167)		2013 (n=168)		2014 (n=160)		Total (n=495)	
	No.	%	No.	%	No.	%	No.	%
0- 10 yrs	2.00	1.20	3.00	1.79	4.00	2.50	9.00	1.82
11-20 yrs	14.00	8.38	18.00	10.71	11.00	6.88	43.00	8.69
21-30 yrs	37.00	22.16	44.00	26.19	42.00	26.25	123.00	24.85
31-40 yrs	47.00	28.14	35.00	20.83	35.00	21.88	117.00	23.64
41-50 yrs	38.00	22.75	36.00	21.43	31.00	19.38	105.00	21.21
51-60 yrs	24.00	14.37	16.00	9.52	31.00	19.38	71.00	14.34
61-70 yrs	3.00	1.80	11.00	6.55	4.00	2.50	18.00	3.64
> 70 yrs	2.00	1.20	5.00	2.98	2.00	1.25	9.00	1.82
Total	167.00	100.00	168.00	100.00	160.00	100.00	495.00	100.00

Table 2: Case-wise distribution according to the alleged history of the patients

Alleged History	n=495	%
Brought dead	84	16.97
Unconscious	137	27.68
Natural Illness	53	10.71
Poisoning	104	21.01
Fall from Height	19	3.84
Snakebite	15	3.03
RSA	21	4.24
Burns	10	2.02
Hanging	10	2.02
Assault	3	0.61

Miscellaneous	39	7.88
Total	495	100.00

Table-3 Gross findings of internal organs observed during Post mortem examination.

Gross findings	Brain	Heart	Lungs	Liver	Spleen	Kidneys	Uterus (n=23)
Congestion	295	13	356	321	75	368	
Congestion and edema	20	0	10	10	0	0	
Edematous	28	0	4	0	0	0	
Adherent/ fibrous adhesions	0	0	10	0	0	0	
Pale	22	0	40	30	8	34	
Decomposed/ liquefied	6	4	4	6	6	4	
Hypertrophy	0	23	0	12	14	0	
Atherosclerosis	0	3	0	0	0	0	
Miscellaneous findings	0	11	19	19	15	13	3
No abnormal findings	124	441	52	97	377	76	20
Total	495	495	495	495	495	495	Fetus present= 3

Table 4. Predominant Histopathological findings of different internal organs

HPE findings	Brain	Heart	Lung	Liver	Spleen	Kidney
Congestion	1	--	20	45	9	4
Edema	1	--	147	--	--	--
Active hyperemia	7	3	3	--	9	5
Autolysed	9	8	9	11	10	9
Chronic Ischemic heart disease	--	83	--	--	--	--
Aortic Stenosis	--	32	--	--	--	--
Old Myocardial infarction	--	23	--	--	--	--
Myocarditis/ pericarditis	--	12	--	--	--	--
Pulmonary Tuberculosis	5	--	23	6	14	6
Bronchopneumonia	--	--	53	--	--	--
Lobar Pneumonia	--	--	7	--	--	--
Cirrhosis	--	--	--	27	--	--
Micro vesicular steatosis	--	--	--	34	--	--

Macro vesicular steatosis	--	--	--	44	--	--
Alcoholic cirrhosis	--	--	--	8	--	--
Chronic hepatitis	--	--	--	18	--	--
Acute Tubular Necrosis	--	--	--	--	--	136
Chronic pyelonephritis	--	--	--	--	--	10
Benign nephrosclerosis	--	--	--	--	--	6
Miscellaneous (others)	14	10	51	42	15	27
No abnormal findings	458	324	182	260	438	292
Total	495	495	495	495	495	495

Table 5: Organ system-wise distribution of final cause of death after histopathological reporting (N=495)

Organ system	Cases (%)
Heart-related	42 (8.48)
Lungs related	36 (7.27)
Kidney related	7 (1.41)
Poisoning	36 (7.27)
Septicemia	10 (2.02)
Hanging/Head injury	9 (1.82)
Miscellaneous	38 (7.68)
Unascertained	317 (64)
Total	495 (100)

Table 6: Relevance of histopathology examination

Preliminary COD	Final COD
Unascertained (n=447)	Mechanism of death not shown by gross anatomic findings was discovered by histopathology examination (n=130) 26%
	Cause of death Unascertained (n=317) 64%
A preliminary "cause of death" was given (n=48)	The more detailed cause of death given (in line with the preliminary cause) (n=37) 7.5%
	A different cause of death (n=11) 2.2%
Total 495	495

Table 7: Comparison of usefulness of HPE

	Langlois et al. (13)	De la Grandmaison et al(10)	Molina et al(7)	Judith Fronczek(11)	Present study
Mechanism of death not shown by gross anatomic findings was discovered by histology	24 %	40 %	Only 1 case %	2 %	130/495 (26.3 %)
Histopathology provided, altered, or confirmed the cause of death (Complementary information)	53 %	49 %	Nil	41 %	178/495 (36 %)
No cause of death		7.5 %			317/495

Discussion

Age & gender-wise distribution of cases showed male preponderance, and cases were higher during the 3rd, the 4th, and 5th decades of life. These findings are in line with other studies.[5,6,8]

In maximum cases, primary pathology lay in Cardio-Vascular System (8.48 % cases) followed by Respiratory System (7.27 % cases) compared to other systems. Other studies observed identical findings[8,11]. However, the fatal pathology was most often present in the central nervous system (34 %), followed by the cardiovascular system (26 %) in other studies[12]. Macroscopic and microscopic discrepancies in organs were observed, particularly in relation to the diagnosis of pneumonia [8,13,14]. Zaitoun and Fernandez observed that macroscopical examination alone might lead to underdiagnosis or overdiagnoses of bronchopneumonia [15]. Gross discordance was observed in liver and kidney-related pathology in a study by Kandy NC et al. [13], with the slightest discrepancy in brain pathology [16]. Observations were similar in the present study, with discrepancies in gross and microscopic findings. Congestion was the most common gross abnormal finding. However, gross and microscopic findings were discordant as edema of the lungs and acute tubular necrosis of the kidney were the most common abnormal findings in microscopic examination.

Cause of death remained unascertained on macroscopic examination in 447 cases (90 %). 'No abnormal findings' was most commonly noted on gross and microscopic examination, suggesting the futility of histopathological examination. The cause of death not shown by gross anatomic findings was reached by histopathology in 130 cases (26 %). The cause of death remained unascertained even after microscopic examination in 317 cases (71 %, n=495). Langlois had similar observations. He studied 203 cases where the "cause of death" was not given after macroscopic examination; histology provided the cause of death in 49 cases (24%) [14]. However, De la Grandmaison et al[11]. found that mechanism of death not shown by gross anatomic findings was discovered by histology in 40 % of cases.

In the present study, interim cause of death was given in 10 % of cases, and discrepancy or change in cause of death was observed in 2.2% of cases. However, histological examination resulting in a significant difference in the diagnosis was reported by Langlois in only 4.8% of cases.[14] In the cases where interim cause of death was given, HPE confirmed the cause of death in 37 cases (7.5 %, n=495). Similarly, histology provided complementary information about the prior medical condition of the deceased in those cases. In a study by Grandmaison GL,[11]. additional

information related to the cause of death was observed in 49% of the cases.

Overall, HPE contributed significantly in 36 % (n=495) of instances by either confirming macroscopic COD, or provided/ assisted/ altered the COD. HPE also discovered incidental pathologies during the autopsies. Other studies reported more contribution from HPE [14]. Histopathological examination is effective when requested to

- a) Confirm the cause of death,
- b) to find out the cause of death,
- c) to find out delayed histopathological changes and,
- d) to confirm or exclude disease/pregnancy.

In about 2/3rd of the cases, HPE is not helping in framing the cause of death. In this sense, it is burdening the State, but it is necessary to arrive at the cause of death (rest 1/3rd). Only in 11 autopsies (2.2%) the "cause of death" was changed based on histopathological examination. Still, the relevant sections of the Indian Penal Code remained unaltered, and the cases were processed per those sections.

Conclusion

In 90% of the cases in which cause of death had not been unascertained on macroscopic examination, a definite cause of death after HPE was given in only about 26% while in the remaining 74 % of the cases, cause of death still remained undetermined. In about 10% cases where a preliminary cause of death was given, HPE confirmed the same in about 75%. However, COD was modified in the remaining 25% which emphasizes the importance of conducting this examination even when an interim cause of death is reached during autopsy. HPE played a role in relation to the cause of death in 36% of cases, thus the extra burden (human resources and financial) on the State's resources was justified. In our study, there was no alteration in the legal status for any of the cases in which HPE was done, hence, it can be concluded that though HPE may not useful from legal point of view but it does help in providing the correct cause of death to the aggrieved relatives of the deceased.

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