

Original Article

A Retrospective Study of Medicolegal Autopsies Requiring the Aid of Histopathological Examination, Encountered in a Tertiary Care Hospital in Eastern India and the associated Spectrum of Pathological Conditions

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Abstract

Background : Few studies in the past have addressed the issue of efficacy and importance of Histopathological examination in Medicolegal autopsy. As pathological autopsy is rarely performed in this state owing to obvious issues of consent, the trends of disease extrapolated from medicolegal autopsies by histopathological examination, can partially supplement the existing gap of knowledge, particularly for organs like heart, brain, liver, and lung, which seldom undergoes resection.

Aims and Objective : (1) To study the spectrum of pathological conditions related to cases of medicolegal autopsies performed in this three-year time interval. (2) To identify the variables influencing the histopathological diagnosis in cases of medicolegal autopsy in the present infrastructure. (3) To estimate the efficacy of histopathological examination in explaining the cause of death in medicolegal autopsies.

Materials and Method : An observational retrospective cross-sectional study was undertaken in the Department of Pathology in collaboration with the Department of Forensic Medicine & Toxicology, R G Kar Medical College and Hospital, Kolkata for a 3-year duration. All the cases of medico-legal autopsies requiring histo-pathological examination where the cause of death was kept pending (obscure autopsy) of the cause mentioned as natural were taken. The necessary details of the cases and the reports were collected from Departmental archives with a review of the histopathology slides.

Results : Cause of death could be established in a good number of cases among the obscure autopsy group, whereas diversified histopathological findings were noticed among the other cases of natural deaths which revealed the pathological spectrum of diseases obtained, was helpful as a reflection of prevalent patterns of general population.

Conclusion : Routine histological examination of medicolegal autopsy cases may not be recommended based on the current infrastructural scenario. However, it can supplement and enrich our understanding of pathological conditions causing death, which may be already apparent on gross examination and even reveal very rare and fascinating cases, as experienced in our study.

Key words : Autopsy, Histopathology, Cause of Death.

Since Edward Bulkley performed the first Medicolegal Autopsy in colonial India¹, Medicolegal Autopsy became a part and parcel of any inquest procedure - and the tradition continues to date. However, the relative paucity of Histopathology labs and trained personnel as compared to the enormous number of autopsies performed over the year, limits the number of histopathological

Editor's Comment :

- Routine histological examination of medicolegal autopsy enriches the understanding of pathological conditions causing death.
- Pathological spectrum of diseases obtained through autopsy can reflect prevalent patterns of disease in the general population.

examinations associated with autopsy, in our country. Few studies in the past have addressed the efficacy and importance of HPE in Medicolegal Autopsy in India, particularly in the state of West Bengal, which has a rich history in the development of Forensic medicine tracing from the colonial past.

AIMS AND OBJECTIVE

(1) To study the demographic profile of the cases of

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Medicolegal Autopsies requiring the aid of histopathological examination in the three-year time frame

(2) To study the spectrum of pathological conditions related to cases of Medicolegal Autopsies performed in this time frame where the cause of death was either natural or obscure.

(3) To identify the variables influencing the histopathological diagnosis in cases of Medicolegal Autopsy in the present infrastructure

(4) To estimate the efficacy of histopathological examination in explaining the cause of death in Medicolegal Autopsies

MATERIALS AND METHODS

An observational Retrospective cross-sectional study was undertaken in the Department of Pathology in collaboration with the Department of Forensic Medicine and Toxicology, R G Kar Medical College and Hospital, Kolkata, 12-month duration from 2021 to 2023.

All the cases of Medicolegal Autopsies whose cause of death were written to be natural or obscure undergoing histo-pathological examination (mostly brought dead in the ER with a possibility of natural death) within the 3-year interval (from March, 2021 to March, 2023) were included in the study. Among the cases, the COVID-19-positive cases were excluded from the study. The tissues that were visibly decomposed and the biopsy samples obtained from living patients as a part of clinical workup or therapeutic management were also excluded from the study.

Table 1 — Distribution of cases according to age range and Sex

Age Range	Male	Female	Total
21-30	2	1	3
31-40	3	2	5
41-50	5	0	5
51-60	3	0	3
61-70	4	1	5
Not Known	6	1	7
Total	23	5	28

Table 2 — Spectrum of predominant pathological conditions with respect to individual organs

Heart	Lung	Liver	Kidney
Atherosclerosis (5)*	Pulmonary edema (4)	Hepatic Steatosis (4)	Chronic Pyelonephritis (2)
Healed infarct (1)	Lobar Pneumonia (1)	Cirrhosis of liver (1)	Interstitial nephritis (1)
Myocardial infarction (1)	Fungal Pneumonia (1)		Myeloma kidney (1)
Calcific aortic stenosis (1)	ARDS in plasma cell		ESRD (1)
Pericarditis (1)	leukaemia (1)		
*Two cases of the autolyzed sample included			

The necessary details of the cases and the reports were collected from the Medical records department with preparation and interpretation of the histopathology slides from archived Formalin fixed paraffin embedded blocks. The collected data was tabulated and statistical analysis was done by SPSS version 25.

ANALYSIS AND RESULT

In Table 1 out of the total 28 cases, 82.14% cases were from male subjects and 38.1% of cases (with known age group) were below 40 years by age.

In Table 2 Spectrum of predominant pathological conditions with respect to individual organs.

Table 3 illustrating the relative contribution of histopathological examination in modifying the cause of death obtained from autopsy (excluding the two cases with complete autolysis).

Table 4 showing the distribution of cases according to cause of death apparent from autopsy with respect to contribution from histopathological examination (excluding the two cases with complete autolysis).

The Fisher exact test statistic value is 0.0022. The result is significant at $p < 0.05$

In Table 5 distribution of degree of autolysis in cases with respect to the time interval (in days) between the date of autopsy and the date of receiving in the department.

A Statistically significant association is found between time interval and degree of autolysis of tissue ($P = 0.033$). Among the tissues preserved for 60 days or less, only 21.4% showed features of autolysis; whereas, 83.4% of the tissues underwent autolysis,

Table 3 — Showing the relative contribution of histopathological examination

Cause of death from autopsy findings (n=26)			
Obscure (n=14)		Diseased condition of organ/organs (n=12)	
HPE reveals co-morbidity to explain the cause of death (n=8)	HPE reveals specific organ-related findings to explain the cause of death (n=6)	HPE reveals organ related specific findings sufficient to establish the cause of death (12)	HPE reveals non-specific organ-related findings insufficient to establish the cause of death (0)

Table 4 — Distribution of Cause of Death

		Specific information on co-morbid pathology obtained from HPE	
		Yes	No
Written Cause of death at autopsy report	Yes	12	0
	No (obscure autopsy)	6	8

Table 5 — Distribution of Degree of Autolysis

Time interval in days	No autolysis	Partial/complete autolysis	Total
1-60	11(78.6%)	3(21.4%)	14(100%)
60-120	4(50%)	4(50%)	8(100%)
Beyond 120	1(16.6%)	5(83.4%)**	6 (100%)
Total	16 (57.1%)	12(42.9%)	28(100%)

**Two cases of complete autolysis included

which were kept for more than 120 days.

DISCUSSION

The medicolegal autopsies examined in this study comprise cases from a wide age range, the lowest being 25 years to the highest being 69 years (Table 1). Male cases are over represented as compared to females, in this study. This may be because male cases are the predominant section coming for autopsy as a whole.

The histopathological spectrum of diseases is summarized organwise in Table 2, which is concordant with the study of Singh HC, *et al*¹, performed in the nearby state of Orissa, India. Two representative cases showing pulmonary edema (Fig 1) and hepatic steatosis (Fig 2) are the commonest findings with respect to the lungs and liver respectively. Singh H C, *et al*² performed a study on 100 cases over four years. Myocardial infarction and fatty liver were found to be the most common histopathological findings. Seven cases of liver cirrhosis, 5 cases of pyelonephritis, and 6 cases of Tuberculosis were the other notable clinical conditions apparent in their study.

In our study, the microscopic findings were sufficient enough to explain the cause of death in 76.92% of cases (sparing the two cases with complete autolysis). However, it has supplemented and enriched our understanding of pathological conditions causing death, which was apparent or was suspected on gross examination. It has also uncovered a few pathological conditions that were not suspected during gross examination in the obscure cases (Table 3). The contribution of histopathology in obtaining specific

information on the pathological conditions to establish the cause of death in such autopsies was found to be statistically significant (Table 4). Still, it should be noted that the contribution of conventional histopathology is meager in elucidating the cause of death in truly obscure autopsies when other ancillary investigations are not done. Cases with cardiac arrhythmia or acute poisoning often end fatally without leaving any specific sign on microscopical examination too³. So, Routine histological examination of medicolegal autopsy cases seems to have limited value based on the current infrastructural scenario.

Views provided by Pathak A, *et al*³ the crucial issue of routine histopathological examination of viscera in medicolegal autopsy provides hardly any benefit in ascertaining the cause of death. In their three-year study based on Rajkot, they found only 5.56% of cases benefited from tissue examination. Though they do not disapprove of the rational use of histopathology in selective obscure cases, from a medico-legal point of interest, the relative contribution may be sparse in routine autopsy, according to their point-of-view. Molina D K, *et al*⁴ demonstrated, in only a single case out of the 189 cases, cause of death was affected by histological examination. Underscoring the fundamental difference between the aims of medicolegal and pathological autopsy, they concluded that the routine practice of histopathology in medicolegal cases is often unnecessary. However, Parai JL, *et al*⁵, in contrast to Pathak A, stated a strong inclination towards microscopic examination of tissues to confirm or refute the gross findings; notwithstanding the issue of apparent cost implications implicated in it.

Nonetheless, the pathological spectrum of diseases obtained is helpful as a reflection of prevalent patterns of disease in the general population; especially where routine pathological autopsy is not performed as evident in the studies of Sindhura J, *et al*⁶, Khiste JS, *et al*⁷ and Singh HC, *et al*². Especially, they may be helpful for assessment of burden of disease in the brought dead patients. Moreover, incidentally, it can reveal very rare and academically fascinating cases, as experienced in two instances in our study.

In one such case conducted by the authors, the retroperitoneal fatty tissue sent separately was diffusely infiltrated by sheets of atypical plasma cells. On finding the same, other tissues were subjected to histopathology and were found that ganglions of paravertebral sympathetic chains were also

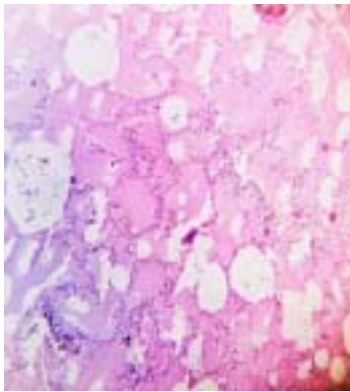


Fig 1 — Pulmonary edema, H&E, 400X

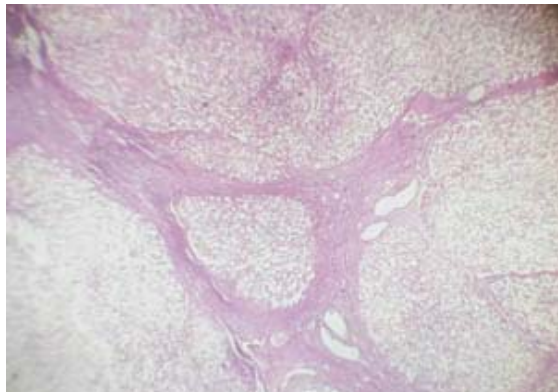


Fig 2 — Diffuse steatosis with cirrhotic change, H&E, 100X

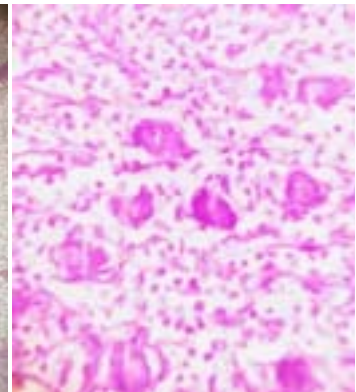


Fig 3 — Atypical plasma cells infiltrating ganglion cells of paravertebral sympathetic chains, H&E, 400X

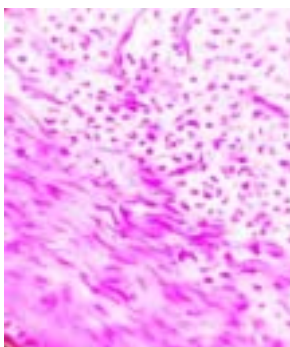


Fig 4 — Atypical plasma cells infiltrating large nerve bundles, H&E, 400X

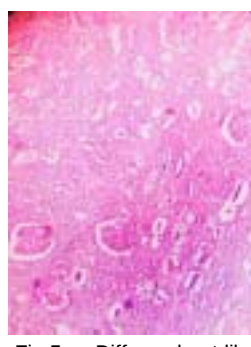


Fig 5 — Diffuse sheet-like infiltration of atypical plasma cells in the renal parenchyma with features of myeloma kidney, H&E, 100X

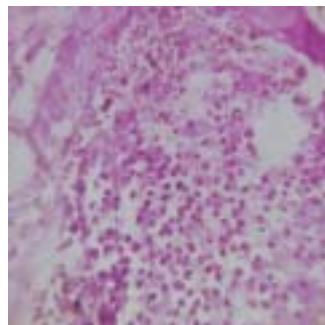


Fig 6 — Atypical plasma cells inside a large blood vessel within a section from lung, H&E, 400X



Fig 7 — Capsulated fungal body in alveolar spaces, GMS, 400X

encroached by neoplastic cells (Fig 3) and the spinal nerve bundles were infiltrated with atypical plasma cells (Fig 4). Not only that, previous history of existing multiple myeloma was there and the renal findings were consistent with myeloma kidney (Fig 5). The lung tissue showed features of pulmonary edema, but most astonishingly, the large blood vessels of the lung were studded with atypical plasma cells and plasmablasts (Fig 6). So, the diagnosis suggests towards a case of Plasma cell Leukaemia with diffuse involvement of retroperitoneal organs.

The second case was one from a young patient, whose demise was suspected as a sudden cardiac death. Multiple solid whitish nodules (some with calcification) were present on bilateral lungs, more towards the periphery of lower lobes and sub-pleural location. Based on gross findings, our suspicion was either Tuberculosis or a cancerous deposit; though, owing to the age of the patient as well as the location, both the differentials seemed to be very unlikely. Histopathological examination revealed, large areas of coagulative necrosis in the lung in different stages

of healing with two thrombosed medium-sized blood vessels. Additionally, numerous large yeast forms of fungus with broad-based budding were found in the necrosed areas admixed with inflammatory cells. The morphological features on GMS stain (Fig 7) were suggestive of *Blastomyces* sp; a very uncommon finding altogether.

Few rare and unexpected cases like giant cell myocarditis, pulmonary hamartoma, aortic dissection, broncho-pulmonary aspergillosis and dual pathology in lung (coexistent adenocarcinoma and tuberculosis) are reported by Sindhura, *et al*. Khiste JS, *et al*⁴ reported two cases of Aspergillosis, pulmonary cryptococcosis and a case of metastatic round cell tumour. An interesting case of sickle cell disease causing vaso-occlusive crisis and a case of Rabies with Negri bodies in brain are reported by Singh HC, *et al* in similar settings. Similar uncommon cases have been reported by Hadijev R, *et al*⁸, Panchal MG, *et al*⁹ and Kaur M, *et al*¹⁰ in their autopsy series. Sharma D, *et al*¹¹ have described one case of each fat embolism, amniotic fluid embolism, Takayasu arteritis, and pneumocystis jiroveci pneumonia associated with

CMV infection in their study. They concluded that histopathological examination was crucial to pinpoint the cause of death in a considerable number of medicolegal autopsies.

Autolysis of Tissue :

A Significant association is found between the degree of autolysis of specimens with the interval between specimen harvesting and reception in the Department of Pathology (Table 5). It underscores the improper way of preservation in formalin, which is at least frequent in our setup. Appropriate maintenance of formalin volume with sectioning of solid organs before final despatch ensures proper fixation and prevents degeneration by autolysis¹². The ideal duration of formalin fixation should not exceed 48 hours¹³. Shortening of the period between specimen harvesting and receiving the specimen in the pathology department, which often happens due to complex judicial procedures, is recommended - as over-fixation may be detrimental, if ancillary investigations like Immunohistochemistry¹⁴ are planned further.

CONCLUSION

Routine histological examination of medicolegal autopsy cases may not be recommended based on the current infrastructural scenario. However, it can supplement and enrich our understanding of pathological conditions causing death, which may be already apparent on gross examination. The relative contribution of conventional histopathological techniques in ascertaining the cause of death in obscure cases is still rudimentary; however, they can generate information on associated co-morbid conditions in such cases.

Nonetheless, the pathological spectrum of diseases obtained is helpful as a reflection of prevalent patterns of disease in the general population; especially where routine pathological autopsy is not performed. Moreover, incidentally, it can reveal very rare and fascinating cases, as experienced in our study. Appropriate maintenance of formalin volume with sectioning of solid organs before final despatch ensures proper fixation and prevents degeneration by autolysis. Shortening the period between specimen

harvesting and receiving the specimen in the pathology department, which often happens due to complex judicial procedures, is recommended;- as over-fixation may be detrimental, if ancillary investigations like Immuno-histochemistry are planned further.

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Conflict of Interest : None

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