Original Study

Histomorphological Spectrum of Lung Lesions in Medico- legal Autopsy in a Tertiary Care Centre

Siddaganga S M[1], Rajashree J Ingin[2], Manish K[3], Deepak Suntoore[4]

[1]Assistant Professor Department of Pathology. Gulbarga Institute of Medical sciences Kalaburagi. Karnataka, [2]Professor and HOD Department of Pathology, Gulbarga Institute of Medical sciences Kalaburagi. Karnataka, [3]Associate Professor Department of Forensic medicine and Toxicology, Gulbarga Institute of Medical sciences Kalaburagi. Karnataka, [4]Assistant professor Department of Forensic medicine and Toxicology, Gulbarga Institute of Medical sciences Kalaburagi. Karnataka.

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Abstract

Background: Organ specific pathological changes seen during autopsy give a clear idea of the cause of death.

Lungs are one of the most important vital organs in the human body. They are almost always involved in terminal events of cardiovascular diseases. Autopsy is important not only to know the state of lungs but also to study the morphology of various diseases. Various studies have demonstrated that, 20-30% of sudden deaths are due to underlying pulmonary pathology.

Aims and objectives: The significance of this study is to highlight the spectrum of histomorphological features of lung lesions in medico-legal autopsies irrespective of cause of death.

Material and Methods: This was a retrospective study Medico legal autopsies over a period of 5 years carried out in the Department of Pathology in coordination with the Department of Forensic Medicine, Gulbarga Institute of Medical Sciences. Standard protocols are used for gross and histopathology processing.

Results: After thorough histopathological examination, of total 100 cases, various lesions were identified in 93 cases, in 7 cases tissue was autolysed.Majority cases seen in the age group of 20-40yrs with male predominance. The most common cause of death was Road Traffic Accident (RTA) and majority victims were males. The commonly observed pathological features congestion and oedema (44.4%), Pneumonia(26.8%), CVC(22.2%) tuberculosis(9.6%) and ARDS(6.6%).

Conclusion: The present study observed and documented histomorphological spectrum of lung lesions in medico-legal autopsies and highlighted various pathological conditions which are either direct or indirect cause of death.

This study emphasizes that spectrum of histopathological changes in lungs of autopsy cases irrespective of cause of death and highlights some incidental interesting findings in lungs.

Key words: Medicolegal, Lungs, Chronic venous congestion and tuberculosis.

Corresponding Author: Siddaganga S M, Assistant Professor Department of Pathology. Gulbarga Institute of Medical sciences Kalaburagi. Karnataka.

Email: sigisiddaganga@gmail.com

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Introduction

Autopsy is a specialised method of systematic examination of a dead body with objectives of identifying the primary cause of death. The term "autopsy" is derived from the Ancient Greek word autopsia, means "to see for oneself" autos ("oneself") and opsis ("eye")[1,2]

Medico-legal autopsy or Forensic autopsies are done under legal orders in circumstances like unnatural deaths, sudden or suspicious death. The medico-legal autopsy is a procedure which detects the untreated disease, or the disease the person was unaware during his/her life time.

Various histopathological findings unrelated to the cause of death are noticed in routine histopathological examination of medico-legal autopsies. Organ specific pathological changes seen during medico legal autopsy give a clear idea of the cause of death. Histopathological examination of the autopsied specimen also gives a clear idea about incidental findings[3].

These findings have been proved to be of great academic value and serve as an eye opener to the infrequent lesions which go unnoticed when a person is alive. The medico-legal autopsy provides an opportunity for studying not only medically diagnosed diseases, but also the natural evolution of untreated disease. Autopsy also aids in the diagnosis of undiagnosed or misdiagnosed malignant tumours irrespective of underlying cause of death.

Lungs are one of the most important vital organs in the human body and are unique organs which have direct and constant connection to surrounding environment[4]. Lungs are commonly involved in various inflammatory and neoplastic conditions. They are almost always involved in terminal events of cardiovascular diseases. Various studies have demonstrated that about 20-30% of sudden deaths are due to underlying pulmonary pathology[5].

In medico-legal autopsies, depending on the cause of death, the lungs may be found affected in various conditions viz. a collapsed lung as in traumatic pneumo and/or haemo-thorax, or a non-collapsed lung as in pulmonary embolism, or an inflated lung as in emphysema or oedema from various causes; even detailed gross examination of lungs alone gives a clinical diagnosis.

The significance of this study is to highlight the spectrum of histomorphological features of lung lesions in medico-legal autopsies irrespective of cause of death.

Material and Methods

This study is a five- years retrospective cross-sectional study conducted from January 2016 to December 2020, carried out in the Department of Pathology, Gulbarga Institute of Medical Sciences attached to tertiary care hospital. Medico-legal autopsy cases done in either Forensic Medicine department of this institute or by Medical Officers from PHC or CHC in and around Gulbarga, where lung specimen was submitted for histopathological examination were included in this study irrespective of age, gender and cause of death. Both the lungs and single lung, either whole or partial which were sent in 10% formalin were included.

Cases in which lung specimen were not submitted; cases in which lung tissues were autolysed and cases in which microscopic histology was normal were excluded from the study.

Gross external examination and cut surface of all the lung specimens was done using standard protocols. The specimens were examined for size, consistency, colour, texture, areas of consolidation, oedema, exuding froth, pus, areas of haemorrhage, etc.

Representative bits of 3-4mm thickness were submitted for routine formalin fixed paraffin embedding process. Sections were stained with Hematoxylin & Eosin. Special stains like PAS, Zeil Neilson stain were done whenever required.

Ethical clearance was obtained from institutional Ethical committee with reference number **GIMS/ GUL/PHARMA/IEC/59/ 2020-21**

SATISTICAL ANALYSIS: Descriptive date was summarized, and percentage and frequencies were calculated.

Result

This is five-year retrospective study conducted in the department of Pathology Gulbarga Institute of Medical Sciences Kalaburagi from January 2016 to December 2020 included100 medico-legal autopsy cases.

The age of the deceased where a medico-legal autopsy was performed ranged from 1year 10 days to 72years.The mean age (range) of deceased in this study was 21-40 years and maximum cases were seen in this age group.

The number of males and females in this study was 72 and 28 respectively with a male to female ratio being 2.5:1.

Out of the 100 medico-legal autopsy cases. 7 cases (5 bilateral lungs and 2 right lungs were autolysed) hence these cases were excluded from the study. Total 93 cases of lung specimens showed significant histopathological changes. In 83 cases we received both right and left lungs and in 7 cases we received only right lung and in 3 cases only left lung.

Table 1: Mode of death with pathological lesions in lung

SI. No	Mode of death	No of cases
1	Sudden death	18
2	RTA	17
3	Assault/ injury to chest / laceration of lung	03
4	Epilepsy	09
5	Suicide/ hanging	05
6	Uterine rupture	05
7	Alcohol intoxication	06
8	Sepsis	04
9	Drug anaphylaxis	03
10	Burns	03
11	Electric shock	02
12	Snake bite	05
13	CVC etiology	02
14	Fall from height	05
15	SOL	02
16	Intestinal obstruction	02
17	OP poisoning	04
18	Unknown	05
	Total	100

The most common cause of death was sudden death due to myocardial infarction accounting for 18cases, followed by RTAs seen in 17 cases and epilepsy in 9 cases. The other rare causes were assault, suicide, alcohol intoxication, uterine rupture, snake bite, SOL in brain, burns, electric shock etc (Table 1). Most cases of sudden death occurred in the 3rd and 4th decade of life. Maximum victims of sudden death were males 98 and 2 were females. Highest frequency of RTAs was seen in age group of 20-40years. Most of the RTA and OP poisoning victims were males, and all burns victims were females.

The mean weight of the right lung in males was 850+/- 135gm and that in females was 700+/-100gm. The mean weight of left lung in males was 750+/-100gms and that in females was 550+/-90gms.

Table 2: Distribution Of cases according to various gross morphology of lung

Gross morphology	Total number of cases	Percentage
Anthracotic pigmentation	42	45.16%
Pneumonia changes	25	26.88%
Granulomatous inflammation	9	9.67%
Brown indurations (CVC)	10	10.75%
Lacerations	3	3.22%
Saddle thromboembolism in Pulmonary trunk	3	3.22%
Unremarkable	1	1.07%
Total	93	100

On gross examination the external surface and cut surface of both lungs showed anthracotic pigmentation in 42 cases (45.16%) mild to moderate anthracotic pigmentation observed in 38 cases, and 4 cases showed severe anthracotic pigmentation and these cases were associated with fibrosis on external surface, followed by total 25 cases showed pneumonia changes out of 25 cases (26.8%), different stages of lobar pneumonia like congestion, grey hepatization, red hepatization, observed in 18 cases, bronchopneumonia was observed in 4 cases,(Fig.3) aspiration pneumonia in 1 case and interstitial pneumonitis seen in 2 cases. Granulomatous inflammation observed in total 9 cases (9.67%), out of

9 tubercular granulomatous inflammations, on gross 5 cases showed apical cavitatory lesions, grey white firm millet like lesions observed in 3 cases and also showed multiple small cavities and millet like lesions in 1 case (Fig.2). Gross features of CVC like brown induration, firm and heavy lung were noted in 10 cases (10.75%) (Fig.1). Total 3 cases (3.22%) had chest injury showed laceration of lower and middle lobe in which 2 were right lungs and 1 was in left lung. 3 cases (3.22%) showed saddle thromboembolism in the pulmonary artery trunk, in 1 case right pulmonary artery showed complete obliteration of artery and 2 cases thromboembolism was seen in main trunk. Remaining 1 case (1.07%) lung specimen was unremarkable on gross examination. (Table.2)

Table 3: Distribution Of cases according to various Pathological lesions of lung

SI. No	Microscopic findings	No of cases	Percentage
1	Pulmonary vascular diseases	45	48.38
2	Pulmonary infection	34	36.55
3	Chronic obstructive pulmonary disease	14	15.05
	Total	93	100

In the present study all, pathological lesions observed in lung are categorized under three broad headings mainly Pulmonary vascular diseases which constitutes 45 cases (48.38%), followed by Pulmonary infection which constitute 34 cases (36.55%) and Chronic obstructive pulmonary disease are seen in 14 cases (15.05%) (Table.3) `

Table 4: Distribution of cases of Pulmonary vascular diseases

SI. No	Pulmonary vascular disease	No of cases	Percentage
1	Chronic venous congestion	10	22.22
2	Pulmonary edema with congestion	20	44.44
3	Pulmonary hemorrhage with congestion	3	6.66
4	Interstitial congestion	6	13.33
5	ARDS/DAD	3	6.66
6.	Thromboembolism	3	6.66
	Total	45	100

Commonest microscopy pathological lung conditions in the present study were pulmonary vascular disease observed in 45 cases. Out of 45 cases of pulmonary vascular diseases, congestion with oedema observed in 20 cases (44.44%). These cases showed congested blood vessels and intra-alveolar haemorrhages, alveoli distended with protein rich fluid. followed by Chronic venous congestion (Fig.4) seen in 10 cases (22.22%), microscopic findings in these cases were distended alveolar septa with congestion and heart failure cells are seen in alveoli. Interstitial congestion observed in 6 cases (13.33%) and pulmonary haemorrhage with congestion are observed in assault cases, thromboembolism and ARDS/DAD was observed in 3 cases (6.66%) each. (Table.4)

Table 5: Distribution of cases of pulmonary infection

SI. No	Pulmonary infection	No of cases	Percentage
1	Lobar pneumonia	18	52.94
2	Bronchopneumonia	04	11.76
3	Interstitial pneumonia	02	5.88
4	Aspiration pneumonia	01	2.94
5	Tuberculosis	09	26.47
	Total	34	100

Second most common pathological conditions observed is pulmonary infection constitutes 34 cases (36.55%), among infectious diseases lobar pneumonia (Fig.5) was the most common infection comprised of 18 cases (52.94%) characterized by vascular engorgement, intra-alveolar fluid and neutrophilic infiltrates followed by granulomatous inflammation (Fig.3) observed in 9 cases (26.94%), all cases showed caseous necrosis with Langhan's type giant cells and ZN stain was done in all the tubercular granulomatous inflammation cases but only 4 cases showed ZN stain positivity for AFB. These cases were diagnosed to be suffering from pulmonary tuberculosis. Other uncommon pulmonary infections observed are bronchopneumonia 11.76%, interstitial pneumonia in 5.88% and aspiration pneumonia in 2.94%. (Table.5)

Table 6: Distribution of cases of Chronic obstructive pulmonary diseases

SI. No	COPD	No of cases	Percentage
1	Emphysema	06	33.33
2	Chronic bronchitis	08	66.66
	Total	14	100

Other pathological entities observed in lung specimen are chronic obstructive pulmonary diseases (COPD) which comprises 14 cases (15.05%). Features of chronic bronchitis was observed in 8 cases (66.66%) characterized by mucosal gland hyperplasia and chronic inflammatory infiltrates and emphysematous changes (Fig.7) like airspace enlargement, mild fibrosis and chronic inflammatory infiltrates are seen in 6 cases (33.33%). In few cases chronic bronchitis associated with other pathological conditions like CVC lung and pneumonia. (Table.6)

Table 7: Concomitant lesions found in lung

1	Pneumonia with oedema	04
2	CVC with granulomatous inflammation	01
3	HMD with microthrombi	02
4	Bronchiolitis with veg matter in right bronchus and foreign body granulomatous inflammation	01
	Total	08

Present study in 8 cases concomitant lesions were observed. Pneumonia with oedema seen in 4 cases, hyaline membrane disease with microthrombi seen 2 cases and features of bronchiolitis with vegetable matter in right bronchus seen in single case.

The main histopathological changes seen in sudden death due to myocardial infarction was passive pulmonary congestion and pulmonary oedema, 2 cases of acute myocardial infarctions showed incidental findings like granuloma and chronic bronchitis.

In RTA cases microscopic changes were like interstitial congestion, pulmonary oedema and intra alveolar haemorrhages. Out of 3 cases of chest injury all 3 cases showed intra alveolar haemorrhage with haemothorax.

The most common histopathological changes seen OP poisoning was alveolar oedema, diffuse alveolar destruction and some amount of inflammation.

3 cases of snake bite showed features of cellular inflammation, necrosis and cytoplasmic vacuolation of pneumocytes.

Cases of burns showed diffuse alveolar damage, interstitial pneumonitis, and pulmonary oedema. All 3 cases of burns, trachea was sent to identify whether it was antemortem or postmortem burns. In one case tracheal mucosa was plugged with carbon soot and extensive carbon pigment in lung parenchyma was seen in cases of antemortem burns.

Gross morphology of Lungs

Fig 1: Gross photography of CVC of lung showing heavy rusty brown induration and on external examination.

Fig.2 Gross photography of upper lobe of right lung showing apical tubercular cavity with numerous millet like grey white nodules on cut section.

Fig.3 Gross photography of Tb bronchopneumonia shows foci of consolidation, lesions are 1-2cm, grey yellow dry centered on bronchioles (Arrow)

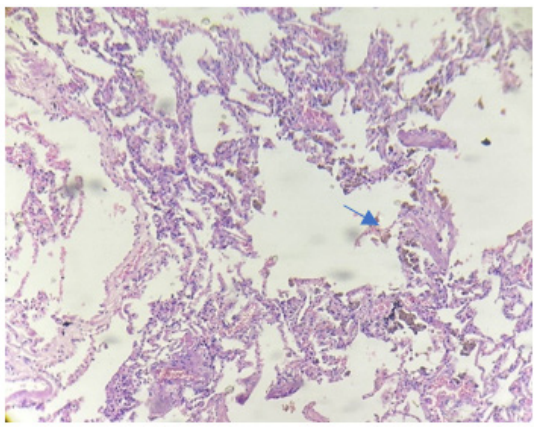

Fig.4 Section from CVC lung shows widened alveolar septa with congested blood vessels and hemosiderin laden alveolar macrophages (Heart failure cells) (H&E; 10X)

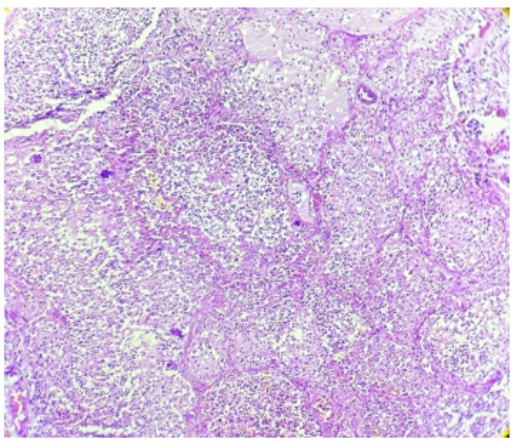

Fig.5 Photomicrograph of Lobar Pneumonia shows alveolar spaces distended by dense acute inflammatory infiltrates, RBCs and macrophages and eosinophilicoedema fluid. (H&E; 10X)

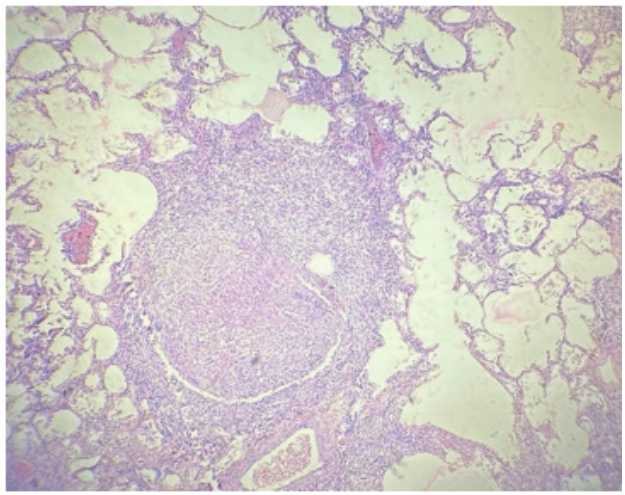

Fig.6 Photomicrograph of TB lung shows well formed granuloma with central caseous necrosis and surrounding alveoli are distended. (H&E; 40X)

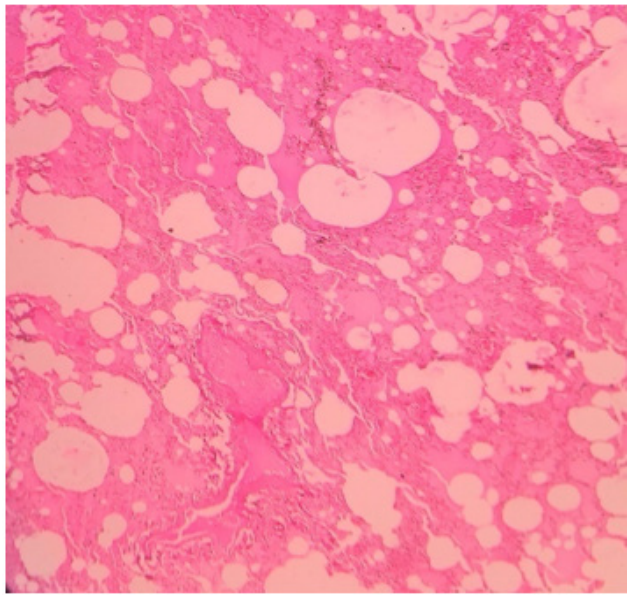

Fig.7 Photomicrography of emphysematous lung shows dilatedalveoli and thickened alveolar septa. (H&E; 40X)

Discussion

Present study was conducted to know various histomorphological changes that occur in lung specimens of medico-legal autopsies. Most of the lung specimens collected during medico-legal autopsies are submitted for histopathological examination when there is no known cause of death. In such conditions it's wise to examine the lungs thoroughly to suggest cause of death. Also, many incidental findings have been highlighted in this study irrespective of cause

of death, which are a great learning tool for both the pathologist and the forensic expert.

A total number of 100 medico-legal autopsies were studied with 166 lung specimens; maximum number of cases being found in the age group of 20-40 years. This finding was consistent with the studies conducted by Zanjad et al[6] and Selvam et al[7].

There was a male preponderance in our study with male to female ratio of 2.5:1 Similar sex predominance was observed by other authors like Selvam[7] and Hanmante RD[8]et al in their studies.

In the present study, the commonest pulmonary lesion encountered was pulmonary oedema with congestion (44.4%), which is similar to studies conducted by Todovoric et al[9] and Pathak and Mangal[10]. This could be death related pathological changes seen in lungs as a terminal event in all cases of cardiovascular diseases.

In developing country like our infective conditions like pneumonia and tuberculosis continue to be one of the major causes of mortality and morbidity. In our study lobar pneumonia was the commonest lung lesion observed in 52.94% cases. This was the main lesion seen deaths which occurred in hospitalised and old aged bed ridden patients. Present study is comparable with Selvambigai G et al[11]. Nazish S et al[12] found Pneumonia to be the first most common finding and Chauhan G et al[13] in their study.

Till date one of the major diseases in developing country like ours TB, though tuberculosis is very common in our area, we get daily patients of Tuberculosis, due to stigma associated with these leads to delay in diagnosis and treatment. This is the reason in Autopsy only 9 cases of Tuberculosis were found. Out of which two were cases of disseminated tuberculosis with lesion involving other organs. Kurawar RR and Vasaikar MS, also found the low percentage of Tuberculosis in their study[14.] Two of the total 9 cases of TB were also HIV positive as per given details and in 1 case granulomatous inflammation was an incidental finding. Similar observations was made in study conducted by Garg M etal[15]

Out of the 3 cases of thromboembolism, there was a history of sudden death in 2 cases, one had history of fall who sustained lower limb long bone fracture and other case was diagnosed with deep vein thrombosis. Histopathological examination revealed saddle thromboembolus in the pulmonary trunk. Similar observation seen in Misra P and Ghosh AK in their studies[16]

Three cases showed features of ARDS in this study. Retrospective study conducted by Sachdev S et all[17] observed low prevalence of ARDS.

Diffuse alveolar damage (DAD), interstitial fibrosis with pneumonia, hyaline membrane diseases and bronchiolitis with vegetable matter in the terminal bronchioles was seen in single case.

Conclusion

In medico-legal autopsies, the histopathological examination of lung specimens is very important which helps in establishing cause of death. The present study observed and documented histomorphological spectrum of lung lesions in medico-legal autopsies and highlighted various pathological conditions which are either direct or indirect cause of death.

In clinical practice pulmonary pathological conditions are commonly encountered, but studying of lung specimens not only provide diagnosis, also give the insight information of varying stages of different diseases. In our study, most of the cases are with unknown history of past illness. In such scenario autopsy findings will provide much information about either cause of death or some incidental findings. Our study also highlights the importance of identifying lethal infections like pneumonia and tuberculosis in developing countries as it can be a major contributor to mortality and morbidity. This study emphasizes that spectrum of histopathological changes in lungs of autopsy cases irrespective of cause of death and highlights some incidental interesting findings in lungs.

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