IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 10 Ver. VIII (October. 2016), PP 37-42
www.iosrjournals.org

Histopathological Analysis of Lung In Sudden Natural Death

Dr.V.Sindu[1], Dr.A.Dhanalakshmi[2]
[1]*Assistant Professor,Department Of Pathology,Coimbatore Medical College*[*]*,Tamil Nadu,India*
[2]*Associate Professor,Department Of Pathology,Coimbatore Medical College*[*]*,Tamil Nadu,India*
** The Tamil Nadu Dr.MGR Medical University*

Abstract: *Sudden natural death can be an unexpected outcome in patients with known illness or unexpected outcome in previously healthy people. Most of the sudden natural deaths are caused by cardiac diseases and hence the lung pathology is often overlooked. The present study is focused on the analysis of lung lesions in sudden natural death. We have analysed 172 cases of sudden natural death over a period of 15months. Among the cases with grossly normal coronaries & absence of structural heart disease 17.4%(n=11) showed granulomatous lesions, 1.6%(n=1) had non-reactive tuberculosis, 1.6%(n=1) showed invasive aspergillosis, 1.6%(n=1) had pneumonia due to pneumocysis jirovecii, 30%(n=19) revealed usual bacterial pneumonia, 3.2%(n=2) showed aspiration pneumonitis, 4.8%(n=3) had chronic reactive airway disease and 1.6%(n=1) showed lung malignancy with brain metastasis. With these results we want to emphasize the need for early diagnosis by thorough investigation in people with respiratory symptoms to prevent deaths from treatable respiratory disorders.*

Key words*: aspergillosis, lung carcinoma, lung in sudden death, pneumocystis jirovecii, tuberculosis*

I. Introduction

The World Health Organisation(WHO) defines sudden death as death occurring within 24 hours of onset of symptoms not otherwise explained, not known to be violent or instantaneous[1].56% of sudden natural deaths occur due to cardiac causes[2] most commonly due to coronary artery occlusion but it can occur due to diseases of any organ or system.

The majority of diseases involving the respiratory system will present with clinical signs and symptoms that can be diagnosed easily. Even if death occurs it is neither sudden nor unexpected. However on occasions respiratory diseases can cause sudden death and they can even be quite dramatic in their presentation. The respiratory causes rank second among the causes of sudden death constituting 16% of cases[2]. Among the respiratory lesions acute severe asthma, pulmonary thromboembolism, lobar pneumonia, massive hemoptysis due to tuberculosis or cancer, pneumocystis jirovecii pneumonia, Hantavirus infection and lung malignancies can cause sudden death[3].

Our study is aimed at identifying the pathological lesions in the lung of sudden death cases in 20 to 60 years of age group and analyse whether these pulmonary lesions have a role in sudden death.

II. Materials And Methods

The study was conducted in the department of pathology, Coimbatore medical college, Tamil nadu. It was a longitudinal prospective study conducted over a period of 15 months from January 2015 to March 2016. The formalin fixed specimens from the cases of sudden death received from the department of forensic medicine were evaluated along with clinical and investigatory data for each case. Informed consent has been obtained from the relatives of the patients and this study has been approved by our institutional ethical committee.

2. 1 Inclusion criteria:

Those cases in 20 to 60 years age group with history of sudden death due to natural causes were included

2.2 Exclusion criteria:

The cases having unnatural manner of death and those with coronary stenosis or structural heart disease were excluded

Out of 184 sudden death cases received 172 were in the age group of 20 to 60 years. Among these 93 had coronary occlusion with or without myocardial necrosis, 1 case had aortic valvular stenosis and 15 cases had left ventricular concentric hypertrophy. These cases were excluded from the present study. 63 cases with grossly normal heart & patent coronaries were evaluated. A complete gross examination of the lungs was done in these cases with inspection of pleura, bronchi, vessels and lung parenchyma. Adequate samples were taken from the lung lesions and processed. Other organs were also examined and the samples taken from the gross lesions. Tissues were processed. Hematoxylin & eosin staining was applied for all the cases along with necessary special stains which included Ziehl-Neelsen (ZN) stain for acid fast bacilli, Modified Fite's stain for

acid fast bacilli, periodic acid schiff(PAS) stain for mucin & fungi using modified McManus method, Grocott methenamine silver(GMS) stain for fungi and mucicarmine for the capsule of Cryptococcus neoformans using Southgate's method. The results were tabulated and analysed.

III. Results

Out of 172 cases of sudden death 63(37%) had essentially normal heart except the occasional fatty streaks in the root of aorta in some of them.

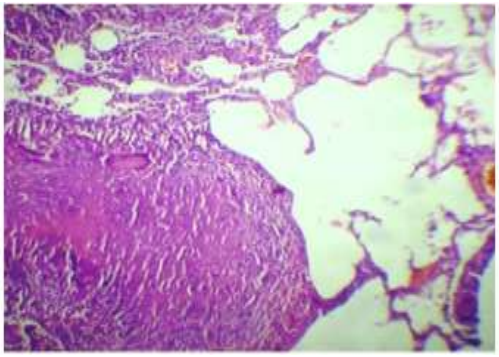

Figure 1: Caseating granuloma-100X

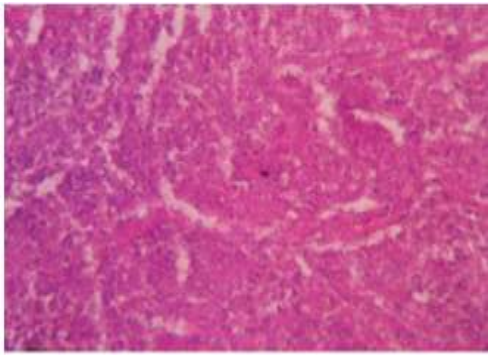

Figure 2: Extensive necrosis-100X

Among these cases 53 (84%) were males & 10 cases(16%) were females of which one case was a 28 years old pregnant woman(TABLE 1). Most of them were in third & sixth decade of life. 54%(n=34) revealed gross lesions and 46%(n=29) revealed only microscopic changes in the lungs.

Table 1: Age & sex distribution

Age group	Number of cases		TOTAL	%
	M	F		
20-30	17	4	21	33.3
31-40	14	2	16	25.4
41-50	7	2	9	14.3
51-60	15	2	17	27
TOTAL	53	10	63	100

Out of the 34 cases with gross lesions in the lung the following findings were noted (TABLE 2).

Table 2: Histopathological findings in lungs with gross lesions

Lesion	Number Of Cases	%
Granulomatous Lesion -Without Cavitation -With Cavitation	11 9 2	17.4%
Non-Reactive Tuberculosis	1	1.6
Pneumocystis Jirovecii Pneumonia	1	1.6
Usual Bacterial Pneumonia	19	30
Invasive Aspergillosis	1	1.6
Large Cell Carcinoma	1	1.6

Out of 11 cases with granulomas 27%(n=3) of cases had a history of treatment for respiratory illness while the other 73%(n=8) of cases were undiagnosed till death. All the cases revealed caseating granulomas with Langhan's type of giant cells which were concluded as tuberculosis(Fig.1).

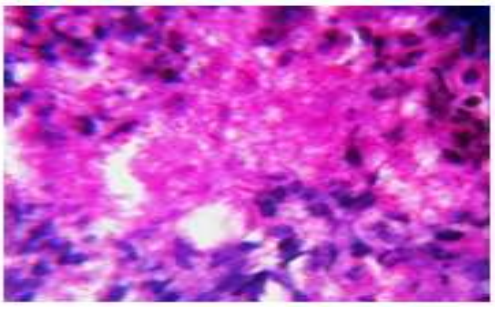

Figure 3: Acid fast bacilli- Fite's stain-400X

Figure 4: Greywhite lesions-lung

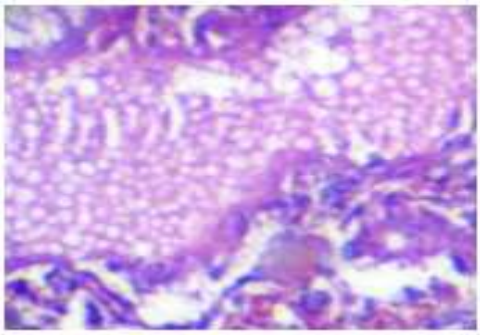

Figure 5: Foamy exudates in alveoli-400X

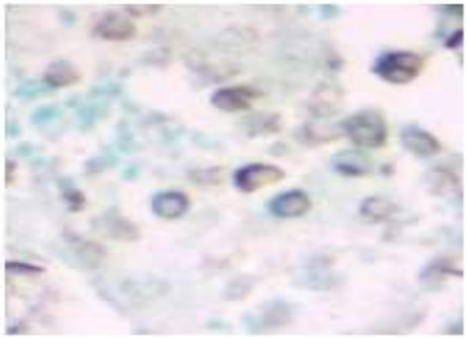

Figure 6: Cysts of Pneumocystis jirovecii-400X

A 55 years old male with a previous history of treatment for tuberculosis revealed extensive necrosis with pneumonic consolidation and occasional macrophages. No granulomas were identified. Fungal stains and mucicarmine for Cryptococcus were negative. Modified Fite's stain for acid fast bacilli revealed numerous rods and fragmented bacilli(Fig.2 & Fig.3). Hence this case was reported as non-reactive tuberculosis.

The case of pneumocystis jirovecii pneumonia was a 25 years old female who developed respiratory difficulty suddenly. Her lungs revealed multiple bilateral ill defined greywhite lesions(Fig.4). Histopathology revealed foamy exudates in the alveoli(Fig.5) with areas of necrosis and ill defined granulomas. ZN stain was negative for acid fast bacilli. GMS stain revealed cysts of pneumocystis jirovecii which were rounded and crescent shaped(Fig.6).

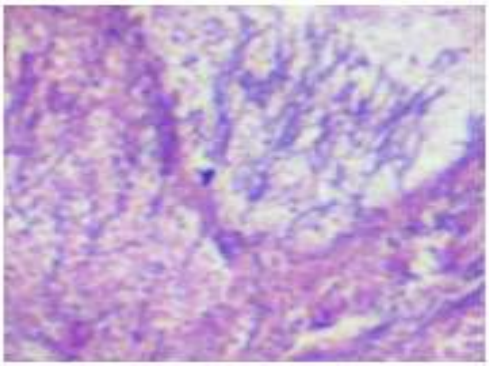

Figure 7: Fungal hyphae within a vessel-100X

Figure 8: Aspergillus – GMS stain-400X

The case of aspergillosis was a 55 years old diabetic who developed sudden breathlessness and died. Numerous acute angled septate hyphae with necrosis were seen in the vessels and the interstitium of the lung with GMS stain(Fig.7 & Fig.8).

Figure 9: Mass lesion-lung

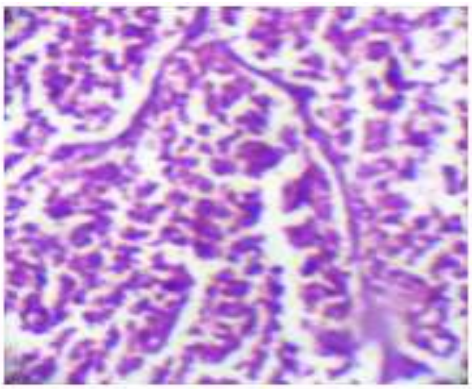

Figure 10: Nests of large pleomorphic cells-400X

A 55 years old male who was on treatment for bronchial asthma became breathless acutely and expired. His right lung showed a large mass lesion in the lower lobe close to the lobar bronchus (Fig.9) measuring 7X6 cm which on microscopy showed features of large cell carcinoma of the lung(Fig.10). Brain showed multiple sub cortical nodules grossly which proved to be metastatic deposits from lung carcinoma(Fig.11 &Fig.12).

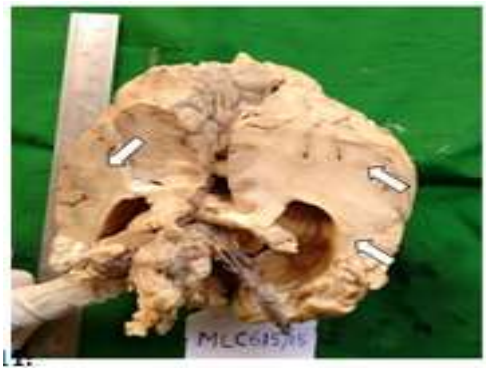

Figure 11: Tiny sub cortical nodules- cerebrum

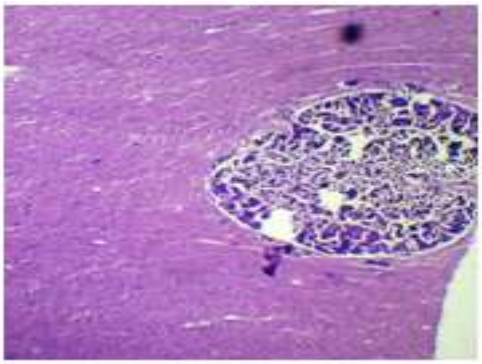

Figure 12: Metastasis in cerebrum-40X

Out of 29 cases with grossly normal lung the following microscopic findings were observed(TABLE: 3).

Table 3: Histopathological findings in grossly normal lungs

Lesion	Number Of Cases	%
Vegetable Matter In The Bronchioles With Pneumonitis	2	3.2
Mucus Plugs In Bronchi & Bronchioles, Bronchial Wall Thickening With Smooth Muscle Hyperplasia	3	4.8
Pulmonary Edema	17	27
Congestion	3	4.8
Hemorrhage	2	3.2
Emphysema	2	3.2

A 35 years old male showed vegetable matter in bronchi and bronchioles(Fig.13) with adjacent consolidation suggestive of aspiration pneumonitis. Later his relatives disclosed that he was an alcoholic which must be the cause for aspiration.

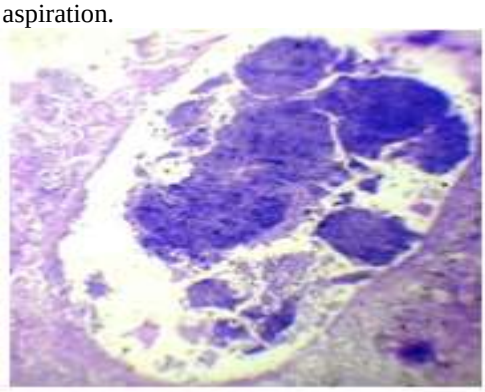

Figure13: Vegetable matter-bronchi-100X

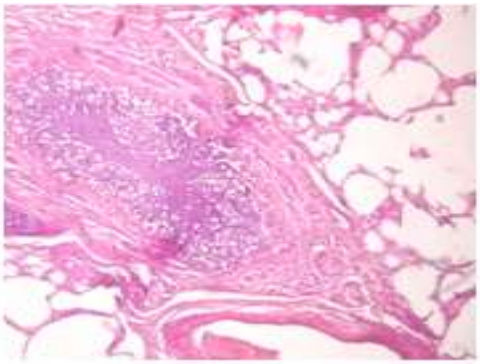

Figure14: Mucus plugs & thickened wall-100X

3 cases revealed mucus plugs in the lumen of bronchi and bronchioles (Fig.14) with thickening of the walls. Retrograde evaluation of the lungs revealed protrusion of the bronchi above the level of cut surface which indicate thickening of the bronchi possibly due to chronic reactive airway disease.

27% of (n=17) cases had only pulmonary edema which could have been due to cardiogenic or non-cardiogenic causes.

IV. Discussion

The incidence of sudden death in India is approximately 10% of all deaths[4]. Natural death means that the death was entirely caused by the disease and trauma or poison did not play any part in causation. We have to bear in mind that a death may appear sudden and unexpected to an outsider but need not have been so from the point of pathological disease process. The deceased may have been symptomless and utterly unaware of his chronic disease or he may have had symptoms but interpreted them as harmless. Also fear, lack of human contact or his own disposition may have prevented him mentioning symptoms to anyone including a doctor. Low socio-economic status would also have been contributed to his negligence to seek medical attention especially in developing countries like India.

In the present study 23%(n=39) of sudden death can be attributed to pulmonary pathology. Among these males were predominantly affected. Most of the patients were in third and sixth decade. The commonest lesion found was usual bacterial pneumonia(30%). Features of tuberculosis was found in 12 cases(17.4%) & most of them died of hematemesis due to erosion of the vessels (Rasmussen aneurysm) traversing the cavity.

Prateek Rastogi[5] also in his study found that 26.64% of sudden deaths are due to respiratory disorders and 16.42% are due to tuberculosis. 4.8%(n=3)cases revealed mucus plugs in lumen with smooth muscle hyperplasia in bronchi & bronchioles. In these cases the death may have been caused by acute severe asthma. A study conducted by cheng[6] in 14 patients died with the history of asthma revealed mucus plugs in 57.1%, proliferation of smooth muscle cells in 78.6% and proliferation of mucous gland in 64.3% of cases. When these findings are seen in asthmatics the mucus plugs in bronchiole is the major factor contributing to sudden death.

The other 3 cases each constituting 1.6% of lung lesions were pneumocystis jirovecii pneumonia, invasive aspergillosis & non-reactive tuberculosis. These cases would have been caused by immunodeficiency. Non-reactive tuberculosis is a condition characterised by foci of necrosis surrounded by normal lung parenchyma. There is no granuloma, cavitation or fibrosis. It is seen in immunodeficient individuals. The patient with aspergillosis was a diabetic which might be the cause for immunosuppression. In pneumocystis jirovecii pneumonia & non-reactive tuberculosis no history pertaining to the cause of immunosuppression could be obtained & significant post mortem hemolysis interfered with analysis for Human Immunodeficiency Virus(HIV). Ansari NA[7] analysed 128 cases which included HIV positive & negative patients. He found that 11% of sudden deaths can be attributed to pneumocystis jirovecii. Pneumocystis jirovecii infection actually progresses faster in immunocompetent individuals. Evaluation of CD4 count, study of bronchoalveolar lavage fluid or induced sputum can be done in asymptomatic individuals to enable prophylactic treatment. Vaideeswar P[8] in his study found that 0.19% of cases(n=39) among 20475 autopsies done over 12 years period had invasive aspergillosis which correlates well with the present study.

In 1959 100 cases of non-reactive tuberculosis have been published. Rajul Singh[9] published 4 cases of non-reactive tuberculosis. Among them one patient had history of diabetes, two had long term steroid treatment for asthma & three were elderly. The condition has seldom been recognized before death. There is an increased risk of infection for those coming in contact with the patient particularly the pathologists who perform the necropsy. The necrosis is caused by the release of tumour necrosis factor from the macrophages triggered by live mycobacterium and its cell wall peptidoglycolipids. The condition should be considered in patients presenting with pyrexia, abnormal chest radiograph & defective immunity. Sputum, fasting gastric contents and liver biopsy material should be examined for tubercle bacilli. In low resource settings the advanced diagnostic techniques should be made available for early detection since the mortality for these lesions are high.

One of the decedents had a large cell carcinoma of the lung(1.6%) with brain metastases which was undiagnosed until death. The lack of awareness about the medical services, lack of literacy, inability to seek medical attention due his socio-economic status or place of living would be the cause for him to be undiagnosed with a large lung tumour until it spreads to brain. This occurs especially with most villages in developing countries like India. The result is in accordance with the study by Renee[10] who found in his study that 0.7% of natural deaths were caused by lung cancer among 24708 autopsy cases studied.

One decedent (1.6%) revealed after thorough examination vegetable matter within bronchi & bronchioles with adjacent pneumonitis. The patient was an alcoholic which was revealed by his relatives later. So aspiration of gastric contents would have been the cause of death in this case. Chia-Yu Chang[11] in his study found that 1.3% of patients died due to aspiration pneumonitis out of 42732 autopsies and most of them had stroke as a cause for aspiration.

The purpose of this study is to bring attention to the treatable respiratory diseases which may cause sudden death thereby we can bring down the mortality rate. Also there are various respiratory diseases which may remain subtle and yet cause sudden death which can be detected by careful dissection of organs & thorough histopathological examination. Since we could not examine organs in a fresh state some of the diseases like pulmonary embolism would have been missed which is a major limitation of this study. The sample size is also a limiting factor to comment about the commonest lung lesions resulting in sudden death. We could not conclude that the pulmonary lesions were the cause of sudden death in these cases as conduction defects in heart could not be excluded.

V. Conclusion

Complete evaluation of sudden death helps to unravel unidentified pathology in the deceased. Organs that appear seemingly innocuous should be viewed with high index of suspicion. Multirational approach is absolutely essential in this regard. Knowledge about wide spectrum of clinical manifestations and histopathological appearances is mandatory. Patients also need to be educated about the results of noncompliance with medical therapy.

References

[1]. World Health Organisation. International statistical classification of diseases and related health problems 10th revision(ICD-10)-WHO version for 2016[Internet]. WHO press,Geneva:World Health Organisation;2015[updated 2015; cited 2016 Mar 24]. Available from: http://apps.who.int/classifications/apps/icd/icd10online.

[2]. Post mortem examination in cases of sudden death due to natural causes. In: Walter E.Finkbeiner, Philip C.Ursell, Richard L.Davis, editors. Autopsy pathology – a manual and atlas,2(Philadelphia:Elsevier;2009) 131-34.
[3]. Graeme Dowling MD. Sudden natural death. In:David Dolinak, Evan Matsha, Emma Lew,editors. Forensic pathology – Principles & practice,1(London:Elsevier academic press;2005) 102-8.
[4]. Dr.Dinesh Rao. Sudden deaths.In:Dr.Dinesh Rao, editor. Autopsy[Internet]. Bangalore,India:2009 Oct 28[cited 2016 Sep 19].Chapter 6. Available from:www.forensicpathologyonline.com/e-book/autopsy/sudden-deaths
[5]. Prateek Rastogi, Tanuj Kanchan, Ritesh G Menezes. Sudden unexpected deaths due to tuberculosis:An autopsy based study. Journal of Forensic Medicine & Toxicology. 2011;28(2): 81-85.
[6]. Cheng D, Yi X, Chen W. Cardio-pulmonary pathology of sudden death in asthma. Zhonghua Jie He He Hu Xi Za Zhi. 2001 may;24(5):295-7.
[7]. Ansari NA, Kombe AH, Kenyon TA, Hone NM, Tappero JW, Nyirenda ST et al. Pathology and causes of death in a group of 128 predominantly HIV positive patients in Botswana. Int J Tuberc Lung Dis. 2002 Jan;6(1):55-63.
[8]. Vaideeswar P, Prasad S, Deshpande JR, Pandit SP. Invasive pulmonary aspergillosis:A study of 39 cases at autopsy. J Postgrad Med. 2004 Jan-Mar;50(1):21-6.
[9]. Rajul Singh, Ramesh C Joshi, John Christie. Generalised non-reactive tuberculosis:a clinicopathological study of four patients. Thorax. 1989;44:952-55.
[10]. Renee L Manser, Malcolm Dodd, Graham Byrnes, Louis B Irving, Donald A Campbell. Incidental lung cancers identified at coronial autopsy:Implications for over diagnosis of lung cancer by screening. Respiratory Medicine. 2005 Apr[cited 2016 Sep 19];99(4):501-507.Available from: www.ncbi.nlm.nih.gov/pubmed/15763458 DOI:10.1016/j.rmed.2004.08.017.
[11]. Chia-Yu Chang, Tain-Junn Cheng, Ching-Yih Lin, Jen-Yin Chen, Tsung-Hsueh Lu, Ichiro Kawachi. Reporting of aspiration pneumonia or choking as a cause of death in patients who died with stroke. Stroke. 2013 Apr[cited 2016 Sep 19];44(4):1182-85. Available from: www.ncbi.nlm.nih.gov/pubmed/23449262 DOI:10.1161/STROKEAHA.111.000663