Original Research Article

Histopathological Spectrum of Lung Lesions in Patients Undergoing Lung Resection – An Institutional Study

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Abstract

Background: Hundreds of millions of people around the world suffer from preventable chronic pulmonary diseases. In present days, tobacco smoking, indoor air pollution, outdoor pollution, allergens, and exposure to occupational hazards have become uncontrollable and the most common risk factors for chronic respiratory diseases. Lung cancer is one of the commonest cancers and cause of cancer-related mortality worldwide. Diagnosis of lung lesions frequently presents a diagnostic challenge to pathologists and clinicians too. The clinical and radiological findings in respiratory diseases are non-specific, and prompt histopathological study is essential for timely diagnosis of these conditions. The present study showed a great interest in the histological characterization of lung lesions at our institution. **Materials and methodology:** A descriptive study was carried out on 50 lung resected specimens received in the department of pathology at Katuri Medical College and Hospital, Chinakondrupadu, Guntur District, Andra Pradesh, India, to find out the spectrum of various neoplastic and non-neoplastic lung lesions encountered in and around Guntur district over a two years period from Oct 2018 to Sep 2020. **Results:** There were 50 cases (30 males and 20 females) during a two-year study period. In our study, the maximum number of cases (20 cases) were reported in the age group of 41-60 years with male preponderance(30 cases). The lung malignancies were more common in males (12cases) when compared to females (7 cases); in our study, the male to female ratio was 1.7: 1. In our study, the most common lung malignancy was primary adenocarcinoma(47.4%), followed by squamous cell carcinoma(26.3%). Granulomatous lesions (36%) were the most common non-neoplastic lesion reported. Smoking was the most common risk factor. **Conclusion:** To conclude, in our study based on morphology, non -neoplastic lesions predominated over neoplastic lesions. The most common lung malignancy was primary adenocarcinoma, followed by squamous cell carcinoma. Granulomatous lesions were the most common non-neoplastic lesion reported. Smoking was the most common risk factor. The present study findings will give valuable baseline information regarding the distributions of lung lesions in our region.

Keywords: chronic pulmonary diseases, Granulomatous lesions, non-neoplastic lung lesions, squamous cell carcinoma.

Introduction

Hundreds of millions of people around the world suffer from preventable chronic pulmonary diseases [1]. The spectrums of lung lesions include congestion, edema, various inflammatory lesions, chronic obstructive pulmonary diseases and neoplastic lesions. Lungs are also secondarily involved in almost all terminal events due to cardiovascular causes[1,2,3].The GLOBOCAN 2018 report estimates that lung cancer remains the leading cause of cancer incidence and mortality, with 2.1 million new lung cancer cases and 1.8 million deaths predicted in 2018, representing close to 1 in 5 (18.4%) cancer deaths worldwide. [4]. In both sexes combined, lung cancer is the most commonly diagnosed cancer (11.6% of the total cases) and the leading cause of cancer death (18.4% of the total cancer deaths), closely followed by female breast cancer (11.6%), prostate cancer (7.1%), and colorectal cancer (6.1%) for incidence and colorectal cancer (9.2%), stomach cancer (8.2%), and liver cancer (8.2%) for mortality.[4] In India, National Cancer Registry Programme Report 2020, by ICMR and NCDIR Bengaluru, estimates that in 2020 cancer cases in the country will be at 13.9 lakhs and likely to increase to 15.7 lakhs by 2025 and also states that cancer of lung, mouth, stomach and oesophagus were the most common cancer among men. Tobacco-related cancers are likely to account for 27.1% of India's cancer cases in 2020.[5]Over 30,000 surgical lung resections are performed annually in the United States [6], approximately 80–90% for malignant and 10–20% for benign lung nodules. [6,7,8] Reported non-neoplastic findings that account for clinically apparent lesions in lung resections include interstitial fibrosis [8,], granulomatous inflammation [6,7], and vasculitides.[7] .Non-small cell lung carcinoma (NSCLC) is the most common lung cancer among the lung malignancies, accounting for about 85.3 % of all the cases.[9] The lung is also one of the most common metastatic sites of many primary cancers.Among non-neoplastic lesions, tuberculosis is the most common. The non-specific nature of symptoms and high prevalence of tuberculosis in our country often leads to misdiagnosis and delayed lung cancer diagnosis. [11].The diagnosis of lung lesions frequently a diagnostic challenge to pathologists as well as to clinicians. Most of the time, relevant clinical history, laboratory investigations, and imaging studies give supportive information, but prompt pathological diagnosis is required for confirmation and prognosis of the disease. This prevents the patient from more invasive procedures. [12]The present study aimed to know the histopathological spectrum of various-neoplastic and non –neoplastic lung lesions encountered at our institution over a period of two years.

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Material & Methodology

Following approval from the institutional ethics committee, the present study was conducted on lung resected specimens of 50 cases received in the department of pathology at Katuri Medical College and Hospital, Chinakondrupadu, Guntur District, Andra Pradesh, India, to find out the spectrum of various neoplastic and non-neoplastic lung lesions encountered in and around Guntur district over a period of two years from Oct 2018 to Sep 2020. All the lung resected specimens were fixed in 10% formalin. Gross findings of resected lung specimens were noted. Multiple sections were taken from the representative areas following the guidelines given in Rosai [13], and sections were processed routinely and stained with Haematoxylin & Eosin stains. All the histological sections were examined microscopically and findings were recorded. Wherever necessary, a Special stain such as PAS was performed. Relevant clinical data and relative information were recorded from the biopsy records and statistical books. Histopathological classification of lung cancers was done according to 2015 WHO classification of lung tumours. [14]

Inclusion criteria: All the resected lung specimens were included in this study, both non-neoplastic and neoplastic lung lesions.

Exclusion Criteria: small biopsies/core biopsies/ inadequate specimens were excluded from this study.

Results

Table 1: Distribution of Lung Lesions in lung resections

Histological type	Number of cases (Total 50 cases, 100%)	
Non neoplastic lung lesions	30 (60%)	
Neoplastic lung lesions	20 (40%)	
	Benign	Malignant
	01	19

Table 2: Distribution of Non – neoplastic lung lesions in lung resections

Diagnosis	Number of cases (30 cases, 100%)
Granulomatous inflammation	11(36%)
Inflammatory	6 (20%)
Interstitial fibrosis	4 (14%)
Pneumonia	5 (16%)
Others (including fungal lesions)	4 (14%)
TOTAL	30 cases (100%)

Table 3: Distribution of Malignant lesions in lung resections

Malignant neoplasms (19 cases, 100%)	
Histopathological type	Number of cases (%)
➢ Primary Malignant neoplasms	
• Adenocarcinoma	9 (47.4%)
• Squamous cell carcinoma- Non-keratinizing	5(26.3%)
• Poorly / undifferentiated carcinoma	2(10.5%)
• Carcinosarcoma	1 (5.3%)
➢ Metastatic / secondary deposits	2 (10.5%)

Table 4: Distribution of Benign lesion in lung resections

Benign neoplasm (one case, 100%)	
Histopathological type	Number of cases (1 case, 100%)
Pulmonary ChondroidHamartoma	1

Table 5: Age-wise distribution of lung lesions

Age in years	Number of cases (Total 50 cases)	
	Type of Lung lesions	
	Neoplastic (20)	Non- neoplastic (30)
1-20	1	3
21-40	4	8
41-60	9	11
61-80	6	8
More than 80	Nil	Nil

Table 6:Distribution of lung lesions among males and females

Gender	The histological type of Lung lesions		
	Neoplastic (20 cases)		Non-neoplastic (30cases)
	Malignant	Benign	
Male (Total 30)	12	1	17
Female (Total 20)	7	0	13

There were a total of 50 cases reported during the two years study period. Non-neoplastic lesions were 30 (60%), and neoplastic lesions contributed to 20 cases (40%) shown in Table1. The maximum number of cases were reported in the age group of 41-60 years (20 cases) followed by 14 cases in persons aged 61-80 years, and the least number of cases (4 cases) were seen in the age group of 0-20 years shown in Table 5. In our study, males were most commonly affected than females (30 males and 20 females) shown in Table 6.In our study, among all the 50cases, 17 cases were primary malignant, 2 cases were metastatic lesions, only one case of benign neoplasm, and the remaining 30 cases were non-neoplastic lung lesions shown in Table 3&4. Among the all neoplastic lesions, the most common histological type was adenocarcinoma which accounts for 9cases (47.3 %), in that 6 cases were mucinous and 3 cases were non-mucinous adenocarcinoma.From which 5 of the adenocarcinoma cases showed lepidic patterns, one case showed tubule-papillary

patterns [Fig 1], and the remaining 3 cases were in an acinar pattern. Five cases (26.3%) of Squamous cell carcinoma were reported. Other malignant lesions were 3 cases(15.7%) of Poorly differentiated / undifferentiated carcinoma,one case(5.2%) of Carcinosarcoma[Fig 2] and 2cases (10.5%) of secondary deposits of the lung, which includes one case of metastatic deposits from adenocarcinoma of GIT and one case from adenocarcinoma deposit of unknown primary. Out of 20 cases of neoplastic lesions, only one benign neoplasm of Pulmonary chondroidhamartoma was reported [Fig 3].

In our study, Granulomatous lesions were the most common type of non-neoplastic lung lesions, accounting for 11 cases (36%), among which one case of military tuberculosis [Fig 4] was reported involving lung and kidney in a 19 years old male patient who had the previous history of TB. In our study, the least commonly reported case was fungal infections, 2 cases of aspergilloma. One case was reported in a 52-year-old male patient who was a chronic smoker and presented with right-sided emphysematous bullae with an entrapped fungal ball in the cavity [Fig 5].In our study, most lung cancer patients (n=13; 68.4%) were smokers. Most males were smokers (n=9; 69.2%), while only 30.8 % of females were smokers.

Discussion

There were a total of 50 cases during the study period of 2 years. The majority of them were seen in the 4th to 6th decade, whereas in studies done by Malik PS et al. [9] and Agarwal A et al. [15], the 5th to 7th decade was the most common age group affected. The lung malignancies were more common in males (12cases) when compared to females (7 cases); in our study, male to female ratio was 1.7: 1 and in studies done by Agarwal et al.,[15] Malik PS et al. [9], Mandal SK et al. [16], Sunderam et al. [17]and study by Pandhi et al.[18], the ratios were 4.7:1, 4.6:1, 1:1, 4.3:1and 2.7:1 respectively.

Table 7: Comparison of present study findings with other Indian studies on lung cancer

Comparision studies	Total no. of cases studied	Male to female ratio	Adeno-Carcinoma(%)	Squamous cell carcinoma(%)	Small cell carcinoma	Poorly differentiated NSC carcinoma(%)	Metastatic deposits(%)
Agarwal A et al [15](2018)	393	4.7	29.3	21.8	12.8	12	6.4
Malik PS et al[9] (2013)	434	4.6	37.3	32.1	28.0	2.8	_
Mandal et al[16] (2013)	466	1.1	30.8	49.1	14.8	3.7	_
Sundaram et al[17](2014)	60	4.3	43.3	31.7	10.0	3.2	_
Pandhi et al[18] (2015)	150	2.7	30.0	41.0	13.0	3.0	_
Baburao et al[19] (2015)	96	3.1	28.1	47.9	2.0	3.1	_
Kumar Mahendra et al [20] (2016)	110	5.6	40.9	-	20.0	2.7	_
Present Study	19	1.7	47.3	26.3	Nil	10.5	10.5

Except, the study by Agarwal et al., no other study reported metastatic lung cancer.In our study, lung malignancies were common in the age group of 41-60 years, and the mean age was 54 years which was comparable to studies done by Malik PS et al. [9] and Jindal [21] were 55 and 54.3 the mean age respectively. The most common malignancy encountered in our study was Non-small cell lung carcinomas, among which adenocarcinoma (9 cases, 47.4 %) was the most common, which was similar to studies done by Agarwal A et al. [15], Malik PS et al. [9], Sundaram et al. [17] and Kumar M et al. [20]. In contrast, in the studies done by Mandal SK et al. [16], Pandhi et al. [18], and Baburao et al. [19], Squamous cell carcinoma was the most common malignancy, as shown in Table no 7. Previously in India, most of the studies[16,21] had reported squamous cell carcinoma as the most dominant subtype, but many recent studies from India showing a change in trends and have reported adenocarcinoma as the predominant subtype.[15,17,20]

In our study, the second common histological type was Squamous cell carcinoma (5 cases, 26.3%) which was similar to studies done by Malik PS et al. [9] (32.1%), Agarwal A et al. [15] (21.8%) and sunderam et al. [17](31.7%). In contrast to other studies mentioned above in Table: 7, no Small cell carcinoma of the lung was encountered in our study.In our study, poorly differentiated non-small cell lung cancers were reported in two cases, accounting for 10.5% of all lung cancer. We reported two cases of metastatic lung cancer accounting for 10.5%, in which one case of metastatic adenocarcinoma deposit from GIT and one case of metastatic adenocarcinoma deposit from an unknown primary. One case (5.2%) of Carcinosarcoma [Fig2] in a 60 years old male patient had a 40 years of smoking history.In our study, most lung cancer patients (n=13; 68.4%) were smokers. Most males were smokers (n=9; 69.2%), and 30.8 % of females were smokers. Present study findings were similar to the study Agarwal A et al. [15], where 76% of cases were smokers.Among the non-neoplastic lung lesions, the majority of the cases were diagnosed as granulomatous lesions (11 cases, 36%) in which 7 of them showed the presence of caseating granulomas composed of collections of epithelioid cells, langhans and foreign body type multinucleated giant cells, lymphocytic collections and caseating necrosis suggesting tuberculosis. The remaining 4 cases showed non-caseating granulomas. This was followed by 6 cases (20%) of inflammatory lesion, mostly chronic inflammatory cell collections like lymphocytes.The present study findings were similar to the study done by Kulshrestha R et al. [22], where most of the cases were granulomatous lesions(%) followed by inflammatory lesions and fibrosis.There were also four cases of Interstitial fibrosis (14%), five cases of Pneumonia (16%); among the 5 cases, 2 cases were chronic non-specific Pneumonitis, 2 cases of chronic lymphoid interstitial pneumonia and one case of chronic non-resolving pneumonia. Two cases of fungal lesions also reported in our study. Here, we discussed a case of Aspergilloma in a 52 years old male who had a history of smoking for 18 years presented with right-sided emphysematous bullae with an entrapped fungal ball.[Fig 5]

Conclusion

In summary, our results showed that non-neoplastic lung lesions predominated over neoplastic lesions. Among non-neoplastic lesions, granulomatous lesions were frequently reported, and tuberculosis being the most common. Among neoplastic lung lesions, adenocarcinoma was the most common histology type reported. Most of the neoplastic lesions showed male preponderance, and smoking was the causative risk factor.The diagnosis of lung lesions frequently a diagnostic challenge to pathologists as well as to clinicians. As a clinician and diagnostician, the pathologist should be aware of clinical presentation, the progression, evolution of the disease, knowledge of environmental exposures, and the pathologist should maintain good communication with the clinician, radiologist, and surgeon to improve the diagnostic accuracy and clinical outcome of the patient. The observations and analysis of the present study findings will give vital baseline information regarding the distribution of lung lesions in our region.

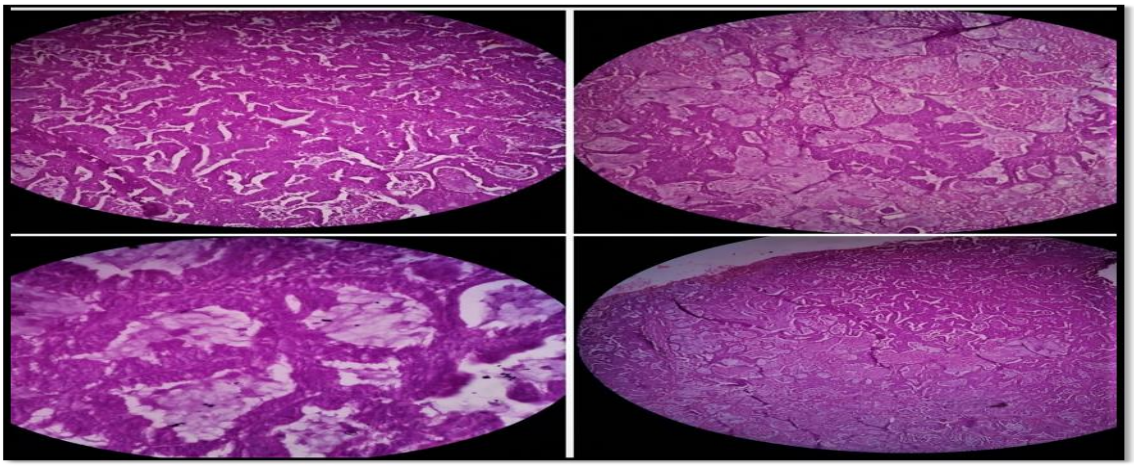

Fig 1: A case of Mucinous- adenocarcinoma- micropapillary type 4342/19 : Microphotographs of H&E Stained Sections from Left lung lobectomy specimen of 40 years old female patient : Mucinous Adeno-Carcinoma exhibiting tubules and micropapillary arrangement . Pleomorphic tumour cells arranged in the form of tubules and papillary pattern admixed with mucin pools.

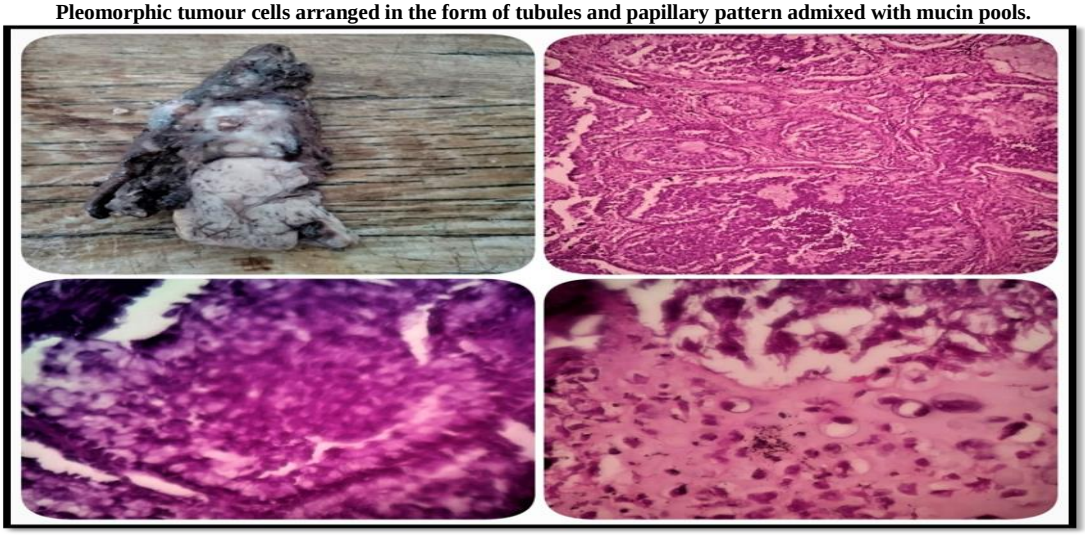

Fig 2: A case of Carcinosarcoma 4283/18: Gross (a) and Photomicrographs of H&E stained sections (b) of Base of Left Lung Lobectomy specimen in a 60 years old male patient

Gross(a): Base of lung lobectomy specimen measuring 12x10x2.5 cms showing a solid irregular greyish brown lesion of size 2 x2cms . Photomicrograph(b): Multiple section studied shows histological features of Carcinosarcoma exhibiting fetal type adenocarcinoma and chondrosarcomatous transformation with cartilage in spindle mesenchymalstroma.

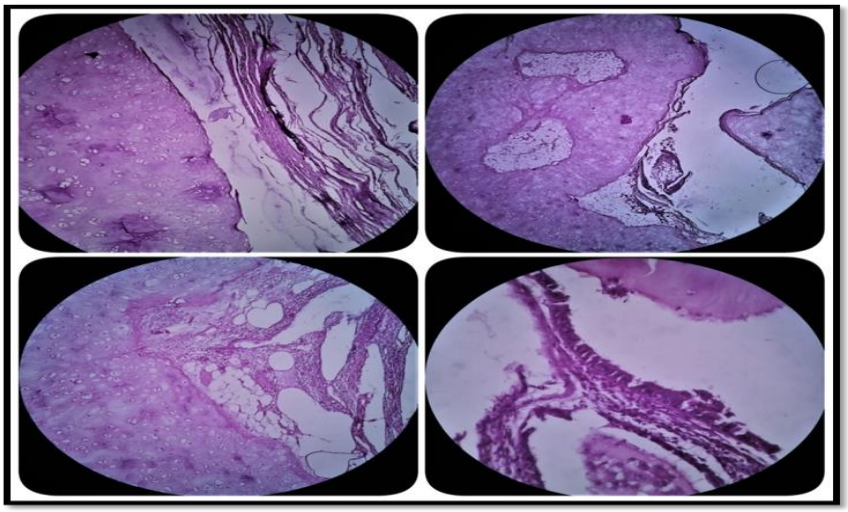

Fig 3: A case of Pulmonary ChondroidHamartoma 20/2020: Gross (a) and Photomicrographs of H&E stained sections (b) of Left Lung Lobectomy specimen from left lower lobe in a 72 years old male patient

Gross (a) : Resected lung specimen showing a well circumscribed,solid, pearlywhite capsulated lesion of size 10x10cms and on cut section gritty to cut admixed with focal myxoid areas. Photomicrographs (b): Pulmonary Chondroid Hamartoma exhibiting circumscribed and capsulated lesion composed of nodules and haphazardly arranged mature hyaline cartilage admixed mature adipose tissue, vascularised connective tissue stroma and entrapped clefts lined by respiratory type of epithelium.

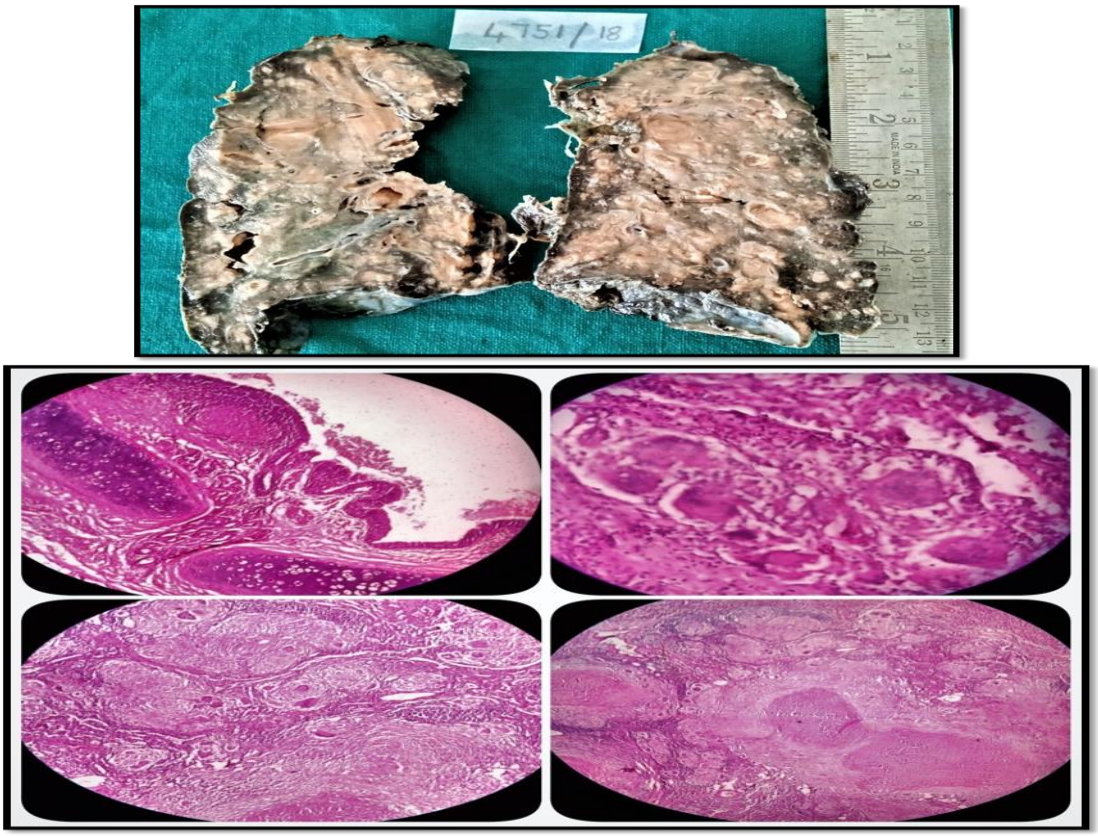

Fig 4: A case of Miliary Tuberculosis of lung 4751/18: Gross (a) and Photomicrographs of H&E stained sections (b) of Left Lung Lobectomy specimen from left lower lobe in a 19years old male patient :

Gross (a) finding of left lung lobectomy specimen measuring 11x7x2 cms. Cut section showing diffusely seen multiple greyish white areas of varying sizes along with necrotic areas. Photomicrographs (b): Showing multiple caseating granulomas seen in the lung parenchyma and in peribronchial areas. Granulomas shows central caseous necrosis surrounded by langhan type and foreign body type multinucleated giant cells, epithelioid histiocytes and lymphocytes.

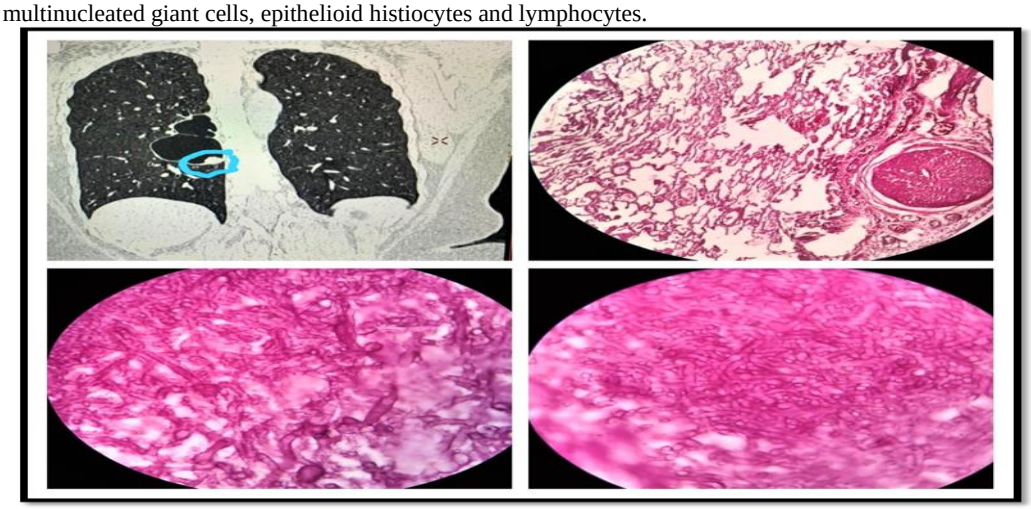

Fig 5: A case of Aspergilloma 1973/19 : HRCT Chest image (a) and Photomicrographs of H&E stained sections (b) of right Lung Lobectomy along with bullectomy specimen from lower lobe in a 52 years old male patient :[a case of fungal ball entrapped in emphysematous bullae].

HRCT Chest image(a):showing approx.9.0x5.6 cms cavitatory lesion with internal small peripheral soft tissue density component (marked in blue circle) noted along with thin septations in postero basal segment of right lower lobe. Photomicrographs(b): Multiple sections studied shows ectatic bronchioles with partial disruption of alveolar septa with entrapped fungal ball showing septate fungal hyphae with acute angle branching.

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