Original Research Paper

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CLINICO-RADIOLOGICAL PROFILE IN DIAGNOSIS OF PULMONARY CAVITORY DISEASE

Medicine

KEYWORDS: Pulmonary cavity , Abscess, Computed Tomography.

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ABSTRACT

Pulmonary cavity is a gas-filled area of the lung in the center of a nodule or area of consolidation and may be clinically observed by use of plain chest radiography or computed tomography. Cavities are present in a wide variety of infectious and noninfectious processes. This STUDY was aimed at different etiological diagnosis and there different clinico-radiological presentations associated with lung cavities.

INTRODUCTION

A cavity is a gas-containing space surrounded by complete wall which is 4mm or greater in thickness. In most cases it is formed by necrosis of a lesion and drainage of the resultant material via communicating airway[1, 6].Three fourths of the margins should be outlined and shadow of any anatomical structure should not form the wall of the cavity. The presence of an air-fluid level is not necessary to the definition , nor the size of the cavity[5].

The radiographic appearance of cavitary lesions should be combined with clinical, laboratory data, other investigative procedures to obtain an accurate diagnosis. Cavitations may be a manifestation of diverse conditions such as pulmonary tuberculosis, bronchiectasis, pyogenic infections due to klebsiella, staphylococci, streptococci , malignancy, parasitic infection , cystic fibrosis, sarcoidosis, S.L.E , rheumatoid lung, pneumoconiosis[2]. Pulmonary cavity is never a presenting symptom, rather patients usually presents with common respiratory symptoms such as fever, cough, expectoration, hemoptysis and shortness of breath. Diagnostic evaluation of pulmonary cavity includes Sputum for AFB, Sputum for gram stain and culture and sensitivity, CXR ,CECT Thorax and interventional procedures like FOB with biopsy and FNAC.

In order to arrive at etiological diagnosis, a multidisciplinary discussion among Physician, Clinical Microbiologist and Radiologist is necessary to arrive at etiological diagnosis. Although many studies have been carried out on cavitating pulmonary diseases ,studies specifically investigating the etiology of cavitating lung lesion are rare .

This study is aimed to asses various etiological factors in the development of a cavity, understand various modes of presentation, clinical and radiological correlation of the cavitary lesions,and it also helpful to prevent delay in diagnosis which causes delay in isolation of the patient with more chance for spread of infection and increase the severity of disease

AIMS & OBJECTIVES

To study the clinico- radiological profile of patients having the cavitary lesions on chest X-Ray

To study the etiology of cavitary lesions.

PATIENTS AND METHODS

It was a prospective study of 100 patients presented with cavitary lesions based on ragiological findings, attending the Department of pulmonary medicine in GOVERNMENT HOSPITAL FOR CHEST AND COMMUNICABLE DISEASES (GHCCD), affiliated to ANDHRA MEDICAL COLLEGE, VISAKHAPATNAM, during a period from JULY 2014 to AUGUST 2015 .

STUDY DESIGN

The inclusion and exclusion criteria used for this study were:

INCLUSION CRITERIA:

Patients presenting with any of the clinical symptoms like cough with or without expectoration, fever, shortness of breath, hemoptysis and chest pain with radiological evidence of cavitatory lesions.

Age >15yrs.

EXCLUSION CRITERIA:

Age <15 years.

Previously diagnosed case of lung cancer

Previously diagnosed case of sputum positive tuberculosis

Presence of pseudo cavities.

RESULTS AND OBSERVATIONS

DEMOGRAPHIC AND CLINICAL DISTRIBUTION:

The age group of the patients varied from 15 years to 70 years. But the highest number were recorded in 4th,5th and 6th decade of life. The maximum incidence of 28 (28%) cases belong to 4th decade of life,

followed by 19 (19%) among 5th and 19 (19%) among sixth decade of life.

Among sex predilection out of 100 patients, 75 (75%) were males and 25 (25%) were females. There was a male predominance over female with male to female ratio of 3:1.

Most common symptoms were cough in 100% followed by expectoration in 97%, fever in 88%, Shortness of breath and chest pain in 87% each, hemoptysis in 45%.(table 1).

TABLE 1 : CLINICAL PRESENTATION OF CAVITARY DISEASES:

SYMPTOMS	TOTAL	PERCENTAGE
COUGH	100	100
EXPECTORATION	97	97
SOB	87	87
FEVER	88	88
CHEST PAIN	87	87
HEMOPTYSIS	45	45

DURATION OF ILNESS IN EACH DISEASE :

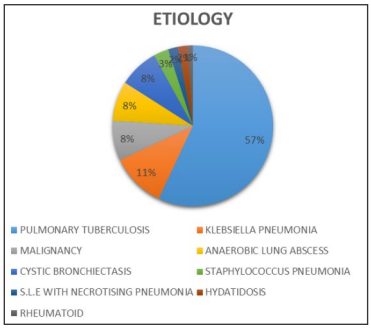
In the present study mean duration of illness was 4±2.7 months with 62% of the patients having symptoms for less than 2 months, 30% having symptoms for 2-6 months and 8% of patients having symptoms for more than 6 months duration. Pulmonary tuberculosis had varied duration of illness from <2m up to 6m. Most of the klebsiella pneumonia, anaerobic lung abscess had an acute to subacute presentation (<2m). Bronchogenic carcinoma had mostly subacute to chronic presentation. i.e. <2m to >6m.(table 2).

TABLE 2: DURATION OF SYMPTOMS IN EACH DISEASE

DISEASE	<2 M	%	2-6 M	%	>6M	%
PULMONARY TUBERCULOSIS	30	48.38	25	86.66	2	25
KLEBSIELLA PNEUMONIA	11	24.19	0	0	0	0
MALIGNANCY	4	6.45	1	3.33	3	37.5
ANAEROBIC LUNG ABSCESS	7	11.29	1	3.33	0	0
CYSTIC BRONCHIECTASIS	7	11.29	1	3.33	0	0
STAPHYLOCOCCUS	1	1.61	2	6.66	0	0
SLE WITH NECROTISING PNEUMONIA	0	0	0	0	2	25
HYDATID	1	1.61	0	0	1	12.5
RHEUMATOID	1	1.61	0	0	0	0
TOTAL	62	100	30	100	8	100

ETIOLOGICAL CAUSE :

The most common Etiological cause was found to be pulmonary tuberculosis (57%) cases followed by klebsiella pneumonia in (11%) of cases, malignancy, anaerobic lung abscess, cystic bronchiectasis in (8%) of cases each, staphylococcal (3%) of cases, SLE and hydatid in (2%) of cases each, Rheumatoid (1%) of case.(graph 1).



Graph 1 : etiological casuses of pulmonary cavities

DIAGNOSTIC PROCEDURES :

Few specific diagnostic procedures were done to identify etiology among 100 cases in addition to all other diagnostic procedures (table 3). Out of which 8 cases were Bronchogenic carcinoma and 7 were proved to be squamous cell carcinoma and 1 case to be adenocarcinoma following FOB, FNAC/BIOPSY of the mass.

Two cases of SLE presented with necrotizing pneumonia, when pneumonia failed to resolve they were subsequently diagnosed to be SLE with necrotizing pneumonia with the help of CT chest and collagen profile. Cavitations due to ruptured hydatid cyst were observed in 2 patients in whom CT SCAN and sputum microscopy were diagnostic.

When compared to Age groups of present study it was observed that cavities due to tuberculosis were most common in the age groups 21 to 50 years. Next common was Klebsiella pneumonia affecting 3rd,4th and 6th decade of life. All the 8 cases of bronchogenic carcinoma were 40 years and above. Lung abscess was most commonly present in 41-60 years of age.

TABLE 3: DIAGNOSTIC PROCEDURES TO IDENTIFY ETIOLOGY:

DISEASE	DIAGNOSTIC PROCEDURE
PULMONARY TUBERCULOSIS	SPUTUM FOR AFB, FOB-BAL FOR AFB CT CHEST.
KLEBSIELLA PNEUMONIA	SPUTUM FOR GRAM STAIN & CULTURE.
MALIGNANCY	CECT CHEST,FOB,FNAC/ BIOPSY OF MASS.
ANAEROBIC LUNG ABSCESS	SPUTUM FOR GRAM STAIN AND ANAEROBIC CULTURE, PREDISPOSING FACTOR.
CYSTIC BRONCHIECTASIS	CT CHEST.
STAPHYLOCOCCUS PNEUMONIA	SPUTUM FOR GRAM STAIN AND CULTURE.
SLE WITH NECROTISING PNEUMONIA	CT CHEST, COLLAGEN PROFILE.
HYDATID	CT CHEST, SPUTUM MICROSCOPY FOR SCOLEX AND HOOKLETS.
RHEUMATOID	CT CHEST, COLLAGEN PROFILE.

RADIOLOGICAL MANIFESTATIONS OF CAVITARY DISEASES :

It was observed from the table that solitary cavities constitute about 45% followed by multiple cavities in 55% of cases (table 4). In the present study more than half of the tubercular cavities were multiple (n=30) followed by solitary cavities. In most of the diseases like klebsiella pneumonia, malignancy, lung abscess, staphylococcus, SLE, hydatid , rheumatoid disease the cavities were single.

In the present study among the patients with pulmonary tuberculosis right lung involvement was most common (n=26) followed by bilateral involvement (n=19). In most of the other diseases right sided involvement is more common than left or bilateral involvement. In cystic bronchiectasis, SLE and hydatid disease right and left lung were equally involved.

TABLE 4: NO OF CAVITIES IN VARIOUS DISEASES:

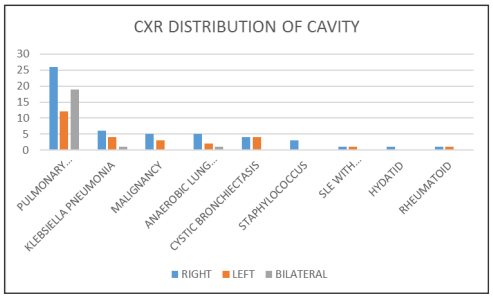
DISEASES	SOLITARY	MULTIPLE
PULMONARY TUBERCULOSIS	17	40
KLEBSIELLA PNEUMONIA	7	4
MALIGNANCY	8	0
ANAEROBIC LUNG ABSCESS	5	3
CYSTIC BRONCHIECTASIS	0	8
STAPHYLOCOCCUS	3	0
SLE WITH NECTROSING PNEUMONIA	2	0
HYDATID	2	0
RHEUMATOID	1	0
TOTAL	45	55

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CHEST X RAY - ZONAL DISTRIBUTION :

Cavitary lesions were seen in right upper zone in (n= 63) of cases, left upper zone in (n=43) cases, right middle zone (n=10) cases, left middle zone (n=9) cases, right lower zone (n=6) cases and left lower zone (n=8) cases. From the above it is observed that pulmonary tuberculosis most commonly occurs in upper zones and less common in middle and lower zones (graph 2).

In most of the other diseases cavities most commonly occurred in upper zones except for hydatid which occurred in lower zone. Right upper zone involvement is common in pulmonary tuberculosis, klebsiella and malignancy. Left upper zone is more common in lung abscess, bronchiectasis, and rheumatoid



GRAPH 2: CXR ZONAL DISTRIBUTION OF VARIOUS CAVITARY DISEASES:

INNER LINING OF THE CAVITIES IN VARIOUS DISEASES:

Among all patients studied , it was observed that 79% of the cavities are regular, 13% of the cavities have shaggy margins and 8% of the cavities are nodular(table5). Most of the diseases had smooth wall, whereas few of the cavities of pulmonary tuberculosis, klebsiella and hydatid have shaggy inner border.

TABLE 5: CHARACTER OF THE INNER LINING OF THE CAVITIESIN VARIOUS DISEASES:

DISEASES	SMOOTH	SHAGGY	NODULAR
PULMONARY TUBERCULOSIS	53 (67,08%)	4 (30.7%)	0 (0%)
KLEBSIELLA PNEUMONIA	10 (11.5%)	1 (20%)	0 (0%)
MALIGNANCY	0 (0%)	O (0%)	8 (100%)
ANAEROBIC LUNG ABSCESS	0 (0%)	8 (8%)	0 (0%)
CYSTIC BRONCHIECTASIS	8 (9.19%)	0 (0%)	0 (0%)
STAPHYLOCOCCUS	3 (1.14%)	0 (0%)	0 (0%)
SLE WITH NECROTISING PNEUMONIA	2 (2.29%)	0 (0%)	0 (0%)
HYDATID	2 (2.29%)	0 (0%)	0 (0%)
RHEUMATOID	1 (1.14%)	0 (0%)	0 (0%)
TOTAL	79 (100%)	13 (100%)	8 (100%)

THICKNESS OF CAVITY WALLS :

About 53% of the cavities are thin walled and rest 47% of the cavities are thick walled. Majority of cavities of pulmonary tuberculosis, bronchiectasis staphylococcus, were thin walled cavities. All the cases of malignancy, few cases of tuberculosis, klebsiella, lung abscess, and bronchiectasis had thick walled cavities.(table 6).

TABLE 6: THICKNESS OF CAVITY WALL IN VARIOUS DISEASES:

DISEASES	THICK (n)	%	THIN(n)	%
PULMONARY TUBERCULOSIS	20	42.5	37	69.8
KLEBSIELLA PNEUMONIA	8	17.0	3	5.66
MALIGNANCY	8	17.0	0	0
ANAEROBIC LUNG ABSCESS	7	14.9	1	1.88
CYSTIC BRONCHIECTASIS	2	4.25	6	11.32
STAPHYLOCOCCUS	0	0	3	5.66
SLE WITH NECROTISING PNEUMONIA	0	0	2	3.77
HYDATID	1	2.12	1	1.88
RHEUMATOID	1	2.12	0	0
TOTAL	47	100%	53	100

FLUID LEVEL IN CAVITY :

It was observed that 81% of the cavities were without fluid level and 19% of the cases were with fluid level. In the present study out of 57 cases of pulmonary tuberculous cavities 47 were without fluid level and only 10 of them had fluid(table7). All the cases of lung abscess (n=8) had fluid level. Among the klebsiella 10 cases were without fluid level and only one case was with fluid level. In case of malignancy none had fluid level.

TABLE 7: FLUID LEVEL IN CAVITIES OF VARIOUS DISEASES:

DISEASES	FLUID LEVEL	%	WITHOUT FLUID LEVEL	%
PULMONARY TUBERCULOSIS	10	52.63	47	58.02
KLEBSIELLA PNEUMONIA	1	5.26	10	12.34
MALIGNANCY	0	0	8	9.8
ANAEROBIC LUNG ABSCESS	8	42.10	0	0
CYSTIC BRONCHIECTASIS	0	0	8	9.8
STAPHYLOCOCCUS	0	0	3	3.70
SLE WITH NECROTIZING PNEUMONIA	0	0	2	2.46
HYDATID	0	0	2	2.46
RHEUMATOID	0	0	1	1.23
TOTAL	19	100	81	100

DISCUSSION

Cavity-forming pulmonary lesions are uncommon in the absence of a concomitant underlying disease because cavities are pathologically formed by necrotic tissue expelled by an underlying lesion. A large number of respiratory diseases can give rise to cavitations. These are easily detected by X-ray of the chest. It is essential to know the exact etiology of cavitations for proper treatment. Though investigative procedures are advancing yet in some cases it poses a problem in pin pointing the exact etiology.

Among 100 patients who had cavitary lesions on the radiograph. The mean age of the patients was 43.58 years (±14.07) range 15-70 years. The age group of the patients varied from 15 years to 70 years. It is observed that cavitary lesions do occurin all age groups. But the highest number are recorded in 4th,5th and 6th decade of life. Cavities due to pulmonary tuberculosis were most common in the age group of 21 to 50 years. Next common was klebsiella pneumonia affecting 3rd,4th and 6th decade of life. All the 8 cases of bronchogenic carcinoma were 40 years and above. Lung abscess was most commonly present in 41-60 years of age .Cavitations were uncommon below 15 years of age.

Based on SEX DISTRIBUTION 75% were males and 25% were females. There was a male predominance over female with male to female ratio of 3:1. Among males highest incidence was in the 3rd and 4th decade of life and among females highest incidence was in 2nd and 4th decade of life.

The single most common ETIOLOGICAL cause was found to be pulmonary tuberculosis (57%) followed by klebsella pneumonia in (11%) of cases, malignancy, anaerobic lung abscess, cystic bronchiectasis in (8%) of cases each, staphylococcal (3%) of cases, SLE and hydatid in (2%) of cases each, Rheumatoid (1%) of case.

Various diagnostic procedures were undertaken to diagnose etiology in the present study. Sputum for AFB was done in most of the cases, Gram stain and Culture in majority of the cases and CXR, CT-Chest, FOB, BAL, FNAC/BIOPSY, COLLAGEN profile, and sputum microscopy for scolex and hooklets were done in selected cases.

The common respiratory symptoms include cough, expectoration, SOB, fever, chest pain and hemoptysis. In the present study cough was the universal symptom in all the patients. All the patients with klebsiella pneumonia, Anaerobic lung abscess, cystic bronchiectasis, Hydatid cyst had significant amount of expectoration. Fever was common symptom in infective causes, Hemoptysis was a prominent symptom in anaerobic lung abscess, malignancy and tuberculosis.

In the study mean duration of illness was 4±2.7 months with more than 50% of the patients having symptoms < 2 months, 30% having symptoms 2-6 months and 8% of patients having symptoms more than 6 months duration.

Pulmonary tuberculosis had varied duration of illness from <2m upto 6m. Most of the klebsiella pneumonia, anaerobic lung abscess had an acute to subacute presentation (<2m). Bronchogenic carcinoma had mostly subacute to chronic presentation. i.e.<2m to >6m.

Among most of the cavities ,more than half of the tubercular cavities were multiple (n=30)followed by solitary cavities and in most of the diseases like klebsiella pneumonia, malignancy, lung abscess, SLE, hydatid , Rheumatoid disease the cavities were single.

Anatomical location of cavities are important guide to find out the etiology of the cavity. In the present study among the patients with pulmonary tuberculosis right lung involvement was most common (n=26) followed by bilateral involvement (n=19).In most of the other diseases right sided involvement is more common than left or bilateral involvement. In cystic bronchiectasis, SLE and Hydatid disease right and left lung were equally involved.

In the present study cavitary lesions were seen in right upper zone in (n= 63) of cases, left upper zone in (n=43) cases, right middle zone (n=10) cases*(fig 1),* left middle zone (n=9) cases, right lower zone (n=6) cases*(fig2)* and left lower zone (n=8) cases.*(fig 3)*Pulmonary tuberculosis most commonly occurs in upper zones and less common in middle and lower zones. In most of the other diseases cavitations most commonly occurred in upper zones except for hydatid which occurred in lower zone*(fig 4).* Right upper zone involvement is common in pulmonary tuberculosis, klebsiella and malignancy. Left upper zone involvement was observed in lung abscess*(fig 5),* bronchiectasis, and rheumatoid.

It was observed that 79% of the cavities were smooth walled. 13% of the cavities had shaggy margins and 8% of the cavities had nodular margins. Cavities in majority of the diseases had smooth walls, whereas few of the cavities of pulmonary tuberculosis, klebsiella had shaggy inner margins and all the cavities of malignancy were nodular. Majority of cavities of pulmonary tuberculosis, bronchiectasis staphylococcus, were thin walled cavities. All the cases of malignancy, few cases of tuberculosis, klebsiella, lung abscess bronchiectasis had thick walled cavities.

About 81% of the cavities were without fluid level and 19% of the cases were with fluid level. Of 57 cases of pulmonary tuberculous cavities 47 were without fluid level and only 10 of them had fluid. All the cases of lung abscess (n=8) had fluid level. Among the klebsiella 10 cases were without fluid level and only one case was with fluid level. In case of malignancy none had fluid level

CONCLUSION.

Patients aged 40 years and above are at increased risk of malignancy. Patients with Co-morbidities like diabetes, alcoholism are at increased risk of infections. Tuberculosis was the commonest cause of cavitary lesions in our settings. This possibility has to be kept in mind during evaluation. Malignancy was next common cause so a high index of suspicion is needed in elderly patients. Both invasive and noninvasive procedures are needed to reach diagnosis. The study stresses the need for systemic approach for diagnosing and managing pulmonary cavitary lesions

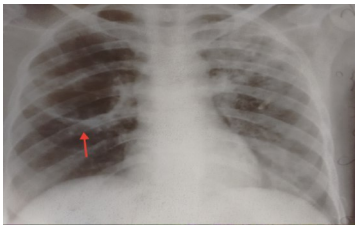


Fig 1 : CHEST X-RAY PA VIEW SHOWING CAVITY IN THE RIGHT MIDDLE ZONE

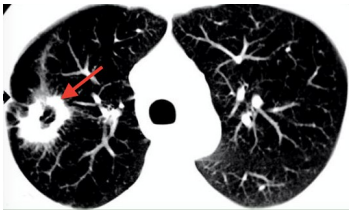


Fig 2 : CECT CHEST SHOWING CAVITATING MASS IN THE RIGHT LOWER LOBE

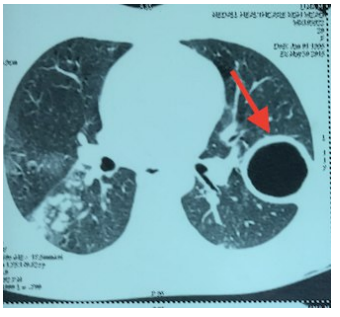


Fig 3 :CECT CHEST SHOWING THICK WALLED CAVITY IN THE LEFT LOWER LOBE

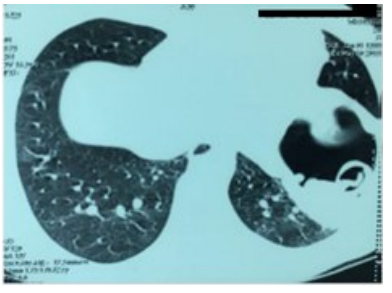


Fig 4 : THICK WALLED CAVITY WITH FLOATING MEMBRANES IN LEFT LOWER LOBE (SERPENTINE SIGN)-HYDATID CYST

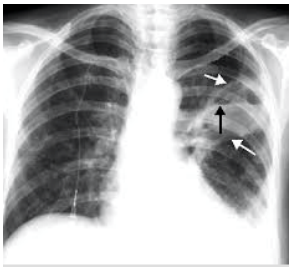


Fig 5 : CHEST X-RAY PA VIEW SHOWING CAVITY WITH AIRFLUID LEVEL IN THE LEFT MIDDLE ZONE – LUNG ABSCESS

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