STUDY OF THE PATTERN AND DISTRIBUTION OF BRONCHOGENIC CARCINOMA IN COMPUTED TOMOGRAPHY OF CHEST

Harsha D. S[1], Vishnu Sharma Moleyar[2], Alka Chaitra Bhat[3], Vinaya Kumar Jogondra[4], Suyog Saligramma Yoganna[5], Muhammed Faseed C. H[6], Sharath Babu S[7]

[1]Assistant Professor, Department of Respiratory Medicine, A. J. Institute of Medical Sciences, Mangalore.
[2]Professor and HOD, Department of Respiratory Medicine, A. J. Institute of Medical Sciences, Mangalore.
[3]Senior Resident, Department of Respiratory Medicine, A. J. Institute of Medical Sciences, Mangalore.
[4]Junior Resident, Department of Respiratory Medicine, A. J. Institute of Medical Sciences, Mangalore.
[5]Junior Resident, Department of Respiratory Medicine, A. J. Institute of Medical Sciences, Mangalore.
[6]Junior Resident, Department of Respiratory Medicine, A. J. Institute of Medical Sciences, Mangalore.
[7]Junior Resident, Department of Respiratory Medicine, A. J. Institute of Medical Sciences, Mangalore.

ABSTRACT

BACKGROUND

Bronchogenic carcinoma is a leading cause of cancer related deaths, more than Colon cancer, breast cancer and prostate cancer combined. Chest computed tomography (CT) chest is widely used for diagnosis, part of staging, planning treatment and monitoring. The type and distribution of lesion in chest CT may give a fair idea regarding the nature and histology of lesion.
Aims and Objectives- To study the chest CT patterns of bronchogenic carcinoma and to correlate the patterns with histological cell type.

MATERIALS AND METHODS

It was a hospital based retrospective study involving 101 patients aged 35-80 years with histologically diagnosed bronchogenic carcinoma patients over a period of five years. Chest CT patterns were studied and compared to histology. Statistical analysis was done by chi square test.

RESULTS

Mass lesions formed 88.1% of cases (p value 0.0001), which was significant. This was followed by solitary pulmonary nodule (5.9%), consolidation (2.97%) and cavitatory lesion (2.97%). 52% of mass lesions were located in both upper lobes and this was significant (p value 0.0001) Adenocarcinoma was the most common cell type. There were 6 (5.94%) solitary pulmonary nodules. Among solitary pulmonary nodules majority were adenocarcinoma (83.33%). 2.97% with cavitating malignancy, all were squamous cell carcinoma.

CONCLUSION

Upper lobe mass lesion is the most common presentation of bronchogenic carcinoma in computed tomography of chest. Solitary pulmonary nodules are commonly located in upper lobes. Adenocarcinoma is the commonest cell type. Squamous cell carcinoma is the most common cause for cavitating bronchogenic carcinoma and common on right side. Adenocarcinoma is overall most common cell type.

KEYWORDS

Bronchogenic Carcinoma, CT Chest Pattern, Mass Lesion.

HOW TO CITE THIS ARTICLE: Harsha DS, Moleyar VS, Bhat AC, et al. Study of the pattern and distribution of bronchogenic carcinoma in computed tomography of chest. J. Evid. Based Med. Healthc. 2017; 4(52), 3172-3176. DOI: 10.18410/jebmh/2017/629

BACKGROUND

Worldwide bronchogenic carcinoma is a leading cause of cancer related deaths irrespective of gender. More people die per year due to lung cancer than Colon cancer, breast cancer and prostate cancer combined.[1] Five year survival rate is 12-15% despite advances in management.[2] Smoking tobacco is the most important risk factor for bronchogenic carcinoma. Major histological types are Adenocarcinoma, Squamous cell carcinoma and Small cell carcinoma. Computed tomography of chest plays an important role in the management of bronchogenic carcinoma. All patients of suspected bronchogenic carcinoma undergo Contrast enhanced CT of chest. It is widely used for diagnosis, part of staging, planning treatment and monitoring.[3,4] CT chest can also assess metastatic disease to bones, liver and adrenals as it upper part of abdomen is also included. The

Financial or Other, Competing Interest: None.
Submission 18-06-2017, Peer Review 19-06-2017,
Acceptance 21-06-2017, Published 27-06-2017.
Corresponding Author:
Dr. Harsha D. S,
Assistant Professor,
Amritha Multispeciality Clinic and Diagnostic Center,
Next to Chakrapani Temple, Near KMC Hospital,
Attavara, Mangalore-575001, Karnataka.
E-mail: hachh86@gmail.com
DOI: 10.18410/jebmh/2017/629

type and distribution of lesion in chest CT may give a fair idea regarding the nature and histology of lesion.

Aims and Objectives

1. To study the chest CT patterns of bronchogenic carcinoma.
2. To correlate the patterns with histological cell type.

MATERIALS AND METHODS

It was a hospital based retrospective study involving histologically proven bronchogenic carcinoma. Patients over a period of five years from January 2012- December 2016 who underwent contrast enhanced CT of chest at A J institute of Medical sciences, Mangalore, India a tertiary care teaching hospital were included in the study. Patients ranging in age from 35 years to 80 years of both gender were included in the study.

Inclusion Criteria

a. Patients with histopathology proven bronchogenic carcinoma.
b. Underwent contrast enhanced CT of chest in the hospital.
c. Aged 35-80 years of either gender.

Exclusion Criteria

a. Histology inconclusive.
b. Pleural effusion with unknown primary.

The patient details such as age, gender and histological cell type were obtained from patient records. The CT chest was interpreted by two senior radiologists with more than ten years' experience. The lesion as appeared in CT were classified into mass lesions, cavitating lesions, solitary pulmonary nodule and consolidation. Solitary pulmonary nodule is defined as single discrete pulmonary opacity surrounded by normal lung tissue 3 cm or less in diameter that is not associated with lymphadenopathy or atelectasis.[5] Anything larger was considered as mass lesion.[5] A cavity is defined as a gas-filled space, seen as a lucency or low-attenuation area, within pulmonary consolidation, a mass, or a nodule.[6] Collapse and consolidation secondary to mass lesion were not considered separately. Pleural effusions with extra thoracic primary were not considered for the study. Mass lesions were further categorised based on the lobe involved into specific lobar, multilobar or hilar lesions. Any metastasis to liver, adrenal glands, ribs, spine, contralateral lung, pleural deposits, pericardial effusion as seen in chest CT were noted. Pleural effusions in bronchogenic carcinoma can be malignant i.e, having pleural deposits and para malignant due to various causes associated with the cancer. So if pleural deposits were visualized in CT it was taken as evidence of metastasis. Pleural effusions associated with malignancy are malignant with direct involvement of pleura and paramalignant, without involvement of pleura and due to other causes. So in the study pleural effusions without pleural deposits were not taken into account as metastasis.[7] The types of lung lesions, their distribution were compiled and compared with the histological types.

Statistical evaluation was done using chi square test and p value <0.05 were considered significant.

RESULTS

There were total of 101 patients with 83 males and 18 females. Majority of the patents were between 50-69 years as shown in chart 1. Adenocarcinoma was the most common cell type in all age group except 60-69 years were squamous cell carcinoma was commonest. Among patients of adenocarcinoma 50-59 year age group had 31.2% cases. Among squamous cell carcinoma patients 60-69 year group had 46.1% cases. Majority of small cell cancer patient's i.e, 50% were in age group 50-59 years.

Mass lesions formed 88.1% of cases (p value 0.0001), which was significant. This was followed by solitary pulmonary nodule (5.9%), consolidation (2.97%) and cavitatory lesion (2.97%) (Chart 2).

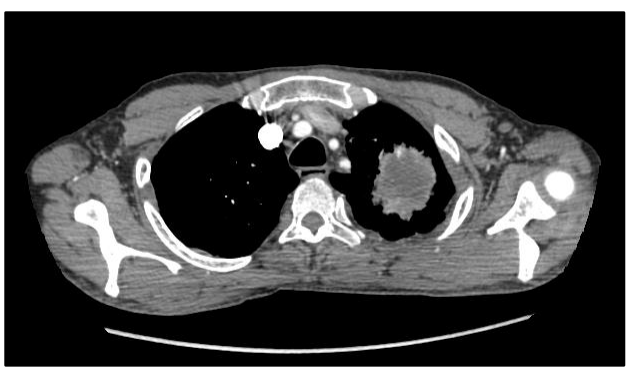

Image 1. Left Upper Lobe Mass Lesion

Image 2. Right Upper Lobe Solitary Pulmonary Nodule

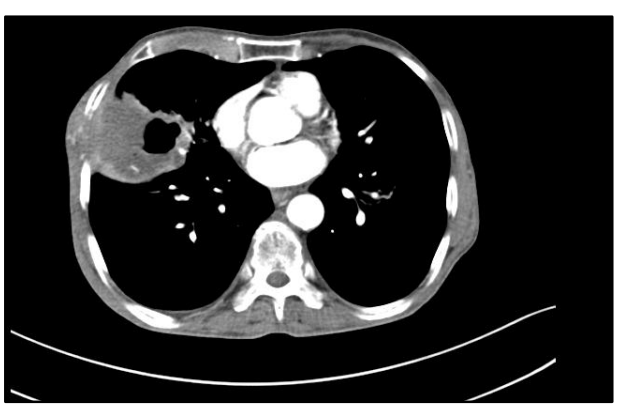

Image 3. Cavitating Lesion

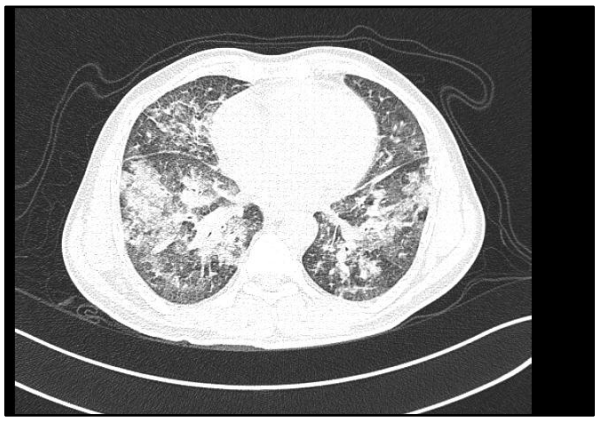

Image 4. Consolidation

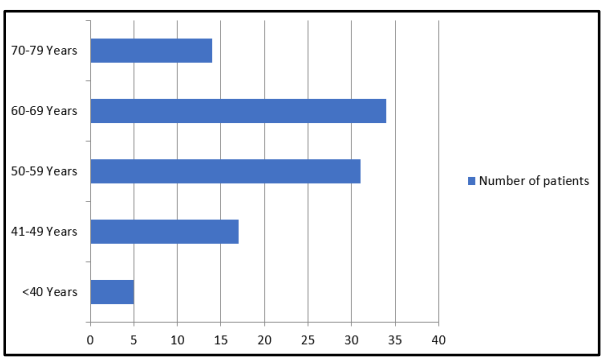

Chart 1. Age Distribution

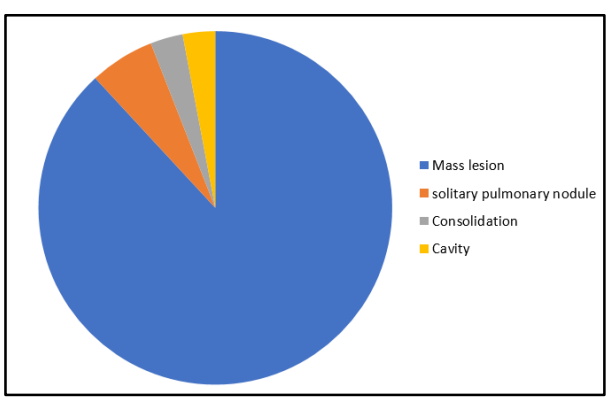

Chart 2. Type of Lesion

Among men squamous cell carcinoma was slightly more common than adenocarcinoma which was not significant (p value 0.811). Among women 77.77% had adenocarcinoma which was significant (p value 0.0001) (Chart 3). All cases of neuroendocrine tumour were seen in men.

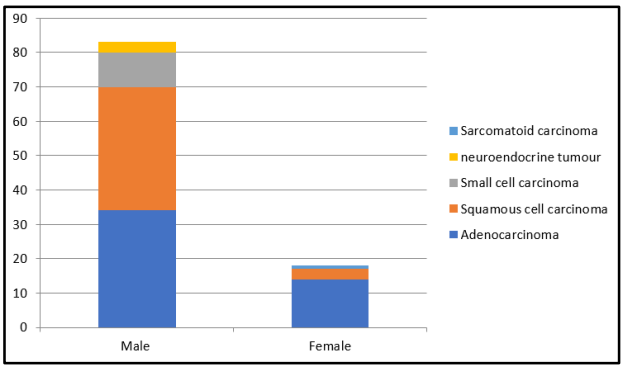

Chart 3. Histological Types and Gender Distribution

Among mass lesions majority (29%) were located in right upper lobe followed by 23% in left upper lobe. 52% lesions were located in both upper lobes and this was significant (p value 0.0001). Majority of lesions were on the right side. This was not statistically significant (p 0.074). Mass lesions involving multiple lobes were seen in 7% patients (Chart 4).

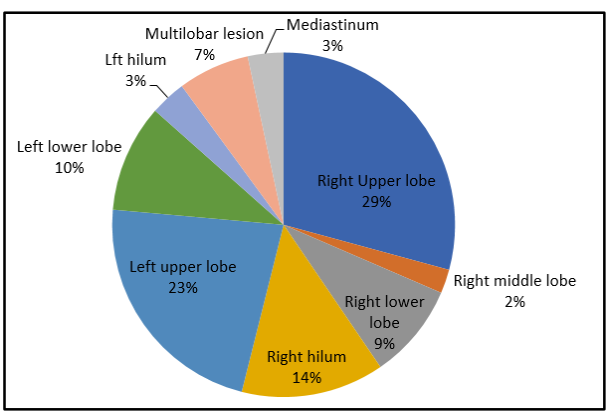

Chart 4. Distribution of Mass Lesion

Among the mass lesions adenocarcinoma was most common (46%) followed by squamous cell carcinoma (38.2%). Among upper lobe lesions adenocarcinoma and squamous cell carcinoma had almost equal distribution. Among lower lobe lesions adenocarcinoma was most common. It four times commoner than squamous cell carcinoma. 60% of squamous cell carcinoma were located in upper lobes. All left hilar mass were squamous cell carcinoma. 77% small cell carcinoma were located on the right side (Table 1).

	Right Upper Lobe	Right Middle Lobe	Right Lower Lobe	Left Upper Lobe	Left Lower Lobe	Right Hilum	Left Hilum	Multi Lobar	Mediastinal Mass
Adenocarcinoma	12	1	5	7	7	5	0	3	1
Squamous cell carcinoma	11	1	1	10	2	4	3	2	1
Small cell carcinoma	2	0	2	2	0	3	0	0	0
Neuroendocrine carcinoma	1	0	0	1	0	0	0	0	1
Sarcomatoid carcinoma	0	0	0	0	0	0	0	1	0

Table 1. Mass Lesion Histological Types and Distribution

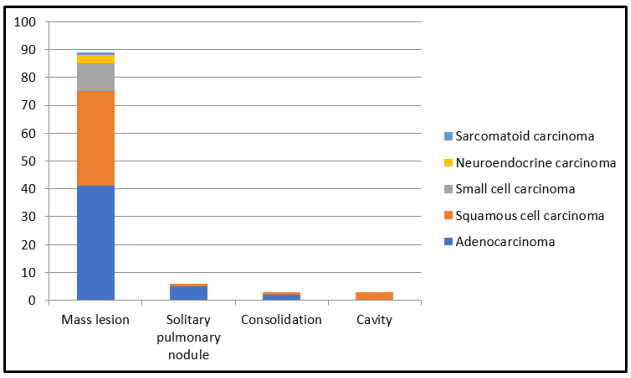

Chart 5. Type of Lesion as Seen in CT Chest and Histological Types in Each

There were 6 (5.94%) solitary pulmonary nodules. Among solitary pulmonary nodules majority were adenocarcinoma (83.33%) (Chart 5). All were situated in upper lobes.

There were three patients (2.97%) with cavitating malignancy. All cavitatory lesions turned out to be squamous cell carcinoma (Chart 5). All were on the right side.

Three patients (2.97%) had consolidation presenting as non-resolving pneumonia. There was no associated mass lesions with these. Two were adenocarcinoma. Obstructive pneumonia was found in 13 patients associated with mass lesion. Out of which 7 (54%) were adenocarcinoma. Collapse associated with mass lesion was found in 8 patients. Adenocarcinoma was the cell type in 6 (75%) of these.

22 patients had pleural effusion, 16 unilateral and 6 bilateral. Out of 22 patients, 16 were adenocarcinoma. All were associated with mass lesion or consolidation (Table 2). Pericardial effusion seen in 3 patients had out of which 66% were squamous cell carcinoma.

Side	Adeno-Carcinoma	Squamous Cell Carcinoma	Small Cell Carcinoma	Total
Right	9	1	0	10
Left	4	2	0	6
Bilateral	3	2	1	6

Table 2. pleural Effusion Location and Histology

59.4% patients had significant lymphadenopathy. Out of which 30.6% had mediastinal adenopathy only, 5.9% had hilar lymphadenopathy, 18.8% had lymphadenopathy of hilar and mediastinal. 3.9% had supraclavicular lymphadenopathy. Among mediastinal lymphadenopathy 51.61% had adenocarcinoma and 38.7% had squamous cell carcinoma, 9.6% had small cell carcinoma. All patients with supraclavicular node had adenocarcinoma.

Metastatic lesions in chest Ct were seen in 29 cases. Some of the cases had metastasis to multiple sites. 48% had metastatic lesions in opposite lung followed by liver metastasis (Chart 6). Out of 29 patients of metastasis in chest Ct most common site was the opposite lung (44.8%).Among these squamous cell carcinoma was the most common cell type (69%). Bone metastasis were seen in 9 patients out of which 6 were seen in ribs. Liver metastasis were seen in 34.5% of patients. Adenocarcinoma was the most common cell type in both liver and vertebral metastasis.

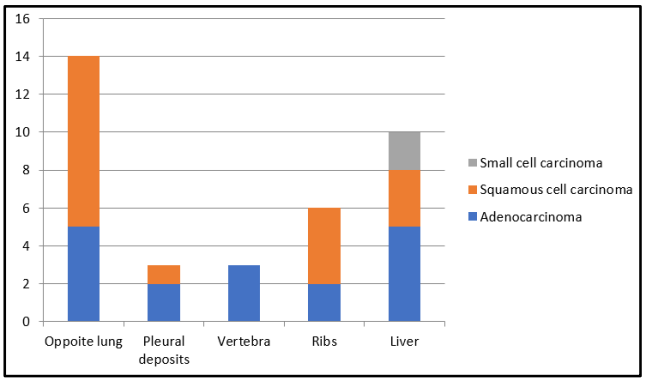

Chart 6. Metastasis

DISCUSSION

Before 1970 squamous cell carcinoma was most common[7]. There was a change in the frequency of cell types after that and adenocarcinoma is the most common cell type globally[8]. A review article on Lung cancer in India in 2004 showed that in India squamous cell carcinoma to be predominant[9]. Another recent retrospective analysis of 1200 patients in India showed adenocarcinoma to be more common.[10] Our study also adenocarcinoma was significantly most common. Among men adenocarcinoma and squamous cell carcinoma had equal frequency. Whereas in women adenocarcinoma was significantly more common. This is in line with previous studies.[11,12]

Among types of lesion in our study mass lesion was most common being seen in 88% of cases. This was significant. They were significantly more common in the upper lobes as compared to other parts of the lung. A study done on 373 patients with histologically proven bronchogenic carcinoma in Chandigarh also showed that mass lesion was the most common pattern. They found the lesions more common in upper lobes and on the right side[13]. Upper lobe especially anterior segment is described as the commonest site for bronchogenic carcinoma.[14]

Among solitary pulmonary nodules adenocarcinoma was most common cell type. All solitary pulmonary nodules were seen in upper lobes. As per current literature also adenocarcinoma and squamous cell carcinoma are the common histology in solitary pulmonary nodules. Among these adenocarcinoma is most common histological type.[5]

Some primary lung cancers are known to undergo cavitation which can be detected on CT Chest. Various studies report cavitation in 2% to 16 % of primary lung cancers.[15,16] In our study it was about 3% which is similar to the frequency reported in previous studies. As per previous studies squamous-cell carcinoma is the commonest histological type of bronchogenic carcinoma to cavitation (82%), followed by adenocarcinoma and large cell carcinoma.[16,17] All cavitating lesions in our study were squamous cell carcinoma.

Adenocarcinoma was the most common cell type in all lesion types except cavitating lesions. Since adenocarcinoma

frequency has increased over the years and currently most common worldwide.[7] this may be the reason for the observation.

Among metastatic lesions seen in the chest CT most common site was opposite lung, followed by liver. In a previous study on 9830 patients CNS, bone (34%), Liver (20%) and respiratory system (18%) were the common metastatic sites.[18] As for metastasis our study was limited to assessing the sites as seen in chest CT only. Other sites could not be assessed. Newer modalities like PET CT are now routinely used for assessment of metastasis of bronchogenic carcinoma. PET CT will be more useful in this regard.

CONCLUSION

1. Upper lobe mass lesion is the most common presentation of bronchogenic carcinoma in computed tomography of chest. Among these most common site was right upper lobe.
2. Solitary pulmonary nodules are commonly located in upper lobes. Adenocarcinoma is the commonest cell type.
3. Squamous cell carcinoma is the most common cause for cavitating bronchogenic carcinoma and common on right side.
4. Adenocarcinoma is overall most common cell type.

REFERENCES

[1] Siegel R, Naishadham D, Jemal A. Cancer statistics, 2013. CA Cancer J Clin 2013;63(1):11-30.
[2] Jemal A, Bray F, Center MM, et al. Global cancer statistics. CA Cancer J Clin 2011;61(2):69-90.
[3] Rivera-Garcia R, White CS, Templeton PA. Lung cancer: value of various imaging modalities. Clin Lung Cancer 1999;1(2):130-136.
[4] Verschakelen JA, Bogaert J, Wever WD. Computed tomography in staging of lung cancer. Eur Respir J Suppl 2002:19(Suppl 35):40S-48S.
[5] Ost DE. Approach to patient with pulmonary nodules. In: Grippi MA, ed. Fishman's pulmonary diseases and disorders. 5th edn. NewYork: McGraw Hill Education 2015:1684-1699.
[6] Hansell DM, Bankier AA, MacMahon H, et al. Fleischner society: glossary of terms for thoracic imaging. Radiology 2008;246(3):697-672.
[7] Sahn SA, Huggins JT. Malignant pleural effusions. In: Grippi MA, ed. Fishman's pulmonary diseases and disorders. 5th edn. NewYork: McGraw Hill Education 2015:1164-1187.
[8] Devesa SS, Bray F, Vizcaino AP, et al. International lung cancer trends by histologic type: male:female differences diminishing and adenocarcinoma rates rising. Int J Cancer 2005;117(2):294-299.
[9] Behera D, Balamugesh T. Lung cancer in India. Indian J Chest Dis Allied Sci 2004;46(4):269-281.
[10] Noronha V, Dikshit R, Raut N, et al. Epidemiology of lung cancer in India: focus on the differences between non-smokers and smokers: a single-centre experience. Indian J Cancer 2012;49(1):74-81.
[11] Olsen JH. Epidemiology of lung cancer. Eur Respir 1995;1:1-17.
[12] Seow A, Duffy SW, Ng TP, et al. Lung cancer among Chinese females in Singapore 1968–1992: time trends, dialect group differences and implications for aetiology. Int J Epidemiol 1998;27(2):167-172.
[13] Sharma CP, Behera D, Aggarwal AN, et al. Radiographic patterns in lung cancer. Indian J Chest Dis Allied Sci 2002;44(1):25-30.
[14] Fraser RP, Parre JP, Pare PD, et al. Neoplastic diseases of the lung. In: Fraser RG, ed. Diagnosis of diseases of chest. 3rd edn. Philadelphia: WB Saunders 1989:1327-1475.
[15] Chaudhuri MR. Primary pulmonary cavitating carcinomas. Thorax 1973;28(3):354-366.
[16] Mouroux J, Padovani B, Elkaïm D, et al. Should cavitated bronchopulmonary cancers be considered a separate entity? Ann Thorac Surg 1996;61(2):530-532.
[17] Vourtsi A, Gouliamos A, Moulopoulos L, et al. CT appearance of solitary and multiple cystic and cavitary lung lesions. Eur Radiol 2001;11(4):612-622.
[18] Riihimaki M, Hemminki A, Fallah M, et al. Metastatic sites and survival in lung cancer. Lung Cancer 2014;86(1):78-84.