Original Research Article

A study to evaluate the imaging characteristics of bronchogenic carcinoma by MDCT with histopathological correlation

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Abstract

Background: The present study is aimed at evaluating the imaging characteristics of bronchogenic carcinoma by MDCT with histopathological correlation, its diagnostic accuracy and effectiveness in staging. **Methodology:** it was a retrospective study. 50 patients with clinical or radiological suspicion of bronchogenic carcinoma referred for CT scan of thorax to the Department of Radio Diagnosis, Sapthagiri institute of medical sciences & research Centre College, Bengaluru was taken. **Results**: Out of the fifty patients included in the study, 100% of the patients (n = 50) were suspected to have bronchogenic carcinoma on the basis of MDCT evaluation. However histopathological evaluation confirmed the diagnosis of bronchogenic carcinoma in all 100% (n = 50) of the cases. The Sensitive and positive predictive value of MDCT in evaluating bronchogenic carcinoma is 100% proving that it is indeed a good tool in the evaluation of bronchogenic carcinoma. **Conclusion:** Multi Detector Computed Tomography has a high positive predictive value suggestive of great diagnostic accuracy in the evaluation of Bronchogenic Carcinoma.
Key Words: Bronchogenic carcinoma, MDCT

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INTRODUCTION

Bronchogenic carcinoma is one of the commonest malignant neoplasms all over the world. Deaths due to lung cancer are more than those due to colorectal, breast and prostate cancers put together.[1] The prevention and early diagnosis of lung cancer thus assumes a major public health issue. Bronchogenic carcinoma was considered to be rare in the beginning of the century but has now reached epidemic proportions. This dramatic increase correlated with the widespread prevalence of cigarette smoking. Bronchogenic carcinoma is the leading cause of cancer deaths in developed countries and is also rising at alarming rates in developing countries.[2] It is increasingly being recognized in India. The prevention and early diagnosis of lung cancer thus assumes a major public health issue. Imaging plays a very vital role in the management of patients with lung cancer. The role of imaging ranges from screening for lung cancer in high risk individuals to staging bronchogenic carcinoma in advanced stages of the disease.[3] Multidetector Computed Tomography (MDCT) is the modality of choice for evaluating bronchogenic carcinoma.[4,5] It helps to characterize lung nodules detected by radiography and aids in guided biopsy. Most importantly, it accurately stages the tumor because of the superior multiplanar reformatted images and thus help determine the prognosis. The accurate staging of bronchogenic carcinoma is essential in planning treatment, and it is of

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crucial prognostic significance[6].The present study is aimed at evaluating the imaging characteristics of bronchogenic carcinoma by MDCT with histopathological correlation, its diagnostic accuracy and effectiveness in staging.

MATERIAL AND METHODS

SOURCE OF DATA

Retrospective study was conducted. 50 patients with clinical or radiological suspicion of bronchogenic carcinoma referred for CT scan of thorax to the Department of Radio Diagnosis, Sapthagiri institute of medical sciences & research Centre College, Bengaluru was taken from the medical records.

METHOD OF COLLECTION OF DATA.

Data was collected from medical records. 50 cases with suspected bronchogenic carcinoma referred for CT scan of thorax was considered.All scans are done using GE bright speed 16 slice MDCT with 120 KVp and 300 mAs with 5mm section thickness, retro reconstruction of 0.625mm section thickness and reformation. Contrast study is done using 70-80 ml of 350mg/ml non-ionic iodinated contrast, injected using pressure injector at the rate of 3ml/s. Sections are taken from the level of lung apices to the diaphragm routinely including the adrenals. Lung lesions are characterised based on the site, size, enhancement pattern, presence of calcification, cavitation, and involvement of the hila, pleura, chest wall or mediastinum. MDCT findings are correlated with histo-pathological examination of the specimen obtained from FNAC / biopsy of the lesion.

INCLUSION CRITERIA

1. Patients with clinically or radiologically suspected bronchogenic carcinoma.
2. Patients in whom histopathological correlation is available.

EXCLUSION CRITERIA

1. Patients in whom histopathological correlation is not available.
2. Patients with extra-pulmonary malignancy with lung metastasis

Technique for CT study

Patients were kept nil orally 4 hrs prior to the CT scan to avoid complications while administrating contrast medium. Risks of contrast administration were explained to the patient and consent was obtained prior to the contrast study. Routine anteroposterior topogram of the chest was initially taken in all patients in the supine position with the breath held. Axial sections of 5 mm thickness was taken from the level of lung apices to the diaphragm routinely including the liver and adrenals. In all cases plain scan was followed by intravenous contrast scan in suspended inspiration. For contrast enhancement 70-80 ml of 350mg/ml non-ionic iodinated contrast was injected using pressure injector at the rate of 3-4ml/s. Sections were taken in arterial (30 sec) and portal venous (60 – 90 sec) phases. Post study retro reconstructions were done at 0.625 mm section thickness. Sagittal and coronal reconstructions were made wherever necessary. Newer techniques in multislice CT like curved planar reformatting, volume rendering, Maximum and minimum intensity projections and inversion were done as and when necessary. The scans were reviewed on a direct display console at multiple window settings (i.e. Mediastinal window at 350 /40; Lung window at 1400/600; Bone window of 2400/200). The Pre and Post contrast images were viewed and analysed by a panel of radiologists.

RESULTS

Table 1: Distribution of subjects according to age group

Age group	Frequency	Percentage
<50yrs	8	16
51-60yrs	20	40
61-70yrs	15	30
>70yrs	7	14
Total	**50**	**100**

The age distribution of patients with bronchogenic carcinoma in our study is between the age group of < 50 – >70 years with a mean age of 60 years. 40% of the patients were in the age group of 50-60 (n = 20) , 30% were in the age group of 60-70 (n = 15) ,14% were in the age group of more than 70(n = 7) and 16% were in the age group of less than 50. Among the 50 patients included in this study , 10% were females (n = 05) and 90% were males (n = 45).

Table 2: Distribution of subjects according to location of bronchogenic carcinoma

	Frequency	Percentage
LEFT LL	2	4.0
LEFT UL	17	34.0
RT LL	3	6.0
RT ML	6	12.0
RT UL	22	44.0
Total	**50**	**100.0**

Of the fifty patients evaluated for bronchogenic carcinoma, 44 % patients had right upper lobe opacities (n = 22) and next predominant location of the lesion was left upper lobe with 34% (n = 17) and rest of the lesions elsewhere in the lung parenchyma. Of the fifty patients evaluated for bronchogenic carcinoma, 50 % patients had patchy ill defined opacities (n = 25) and 50% patients had larger lesions (n = 25).

Table 3: Distribution of subjects according to symptoms

	Frequency	Percentage
Cough	32	64
Loss of appetite	10	20
Dyspnoea	14	28
Hemoptysis	04	8
Chest pain	17	34

In our study involving fifty patients, 64% of patients had cough (n = 32) ,20% patients had loss of appetite (n = 10), 28% patients had dyspnoea (n = 14), 8% patients had hemoptysis (n = 04), 34% patients had chest pain (n = 17). Our study revealed that 54% of patients had mediastinal lymph nodes (n = 27) and 46% patients did not have In our study, 100% of patients had lesions which showed heterogeneous enhancement on post contrast images (n = 50) and 0% patients had lesions which showed homogenous enhancement on post contrast images (n = 0).

Table 4: Distribution of subjects according to Histological Types of Bronchogenic Carcinoma

	Frequency	Percentage
Squamous cell carcinoma	33	66.0
Adenocarcinoma	14	28.0
Small Cell Carcinoma	01	2.0
Undifferentiated Large cell Carcinoma	02	4.0

In our study of fifty patients with bronchogenic carcinoma the distribution of various histological types of bronchogenic carcinoma is as follows ; 66% of patients had squamous cell carcinoma (n = 33), 28% patients had adenocarcinoma (n = 14), 2% patients had small cell carcinoma (n = 1), 4% patients had undifferentiated large cell carcinoma (n = 2) In our study 50% of female patients had adenocarcinoma (n = 2), 50 % of female patients had squamous cell carcinoma (n = 2), 62% of male patients had squamous cell carcinoma (n = 31), 24% of male patients had adenocarcinoma (n = 12), 6% of male patients had small cell carcinoma (n = 3) and 8% of male patients had undifferentiated large cell carcinoma (n=4).

In our study 50% of female patients had adenocarcinoma (n = 2), 50 % of female patients had squamous cell carcinoma (n = 2), 62% of male patients had squamous cell carcinoma (n = 31), 24% of male patients had adenocarcinoma (n = 12), 6% of male patients had small cell carcinoma (n = 3) and 8% of male patients had undifferentiated large cell carcinoma (n = 4). Our study revealed that 70% of squamous cell carcinoma was present in the age group of 51-60yrs, 33.3 % of adenocarcinoma was present in the age group of 60-70yrs, 28.6% of undifferentiated carcinoma was present in the age group of more than 70yrs and 12.5% of small cell carcinoma were present in the age group of less than 50yrs. In our study 58.3% of non smokers had squamous cell carcinoma (n = 7), 33.3% of non smokers had adenocarcinoma(n = 4) and 8.3% of non smokers had undifferentiated large cell carcinoma (n = 1). Among the smokers, 68.4% of them had squamous cell carcinoma (n = 26), 26.3% of them had adenocarcinoma (n = 10), 2.6% of them had small cell carcinoma (n = 1) and 2.6% of them had undifferentiated large cell carcinoma (n = 1). In our study 64% seen in right upper lobe and 72.7% in left upper lobe segment are squamous cell carcinoma. Adenocarcinoma is also predominantly seen in right upper lobe Out of the fifty patients included in the study, 100% of the patients (n = 50) were suspected to have bronchogenic carcinoma on the basis of MDCT evaluation. However histopathological evaluation confirmed the diagnosis of bronchogenic carcinoma in all 100% (n = 50) of the cases. The Sensitive and positive predictive value of MDCT in evaluating bronchogenic carcinoma is 100% proving that it is indeed a good tool in the evaluation of bronchogenic carcinoma.

DISCUSSION

The incidence of lung cancer has seen a steady rise in incidence over the past few years especially in developing countries like India.[7] In our study an attempt has been made to ascertain the demographic characteristics, clinical presentation, MDCT characteristics and Histological types of bronchogenic carcinoma .Bronchogenic carcinoma is seen to be more common in the age group 51 – 60 years. This is in concordance with studies done by Rawat *et al* [8] , Karuna RK *et al* [9] and others [10,11] .The mean age in our study was 55 years which is similar to that found in a study done by Krishnamurthy A *et al* [10] .On the contrary it is slightly less than the mean age seen in studies done by Yousif A[12] and CM Shetty [41] .Male to female ratio is 9:1 in our study which is similar to the study of Rawat *et al* [8] and others[9,10,] In our study adenocarcinoma and squamous cell carcinoma are equally seen in females and squamous cell carcinoma is more commonly seen in males. This is in concordance with other studies [10,12,] Cigarette smoking which is a significant etiological factor is probably responsible for the high incidence of Bronchogenic Carcinoma especially the subtype squamous cell carcinoma in male patients. Bronchogenic carcinoma is seen more commonly in smokers than non-smokers. Similar observations have been reported by other studies[8,10,12,13] In our study there is evidence of a strong association between the occurrence of smoking and squamous cell carcinoma. 72% of the smokers were found to have squamous cell carcinoma. Similar results were obtained in study by Krishnamurthy A[10] and Arora VK *et al*[11]. Cough is the most common presenting

complaint among patients in our study (64%) followed by chest pain (34%) and Dyspnoea (28%). This is in agreement with study by Arora VK *et al* [11] and others[7,8,14,15] In our study it was found that majority of the lesions predominantly in the right upper lobe segment (44%). This is in concordance with the study done by A Vigg[15] where peripheral lesions are found to be more common than central lesions. Our study revealed that squamous cell carcinoma is commonly a right upper lobe lesion(70%) and similar findings were seen in a study done by CM Shetty [7].48% of cases in our study have a lobulated contour which is contrary to the study by CM Shetty[7] wherein most of the lesions had spiculated margins. 6% of our cases showed calcification which was seen predominantly in patients with squamous cell carcinoma. This is in agreement with the study by CM Shetty [7]. Calcification is associated more commonly with squamous cell carcinoma.98% of cases in our study showed heterogenous enhancement on post contrast images which is concordant to the findings in the study by CM Shetty [7] .54% of patients in our study had metastasis at the time of presentation. This is in concordance with the study by Rao Sukesh *et al*[14] In our study the most common site for metastasis was seen to be bones (20%) followed by liver (12%). This is contrary to the study by Dey A [13] and C.M Shetty[7] Mediastinal nodal involvement was seen in 54% of cases with bronchogenic carcinoma in our study. Similar findings were seen in studies by Yousif A Al [12] and CM Shetty [7]. In our study squamous cell carcinoma was seen to be the most common histological subtype accounting for 66% of cases. This is in concordance with the study by Rawat *et al*[8], Prasad R[16] and others[7,11,12,13.] Which revealed that squamous cell carcinoma was the most common histological subtype followed by adenocarcinoma. However, our findings are contrary to the studies done Devesa *et al*[17] which showed an increasing trend in the incidence of adenocarcinoma.

LIMITATIONS

- Interobserver variation as a single radiologist did not review all cases.
- Patients with Bronchoalveolar Carcinoma could not be accurately staged due to multifocal involvement which was seen in our cases.
- MDCT cannot precisely distinguish between reactive hyperplasia and metastatic mediastinal lymphadenopathy.

CONCLUSION

Multi Detector Computed Tomography has a high positive predictive value suggestive of great diagnostic accuracy in the evaluation of Bronchogenic Carcinoma. There is significant correlation with the MDCT diagnosis of Bronchogenic carcinoma with that of Histopathology. MDCT is a useful tool in the staging of Bronchogenic Carcinoma.

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