

**EVALUATION OF LUNG MASSES USING COMPUTED TOMOGRAPHY AND
COMPARASION OF RESULTS WITH HISTOPATHOLOGY.****¹Dr. Shabir Ahmad Bhat, ²Dr. Shadab Maqsood and ³*Dr. Iqbal Hussain Dar**¹Associate Professor Department of Radiology GMC Srinagar.²Lecturer Department of Radiology GMC Srinagar.³Post-Graduate Scholar Department of Radiology GMC Srinagar.***Corresponding Author: Dr. Iqbal Hussain Dar**

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ABSTRACT

This prospective study conducted in the tertiary care hospital setting included 50 subjects (31 males, 19 females) in the age group of 20-80 (mean, 54±15.43) years with radiological evidence of parenchymal lung shadows. These cases were subjected to detailed history, clinical examination and laboratory investigations. The radiographic features were confirmed by computed tomography (CT) and histopathology. Anaemia and elevated ESR were noted in a significant proportion of cases. Majority of the masses involved the right upper lobes; 64% of the malignant masses had ill-defined or irregular margins and 54% masses were 4 to 6 cm in size. CT examination picked up findings not appreciable on chest radiography. We conclude that CT proves to be a better diagnostic modality to determine the location, size and character of the mass shadows, and helps significantly in differentiating benign from the malignant lesions.

KEYWORDS: Computed tomography, lung masses, Radiography.**INTRODUCTION**

Computed tomography (CT) of the human body has become established as an important radiological diagnostic modality. The ability of CT scanning to better distinguish specific tissue densities in the thorax and to display lungs and mediastinum in a transverse plane at times provide unique diagnostic information unobtainable with conventional radiographic techniques.^[1-4] The lung mass, as by definition on chest radiography, is any localized circumscribed opacity with no associated pulmonary, pleural or mediastinal abnormality.^[5] CT provides promise for early detection of lung cancer, but pulmonary function impairment may reduce its benefit.^[6] The various lung masses detected on CT include infections, inflammatory, calcific and fibrotic lesions, and vascular malformations in addition to various benign and malignant antipathologies-1-5 Localized lung parenchymal lesions have been evaluated by CT for size, shape, outline and for the presence of calcification or cavitation. In addition CT is valuable for evaluation of other abnormalities like lobar collapse, septal lines, mediastinal lymphadenopathy, bone destruction and pleural fluid. Cysts, fatty masses, vascular lesions and loculate effusions are readily distinguished from solid masses by their character and attenuation values.^[1,3,4] A major contribution offered by CT in the evaluation of pulmonary parenchyma is the demonstration of otherwise occult pulmonary nodule. This is particularly

true in evaluating patients with newly diagnosed malignancies in which aggressive therapy may be necessary for cure. It is essential when planning such cure that evidence of distant metastasis be recognized easily so that unnecessary surgery may be obviated.^[1,3,4,7,8] CT accurately depicts the normal differences in attenuation between bones, muscle and subcutaneous tissue of the chest wall, and demonstrates the extent of chest wall tumours more clearly, than other modalities. Additionally it differentiates chest wall tumours from pleural thickening or loculate effusion.^[1,4,8,11] To detect and characterize the lung masses, to establish the origin and extent of such masses, to differentiate between benign and malignant lesions, and, to compare the detection of masses by conventional chest radiography with CT in our setup, formed the basis of the present study.

MATERIAL AND METHODS

The prospective study was conducted over a period of 18 months from December 2016 to June 2018 on 50 patients of both sexes in the age group of 20-80 (mean, 54±15.42) years who attended the medical college outpatient department or were admitted with evidence of lung mass on chest radiography at the Government Medical College Srinagar - a tertiary care centre of the Jammu and Kashmir State of India. The patients of the study group were subject to detailed history taking and

clinical examination was performed meticulously. The history included symptoms like cough, haemoptysis, chest pain, breathlessness, fever, weightloss and general wellbeing. History of smoking was taken in all the patients. The examination included detailed general physical and systemic examination with particular reference to the chest. All the cases were subjected to the following investigations: complete haemogram, erythrocyte sedimentation rate (ESR, by Wintrobe's Method), sputum examination for gram positive and gram negative, and acid fast bacilli, chest radiographs (both PA and lateral views) and fibre optic bronchoscopy. CT of the chest was performed using the Multi Slice (256) CT scanner. The indication included purely lung masses. Pleural based and mediastinal masses were excluded from the study. A preliminary supine scout image of thorax with lead marks at 5mm intervals from apex of lung was obtained to localize the area of interest. The liver and adrenals were routinely included in the scan. The cases where a vascular lesion was being studied or differentiation between vascular and non-vascular lesions was needed, intravenous contrast was used in the form of 80-100ml of 60% iodinated contrast agent injected via peripheral veins. The patients were observed for hypersensitive reactions to the contrast agents and if needed treated meticulously with intravenous anti-histaminics and corticosteroids. In some mass lesions CT guided aspiration for cytology was done, and CT findings were correlated with the histopathological examination.

Table 1: Chest Examination Findings (n=50).

Clinical Finding	No. of patients (%)
Consolidation	10(20)
(R)	6(12)
(L)	4(8)
Collapse	7(14)
(R)	4(8)
(L)	3(6)
Pleural effusion	6(12)
(R)	4(8)
(L)	2(4)
Normal examination	27(54)

(R), right; (L), left. Variables in patients indicate the percentage

Table 4: Histopathological Analysis of lung masses (N=50).

Histopathologic Diagnosis	
MALIGNANT	
Squamous cell	16(32)
Adenocarcinoma	7(14)
Metastatic carcinoma	3(6)
BENIGN	
Schwannoma	2(4)
Hamartoma	1(2)
NON NEOPLASTIC	
Cystic masses	5(10)
Tuberculoma	5(10)
Aspergilloma	3(6)
Lung abscess	3(6)
Focal organizing pneumonia	2(4)
Loculated fluid	2(4)
Intracavitary foreign body	1(2)

RESULTS

Of the 50 patients studied, 31(62%) were males and 19(38%) females, more than 60% belonged to age beyond 5 decades. 22 (60%) of the 31 males and 2(10%) of the 19 females were smokers. The main symptoms included cough (40%), chest pain (21%), haemoptysis (17%), fever (16%), loss of appetite (30%), and headache (2%). The general physical examination revealed anaemia in 41(82%), supraclavicular lymphadenopathy in 4(8%), hepatomegaly in 4 (8%) and ulcerated abdominal wall mass in one(2%) cases. Examination of the chest showed features of consolidation in 10 (20%), collapse in 7(14%) and pleural effusion in 6(12%) patients. However in 27(54%) patients examination of the chest was normal (Table 1). Among the baseline routine investigation mildly elevated ESR (21-30mm/1st hour) was in 22(44%), and above 40mm/hour in 9(18%) cases. Sputum of 2 patients showed malignant cells, and in 4(8%) patients acid fast bacilli were stained, however 44 cases had normal sputum examination.

Chest Radiography

Of the 50 cases, 20(40%) had mass lesion in the upper lung zones, 14(28%) in the mid zones and 16(32%) in the lower zones. 28(56%) mass lesions were central and 22(44%) were peripheral in location. The size of 30(60%) lung masses was in the range of 4-6cms; 12 masses were 6-10 cms and 8 masses were 2-4cms. 24(48%) masses showed irregular/lobular margins, 18(36%) were having ill-defined margins and 8(16%) were sharply demarcated. The other findings observed in chest radiography included: calcification (2%), cavitations (4%), lymph node involvement (8%), associated collapse (4%), consolidation (6%), effusion (8%) and rib destruction (2%). On the basis of image morphology the masses in 38(76%) cases were considered as neoplastic and in 12(24%) cases as non neoplastic.

CT Evaluation

The majority of masses involved anterior segment of right, upper lobe and multiple segments of the right lung. On the left side, majority of the masses involved apicoposterior segment (8%) and multiple segments were involved in 12%. Of the 50 cases, 28(56%) masses were 4-6 cms in size, 14(28%) were 6-10 cms and 8(16%) were 2-4 cms. Density of the masses (in Hounsfield units, HU) was of soft tissue in 35(70%), fluid-density in 10(20%) and soft tissue density with evidence of calcification in 5(10%) cases. Of the 50 masses studied by CT, 7(14%) had lobulated margins, 13(26%) were sharply defined, 19(38%) were irregular and 11(22%) had ill-defined margins. Other CT findings observed included calcification (12%), cavitation (10%), satellite lesions (4%), air bronchogram (4%), collapse (80%) and loculated fluid (4%). Among the 6 cases with calcification 4 showed peripheral and one had central calcification. Another one had pleural calcification in addition. Cavitation as was seen in 5 cases, 3 had preformed cavities and 2 were having central cavitation (not evident on chest radiography). Contrast enhancement improved diagnosis in 24 cases and in 12 cases no improvement was seen from CT evaluation. 19 (38%) were considered to be non-neoplastic and 31(62%) as neoplastic in nature on the basis of size, density, margins and cavitation. The presence of satellite lesions, air bronchogram, rib destruction, pleural effusion, lymph node involvement and metastasis so helped in differentiation. Of the 19 non-neoplastic masses, were cystic in nature, 5 were granulomas with evidence of sharply defined margins and cavitation. Loculated fluid was seen in 2 cases which was mimicking lung masses on chest radiographs. 2 cases proved focal organizing pneumonias because of air bronchogram and lobar distribution, and one lung abscess because of characteristic wall enhancement and fluid density.

Histopathological Study

Out of 50 masses studied radiologically and confirmed histopathologically,^[29] were neoplastic and 21 non-neoplastic in nature. Of the neoplastic lesions, squamous cell carcinoma was confirmed in 16 (32%) masses. Among the non-neoplastic lesions cystic masses and tuberculomas (10% each) were more common than other pathologies (Table 2).

DISCUSSION

In our study the primary carcinomas and metastases predominantly involved patients beyond fourth decade. Metastases were seen with equal frequency among both sexes. Primary carcinomas were more common (76%) in men of whom history of smoking was present in 90%. The study revealed granulomas common in patients with age below 40 years, slightly more common in women. Benign lesions like loculated fluids, aspergillomas, organizing pneumonias and lung abscesses did not show any sex predilection or specific age involvement. Schwannomas occurred with equal

frequency among both sexes. In a similar way in the study of Godwin and Cowokers,^[12] primary carcinomas, metastases and hamartomas were more common in patients over 40 years of age. Metastases were present with equal frequency in both sexes but primary carcinomas and hamartomas were predominant in men, and granulomas were more common in women. Malignant lesions in our study were all symptomatic in nature with cough, chest pain and haemoptysis as the common symptoms. Headache was predominant feature in 2 patients due to secondaries in brain with primary lung carcinomas.

Godwin.^[13] subsequently reported that malignant lesions were more likely to be symptomatic compared to benign ones. However in most cases symptoms attributed to solitary pulmonary nodule were not present. Physical examination and routine laboratory investigations were not helpful in distinguishing benign from malignant lesions. In our study, the radiographic evaluation showed predominance of right side, particularly upper lobe. This observation is consistent with those of the previous studies conducted by Therog,^[14] Godwin^[12] and Shinz.^[15] Majority of the masses in our study were of the size of 4-6 cms. Zerhouni,^[16,24] and co-workers,^[16] in their study of 384 nodules reported that 118 nodules measuring less than 3cm were benign and of the 35 of 36 nodules greater than 3cm were malignant. Large size can therefore be considered as a significant indicator of malignancy. It was stressed that small size cannot be used as a criterion against malignancy because 42% of the malignancies in their study measured less than 2 cm in diameter. In our study edge characteristics were clearly delineated in all the lung masses and 26% of masses having sharply defined margins were benign.

The masses (74%) having lobulated, irregular or ill-defined margins were either malignant or inflammatory in nature. In the study conducted by Zerhouni,^[16,24] 178 of the 384 pulmonary nodules having smooth or lobulated border proved malignant in 100 cases. Where CT enabled correct identification in 57 of these. Regarding calcification, chest radiography in our 50 patients showed calcification in one (2%) mass only. Contrarily CT detected calcification in 8 (16%) masses of which 5(10%) were tuberculomas, 2(4%) had pleural wall calcification and one (2%) was hamartoma. No malignant mass in our study showed calcification. Again in the study of Zerhouni^[16] no calcification was picked up by conventional chest radiography when 55% of these nodules on CT showed calcification. Our study is also consistent with study of Sigeltnan^[17] where no calcification was seen on chest radiography and the number increased to 20 on CT. No malignant nodule in this study was calcified. Histopathological results showed that commonest mass was malignant followed by tuberculoma. Among the malignant lung masses, squamous cell carcinoma was the most common histopathological type. This observation is consistent with previous study of Hyde.^[18,22] and same was the

observation of Khan and co-workers from Kashmir valley, although adenocarcinoma is the commonest lung carcinoma worldwide at present.^[20]

REFERENCES

- Mime EC. Correlation of physiologic findings with chest roentgenology. *Radiol Clin North Am*, 1973; 11: 17-44.
- Muller N. High resolution CT of the chest. *Semin Roentgenol*, 1991; 26: 104-192.
- Naidich DP, Harkins TJ: Airways and lungs: correlation of CT with fiberoptic bronchoscopy. *Radiology*, 1995; 197: 1-12.
- Josh RG, Sagell SS, Stanley RG, Levitt RG Computed tomography of thorax. *Radiology*, 1978; 126: 125-136.
- Wolfgang D. Differential diagnosis of chest disorders in radiology. *Radiological Rev. Manual*, 1996; 300-350.
- Nathan MH, Collins VP, Adams RA. Differentiation of benign and malignant pulmonary nodules growth rate. *Radiology* 1962; 79: 221-232.
- Lilington GA. The solitary pulmonary nodule. *Am Rev Respir Dis*, 1974; 110: 699-707.
- Mave-Dickson W, Trefler M, Dickson DR. Comparison of dosimetry and image quality in computed and conventional tomography. *Radiology*, 1979; 131: 509-514.
- Pugatch RD, Braver JH, Roblins AH, Faling U. Diagnosis of pericardial cysts. *Am J Roentgenol*, 1978; 131: 515-521.
- Mendelson DS, Rose JS, Efremidis S *et al.* Bronchogenic cysts with high CT numbers. *Am J Roentgenol*, 1983; 140: 463-469.
- Mendez G, Isikoff MB, Isikofa SK, Sinner WN. Tumors of the thorax demonstrated by CT. *Am J Roentgenol*, 1979; 133: 207-211.
- Godwin JD, Speckman JM, Fram EK *et al.* Distinguishing benign nodule by CT. *Radiology*, 1980; 144: 349-351.
- Godwin JD Symposium on cardiopulmonary imaging. *Radiol Clin North America*, 1983; 21: 709-719.
- Therog EG Varying manifestation of peripheral pulmonary neoplasm: a radiologic pathologic correlative study. *Am J Roentgenol*, 1977; 128: 893-917.
- Shinz MS, Ho KJ. CT and bronchogram observation in post obstructive pulmonary consolidation. *Un. Imaging*, 1992; 16: 109-113.
- Zerhouni EA, Stitik FP, Sigelman SS *et al.* CT of solitary pulmonary nodule: a cooperative study. *Radiology*, 1986; 160: 319-327.
- Siegelman SS, Khouri NF, Scott WW, Leo FP, Zerhouni EA. Computed tomography of pulmonary nodule. *Seminars Roentgenol*, 1985; 19: 167-178.
- Hyde I Inflammatory diseases of lung. In David Sutton (ed) *Text Book of Radiology and Medical Imaging. Vol 1*. London: Churchill Livingstone, 1992; 413-484.
- Khan GQ, Mohi-din G, Romshoo GJ, Hassan G, Dewani MS, Rashid H. Experience of fiberoptic bronchoscopy in the diagnosis of lung cancer in Kashmir valley. *J Med Sci*, 2000; 3: 1031-106.
- Minna JD. Neoplasms of the lung. In: Kasper DL, Braunwald E., Fauci AS: *editors. Harrison's principles of Internal Medicine*. 16th ed. New York: McGraw-Hill, 2005; 506-516.
- Ali Nawaz Khan Hamdan H AL-Jahadali and Shyam Sunder. Solitary Pulmonary Nodule A Diagnostic Algorithm in light of current Imaging Technique. *Avicenna J MED*, 2011 Oct-Dec; 1(2): 39-51.
- Alexander M Furman, Jihane Zada DiTY, Afawi Ayman OSoubani. *Futur eOncol*, 2013; 9(6): 855-865.
- Asif Alvi MD: Chief Editor Ryl and PByrd Dr. Solitary Pulmonary updated June 02, 2014.
- Sanjay Manocha MD, Kavita Gaig Solitary Pulmonary Nodule Imaging. *Medicine medscape.com*, Nov 9, 2015.