

Computerized Tomography Characterization of Mediastinal Lymph Node Masses with Fine Needle Aspiration Cytology Correlation

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Abstract

Introduction: Lung cancer is the most common cancer among men in developed nations, and generally has a poor prognosis. Metastasis of lung cancer to mediastinal lymph nodes presents with a diagnostic dilemma, and many a time, it may be the only presenting sign for lung cancer.

Materials and Methods: All the participants underwent a computerized tomography (CT) imaging of the thorax using a GE Hispeed FX/I spiral CT scanner. Unenhanced CT imaging was done on all patients, with contiguous 10 mm sections obtained at an interval of 1 cm and scanning time of 3-4 s. The distribution, attenuation, and enhancement characteristics of the lymph nodes were evaluated after an intravenous bolus of ionic/non-ionic contrast. All the patients also underwent fine needle aspiration cytology of the lymph node to ascertain the pathophysiology of mediastinal lymphadenopathy.

Results: A total of 32 participants were finally included in the study. Among the participants aged <39 years, most (42.8%) were having lymphoma. At the same time, in those participants aged >40, all of them were having metastatic lesions of the lungs. Among those who reported dyspnea, 75% of the participants were suffering from a malignant lesion of lung, while 25% had lymphoma. Among those participants who had extra-thoracic lymphadenopathy, 86.6% had metastatic lesion of the lung, with the rest having lymphoma and granulomatous lesion of the lungs. Among the patients with no extra-thoracic lymphadenopathy, the vast majority (76.4%) were suffering from metastatic lesions from the lungs.

Conclusion: It was found that the vast majority of patients presenting with mediastinal lymph node enlargement has an underlying lung malignancy presenting as metastasis. Furthermore, CT scan is a modality which can aid in diagnosis and staging of the lymph node enlargement but it cannot replace the importance of a tissue diagnosis.

Key words: Computerized tomography, Fine needle aspiration cytology, Lung cancer, Mediastinal lymphadenopathy

INTRODUCTION

Lung cancer is the most common cancer among men in developed nations, and generally has a poor prognosis. It accounts for almost 13% of all cancer incidence worldwide and 18% of all cancer deaths. In absolute numbers, the incidence of lung cancer is 1.8 million/year worldwide

and results in the death of almost 1.4 million patients.¹ Metastasis to mediastinal lymph nodes presents with a diagnostic dilemma, and many a time, it may be the only presenting sign for lung cancer. Mediastinoscopy or thoracoscopy along with histopathological evaluation has been recommended as diagnostic standards but considering the extensive invasiveness and need for general anesthesia; these investigations are less favored by clinicians and patients.² The invasive nature of these tests has led to a demand for minimally invasive tests with comparable yields.

The advent of modern radiological procedures such as computerized tomography (CT) scan and positron emission tomography (PET) has revolutionized the diagnostic procedures in mediastinal lymphadenopathy. A completely

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non-invasive procedure like CT scan alone could yield a sensitivity of around 60% and specificity of more than 80%.³ Other procedures like endobronchial ultrasound are also among possible candidates to replace invasive tests like mediastinoscopy and thoracoscopy and give an acceptable level of yield with very few adverse events.⁴ PET is a better procedure in terms of yield, but the procedure is severely limited when considering the cost of equipment and technical requirements of the imaging. Therefore, PET/CT scan is out of the purview for most centers in developing nations.⁵

In this study, we wanted to study the profile of patients who present with mediastinal lymphadenopathy to a tertiary care medical training institution in South India and assess the efficacy of diagnosing the etiology using CT scan. Furthermore, the radiological properties of the lesions were noted and documented in the study, and attempts were made to decipher its association with etiopathogenesis.

MATERIALS AND METHODS

The study was conducted in the Department of Radiodiagnosis of Government Medical College, Calicut, Kerala, India. The medical college is a 2500 bedded quaternary care institute, which receives referral patients from across the state of Kerala, India. The campus also houses an Institute of Chest Diseases, which is a state of the art center for all pulmonary conditions.

The study was done among patients from Internal Medicine, General Surgery, Oncology and Pulmonary Medicine Departments, who were suspected of having thoracic lymphadenopathy through radiographic findings and respiratory complaints.

All the patients satisfying inclusion criteria were approached, and those giving written informed consent were included in the study. All the participants underwent a CT imaging of the thorax, using a GE HiSpeed FX/I spiral CT scanner. Unenhanced CT imaging was done on all patients, with contiguous 10 mm sections obtained at an interval of 1 cm and scanning time of 3-4 s. The distribution, attenuation, and enhancement characteristics of the lymph nodes were evaluated after an intravenous bolus of ionic/non-ionic contrast. Delayed scans and upper abdominal sections were obtained in select participants after case-to-case assessment. Those having glomerular filtration rate of <30 ml/min was excluded from a contrast enhanced CT (CECT) imaging.

All the patients also underwent fine needle aspiration cytology (FNAC) of the lymph node to ascertain the

pathophysiology of mediastinal lymphadenopathy. The lymph nodes were sampled using a 22-gauge lumbar puncture needle under CT guidance. Those lymph nodes situated in the middle mediastinal compartment were excluded from FNAC due to difficult access and high risks involved in the procedure.

The study was presented before and approved by the Institutional Ethics Committee of Government Medical College, Calicut, Kerala, India. All the participants that were approached for the study gave their consent, and no significant adverse events were reported during the conduct of the study.

RESULTS

A total of 32 participants were finally included in the study. All the participants underwent noncontrast and CECT scan, and 29 participants were subjected to FNAC under CT guidance.

A total of 26 (81.25%) participants had metastatic lesions from the lung as the reason for mediastinal lymphadenopathy. Three (9.3%) had lymphoma, 2 (6.25%) had granulomatous inflammation of the nodes suggestive of tuberculosis, and 1 (3.12%) had reactive hyperplasia of the lymph nodes (Table 1).

The clinical and demographic characteristics of the participants were also assessed in the study. Among the participants aged <39 years, most (42.8%) were having lymphoma. At the same time, in those participants aged >40, all of them were having metastatic lesions of the lungs. Among males, the vast majority (83.3%) of the participants had mediastinal lymphadenopathy secondary to malignant lesions of the lung. Among the two female participants, one (50%) had a metastatic lesion of the lung and another (50%) had granulomatous lymphadenopathy. Among the participants who self-reported the use of tobacco, all were suffering from metastatic lesions from the lungs. Among non-smokers too, the majority (66.6%) were suffering from lung metastasis, followed by lymphoma (16.5%) and granulomatous inflammation (11.1%) (Table 2).

Among those who reported dyspnea, 75% of the participants were suffering from a malignant lesion of lung, while 25% had lymphoma. Among the participants who reported chest pain, 76.4% had metastatic lung lesion, while 17.6% had lymphoma. All the participants who had hemoptysis or hoarseness were having metastatic lesions of the lung. In case of cough, 60% had a malignant lung lesion while 20% had granulomatous lesion and 20% had reactive hyperplasia. Among the participants who had neck

swelling, 60% had metastatic lung lesion and 40% had lymphoma (Table 2).

Radiological features of the affected mediastinal lymph nodes were also studied. Among those who had affected anterosuperior group of lymph nodes, 79.3% were suffering from metastatic lesions of the lung and 10.3% had lymphoma. Among the participants who had

enlarged middle mediastinal lymph nodes, 80% had a lung malignancy and 10% had lymphoma. All the participants who had enlarged posterior mediastinal nodes were suffering from metastatic lesions from lung malignancies. Among the participants with confluent nodal morphology, the vast majority (83.3%) had metastasis from lungs. A similar trend was observed in those with discrete nodal morphology, with 75% having a malignant primary of the lungs. Metastatic lesion of the lung was the predominant condition in participants who showed attenuation of <30 HU (87.5%) and also in those who had attenuation of more than 35 HU (80.7%). Metastatic lung lesions were seen maximally in cases of those participants which showed homogeneous contrast enhancement (66.6%), patchy contrast enhancement (94.4%), and also rim enhancement (66.6%) (Table 3).

Among those participants who had extra-thoracic lymphadenopathy, 86.6% had metastatic lesion of the lung, with the rest having lymphoma and granulomatous

Table 1: Type of mediastinal lymph node lesions, characterised by CT and FNAC

Type of lesion on CT scan and FNAC	Number	Percentage
Metastatic lesions from lungs		
Small cell carcinoma	8	25.00%
Adenocarcinoma	3	9.30%
Squamous cell carcinoma	10	21.25%
Poorly differentiated carcinoma	5	15.62%
Lymphoma	3	9.30%
Granulomatous lesion	2	6.25%
Reactive hyperplasia	1	3.12%

CT: Computerized tomography, FNAC: Fine needle aspiration cytology

Table 2: Clinico-demographic characteristics of participants

Characteristic	Metastatic lesion	Lymphoma	Granulomatous	Reactive	Total
Age					
Up to 39 years	1 (14.2%)	3 (42.8%)	2 (28.5%)	1 (14.2%)	7
40-59 years	14 (100%)	0	0	0	14
60 years and above	11 (100%)	0	0	0	11
Sex					
Male	25	3 (10%)	1 (3.3%)	1 (3.3%)	30
Female	(83.3%) 1 (50%)	0	1 (50%)	0	2
Smoking					
Yes	14 (100%)	0	0	0	14
No	12 (66.6%)	3 (16.6%)	2 (11.1%)	1 (5.5%)	18
Symptoms					
Dyspnea	6 (75%)	2 (25%)	0	0	8
Chest pain	13	3 (17.6%)	1 (5.8%)	0	17
Hemoptysis	(76.4%)	0	0	0	10
Hoarseness	10 (100%)	0	0	0	8
Cough	8 (100%)	0	1 (20%)	1 (20%)	5
Swelling of neck	3 (60%) 3 (60%)	2 (40%)	0	0	5

Table 3: Radiological features of lymph nodal involvement

Characteristic	Metastatic lesion	Lymphoma	Granulomatous	Reactive	Total
Lymph nodes involved					
Anterosuperior	23 (79.3%)	3 (10.3%)	2 (6.8%)	1 (3.4%)	29
Middle mediastinal	24 (80%)	3 (10%)	2 (6.6%)	1 (3.3%)	30
Posterior	4 (100%)	0	0	0	4
Nodal morphology					
Confluent	20 (83.3%)	3 (12.5%)	1 (4.1%)	0	24
Discrete	6 (75%)	0	1 (12.5%)	1 (12.5%)	8
Attenuation					
<30 HU	7 (87.5%)	0	1 (12.5%)	0	8
More than 35 HU	21 (80.7%)	3 (11.5%)	1 (3.8%)	1 (3.8%)	26
Enhancement					
Homogenous	8 (66.6%)	2 (16.6%)	1 (8.3%)	1 (8.3%)	12
Patchy irregular	17 (94.4%)	1 (5.6%)	0	0	18
Rim	2 (66.6%)	0	1 (33.3%)	0	3

Table 4: Other clinico-radiological findings in the participants

Characteristic	Metastatic lesion	Lymphoma	Granulomatous	Reactive	Total
Extrathoracic adenopathy					
Yes	13	1 (6.6%)	1 (6.6%)	0	15
No	(86.6%) 13 (76.4%)	2 (11.7%)	1 (5.8%)	1 (5.8%)	17
Vascular compression					
Yes	13	2 (13.4%)	0	0	15
No	(86.6%) 13 (76.4%)	1 (5.8%)	2 (11.7%)	1 (5.8%)	17
Pleural effusion					
Yes	4 (80%)	1 (20%)	0	0	5
No	22 (81.4%)	2 (7.4%)	2 (7.4%)	1 (3.7%)	27

lesion of the lungs. Among the patients with no extrathoracic lymphadenopathy, the vast majority (76.4%) were suffering from metastatic lesions from the lungs. Among the participants who had vascular compression from mediastinal lymphadenopathy, 86.6% had metastasis from lungs and the rest had lymphoma as their diagnosis. Only 5 participants had pleural effusion, and of this 80% were having metastatic lesions from lungs, and 20% had lymphoma (Table 4).

DISCUSSION

Among all the study participants, 81.25% were having metastatic lesions from the lungs, while the rest had varied diagnosis such as lymphoma, reactive lymphadenopathy, and granulomatous inflammation. The prevalence of malignant lesions of the lung as the cause of mediastinal lymphadenopathy is much more than the figures reported in previous studies. Studies done in Germany⁶ and the United States⁷ have showed the prevalence ranging from 55% to 65%, but our study has shown the prevalence as high as 81.25%. This may be attributed to the fact that tobacco usage, especially crude forms like beedi or khaini, is on the increase in developing countries like India.

Among the participants aged <40 years, only 14.1% were suffering from metastatic lesions from the lung, while all (100%) of the participants aged 40 or above had lung malignancy. The vast majority of the participants (91.3%) were males, and among the male participants, 83.3% were suffering from metastatic lung malignancy. At the same time, only 50% of the female participants had lung metastasis to lymph nodes. This trend conforms to those seen in studies done across the world, on patients with mediastinal lymph node enlargement.⁸ All the participants who reported smoking had metastatic lesions of the lung, while only 66.6% of the non-smokers had a diagnosis of a malignant lesion of the lung. The association of smoking with metastatic lung malignancy has been proven across different settings and is similar to what is observed here.⁹

The CT scan is seen as an alternative to more invasive investigations like thoracoscopy and mediastinoscopy

in diagnosing and staging mediastinal lymphadenopathy associated with lung malignancy. The CT scan can be beneficial in avoiding the surgical staging procedure in lung malignancy, in the absence of any demonstrable macroscopic lymph node metastasis.¹⁰ The advent of high-resolution CT and CECT has improved the scope of CT scan in comprehensive evaluation of mediastinal lymph nodes.¹¹ The PET-CT has been a revolutionary method which improved the accuracy in effectively diagnosing and staging the mediastinal lymph nodes, but the expensive nature of the investigation severely limits its utility, at least in developing nations.¹² However, systematic reviews done by Cochrane has shown that all these imaging modalities can be used as an adjuvant in diagnosis and staging but cannot replace the importance of a tissue diagnosis. Furthermore, the review states that imaging done alone, cannot be used to take management decisions in case of mediastinal lymphadenopathy due to probable lung malignancy.¹³

CONCLUSION

It was found that the vast majority of patients presenting with mediastinal lymph node enlargement has an underlying lung malignancy presenting as metastasis. Furthermore, CT scan is a modality with can aid in diagnosis and staging of the lymph node enlargement, but it cannot replace the importance of a tissue diagnosis.

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