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PET/CT in Mediastinal Lymphadenopathy; Merits and Pitfalls

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ABSTRACT

Background: Enlarged mediastinal lymph nodes require assessment to ascertain their benign or malignant origin. Noninvasive techniques are crucial for diagnosing benign as well as malignant mediastinal lymph nodes. PET/CT, which combines morphological plus functional imaging, is a noninvasive technique utilized for evaluating mediastinal lymphadenopathy. In PET, the standard uptake value (SUV), as a semi-quantitative measure, indicates the level of metabolic activity in certain tissues. While FDG absorption levels are typically elevated in neoplastic conditions, they may also be attributed to physiological factors or artifacts. Furthermore, FDG uptake may manifest in benign diseases, including viral, inflammatory, as well as iatrogenic lesions.

Results: This cross-sectional study included 120 cases; 67 male (56 %) and 53 female (44 %). 63 cases (52.5%) presented with mediastinal lymphadenopathy on CT and 57 patients (47.5%) came for metastatic work up. They were between the ages of 23 and 85, with 62 being the mean age. Three patients showed high FDG uptake suggesting malignant diagnosis, however, was to be benign. Thirty-four patients showed low FDG uptake, suggesting benign lesions yet with malignant final diagnosis, while thirty patients showed borderline FDG uptake so being indeterminate diagnosis. One patient showed metabolic activity of undetermined nature and proved finally as benign nature. All of these findings were considered as pitfalls for using PET/CT examination in assessment of the malignant, benign and metabolically active lesions.

Conclusions: PET/CT examination merits; detection of primary lesions and metastasis, assessment of treatment response and being useful as non-invasive investigation for follow up. On the other hand, number of patients showed high FDG uptake suggesting malignant diagnosis, however, was to be benign, and others showed low FDG uptake, suggesting benign lesions yet with malignant final diagnosis, others showed borderline FDG uptake so being indeterminate diagnosis. Ultimately, implementing both PET FDG uptake and CT characteristics, such as size and attenuation, in a comprehensive integrated report, alongside high-quality clinical and laboratory data in a multidisciplinary meeting context, enhances the likelihood of achieving an accurate diagnosis for the patient.

KEYWORDS: Lymphadenopathy, PET/CT, malignant, benign.

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BACKGROUND

Enlargement of mediastinal lymph nodes identified on chest X-ray or chest CT requires further evaluation to determine their benign or malignant nature. Due to the intricate structure of the mediastinum and the potential risks associated with biopsy interventions, noninvasive approaches play a crucial role in distinguishing between benign and malignant lymph nodes in this region (1).

Lymphadenopathy precipitates multiple mediastinal lesions. Lymphoma as well as Sarcoidosis make a significant portion of the mediastinal lymphadenopathy differential diagnosis (2) .

Analysis Positron emission tomography-computed tomography (PET/CT) integrates morphological and functional data, serving as a noninvasive technique for evaluating enlarged mediastinal lymph nodes along with related disorders throughout the body (3). Both PET and CT assist in differentiating between normal physiological uptake and pathological uptake. Upon precise localization of functional problems, quantify the incidence of false positives and false negatives in imaging data (4) .

Standard uptake value (SUV) is a semi-quantitative metric utilized in PET data analysis that portrays the extent to which the scanned organs are engaged in metabolic processes, specifically aerobic glycolysis (1) .

The mediastinal nodes can benefit greatly from PET-CT because it combines morphologic and metabolic data, which has a significant influence on the individual performance of CT and PET, respectively. Therefore, when evaluating mediastinal nodal staging, PET/CT is far more relevant than either PET alone or CT alone (5) .

The mediastinal lymph nodes in the CT scans of the PET/CT scan are evaluated based on size (short-axis diameter), internal density, calcification presence, and any extra-capsular invasion, if applicable (6).

Within the PET images, all detectable enlarged lymph nodes are classified into nodes showing no FDG uptake, uptake less and uptake greater than the uptake of the mediastinal blood pool. Among PET images, malignant lymph nodes present higher FDG uptake and benign nodes show lower FDG uptake than mediastinal blood pool uptake (7).

Conventional noninvasive examinations, such as CT as well as magnetic resonance imaging (MRI), are regarded as the standard imaging techniques for evaluating mediastinal lymph node disease.

While CT scanning can detect lesions, it is still challenging to differentiate between benign as well as malignant enlarged lymph nodes due to MRI's relatively poor spatial resolution, which makes it difficult to detect air in both lungs as well as lymph node calcification (8) .

While fluorine-18 fluorodeoxyglucose (FDG) PET/CT is not regarded as a standard evaluation for sarcoidosis, it offers significant utility in the diagnosis as well as management of the condition. FDG PET/CT offers a distinct benefit by delivering both functional and anatomical assessment of the entire body, a capability not afforded by other imaging modalities (9).

In our study we were aiming to detect the detect role of PET/CT in assessment of mediastinal lymphadenopathy (benign versus malignant lymph nodes) as well as detecting the merits and pitfalls of PET/CT in their diagnosis.

METHODS

Study design

In this cross-sectional study, 120 individuals were examined; 67 male (56 %) and 53 Female (44 %) presented with mediastinal lymphadenopathy on CT. They were between the ages of 23 and 85, with 62 being the mean age. Fifty-seven patients (47.5%) made the examination as a part of metastatic work up (Table 1).

Table (1): Characteristic data of 120 patients

Variables		Number
Age	**Range**	85-23
	Mean	62
Gender	**Male**	67
	Female	53

The research was carried out over a course of 20 months, from March 2021 to October 2022. Patients were directed to a private radiology facility for PET/CT imaging.

Institutional ethical clearance was obtained prior to the commencement of this investigation. Consent was acquired from patients or their designated representatives. The predominant symptoms observed at presentation were pain in the chest along with dyspnea, whereas other symptoms, including cough and loss of weight, were less frequently recorded.

Inclusion criteria:

Enlarged mediastinal lymph nodes as the short axis >1 cm by CT images.
Metastatic work up.

Exclusion criteria:

Contraindication for PET/CT examination e.g. pregnant patients .

A. PET/CT:

Imaging techniques of PET/CT:

I) Patient preparation:

All patients were instructed to fast for 6 hours before the examination. All metal objects associated with the patient were extracted. The patient putting on a gown. An intravenous cannula was put into the patient's arm for the administration of 18F-FDG. The patient was instructed to void before the examination. The patient was advised to refrain from any activity prior to the scan and after the administration of the radioisotope to prevent misinterpretation caused by physiological muscle uptake of FDG.
To diminish brown fat, we established a controlled-temperature (warm) environment for patients prior to the 18F-FDG injection, along with a high-fat, low-carbohydrate, as well as protein-allowed diet before the scanning.

II) Dosage administration:

Estimated dose to the patient is 10-20 mCi, administered 45-90 minutes prior to the assessment, known as the uptake phase. Patients were instructed to remain in a relaxing environment, free from distractions, and to minimize their movements to reduce physiological uptake of FDG in skeletal muscle.

III) Patient position:
The patient was positioned in the supine position (head fixation and arms up).

IV) Image acquisition:

Examination time and technique:
Initially, we employed low-dose non-enhanced CT, followed by a whole-body PET investigation. A diagnostic enhanced whole body CT scan was subsequently performed. The testing duration was roughly 25 to 30 minutes. The standard whole-body PET/CT scan (brain, neck, chest, abdomen, pelvis) begins at the skull and progresses caudally to the upper thigh region. The patient was instructed to breathe calmly. The scanning parameters identified were a pitch of 1.5, a collimator width of 5.0 mm, a gantry rotation time of 0.8 seconds, and a field of view of 50 cm.

CT Technique:
The enhanced CT was performed after injection of 1 ml/Kg of contrast medium at a rate of 4 ml/sec by using a power injector.

PET Technique:
The PET scan was conducted subsequent to the CT scan without repositioning the subject. Around 6-7 bed positions are designated in the three-dimensional acquisition mode for whole-body scanning, with an acquisition time of 3-5 minutes per bed position.

PET/CT Fusion
Initially, both Trans-axial PET and CT images were reconstructed. The coronal as well as sagittal images were subsequently reformatted. Both PET as well as CT imaging yield corresponding "fusion" images. The integrated PET/CT scan for whole-body acquisition required approximately 25 minutes.

Image analysis and interpretation:
The CT examinations were analyzed by radiologists, whereas all PET/CT examinations were evaluated independently by experienced nuclear medicine specialists and radiologists. The region of interest (ROI) was delineated over the area of peak activity inside the tumor tissue, followed by the calculation of SUV. Abnormal 18F-FDG uptake refers to the accumulation of the radiotracer in areas outside of normal anatomical soft tissue, exhibiting higher uptake than the background activity, taking into account the typical sites of physiological FDG absorption.

In PET/CT imaging, lymph nodes exhibiting elevated FDG uptake are deemed positive for metastatic dissemination, even if their short-axis dimension is less than 1 cm. Negative FDG-uptake lymph nodes were deemed benign, even if they exceeded 1 cm in short-axis size.

In this study no FDG uptake was interpreted as metabolically inactive thus suggesting a benign lesions, however, in cases of FDG uptake, a value of SUV above 7 was considered metabolically active and suggested malignancy, SUV value less than 4 was considered more likely to be a benign lesion, while values in-between (4-7) was considered metabolically active, however of query nature. These assumptions were taken based on the experience of the radiologist in charge and surfing the net for pertained literature. The following locations were assessed for distant metastases: liver, brain, bone, lung, peritoneum as well as abdominal nodes.

B. Histopathological diagnosis:
Histopathological evaluation of the mediastinal lymph nodes was performed in all cases [via trans-bronchial needle aspiration (TBNA), endobronchial ultrasound guided – trans-bronchial needle aspiration (EBUS-TBNA) as well as endoscopic ultrasound-guided fine needle aspiration (EUSFNA)]. Also, biopsies from liver, abdominal lymph nodes (72 cases) and cervical lymph nodes (12 cases) were taken.

C. Statistical analysis:
Data were inputted and encoded utilizing the statistical software SPSS (Statistical Package for the Social Sciences) version 26 (IBM Corp., Armonk, NY, USA). Data was summarized utilizing mean, SD, median, minimum, & maximum with quantitative data, as well employing frequency (count) & relative frequency (%) with categorical data. Comparisons of quantitative variables were conducted utilizing the non-parametric Mann-Whitney test (Chan, 2003). The ROC curve was generated, and area under the curve analysis was conducted to identify the optimal cutoff value.

RESULTS
This cross-sectional study included 120 cases; 67 male (56 %) and 53 female (44 %). 63 cases (52.5%) presented with mediastinal lymphadenopathy on CT and 57 patients (47.5%) came for metastatic work up. They were between the ages of 23 and 85, with 62 being the mean age. Patients were referred to a private radiology center to perform PET/CT.

Among our cross-sectional study, we discussed the characters of the affected lymph nodes (Table 2 and 3).

Table (2): The number of the affected lymph nodes

Number of lymph nodes	Number of patients
1	20(16.7%)
2	14(11.7%)
Few (less than 10)	76(63.3%)
Multiple (more than 9)	10(8.3%)

Table (3): The site of the lymph nodes

Site of affected lymph nodes		Number of cases
Supraclavicular Zone	Station 1(Supraclavicular).	3 (2.5%)
Superior Mediastinal LNs zone	Station 2 (Upper right paratracheal).	69 (57.5%)
	Station 3 (Pre-vascular and retro-tracheal).	34 (28.3%)
	Station 4 (Lower paratracheal).	51 (42.5 %)
Aorto-pulmonary Zone	Station 5 (Sub-aortic).	23 (19.1 %)
	Station 6 (Para-aortic).	47 (39.1 %)
Subcarinal Zone	Station 7 (Subcarinal).	76 (63.3%)
Inferior Mediastinal LNs	Station 8 (Para-esophageal).	3 (2.5 %)
	Station 9 (Pulmonary ligament).	0 (0%)
Extra-Mediastinal LNs	Station 10 (Hilar).	42 (35 %)
	Station 11 (Interlobar).	0 (0%)
	Stations 12-14 (Peripheral).	0 (0 %)

The commonest site of lymph nodes affection is the subcarinal group 76 cases (63.3%) followed by upper paratracheal 69 cases (28.3%).

Among our study, 96 patients (80%) finally showed malignant diagnosis, the most common cause detected was the metastatic lymph nodes in 57 patients (47%) patients, while the least cause noted is leukemia in 6 patients (5%). On other hand, 24 patients (20%) finally showed benign diagnosis, the most common cause detected is inflammatory changes in 17 patients (14.1%), while the least cause noted is Rosai Dorfman in one patient (0.8%) (Table 4).

Table (4): Summary of Histopathological diagnoses of mediastinal lymphadenopathy.

	Histopathological diagnosis	Number of cases	Male: female ratio
Benign	**Sarcoidosis**	5 (4.1%)	3/2
	Non-specific Lymphadenitis	17 (14.1%)	8/9
	tuberculosis	1 (0.8%)	1/0
	Rosai Dorfman	1(0.8%)	0/1
	Total no.	24 (20%)	
Malignant	**metastatic**	57 (47 %)	32/26
	Lymphoma	33 (27.5%)	21/12
	Leukemia	6 (5%)	3/3
	Total no.	96 (80 %)	

The size of the largest affected lymph nodes is summarized in (Table 5).

Table (5): The size of affected lymph nodes

	Benign L.N	Malignant L.N
Range	8.9 cm -0.7 cm	9 cm - 0.8 cm
Mean	2.38	2.31
Median	1.9	2

Thirty-one patients (25.8 %) showed high FDG uptake with SUV range from 7.5-20 suggesting malignant diagnosis by PET/CT; and proved as such by histopathology (Figure 1).

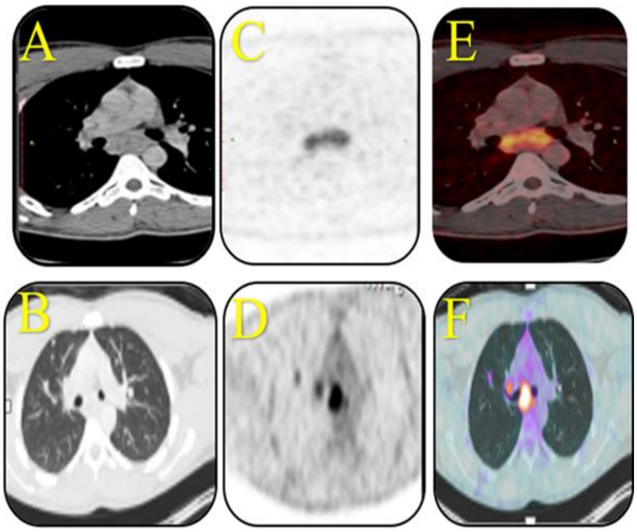

Figure 1. (A & B) axial CT images, (C & D) PET images and (E & F) fused images, show enlarged subcarinal lymph node with SUV uptake 8.8 as well as right upper lobe metabolically active nodule. Imaging diagnosis: lymphadenopathy with high SUV suggesting malignant nature. Histopathology result: Metastasis.

Three patients (2.5 %) showed high FDG uptake suggesting malignant diagnosis, however, were proved to be benign and considered as pitfalls for using PET/CT examination in assessment of the metabolically active lesions (Table 6, Figure 2).

Table (6): Lymphadenopathy showing high FDG uptake with benign final diagnosis

Number	History	Affected lymph nodes Groups	SUV	PET/CT diagnosis	Histopathology
1	**Lymphadenopathy**	Subcarinal Retrocarinal	8.8	malignant	Rosi dorfamn
2	**Pulmonary nodule**	Bilateral hilar Subcarinal Superior mediastinum	12.5	malignant	Sarcoidosis
3	**Mediastinal lymphadenopathy**	right hilar anterior mediastinal, pre-vascular, para-tracheal	10.5	malignant	Sarcoidosis

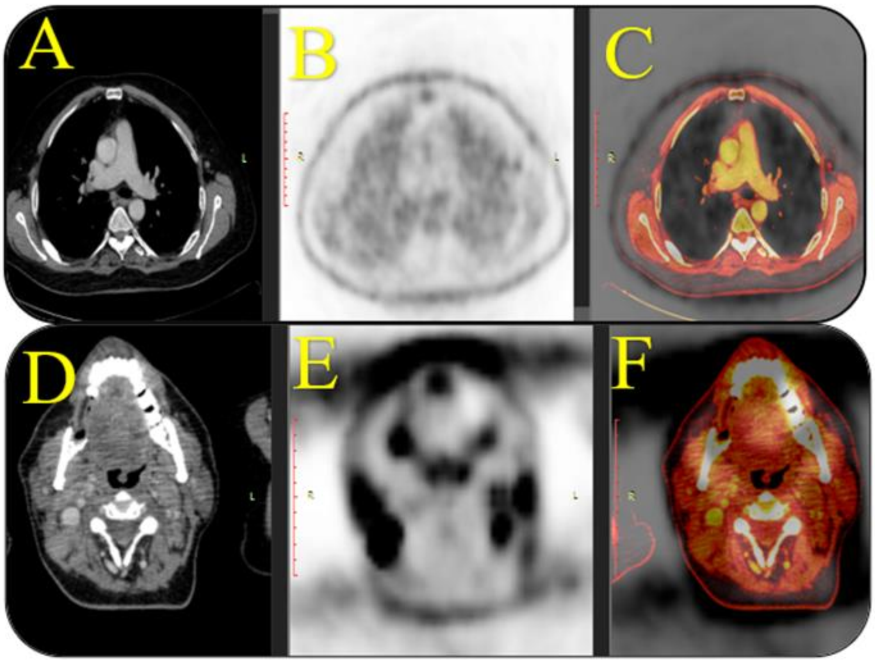

Figure 2. A) axial CT image, B) PET image and C) fused image, show subcarinal metabolically active lymph node, D) axial CT image, E) PET image and F) fused image, show enlarged bilateral cervical lymph nodes. Imaging diagnosis: high FDG uptake SUVmax 8.8 suggesting malignant lymph nodes. Histopathology result: Rosi Dorfman.

Thirteen patients (10.8 %) showed low FDG uptake suggesting benign diagnosis and proved as such by histopathology.

Thirty-four patients (28.3 %) showed low FDG uptake, ranging from 1.3-3.7 suggesting benign lesions, yet with malignant final diagnosis. That was considered as a pitfall of PET/CT examination in assessment of metabolically active lesions (Figure 3).

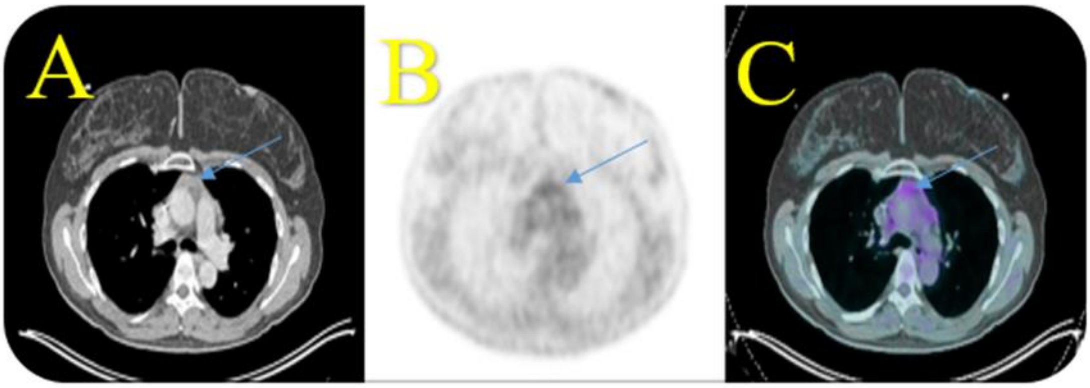

Figure 3. A) axial CT image, B) PET image and C) fused image, show superior mediastinum lymph node with SUV uptake 2.6. Imaging diagnosis: lymphadenopathy with low SUV suggesting benign nature. Histopathology result: proved Metastases from adenocarcinoma.

So, 47(39.16%) cases showed low FDG uptake of which 13 cases were proved benign while 34 cases were proved malignant by histopathology of which 16 cases (47 %) were metastatic, 13 cases (38.2%) were lymphoma and 5 cases (14.7%) were leukemia. The SUV reading of malignancy cases ranged from 1.3-3.8 (average = 2.7).

Thirty patients (25 %) showed borderline FDG uptake with SUV range within 4-7 so being indeterminate diagnosis and proved finally as malignant nature. That was considered as a pitfall of PET/CT examination in assessment of metabolically active lesion (Figure 4).

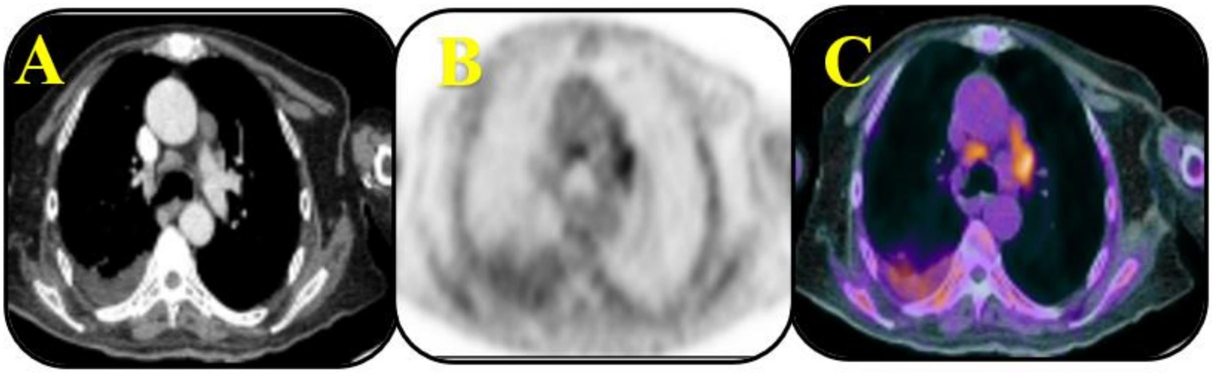

Figure 4. A) axial CT image, B) PET image and C) fused image, show enlarged aorto-pulmonary window and pre-tracheal lymph node with SUV uptake 6.8. Imaging diagnosis: lymphadenopathy with indeterminate diagnosis (borderline range SUV). Histopathology result: Non-Hodgkin lymphoma.

One patient (0.8 %) showed borderline FDG uptake (SUV between 4 and 7) and proved finally as benign nature (sarcoidosis), considered as pitfall for using PET/CT examination in assessment of the metabolically active lesions.

So, 31 cases showed borderline FDG uptake from 4 to 7 of which 30 cases (96.7 %) were histopathological proved malignant of which 19 case (63.3 %) metastatic, 10 case (33.3%) lymphoma and 1 (3.3%) leukemia and 1 case with FDG uptake of SUV 4 was benign (sarcoidosis).

Five patients (4.1 %) showed CT features of sarcoidosis and proved as such by histopathology. Two cases show high FDG uptake suggesting malignant diagnosis, one case showed metabolically activity of undetermined nature while two cases showed low FDG uptake suggesting benign diagnosis.

Statistical data

We summarized some date among the comparison among benign as well as malignant lesions such as the number of the affected lymph nodes, the gender, age as well as size of the largest affected lymph node (tables 7 and 8).

Table (7): Comparison between benign and malignant

		PET diagnosis				P value
		Benign		Malignant		
		Count	%	Count	%	
Number of LNs	**1**	4	16.7%	16	16.7%	0.426
	2	2	8.3%	12	12.5%	
	few	14	58.3%	62	64.6%	
	multiple	4	16.7%	6	6.3%	
Gender	**Female**	7	29.2%	51	53.1%	0.036
	Male	17	70.8%	45	46.9%	

Table (8): Comparison between benign and malignant

	PET diagnosis										P value
	Benign					Malignant					
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
Age	56.29	12.98	56.00	33.00	77.00	56.46	13.11	58.50	21.00	80.00	0.893
Size of L.N (cm)	2.38	1.75	1.90	0.80	8.90	2.31	1.15	2.00	0.80	8.90	0.419
SUV	2.96	3.36	2.30	0.00	12.50	5.97	3.61	5.00	1.30	20.00	< 0.001

Statistical data in details among the PET/CT diagnosis including cut-off values, sensitivity and Specificity were described in (table 9) as well as (Figure 5).

Table (9): Statistical data of PET/CT diagnosis

Area Under the Curve	P value	95% Confidence Interval							
		Lower Bound	Upper Bound	Cut off	Sensitivity %	Specificity %	PPV %	NPV %	Accuracy %
0.765	< 0.001	0.646	0.885	4.10	62.5	87.5	95.24	36.84	67.50

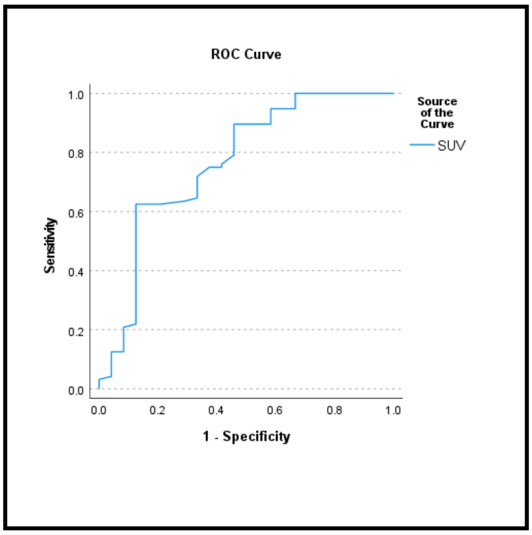

Figure 5. Statistical data of PET/CT findings

DISCUSSION

This research involved the assessment of 120 cases; 67 male (56 %) and 53 Female (44 %), with mediastinal lymphadenopathy on CT 63 cases (52.5%) and for metastatic work up 57 patients (47.5%). They were between the ages of 23 and 85, with 62 being the mean age. In this study 34 cases showed high FDG uptake (SUV > 7) which suggested malignancy. Thirty-one cases of whom were histopathological proved malignant and three cases were proved benign. The diagnosis of malignant lesions with high SUV (>7) were thus 100% sensitivity and 91.7% specificity.

These findings accord with prior studies indicating that an elevated SUVmax value correlates with increased glucose transporter protein as well as enhanced glycolytic activity in tumor cells, thereby linking elevated SUVmax to greater malignant potential (10).

Comparable results in other studies indicate that elevated SUVmax correlates with increased malignancy potential in thyroid gland lesions (11).

Another study indicated that malignant tissues typically exhibit a markedly elevated SUV, regarded as the most significant advantage of PET due to their heightened metabolic rate. The PET sensitivity in that study was exceptionally high (95.31%), accompanied by a low specificity (20%). Inflammatory or granulomatous conditions, including tuberculosis, sarcoidosis, coccidioidomycosis, aspergillosis, histoplasmosis, Wegener's granulomatosis, as well as pneumonia, may yield false-positive findings (12).

On other hand, in our study 47 cases showed low FDG uptake (SUV range 1.8-4), 34 cases were proved histopathological malignant and 13 cases were proved benign. This denotes that in this study low FDG uptake holds the possibility of malignancy. These findings keep in touch with previous research which showed that a number of clinicians advice to use of a SUV threshold of 2.5 to separate benign from malignant lesions, depending on the results of many old studies However, this way shows significant shortcomings may leading to patient misinterpretation. SUV of 2.5 should not be considered as a magic threshold for differentiation benign from malignant lesions (13).

Many previous researches showed a notable overlap in the value of FDG uptake in the malignancy aggression in the low range SUV (14).

Enlarged malignant lymph nodes may be considered to be lymphoma or metastatic carcinoma, while benign enlargement causes is commonly due to infection and sarcoidosis (15).

A high FDG (SUV > 7) were more likely to suggest malignancy (91.17%) while in cases of SUV uptake < 7 we had 86 cases of which 64 cases were histopathological proved malignancy while 22 cases were benign. These findings suggest that high FDG (>7) favors malignancy while SUV <7 holds the possibility of malignancy specificity of 74.4 %. This denotes that in this study high FDG uptake holds the possibility of benign nature.

These findings suggest that PET/CT with SUV more than 7 have the merit of suggesting malignancy with specificity of 91.17% while PET/CT with SUV less than 7 are indeterminate for reflecting a benign from malignancy, however metabolic activity in this study were in favored malignancy in 98 cases.

In cases of no FDG uptake benign diagnosis was assumed and proved as such.

PET/CT can help in the diagnosis of sarcoidosis disease, especially when conventional examinations are indeterminate. In addition, PET/CT may assess treatable active diseases, particularly in pulmonary and cardiac sarcoidosis. (16).

Sarcoidosis disease shows a predisposition for lymphoid malignancies. Both of the Sarcoidosis and lymphoma can present increased FDG uptake in the enlarged lymph nodes in the mediastinum, so FDG-PET-CT cannot replace the need for verification by histology (17).

All in all, the Statistical data in details among the PET/CT diagnosis of mediastinal lymphadenopathy at cut off value = 4.10 showed sensitivity, Specificity as well as Accuracy are 62.5 %, 87.5 % & 67.50 % respectively.

As reviewing previous studies, we found the node SUVmax cut-off of 6.2 demonstrated sensitivity and specificity of 93% and 40 %, respectively (Kumar et al., 2011). The node SUVmax cut-off of 2.5 demonstrated sensitivity and specificity was 78% and 70 %, respectively (Yu et al 2018). The node SUVmax cut-off of 3.9 exhibited a sensitivity of 90.9% with a specificity of 61.9% (18).

Sixteen instances (13.3%) of false-positive PET/CT results in assessing mediastinal lymphadenopathy were identified, with nonspecificity being the primary source of false-positive lymph nodes
.
In the investigation conducted by YU and colleagues from Alabama, histoplasmosis infection was identified as the predominant source of false positives. Silicosis was identified as a cause of false positives in a study conducted in Germany. In a separate study, patients suffering from tuberculosis were frequently misidentified as having malignant tissue among the false-positive cases, which constituted 72.7% of all misdiagnosed instances (1).

This study indicates that lymph node size is not a factor in differentiating benign from malignant mediastinal lymph nodes. No definitive cutoff exists for the short axis of lymph nodes to distinguish benign from malignant lymph nodes. The size of the lymph nodes in malignant groups shows range from 8.5 to 0.8 cm with mean and the median value equal 2.38 and 1.90 respectively while in benign groups shows range from 8.9 to 0.8 cm with mean and the median value equal 2.31 and 2.00 respectively. However, in literature (YU and co-workers), they assumed that size of lymph nodes had a direct relationship to its malignancy.

In this study, we found the most common complaint is the generalized lymphadenopathy, which emphasis the high percentage of lymphoma diagnosis in our study (27.5%). Howeverthe most common histopathological diagnosis detected is the metastatic lymph nodes (47.5%). Among the benign causes found, the nonspecific diagnosis is detected (14.2%).

In our study, the common count of the detected enlarged/FDG uptake lymph nodes is ranging between three to nine lymph nodes (63.3%). While multiple affected lymph nodes showed at the minor percentage of the examined cases in our study (8.3%).

CONCLUSIONS

PET/CT examination using combined functional and morphological data can be used as a significant noninvasive way to accurately diagnose and characterize enlarged mediastinal lymph nodes.

We discuss in our study number of merits and pitfalls of PET/CT examination among the 120 cases, and finally we found out many benefits of the PET/CT scan among the cases of lymphadenopathy or the cases referred for metastatic work-up.

SUV greater than 7 is more towards malignant lesions (91.7% specificity), However, several benign tumors, such as sarcoidosis, exhibited elevated FDG uptake. SUV equal to or less than 7 does not mean benign lesion but holds the possibility of malignancy. Employing both PET FDG uptake and CT features (such as size and attenuation) in a comprehensive integrated report, alongside high-quality clinical as well as laboratory data in a multidisciplinary meeting context, enhances the likelihood of achieving an accurate diagnosis for the patient.

LIST OF ABBREVIATIONS

- CM: Centimeter
- CT: Computed tomography
- EBUS-TBNA: Endobronchial ultrasound-guided trans-bronchial needle aspiration
- EUSFNA: Endoscopic ultrasound-guided fine needle aspiration
- FDG: Fluorodeoxyglucose
- MRI: Magnetic resonance imaging
- NPV: Negative predictive values
- PET: Positron emission tomography
- PET/CT: Positron emission tomography/computed tomography
- PPV: Positive predictive values
- ROC: Receiver operating characteristic
- ROI: Region of interest
- SUV: Standard uptake value
- TBNA: Transbronchial needle aspiration

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