

Role of positron emission tomography combined with computed tomography (PET/CT) using ^{18}F -fluorodesoxyglucose (^{18}F -FDG) in the initial staging of non-small cell lung cancers, first experience of the Tunisian center

Place de la tomographie par émission de positons couplée à la tomodensitométrie (TEP-TDM) au ^{18}F -fluoro-desoxy-glucose (^{18}F -FDG) dans la stadification initiale des cancers bronchopulmonaires non à petites cellules, première expérience du centre Tunisien

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ABSTRACT

Introduction: Lung cancer remains the leading cause of cancer-related mortality in Tunisia. Addressing this significant public health issue requires precise initial staging of the disease to ensure appropriate management.

Objective: Focusing on the Tunisian context where ^{18}F -FDG PET/CT has been in use since late 2019, this study aims to evaluate the impact of this technique on the initial staging and consequent therapeutic strategy for non-small cell lung cancer

Methods: This is a retrospective descriptive study conducted at the Nuclear Medicine Department of CHU Sahloul in Sousse from January 2020 to January 2023, involving 61 patients who underwent ^{18}F -FDG PET-CT for initial staging of NSCLC.

Results: The study found that PET-CT modified the T stage in only 18% of patients, while it altered the N stage in 54.1% and the M stage in 45.9% of cases. This resulted in a change in disease stage for 40 patients (65.6%) and adjusted therapeutic management for 27 patients.

Conclusion: ^{18}F -FDG PET-CT provides more accurate staging compared to conventional imaging, particularly for lymph node and distant metastatic assessment in NSCLC patients. This leads to changes in treatment strategies, resulting in more appropriate management.

Keywords: PET scan, Staging, Non-small cell lung cancer, Initial assessment, Therapeutic management

RÉSUMÉ

Introduction: Le cancer bronchopulmonaire continue à occuper la première place entermes de mortalitéliée aux cancers enTunisie. Il s'agit d'un véritable problème de santé publique dont la prise en charge nécessite une stadification initiale précise de la maladie.

Objectif: Mettre l'accent sur la place de la TEP-TDM au ^{18}F -FDG dans la stadification initiale des cancers broncho-pulmonaires non à petites cellules (CBNPC), notamment depuis l'introduction de cette technique d'imagerie en Tunisie en fin 2019.

Matériel et méthodes: Il s'agit d'une étude descriptive rétrospective menée au service de médecine nucléaire du CHU Sahloul de Sousse entre Janvier 2020 et Janvier 2023, incluant 61 patients adressés pour TEP-TDM au ^{18}F -FDG dans le cadre du bilan d'extension initial de leur CBNPC.

Résultats: Notre étude a montré que la TEP-TDM au ^{18}F -FDG a modifié le statut tumoral (T) chez seulement 18 % des patients, tandis qu'elle a permis de modifier le statut ganglionnaire (N) dans 54,1 % des cas et le statut métastatique (M) dans 45,9 % des cas. Cela a entraîné un changement du stade de la maladie pour 40 patients (65,6 %) et de la prise en charge thérapeutique pour 27 patients.

Conclusion: La TEP-TDM au ^{18}F -FDG permet une stadification plus précise que l'imagerie conventionnelle des patients atteints de cancer CBNPC, essentiellement pour le statut ganglionnaire et métastatique à distance. Il en découle une modification de la stratégie thérapeutique, et par conséquent une prise en charge plus adéquate.

Mots-clés: TEP-TDM- Bilan d'extension- Cancer bronchopulmonaire non à petites cellules- Stadification initiale- Prise en charge thérapeutique

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INTRODUCTION

Lung cancer remains the leading cause of cancer-related mortality worldwide and represents a major public health challenge in Tunisia, where its incidence continues to rise. According to the most recent data from the Northern Tunisia Cancer Registry, which is based on the 2010-2014 period, lung cancer is the leading cancer site among men, with an age-standardized incidence rate (ASIR) of 37.6 per 100,000 and constitutes the sixth most common cancer in women, with an ASIR of 5.8 per 100,000 (1).

Among all lung cancer cases, approximately 85% are diagnosed as non-small cell lung carcinoma (NSCLC) (1). Despite therapeutic advances, the overall prognosis in the Tunisian context remains poor, with a median survival of only 10 months and a five-year survival rate of 22.1%, largely attributable to late-stage diagnosis and the frequent presence of metastatic disease at initial presentation (2). These diagnostic delays are exacerbated by the underestimation of early symptoms, low awareness of the link between tobacco use and cancer, a high smoking prevalence exceeding 50% among adult men, and growing exposure among women and youth (2).

In this challenging setting, accurate initial staging is a clinical imperative for NSCLC management, as it directly dictates the choice between curative and palliative therapeutic pathways. The Tumor–Node–Metastasis (TNM) staging system is the cornerstone of this assessment. Traditionally, contrast-enhanced computed tomography (CT) of the chest and upper abdomen has been the primary tool, providing detailed anatomical information for evaluating the primary tumor (T status). The advent of 18F-fluorodeoxyglucose positron emission tomography combined with computed tomography (18F-FDG PET/CT) has transformed this paradigm. By integrating metabolic and anatomical data, PET/CT offers superior sensitivity and specificity for detecting mediastinal lymph node involvement and distant metastases compared to CT alone, leading to more accurate staging and subsequent changes in clinical management [4]. Consequently, it has become an essential component of the standard diagnostic workup for newly diagnosed NSCLC patients.

Objectives: Focusing on the Tunisian context where 18F-FDG PET/CT has been in use since late 2019, this study aims to evaluate the impact of this technique on the initial staging and consequent therapeutic strategy for non-small cell lung cancer.

METHODS

Study design

This retrospective, descriptive study analyzed all patients with NSCLC who underwent FDG PET/CT for the initial staging of the disease in the Nuclear Medicine department of Sahloul hospital between January 2020 and January 2023.

Population

A total of 61 patients were included in this study. All of them had histopathological evidence of the disease and underwent PET/CT and thoraco-abdominopelvic computed tomography (TAP CT) as part of the initial extent of disease assessment, with both imaging modalities performed within a maximum of 3-month interval.

Exclusion criteria were patients who have already started chemotherapy, radiotherapy or surgical treatment, as well as those whose medical records were incomplete or missing.

Data collection

We collected epidemiological (age, gender and medical history), clinical (NSCLC risk factors, discovery circumstances), paraclinical (histopathological data, PET/CT and TAP CT) and therapeutic data for each patient.

Statistical analysis

Data entry and analysis were performed using SPSS 25 software. For the descriptive analysis, qualitative variables were expressed as relative and absolute frequencies, while quantitative variables were reported as means and standard deviations.

In the analytical study, the agreement between the two imaging modalities was assessed using Cohen's kappa coefficient, with the statistical significance level set at $p < 0.05$.

The strength of agreement for the resulting kappa values was interpreted according to the widely used benchmark proposed by Landis and Koch (1977)(4), as summarized in Table 1 below:

Table 1. Interpretation of Kappa statistics

Kappa Value (κ)	Strength of Agreement
< 0.00	Poor
0.00 – 0.20	Slight
0.21 – 0.40	Fair
0.41 – 0.60	Moderate
0.61 – 0.80	Substantial
0.81 – 1.00	Almost Perfect

RESULTS

Epidemiological and clinical data

Our study involved 61 patients, predominantly male (93.4%), with an average age of 65 years. Most patients (95%) were active smokers, with an average of 60.9 pack-years. These data are consistent with those from the National Cancer Registry of 2010-2014, in which smoking is responsible for more than 80% of lung cancers (1). Diabetes was present in 24.6% of the patients. Pulmonary infections included a history of SARS-CoV-2 pneumonia in three patients, while 7 patients had chronic obstructive pulmonary disease (COPD). There were no

cases of pulmonary tuberculosis. Clinically, the majority of patients had respiratory symptoms (85.2%), with persistent cough being the most common. The disease was discovered incidentally in 3 patients during imaging for other conditions (Table 2).

Table 2. Epidemiological and clinical data

Population	n= 61
Age (years)	65 ± 8.73
Gender	M= 57 F= 4 Sex ratio (M/F) = 14.25
Medical history	
Tobacco exposure	58(95%)
Exposure to wood smoke	1 (1.6%)
Occupational exposure	0 (0.0%)
Diabetes	15 (24.6%)
Pulmonary infections and chronic disease	
SARS-COV 2	3 (4.9%)
COPD	7 (11.5%)
Pulmonary tuberculosis	0 (0,0%)
Other neoplasms	3 (4.9%)
Clinical presentation	
Respiratory symptoms	53 (85.2%)
General health deterioration	32 (52.5%)
Local-regional extension signs	3 (4.9%)
Distant extension	4 (6.6%)
Incidental discovery	3 (4.9%)

Histopathological data

The most common histological type was adenocarcinoma, found in 57.4% of cases (n=35), followed by squamous cell carcinoma in 39.3% of patients (n=24). These data are also consistent with the findings from the 2010–2014 National Registry, showing that adenocarcinoma is the most common histological type, with an incidence of 39% in men and 52.2% in women (1). Large cell carcinoma and sarcomatoid carcinoma were each found in one patient. No patients underwent genetic or molecular studies in this series.

TAP CT data

According to the 8th edition of the TNM classification, the distribution according to T status was as follows: 4 patients were classified T1, 12 patients T2, 15 patients T3 and 30 patients T4. For nodal status, 39.3% of patients (n= 24) were classified as N0 (21.3%; n=13) or N1 (18%; n=11) with unilateral hilar lymph node involvement. The most common nodal involvement was N2 (ipsilateral mediastinal and/or subcarinal lymph node involvement), observed in 37.7% of patients (n= 23), while N3 was seen in 23% (n=14). Regarding metastatic status, 65.6% of patients were classified as M0 (n=40), with bone metastases being the most frequent in metastatic cases.

PET/CT data

At the time of diagnosis, most patients were classified

as T4 on the PET-CT. For nodal status, the most frequent finding was contralateral mediastinal-hilar involvement (N3), observed in 37.7% of patients (n= 23), followed by N2 in 27.9% (n= 17). In terms of metastatic status, 44.3% of patients (n= 27) were classified as non-metastatic (M0), while 55.7% (n= 34) had metastases. The most common metastatic sites were bone (n=25) and adrenal glands (n=11).

Comparison of TAP CT and PET/CT data

Agreement in Primary Tumor (T) Staging Between CT and PET/CT

A comparative analysis of tumor (T) staging between CT and subsequent PET/CT revealed a high degree of concordance. In the majority of cases (82%, n=50/61), the T status determined by initial CT remained unchanged following PET/CT evaluation, as detailed in the cross-tabulation (Table 3). Statistical assessment of inter-modality agreement using Cohen's Kappa yielded a coefficient of $\kappa = 0.721$ ($p < 0.001$).

Table 3. Agreement in Primary Tumor (T) Staging Between CT and PET/CT

		TDM T staging				Total
		M0	M1a	M1b	M1c	
TEP/FDG	M0	23	1	3	0	27
T staging	M1a	2	1	0	0	3
	M1b	8	0	4	0	12
	M1c	7	3	4	5	19
Total		40	5	11	5	61

Agreement in Lymph Node (N) Staging Between CT and PET/CT

The assessment of lymph node (N) status revealed significant reclassification by integrated 18F-FDG PET/CT compared to conventional CT staging. While CT and PET/CT findings were concordant in 45.9% of patients (n=28/61), PET/CT modified the nodal stage in the majority of cases (54.1%). Specifically, PET/CT led to upstaging in 34.4% (n=21) and downstaging in 19.7% (n=12) of patients, as detailed in the cross-tabulation (Table 4). Statistical analysis of inter-modality agreement yielded a Cohen's kappa coefficient of $\kappa = 0.248$ ($p=0.001$), which, according to the Landis and Koch criteria, indicates only fair agreement beyond chance. This low kappa value quantitatively underscores the substantial discordance observed in the contingency table, particularly in distinguishing between N0, N1, N2, and N3 categories. It is important to note that histological confirmation of these PET/CT-based nodal stage modifications was available in only 2 patients, highlighting a limitation in the pathological validation of the imaging findings in this cohort.

Table 4. Agreement in Lymph Node (N) Staging Between CT and PET/CT

		TDM N staging				Total
		N0	N1	N2	N3	
TEP/FDG	N0	5	2	1	2	10
N staging	N1	3	5	1	2	11
	N2	1	1	11	4	17
	N3	4	3	10	6	23
Total		13	11	23	14	61

Agreement in Distant Metastasis (M) Staging Between CT and PET/CT

The evaluation of distant metastatic (M) status demonstrated that integrated 18F-FDG PET/CT provided significant reclassification compared to conventional CT. Although a majority of patients (82%; n=50/61) exhibited no change in their M status (M0 or M1) following PET/CT, the modality led to a modification in 18% of cases (n=11). Analysis of the cross-tabulation (Table 5) reveals specific patterns of discordance; notably, PET/CT identified new metastatic sites (upstaging to M1a, M1b, or M1c) in several patients initially staged as M0 by CT. Statistical assessment of inter-modality agreement yielded a Cohen's kappa coefficient of $\kappa = 0.288$ ($p < 0.001$), which, according to the Landis and Koch criteria, indicates fair agreement beyond chance. This moderate level of agreement, lower than that observed for T staging but higher than for N staging, quantitatively confirms that while PET/CT does not routinely alter the M status for most patients, it remains a critical tool for detecting occult metastases and refining the metastatic stage in a substantial subset. Ultimately, the PET/CT allowed the stage of the disease to remain the same in 21 patients (34.4%) with a p value < 0.05 . Thus, for the remaining 40 patients (65.6%), the stage of the disease was altered by the PET/CT, as shown in Table 5.

Table 5. Agreement in Distant Metastasis (M) Staging Between CT and PET/CT

		TDM M Staging				Total
		M0	M1a	M1b	M1c	
TEP/FDG	M0	23	1	3	0	27
M staging	M1a	2	1	0	0	3
	M1b	8	0	4	0	12
	M1c	7	3	4	5	19
Total		40	5	11	5	61

Agreement in staging between CT and PET/CT

The final integration of PET/CT findings resulted in a significant reclassification of the overall disease stage. The initial CT-based stage was confirmed in only 21 patients (34.4%), while the remaining 40 patients (65.6%) experienced stage modification following PET/CT. As illustrated in the cross-tabulation (Table 6), these alterations were non-uniform, reflecting complex patterns of upstaging and downstaging across multiple stage categories (e.g., shifts between IIIA, IIIB, IIIC, IVA, and IVB). Statistical analysis of the overall stage agreement between the two modalities yielded a Cohen's kappa

coefficient of $\kappa = 0.221$ ($p < 0.001$), which, according to the Landis and Koch criteria, indicates fair agreement—the weakest among the TNM parameters. This low kappa value, coupled with the substantial 65.6% reclassification rate, quantitatively underscores the profound impact of 18F-FDG PET/CT on the definitive clinical staging of NSCLC, fundamentally altering the therapeutic landscape for the majority of patients in this cohort.

Table 6. Agreement in staging between CT and PET/CT

Stage of the disease according to PET/CT											
Stage of the disease according to TAP CT		IA	IB	IIA	IIB	IIIA	IIIB	IIIC	IVA	IVB	Total
	IA	0	0	0	0	0	0	0	1	0	1
	IB	0	0	0	0	0	1	0	0	0	1
	IIA	0	0	0	1	0	0	0	1	0	2
	IIB	0	0	0	1	0	0	0	3	0	4
	IIIA	0	0	0	1	6	2	2	0	1	12
	IIIB	1	1	0	0	0	2	0	4	6	14
	IIIC	0	0	0	0	1	2	2	0	1	6
	IVA	0	0	0	0	1	1	2	6	7	17
IVB	0	0	0	0	0	0	0	0	4	4	
Total		1	1	0	3	8	8	6	15	19	61

Impact on Therapeutic Management

PET-CT reclassified the disease in 27 out of 61 patients (44.3%), leading to changes in their therapeutic management. Six patients were upgraded to advanced stages, resulting in a shift from loco-regional curative treatments to multimodal therapies, given the ineffectiveness of thoracic surgery and the relevance of moving to platinum-based chemotherapy in these advanced stages (4). Eighteen patients had their treatment protocols adjusted and 3 patients were downgraded to localized stages, sparing them from unnecessary aggressive treatments. The remaining 34 patients, especially those with advanced stages, saw no change in their treatment plans.

DISCUSSION

Tumor status T

Our study was consistent with the literature in showing that enhanced contrast (CE) chest CT remains the reference examination for characterizing the primary tumor and assessing its loco-regional extension. It accurately measures tumor size in different planes, evaluates relationships with adjacent mediastinal cardiovascular structures, and checks for possible wall extension(5). In this context, PET/CT does not provide additional value compared to CE chest CT. However, it can be beneficial in T staging of tumors with extensive atelectasis, as it helps distinguishing between primary tumors and post-obstructive atelectasis more effectively(6). Additionally, metabolic parameters from PET/CT (SUV, MTV, TLG) can be considered as independent prognostic factors. In fact, elevated SUV correlates with poorer survival rates, and MTV and TLG have shown inverse relationships with mortality and progression-free survival in early-stage NSCLC(7)(8). However, no standardized thresholds

for these parameters currently predict prognosis with certainty. In our study, these parameters were not considered due to their primarily prognostic and therapeutic relevance rather than their utility in disease staging.

Node status N:

Node staging is crucial for determining the appropriate therapeutic approach and identifying patients suitable for potential curative surgery. For mediastinal nodal involvement, the main criterion used in NSCLC staging with CT is node size, with mediastinal nodes considered pathological when the short axis is 10 mm or greater (9). However, many authors have shown that node size is insufficient due to the risk of false negatives and positives, particularly in cases of obstructive pneumonia. To address this issue, several studies and meta-analyses have evaluated the role of PET/CT in nodal staging of NSCLC patients over the last two decades. These studies consistently showed that PET/CT has superior sensitivity and specificity compared to CE CT alone, with respective rates ranging from 57% to 61% and 78% to 82% for CE TAP CT and from 74% to 83% and 85% to 92% for PET/CT(10-12).

In our study, PET/CT reclassified 12 of the 24 patients initially classified as N0/N1 on CT to N2/N3 (Figure 1) and downgraded 6 of the 26 patients initially considered N2/N3 to N0/N1(Figure 2).Despite its superior performance, some authors argue that PET/CT's results are still insufficient for guiding therapeutic decisions due to persistent risks of false positives and false negatives.

Regarding the risk factors for false negatives, they may include location and size of the primary tumor. In this context, several studies have demonstrated that central tumors are associated with a higher risk of false negatives for N2 nodal involvement, which some of them may explain by the difficulty in distinguishing between the hypermetabolism of the primary tumor and that of an adjacent pathological node(13-14). Tumors located in the right upper lobe may also be correlated with an increased risk of false negatives. This has been confirmed by studies from Alsarraf et al. and Cerfolio et al., which attribute these results to the higher frequency of superior and inferior paratracheal nodal involvement for this group of tumors(15). Other studies have found that the risk of false negatives for nodal involvement in PET/CT increases with higher SUVmax values of the primary tumor (16-17). However, no standardized threshold for SUVmax has been established. Lymph nodes with a short axis less than 8-10 mm may also be falsely negative in PET/CT, partly due to the partial volume effect. This was confirmed by Castro et al. in 2017, who found a 14.2% false negative rate among patients with nodes ≤ 10 mm(18).

Regarding the risk factors for false positives, it essentially involves granulomatosis, and tuberculosis. Indeed, like other granulomatosis, tuberculous cells show increased glycolytic activity, which can lead to hypermetabolism on PET/CT. Reactive hyperplasia and active inflammation from tuberculous lymph node involvement also contribute to a higher risk of false positives. Recent

studies have evaluated the sensitivity and specificity of PET/CT for N staging of NSCLC in tuberculosis-endemic countries. Most of these studies found lower sensitivity and specificity in these regions (19-20).

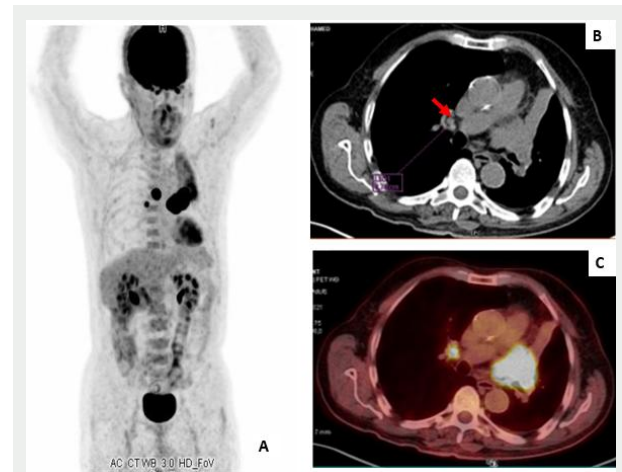


Figure 1. A 56 year old patient with a squamous cell carcinoma of the left lung, initially classified as T4N1 on CT. **A:** PET MIP image shows the intensely hypermetabolic left upper lobar mass associated with pathological subcarinal and contralateral laterotracheal adenopathy. **B:** CT image in the axial plane (mediastinal window): 8mm lymph node (red arrow) that was not considered as pathological on CT. **C:** Fused PET image showing the contralateral lymph node that reclassified this patient as T4N3.

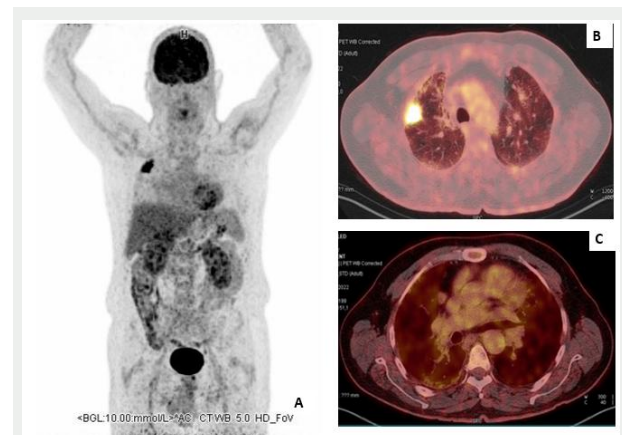


Figure 2. A 63 year old patient referred for initial assessment of right upper lobar adenocarcinoma initially classified T1N3 on CT. **A:** PET MIP image, **B:** Fused PET-CT image in the axial plane (parenchymal window) showing the intensely hypermetabolic right upper lobar mass **C:** Fused PET-CT image in the axial plane (mediastinal window) showing no evidence of pathological mediastinal node. This patient was reclassified as T1N0, consequently he underwent curative right upper lobectomy, with anatomopathological results confirming the N0 status diagnosed by PET.

Metastatic status M

According to the eighth edition of the TNM classification, it is essential to distinguish between intrathoracic metastases (M1a) and extrathoracic metastases (M1b, M1c) in NSCLC. For intrathoracic metastases, CE CT is effective in identifying pleural and pericardial involvement and can also detect contralateral nodular tumor lesions, though it cannot always confirm their

benign or malignant nature (21). PET/CT is valuable for identifying intrathoracic sites, particularly in cases where invasive diagnostic procedures are risky or pleural fluid is insufficient (22). Studies have shown that PET/CT has higher sensitivity and comparable specificity to contrast-enhanced CT in evaluating pleural effusion and characterizing contralateral solid nodules.

Concerning bone metastases, studies have shown that PET/CT has higher sensitivity and specificity compared to other imaging techniques. For example, a study by Song et al. reported sensitivities of 94.3% for PET/CT versus 78.1% for bone scintigraphy, with specificities of 98.8% and 97.4%, respectively (23). A 2012 meta-analysis also confirmed PET/CT's superior performance. These findings are supported by recent literature reviews from 2018 and 2020 (3) (24-25).

PET/CT has also shown excellent performance in detecting adrenal glands metastases in patients with NSCLC. Actually, a meta-analysis by Boland et al. found sensitivity and specificity of 97% and 91%, respectively (26). Another meta-analysis published in 2017 reported respective rates of 89% and 90% (27). In this context, recent guidelines suggest combining metabolic and morphological criteria for better accuracy. A study of 1,388 patients estimated sensitivity and specificity at 97% and 86%, respectively, using criteria of a Hounsfield unit greater than 10 and a SUVmax greater than 3.1 for malignancy (28). A more recent study of 117 adrenal masses, applying morpho-metabolic criteria, reported 100% sensitivity and 97.3% specificity, with malignancy defined by a Hounsfield unit greater than 10 HU and a SUVmax over 2.8 (29).

PET/CT can also help better detect hepatic secondary lesions. In fact, a 2007 study showed that PET-CT had a sensitivity of 98% and a specificity of 75% for detecting liver metastases, identifying 53 out of 56 patients, compared to 45 detected by CT (30). Another study by Marom et al. found that while both PET-CT and CE CT correctly identified all hepatic metastases, CT overestimated 10 benign lesions as metastatic. Thus, PET-CT was concluded to be more accurate than CT in detecting liver metastases (31).

Impact of ¹⁸F-FDG PET/CT on staging and therapeutic management of non-small cell lung cancers

Recently, studies have been affirming PET/CT's superiority in initial staging and its usefulness in non-invasive N staging and distant metastasis detection. The key benefit of metabolic imaging is its ability to refine treatment plans, enabling curative surgeries for patients initially misclassified and avoiding unnecessary surgeries for those incorrectly deemed operable. In studies of resectable NSCLC, PET/CT altered treatment plans in 10% to 41% of patients(32). Additionally, PET/CT aids in optimizing radiation therapy for inoperable stage I and II patients and helps identify distant metastases or N3 lymph node involvement in stage III patients, guiding appropriate treatment and avoiding unnecessary interventions. For example, a multicentric randomized trial by Maziak et al. showed that PET-CT correctly

reclassified 13.8% of patients compared to 6.8% with conventional imaging(33). Another study by Fischer et al. found that PET-CT reduced the total number of thoracotomies, particularly unnecessary ones(34).

Radiation therapy planning

For several years, PET/CT has been preferred over CT alone in the planning of radiation therapy for patients with locally advanced NSCLC. This is primarily due to its ability to provide a better definition of the Gross Tumor Volume (GTV) and Clinical Target Volume (CTV), enabling more effective disease control while reducing the likelihood of adverse effects (35). This advantage stems from the superiority of metabolic imaging in distinguishing between the primary tumor and atelectasis, as well as its improved accuracy in N staging (36). In the Tunisian context, this practice is essential for advanced techniques like Stereotactic Body Radiation Therapy (SBRT), where precise targeting is paramount. A recent national study explicitly mandated an FDG PET/CT scan for optimal disease staging in all patients selected for lung SBRT, underlining its indispensable role in the modern radiotherapy workflow for accurate treatment planning and patient selection (37). Indeed, PET/CT is now strongly endorsed by the ESTRO ACROP guidelines for target volume delineation in the management of locally advanced NSCLC (35).

Assessment of treatment response

The evaluation of therapeutic response in NSCLC has traditionally relied on RECIST criteria using contrast-enhanced CT. However, there is an increasing recommendation to integrate PET/CT into this assessment. The sensitivity and specificity of PET-CT vary across studies, ranging from 81-97% and 64-100%, respectively (36). With the incorporation of PERCIST criteria, metabolic imaging has demonstrated superior predictive value for patient outcomes compared to anatomical changes alone. A key advantage of PET-CT is its ability to detect therapeutic response earlier and more specifically, as metabolic changes often precede anatomical-morphological changes (36). Recent progress in this field has been accelerated by the development of artificial intelligence and machine-learning-based models for image interpretation, promising even greater precision in the future (38).

Study limitations

The main limitation of our study is the lack of histological data, as only two patients who experienced a change in lymph node staging due to PET-CT underwent histological confirmation. Additionally, the small sample size, even though resulting in final outcomes consistent with existing literature, poses a limitation. The retrospective nature of the study further contributes to this limitation by leading to a shortage of clinical and paraclinical data.

CONCLUSION

NSCLC remains a global health concern due to its rising incidence and mortality. Recent advancements in diagnostic and therapeutic approaches have been significant, with PET/CT proving superior to conventional imaging in initial NSCLC staging. This technique is particularly effective for assessing mediastinal and distant metastasis but has limited impact on local and loco-regional staging.

In our study of 61 patients, PET-CT altered the T stage in 18% of cases but adjusted the N stage in 54.1%, showing upstaging in 34.4% and downstaging in 19.7%. The lack of histological confirmation was a limitation, as only two patients had histological verification. PET-CT detected metastatic lesions in 39.3% of cases but downstaged 6.6% of patients, which could impact treatment strategies. Overall, PET-CT led to changes in TNM classification for 65.6% of patients, influencing treatment decisions for 27 patients. It helped avoid unnecessary surgeries and enabled better-targeted treatments. Based on these findings and international guidelines, we recommend integrating PET-CT into initial NSCLC staging and therapy planning. It also shows promise for early and specific evaluation of treatment response, though further research is needed to standardize its prognostic parameters.

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