Role of PET/CT in Diagnosis and Staging of Malignant Mesothelioma

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Abstract

Background: Malignant mesothelioma is a malignancy arising from the coelomic mesodermal lining forming the pleura, peritoneum, pericardium and tunica vaginalis. The disease is causally linked to asbestos exposure. 18-F-FDG-PET/CT has demonstrated significant improvements in the diagnosis and accurate staging in malignant mesothelioma. Integration of functional PET data with the anatomical information of CT has markedly increased the sensitivity, specificity and accuracy of determination of local tumoral extensions, regional lymph nodes or distant visceral metastasis.

Material and Methods: This is a retrospective study carried out in a Private Radiology Center from March 2012 to December 2014 for patients who have done PET/CT scans for staging of patients with pathologically proven malignant mesothelioma. A total number of 55 patients (40 male and 15 female) with age range 22-70 (average 55), 47 patients with biopsy proven malignant pleural mesothelioma and 8 patients with biopsy proven malignant peritoneal mesothelioma.

Results: Our study included 55 patients with biopsy proven malignant pleural and peritoneal mesothelioma. All patients had increased FDG uptake in their primary tumor with SUV max (range 4.2-21.7) (mean SUVmax 9.5) at the time of the initial diagnosis. The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET/CT scan in local tumor (T) staging were 100%, 85%, 98%, 98% and 100% respectively. The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET/CT scan for nodal (N) staging were 87%, 91%, 89%, 93% and 84% respectively. The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET/CT scan for the distant (M) staging were 98%, 87%, 97%, 98% and 87% respectively.

Conclusion: 18 FDG-PET/CT has proved to be a highly sensitive and specific tool in diagnosis and accurate staging of the disease in patients who proved pathologically to have malignant mesothelioma.

Key Words: PET/CT – 18F-FDG – Malignant mesothelioma-diagnosis – Staging.

Introduction

MALIGNANT mesothelioma is a malignancy arising from the coelomic mesodermal lining forming the pleura, peritoneum, pericardium and tunica vaginalis. The disease is causally linked to asbestos exposure with an etiological fraction of 80% or more. The global mesothelioma burden is unclear. It is estimated that as many as 43000 people worldwide die from the disease each year [1].

The disease has high mortality rate yet it could be treated if diagnosed early. Advances in the management of malignant mesothelioma have occurred during the past few years, including the adoption of an internationally accepted staging system, new active chemotherapeutic regimens, novel targeted agents, improved approaches for local control, and decreased morbidity and mortality in patients who undergo extrapleural pneumonectomy [1].

Key reasons for early diagnosis and staging of malignant mesothelioma are to distinguish between early resectable stage (who may be potentially curable by aggressive surgical means and trimodality therapy) and late unresectable stage presentation of malignant mesothelioma (who may be treated with radiation and/or chemotherapy) [2].

Computed Tomography (CT) is the primary imaging modality used in staging and therapeutic planning for mesothelioma. However, CT often fails to accurately demonstrate early chest wall and trans-diaphragmatic invasion, mediastinal lymph node involvement and occult distant metastasis [2].
Recently, 18-F-FDG-PET/CT has demonstrated significant improvements in the diagnosis and accurate staging in a variety of tumor sites including mesothelioma [3].

FDG-PET/CT has an emerging role in the early diagnostic workup of patients with malignant mesothelioma. Applications for FDG-PET/CT at this time point include differentiation between malignant and benign pleural lesions, guide biopsy of neoplastic tissue metabolically more active, classification of stage and identification of candidates for aggressive surgical management [4].

PET/CT is superior to other imaging modalities, as it predicts unresectability by detecting early local disease extensions, mediastinal lymph node involvement and occult distant metastatic disease [5].

**Aim of the work:** The purpose of this study is to highlight the beneficial role of PET/CT scan in diagnosis and accurate staging of the disease in patients who proved pathologically to have malignant mesothelioma therefore determining the optimal treatment.

**Patients and Methods**

This is a retrospective study carried out in Private Radiology Center from March 2012 to November 2014 for patients proved pathologically to have malignant mesothelioma.

A total number of 55 patients (40 male and 15 female) with age range 22-70 (average 55 year) presented for assessment and initial accurate staging of biopsy proved malignant mesothelioma.

These patients were subjected detailed careful history taking before doing the study especially that of previous allergy or reactions to contrast material and laboratory analysis including serum creatinine.

**Reference standard:**

The reference standard to determine the accuracy of the imaging findings included histopathology (for the primary tumors in all the examined patients) and follow-up studies for the assessment of the primary tumor and the distant metastatic lesions.

**Patient preparation:**

All patients were asked to fast for six hours prior to scan. All metallic items were removed from the patient, including, pants with zipper, etc. An I.V. cannula was inserted in the patient’s arm for administration of 18F-FDG. The patients were instructed to avoid any kind of strenuous activity prior to the examination and following the injection of the radioisotope to avoid physiologic muscle uptake of FDG. The patient was asked to void prior to scanning.

**Protocol of PET/MDCT technique:**

All exams performed using a Philips Gemini TF 64 (Time-of-Flight) PET/CT machine.

One liter of negative oral contrast agent (5% mannitol) was administrated approximately one hour before examination and 10-20mCi (370 MBq; approximate dose to patient, 3-5MBq/Kg) of 18F-FDG 45-90 minutes before examination. This period is referred to as the uptake phase and is the necessary amount of time for the FDG to be adequately biodistributed and transported into the patient’s cells. Patients were asked to rest in a quiet room and they were asked to keep their movements, including talking, at an absolute minimum. This minimizes physiologic uptake of FDG into skeletal muscle, which can confound interpretation of the scan. Patients should be comfortable and relaxed.

Low dose non-enhanced CT scan was performed first, then a whole body PET study followed by diagnostic enhanced whole body CT scan. The whole study took approximately 20-30 minutes.

For a typical whole body PET-CT study (neck, chest, abdomen, and pelvis), scanning began at the level of the skull base and extended caudally to the level of the upper thighs. The contrast enhanced helical CT was performed following injection of 1-2ml/Kg of a low-osmolarity iodinated contrast medium at a rate of 1.5-2m/sec by using a power injector. The total length of CT coverage was an integral number of bed positions scanned during acquisition of PET data approximately six to seven bed positions. The study was performed with the patient breathing quietly. Typical scanning parameters would be a collimator width of 5.0mm, pitch of 1.5, gantry rotation time of 0.8 second, and field of view of 50cm. The helical data are retrospectively reconstructed at 1mm intervals.

In case that PET study of the brain is added, it requires about 10 minutes scanning the brain with arms by side to discriminate between the hypermetabolic activities of the brain and the metastases.

PET image data sets were reconstructed using CT data for attenuation correction and co-registered images were displayed using special software.
The standardized uptake value (SUVmax) was determined measuring a Volume of Interest (VOI). An increase in glucose uptake to a level greater than that in the surrounding tissue (more than the mediastinal blood pool in the chest and more than the background activity in the rest of the body) at qualitative analysis or a standard glucose uptake value of more than 2.5 were considered to characterize pathological process. Tumor mass was identified by areas of pathologically increased FDG uptake avoiding physiologic uptake.

**Results**

Fifty-five patients (40 men and 15 women; their age range between [22-70 years], 47 of them with biopsy-proven Malignant Pleural Mesothelioma (MPM) and 8 patients with biopsy-proven malignant peritoneal mesothelioma were retrospectively evaluated.

All patients has increased FDG uptake in their primary tumor with SUVmax (range 4.2-21.7) (mean SUVmax 9.5) at the time of intimal diagnosis.

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET scan in local Tumor (T) staging were 96%, 75%, 94%, 98% and 60% respectively.

The sensitivity, specificity, accuracy, positive and negative predictive value for CT scan in local Tumor (T) staging were 94%, 75%, 92%, 97% and 50% respectively.

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET/CT scan in local Tumor (T) staging were 100%, 85%, 98%, 98% and 100% respectively Fig. (1).

The combined use of PET/CT allowed detection of focal subtle tumor invasion as well as accurate localization of local tumor invasion Fig. (2).

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET scan in regional lymph Node (N) staging were 87%, 91%, 89%, 93% and 84%.

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for CT scan in lymph node staging were 93%, 84%, 52%, 87% and 91% respectively.

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET/CT scan in lymph node staging were 97%, 91%, 94%, 93% and 95% respectively Fig. (3).

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET scan for distant (M) metastasis were 68%, 87%, 70%, 96% and 31% respectively.

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for CT scan for distant metastasis were 76%, 37%, 70%, 87% and 21% respectively.

The sensitivity, specificity, accuracy, positive predictive value and negative predictive value for PET/CT scan for distant metastasis were 98%, 87%, 97%, 98% and 87% respectively Fig. (5).

**Statistical analysis:**

Results are expressed as mean ± standard deviation or number (%).

Statistical Package for Social Sciences (SPSS) computer program (Version 19 windows) was used for data analysis. *p*-value ≤0.05 was considered significant and <0.01 was considered highly significant.

Sensitivity, specificity, accuracy, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) were calculated for the three (PET, CT and PET/CT) techniques.

Sensitivity was defined as number of true positives/number of true positives + number of false negatives. Specificity was defined as number of true negatives/number of true negatives + number of false positives. Accuracy was defined as number of true positives + number of true negatives/number of true positives + false positives + false negatives + true negatives.

Comparison between mean values of SUV in the two studied groups was performed using Mann-Whitney test. Comparison between mean values of SUV in the three studied groups was performed using Kruskal-Wallis test followed by Mann-Whitney test if significant results was performed. Receiver Operating Curve (ROC) is used to determine the cutoff value of SUV and its diagnostic efficacy.

**Analysis of the findings:**

True positive cases in this study were defined as lesions appear malignant on PET-CT scan and proved to be malignant on follow-up. Similarly, true negative can be defined as areas reported as
Role of PET/CT in Diagnosis & Staging of Malignant Mesothelioma

312 non-neoplastic on PET-CT scan and proved to be benign on follow-up.

False positive cases in this study were defined as lesions appear malignant but turned out to be benign on follow-up studies. Similarly, false negative can be defined as areas reported as non-neoplastic and proved to be malignant on follow-up.

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**Fig. (1):** Sensitivity, specificity, accuracy, positive and negative predictive value for the three (PET, CT and PET-CT) modalities in local tumor (T) staging.

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**Fig. (2):** Axial, Positron Emission Tomography (PET) (A), Integrated PET-CT (B), Computed Tomography (CT) (C) in a 45-year old male patient with biopsy proved malignant pleural mesothelioma who presented for intimal staging. PET/CT show increased [18F] (FDG) uptake in the primary right pleural tumor and focal increased uptake in right serratus anterior muscle with SUVmax 10 impressive of muscular metastasis which is hardly depicted by the conventional Computed Tomography (CT).

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**Fig. (3):** Sensitivity, specificity, accuracy, positive and negative predictive value for the three (PET, CT & PET-CT) modalities in regional nodal staging.
Fig. (4): Integrated PET-CT axial images (A & B) in a 55-year-old male patient with biopsy proved malignant pleural mesothelioma which show increased (FDG) uptake corresponding to nodular left pleural thickening, associated with marked pleural effusion showing low grade FDG uptake and underlying relaxation collapse. FDG avid small subcentimetric (non pathologically enlarged by CT criteria) anterior cardiophrenic and left retrocrural lymph nodes.

Fig. (5): Percent of sensitivity, specificity, accuracy, positive and negative predictive value for the three (PET, CT and PETCT) modalities in distant metastasis (M) staging Fig. (6).

Fig. (6): A 60-year-old man with left malignant pleural mesothelioma. (A) Axial PET/CT image bone window, (B) Axial CT bone window, (C) PET coronal MIP image, show increased FDG uptake by nodular left pleural thickening involving the costal and mediastinal pleura. PET/CT detected FDG avid bony metastases in the left pedicle of D9 vertebra. No lytic or sclerotic lesions were seen on CT and the patient did not have symptoms.
Discussion

Malignant mesothelioma is an aggressive tumor arising from the coelomic mesodermal lining forming the pleura, peritoneum, pericardium and tunica vaginalis, pleural mesothelioma is the most common type [6].

It is often associated with a history of exposure to asbestos in 40-80% of patients [7]. Owing to the latency period of up to 50 years for mesothelioma to develop from the time of exposure, the worldwide figure is expected to increase over the next decade [8].

The disease has high mortality rate yet it could be treated if diagnosed early. Advances in the management of malignant mesothelioma have occurred during the past few years, including new active chemotherapeutic regimens, novel targeted agents, improved approaches for local control [9].

Key reasons for early diagnosis and staging of malignant mesothelioma are to distinguish between early resectable stage (who may be potentially curable by aggressive surgical means and trimodality therapy) and late unresectable stage presentation of malignant mesothelioma (who may be treated with radiation and/or chemotherapy) [10].

Computed Tomography (CT) is the primary imaging modality used in staging of mesothelioma. However, CT may fail to accurately demonstrate occult distant metastasis [2].

The development of integrated PET/CT systems allows PET images and CT to be obtained in the same imaging setting and provides optimal coregistration of images which was found to be more accurate than a side by-side interpretation of separately obtained images [11].

In our study of 55 patients with pathologically proven malignant mesothelioma, we focused on the role of PET/CT regarding the diagnosis and preoperative staging of the disease.

Regarding the role of PET/CT in diagnosis of malignant mesothelioma based on its increased levels of FDG affinity, in our study, we retrospectively evaluated 55 patients with biopsy proven malignant mesothelioma who showed increased FDG uptake of the primary tumor in all the patients with SUVmax values [range 4.2-21.7]. This is due to increased glucose metabolism by the malignant cells increasing efficiency of PET/CT in diagnosis of malignant mesothelioma and differentiating it from benign pleural diseases.

Similarly Schneider et al., reported the results of a retrospective analysis of 18 consecutive patients with biopsy-proven malignant pleural mesothelioma who underwent FDG-PET for staging. All primary lesions were FDG-avid, distinguishing between benign and malignant pleural disease [12].

Another study by Bénard et al., showed that an FDG PET SUVmax cutoff value of 2.0 differentiated benign from malignant disease with sensitivity of 91% and specificity of 100% [13].

Moreover, the use of FDG-PET/CT imaging has been very useful for the selection of the most metabolically active site for needle or thoracoscopic biopsy. This approach tends to increase the yield of positive biopsies, especially in those cases with diffuse pleural thickening or with distorted anatomy after treatment [14].

In our study, we have guided biopsy sites by documenting areas of highest metabolic activity in two patients who had false negative results of prior pleural fluid aspirate and CT guided biopsy yet with morphological appearances suggestive of malignancy. The two patients showed FDG avid pleural tumors by PET/CT and were confirmed to be malignant by repeating the biopsy from different sites of highest metabolic activity and most easily accessible at the same time.

Regarding the role of PET/CT in staging of malignant mesothelioma, our study showed that PET/CT was superior to PET and CT alone in the staging of malignant mesothelioma. The use of integrated PET-CT improves the sensitivity, specificity and accuracy of local extent, lymph node involvement and distant metastasis.

In local Tumor (T) staging, PET/CT accurately detected the presence and extent of metabolically active tumor and subtle local disease involvement showing early chest wall infiltration, mediastinal invasion and trans-diaphragmatic extension.

In our study, PET/CT had a sensitivity, specificity and accuracy of 100%, 85%, and 98% respectively for local Tumor (T) staging with a positive predictive value of 98% and negative predictive value of 100% compared to PET alone which showed sensitivity, specificity and accuracy of 96%, 75% and 94% with a positive predictive value of 98% and negative predictive value of 60%, and compared to CT alone which showed sensitivity, specificity and accuracy of 94%, 75% and 92%, respectively with a positive predictive value of 97% and negative predictive value of 50%.
In our study, PET-CT with the combined use of metabolic activity and the multiplanar reconstruction of the CT component of PET/CT allowed for more optimal evaluation of the chest wall, mediastinum and diaphragm, delineation of soft tissue disease from bony disease and subsequently accurate local tumor staging. PET scan alone could identify focal chest wall invasion in 3 (33.3%) out of 9 patients with chest wall infiltration (which were not detected by conventional CT scan). While the use of diagnostic contrast enhanced CT made it more accurate in anatomical delineation in 1 (50%) out of 2 patients with diaphragmatic invasion and 1 (25%) out of 4 patients with pericardial invasion missed by the use of PET scan as the disease activity couldn't be identified from the normal high myocardial uptake.

In a similar study by Erasmus J.J. et al., reported that T4 stage was accurately determined by PET-CT in 15 of the 24 patients (63%) [15]. Similarly Mavi A et al., reported that PET/CT offers the additional benefit of anatomic imaging which aids in determining tumor invasion [16].

In our study PET/CT over-staged the local Tumor (T) stage in one patient who had focal increased FDG uptake in the chest wall at the biopsy site which was suspicious for dissemination along the biopsy track yet its benign nature proved on subsequent follow-up study evident by exceptional complete resolution of the chest wall lesion despite disease progression of the primary tumor. This demonstrates that the acute inflammatory hypermetabolic process can mimic malignancy which has to be considered in the interpretation guided by thorough clinical and interventional data when both possibilities should have been suggested in the primary study reporting.

Regarding the Nodal (N) staging, our study showed that PET/CT is very useful for the Nodal (N) staging as it can detect micrometastatic foci in non-morphologically enlarged lymph nodes and also due to its high negative predictive value.

In our study, PET/CT had a sensitivity, specificity and accuracy of 97%, 91% and 94% respectively for Nodal (N) staging with a positive predictive value of 93% and negative predictive value of 95%, compared to PET alone which showed sensitivity, specificity and accuracy of 93%, 91% and 89%, respectively with a positive predictive value of 87% and negative predictive value of 91%.

In our study, the fusion imaging of PET and CT allowed to detect and precisely localize the metastatic lymph nodes in the mediastinum compared with the use of PET or CT imaging alone. It was able to diagnose small metastatic foci in mediastinal lymph nodes considered normal (subcentimetric) by CT criteria in 2 of 32 patients (6.2%). Furthermore PET/CT showed good negative predictive value in 4 of 32 patients (12.5%) (Considered pathological (>1cm) by conventional CT criteria).

In a similar study by Erasmus J.J. et al., reported the sensitivity of PET/CT in detecting N2 spread was 50%, their study proved that PET/CT accuracy of staging compared to CT, primarily by identifying additional lymph node involvement [15].

Similarly Ambrosini V, reported that PET/CT identified a higher number of metastatic mediastinal lymph nodes in six patients (40% of cases). On the basis of PET/CT findings, treatment planning was changed in 5 patients (33% of cases) [17].

In another study by Sørensen et al., PET/CT has also shown superior accuracy compared with mediastinoscopy for assessment of N2/N3 categories [18].

In our study, a single false negative result was reported when PET/CT understaged one patient showing FDG uptake less than the mediastinal blood pool in a subcentimetric mediastinal (aorto-pulmonary) lymph node which proved its malignant nature following surgical resection and histopathological assessment. This is explained by low amount of malignant disease in such a node which is the only metabolic marker of functional imaging by PET irrespective of lymph node size. Similarly Lin and Alavi A reported that small nodes with metastasis due to partial volume effects may have a low SUV [19].

Regarding the distant Metastatic (M) staging, our study revealed that the strength of PET/CT in staging patients with mesothelioma is in the detection of extra-thoracic metastases. Its use is particularly important as it influences the decision about the selection of patients for surgery.

In our study, PET/CT had a sensitivity, specificity and accuracy of 98%, 87% and 97% respectively for distant Metastasis (M) staging with a positive predictive value of 98% and negative predictive value of 97%, compared to PET alone.
which showed sensitivity, specificity and accuracy of 68%, 87% and 70% with a positive predictive value of 96% and negative predictive value of 31%, and compared to CT alone which showed sensitivity, specificity and accuracy of 76%, 37% and 70% respectively with a positive predictive value of 87% and negative predictive value of 21%.

PET scan identified 11 of 55 patients (20% of cases) with distant metastasis that were not identified by conventional CT scans as follows; 4 patients with osseous metastasis, 1 patient with peritoneal metastatic nodule, 4 patients with distant lymph node metastasis and 2 patients with subcutaneous and muscular nodules. Moreover, PET/CT showed good negative predictive value by excluding 2 of 12 patients (1.6%) over-staged by diagnosing distant lymph node metastasis based on morphological CT basis.

PET scan and combined PET/CT gave a similar yield in diagnosing distant lymph nodal and osseous metastasis exceeding diagnostic CE-CT by detection of 4 out of 12 patients (33.3%) with distant nodal metastasis and 4 out of 9 patients (44.4%) with osseous metastasis which were missed on CE-CT.

Combining CT with PET has enhanced the sensitivity and specificity of PET alone in diagnosis of pulmonary metastasis in 14 out of 16 patients (87%) which were missed by PET scan alone and hepatic metastatic disease in 3 out of 5 patients (60%). This could be explained by the natural heterogeneous liver uptake, with higher spatial resolution of CE-CT to spot focal parenchymal lesions of abnormal attenuation and/or enhancement when coupled with PET findings of focal increased activity among this heterogeneous pattern of hepatic parenchymal uptake.

In a similar study Armato et al., PET/CT identified occult metastases in 25% of the patients, in more than half of these patients, extrathoracic metastases were not identified by routine radiologic evaluation [20].

Similarly by Schneider and colleagues, reported the usefulness of PET in detecting occult metastases in 2 of 18 patients with MPM [12].

A false negative result in our study, when PET/CT scan failed to detect one patient with small cerebral (1.2cm) right temporal metastatic lesion. The lesion was detected on concurrent MRI for this patient, yet in this case dedicated brain protocol wasn’t included to the PET/CT imaging protocol.

Rohren EM et al., reported that the overall sensitivity of PET for brain metastasis is ~60% as most metastases are at the grey-white matter junction where detection is limited by high-normal cortical brain activity and smaller metastases are less likely to be detected [21].

We had a false positive result in our study, when PET-CT demonstrated focal pulmonary increased activity in the contralateral lung in one patient which could not be morphologically demarcated from underlying pulmonary consolidative changes and its inflammatory nature proved on subsequent follow-up studies. Focal increased FDG uptake can be encountered by inflammatory ground glass opacities and consolidative changes or within heterogeneous scar with or without traction bronchietasis.

Similarly Shim et al., reported that active inflammatory process (pneumonia, tuberculosis and fungal infection) are common causes of false positive results [22].

Regarding the overall disease staging, the results of our study showed that integrated PET/CT with coregistration of anatomic and functional imaging data improves the accuracy of malignant mesothelioma overall staging. This is important in determining the appropriate therapy and avoiding a significant number of futile operations. PET/CT accurately corrected the overall staging in 51 out of 55 (92%) patients and avoided a number of futile treatment in 15 (27.2%) patients mis-staged by the use of CE-CT scan and 14 (25.4%) patients mis-staged by PET scan.

PET scan mis-staged the overall stage in 14 of 55 (25%) patients, it understaged 2 patients with local diaphragmatic and pericardial invasion (stage IV), one patient with hepatic and one patient with brain metastasis (stage IV) and 7 patients with pulmonary metastasis (stage IV). It overstaged one patient with focal local chest wall invasion (stage III) and 2 patients with regional nodal metastasis (stage III).

CE-CT mis-staged the overall stage in 11 of 55 (20%) patients, it understaged regional lymph node metastasis in 1 patient (stage IV) (were non pathological by conventional CT), bone metastasis in 4 patients, and distant lymph node (perigastric) metastasis in one patient and one patient with brain metastasis. It overstaged 4 of 11 patients; 3 patients with regional lymph node metastasis and one patient with distant lymph node metastasis.
In a similar study by Erasmus et al., reported that PET-CT increases the accuracy of pleural mesothelioma staging and improves the selection of patients being considered for surgery compared to conventional CT [18].

Similarly in a study by Plathow et al., showed significantly greater accuracy of PET/CT over other imaging modalities (CT and MRI) to stage patients with MPM [28].

Conclusion:
18FDG-PET/CT has proved to be highly sensitive and specific imaging tool for diagnosis and accurate staging in patients proved pathologically to have malignant mesothelioma.

References
318 Role of PET/CT in Diagnosis & Staging of Malignant Mesothelioma

الملخص العربي

ورم الظهارة المتوسطة الخبيثة هو ورم نادر وشديد العناوين، يؤدي إلى الوفاة في غضون سنة بعد التشخيص، ورم الظهارة المتوسطة الخبيثة ينشأ من الخلايا الظهارية للغشاء البولي أو التجوف البريتوني، أو التامور أو الغشاء المخمدة للخصبة، ورم الظهارة المتوسطة الخبيثة هو الأكثر شيوعا، وحوالي 60-70% من أورام الظهارة المتوسطة الخبيثة ينشأ من الغشاء البولي، و20% من الغشاء البريتوني، في حين ورم الظهارة المتوسطة الناشئة من التامور أو الغشاء المخمدة للخصبة أمر نادر ومتراشا.1-2%

التصوير بالبوزيترون المنبعث أحد تقنيات التصوير الجزيئي، حيث تستخدم النظائر المشعة لتعقب وظيفة بيولوجية داخل الجسم. وفقا لنوع جزيئات البرين المستخدمة.

التصوير الطبقي بالبوزيترون المنبعث المتصل مع الأشعة المقطعية له مزايا كثيرة، من وسائل التصوير الطبي الأخرى مثل تفريقي الأورام الجديدة من الخبيثة وتحديد مرحلة الورم قبل وبعد العلاج، والكشف عن التغييرات الوظيفية قبل أي تغييرات في حجم الورم وتحديد إنتشار الورم بطريقة أفضل وعمل خطة علاج.

تم الاستفادة بهذه التقنية وتطبيق استخدامها في رصد سرطان الظهارة المتوسطة وقد أثبتت تقنية التصوير بالبوزيترون المنبعث المدمجة بالأشعة المقطعية كفاءة عالية ونتائج مرضية في تقنين هذه الورم. كما يتم أيضا استخدامها في تخطيط العلاج الإشعاعي حيث تبين على إدق تحديد لحجم الورم وتحديد إشعاعه. لذلك فإنه إدراج التصوير الطبقي بالبوزيترون المنبعث مع الأشعة المقطعية يعتبر أفضل ومباشرة في التشخيص لمختلف الأورام السرطانية من أي من عناصره على حد.

تضمنت هذه الدراسة 65 مرضاً يعانون من أورام الظهارة المتوسطة تم تشخيصهم عن طريق فحص الأنسجة، ثم فحصهم للتقنيات الأولى، وتحديد مرحلة المرض.