شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

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Role of PET/CT in post therapeutic assessment of bronchogenic carcinoma

Thesis

Submitted for partial fulfillment of the MD Degree in Radio-diagnosis

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Amira Shaheen

List of Contents

List of Abbreviations

Abb.	Full term
18 F –FDG	18 F-Fluorodeoxeglucose
AJCC	American joint committee on cancer
AUC	Area under curve
COPD	Chronic obstructive lung disease
CR	Complete response
CT	Computed tomography
EGFR	Epidermal Growth Factor Receptor
IASLC	International Association for the study of lung cancer
NPV	Negative predictive value
NSCLC	Non small-cell lung cancer
PD	Progressive disease
PET	Positron Emission Tomography
PPV	Positive predictive value
PR	Partial response
RECIST	Response Evaluation Criteria in solid tumors
ROC	Receiver operator characteristic
SCLC	Small cell lung cancer
SD	Stable disease,
SUV	Standardized Uptake Value
SUVmax	Maximum Standardized Uptake Value
TNM	Tumor Node Metastasis
UICC	Union of international cancer control
WHO	World Health Organization

List of Tables

List of Figures

List of Figures Cont...

List of Figures Cont...

INTRODUCTION

Lung cancer is the most common cancer; despite major advances in prevention and treatment, it remains the leading cause of cancer-related death worldwide. Over 85% of cases are of non-small cell lung cancer (NSCLC), while the remainder are small cell lung cancers (SCLCs) ***(Kitajima et al., 2016).***

Treatment of lung cancer consists of a combination of surgery, chemotherapy and radiation therapy depending on pathology and stage of the disease. Prognosis of lung cancer is generally poor with five year overall survival rate of about 15% ***(Khiewvan et al., 2016).***

The goals of therapy for patients with NSCLC depend on the stage of disease: for patients with stage I to III disease, the goal is cure, whereas, for those with stage IV disease, the goals are palliation of symptoms and prolongation of life. The goal of therapy in patients with LS-SCLC is cure, which can be achieved through combined modality therapy with chemotherapy plus radiation ***(Gadgeel et al., 2012).***

A multidisciplinary approach including the use of advanced imaging techniques for early accurate staging of disease and delivery of treatment is needed to avoid futile treatments and improve overall survival, which, in turn, influence the patient's quality of life ***(Sheikhbahaei et al., 2017).***

Combining CT with FDG PET is expected to improve accuracy and early diagnosis of progressive disease because changes in cellular metabolism occur more rapidly than do changes in tumor size. By providing information on the metabolic activity of tumor cells, FDG PET has become a powerful tool in assessing treatment response ***(Sheikhbahaei et al., 2017).***

Initial disease staging in newly diagnosed NSCLC can correctly differentiate patients with potentially curable disease from those indicated for palliative therapy. 18F-FDG PET/ CT has greater staging accuracy than either of the modalities alone because of the improved detection of additional lymph node involvement or distant metastasis ***(Kitajima et al., 2016).***

Restaging after therapy depending only on morphologic changes usually needs a lot of time to detect any changes (several weeks to months). Also it may be incorrect because of edema and peri-tumoral scar tissue formation which may mask tumor regression. As a result of this, many patients are sometimes treated without any benefit from the therapy bearing unacceptable side effects and costly treatment. Considering the above mentioned reasons, the morphologic response only is not ideal ***(Koma et al., 2013).***

18 F-FDG PET-CT is largely used in oncology, especially for monitoring the response to treatment. The imaging of changes in glucose metabolism, as reflected by

cellular uptake and trapping of 18 F-FDG, can provide a response assessment that is both more-timely and more accurate than that provided by standard morphological imaging. Furthermore, the residual metabolic activity of tumors after radiotherapy, as measured by 18 F-FDG uptake, has been shown to correlate with the pathologic response, and to be a significant prognostic factor for survival in patients with NSCLC ***(Massaccesi et al., 2012).***

Early prediction of tumor response to treatment is of particular interest in patients with advanced NSCLC. The majority of NSCLC patients presents with unresectable disease (stage IIIB, IV) and undergo palliative therapy with platinum-based chemotherapy regimens and in 30% of patients, first-line chemotherapy is unsuccessful; therefore, a significant number of the patients undergo multiple-week-toxic therapy without any benefit. Early prediction of tumor response would allow physicians to provide patients with non-responsive tumors with alternative forms of treatment with greater time efficiency ***(Ordu et al., 2014).***

18F- fluorodeoxyglucose (FDG) is the most common radiotracer used in PET imaging. Studies have shown that the degree of 18F-FDG uptake by the tumor, as assessed with maximum standardized uptake value (SUVmax), is a significant predictive factor in treatment response of lung cancer. SUVmax has been widely used as an indicator of tumor metabolic activity because of its convenience of measurement ***(Huang et al., 2014).***

SUV is calculated by normalizing the attenuation corrected FDG uptake in a lesion to the injected dose and body weight. Maximum standardized uptake value (SUVmax) represents a voxel with the maximum FDG uptake in the region of interest (ROI) ***(Lee et al., 2016).***

Radiological follow-up of bronchogenic carcinoma to assess therapy response using CT established by using Response Evaluation Criteria In Solid Tumor (RECIST criteria) depending on size change and reduction of the tumoral mass. However, structural changes may occur late after positive biological response, giving a false impression of stationary course. Also, central necrosis or hemorrhage secondary to treatment may cause an increase in the tumor mass size, giving a pseudoprogression result in CT ***(Osman and Korashi, 2020).***