Role of PET/CT in initial evaluation & follow up of thoracic lymphoma

Essay
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List of abbreviations

Abb.	Full Name
AC	attenuation corrected
ALK	anaplastic lymphoma kinase
AV	atrioventricular
BL	burkitt lymphoma
CD	cluster of differentiation
CHL	Classic Hodgkin lymphoma
CNS	Central nervous system
CT	computed tomography
DLBCL	Diffuse large B cell Lymphoma
EBV	Ebstein- Bar virus
FDG	Fluoro-deoxy-ribo-glucose
GI	gastrointestinal
GLUT	glucose transporter
GU	genitourinary
HD	Hodgkin disease
HHV8	human herpes virus 8
HIV	Human immune deficiency virus
HL	Hodgkin Lymphoma
IPI	international prognostic index
MALT	Mucosa associated lymphoid tissue
MIP	Maximum intensity projection
NAC	Non attenuation corrected
NHL	Non Hodgkin Lymphoma
NK	natural killer cells
NLPHL	Nodular lymphocyte predominant Hodgkin lymphoma
NSCHL	Nodular sclerosis classical Hodgkin lymphoma
PET/CT	positron emission tomography/ computed tomography
PET	positron emission tomography
RS	Reed-Sternberg cells
SVC	superior vena cava
T8	thoracic vertebra number 8
T12	thoracic vertebra number 12
WHO	World health organization

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Introduction

Introduction

Malignant lymphoma which accounts the most common hematological malignancy, it accounts for approximately 8% of all malignancies ***(Okada et al, 2010).***

Hodgkin lymphoma accounts for less than 1% of all cases of cancer, while Non- Hodgkin lymphoma accounts for about 5% of all cases of cancer. Most causes of lymphoma are unknown; there are recognized associations and risk factors. Slightly more men than women are affected, and incidence is higher in the white population. B-cell lymphomas are more common in adults and T-cell lymphomas are more common in children
(Workman & Coleman, 2006).

Patients with a diagnosis of malignant lymphoma are subjected to a series of radiologic studies that include chest radiography, intravenous pyelography, lymphangiography, skeletal surveys, and isotope scans ***(Kwee et. al., 2008).***

The limitations of anatomical imaging include the inability to determine if a mass is benign or malignant or to determine whether a residual or recurrent abnormality is present after treatment ***(Antoch et al, 2002).***

Interpreting a PET/CT study is done by comparing PET and CT data, viewing fused PET/CT images and of course their correlation with clinical history. PET study is displayed as maximum intensity projection (MIP), non-attenuation corrected (NAC), and attenuation corrected (AC) images. CT images are viewed in different windows (soft tissue, bone and lung) and different reconstruction planes (axial, sagittal and coronal) ***(Lin and Alavi, 2009).***

Positron emission tomography (PET) is a molecular imaging technique most widely applied in oncology, using 18F labeled fluorodeoxyglucose (18F-FDG). It provides quantitative and qualitative functional information about tumor cells depending on their increased rate of glucose metabolism. 18F-FDG PET is regarded to be effective in the detection, staging and restaging of malignancies with a remarkable high sensitivity. The combination of PET and computed tomography (CT) represents a very unique imaging modality that scans the whole body in the same session, providing functional and anatomic information in co-registered images. It combines the high sensitivity of PET to the superior anatomical localization by CT resulting in much more accurate detection and staging of malignancies ***(Poeppel et al, 2009).***

Several studies had illustrated the additional value of PET/CT scan compared to various imaging modalities in the accurate initial staging of malignancies. Specifically in the detection of distant metastases, M staging, PET/CT scan is able to identify invisible metastatic lesions not yet developing into structural changes. Thereby, a significant change in the management plan might be done, for example skipping unnecessary surgery to be replaced by palliative therapy ***(Wang et al, 2012).***

Aim of Work

The aim of work is to highlight the role of PET-CT in the initial assessment of the extent of nodal and extra-nodal thoracic Lymphoma at initial presentation, and to investigate the use of PET-CT as a periodic screening tool for assessment of treatment response particularly in cases where the pathological nodes or mass lesions are still visible radiographically yet with indeterminate functional or metabolic status.

Anatomy of the Thorax

Anatomy of the thorax

I-LUNGS:

The two lungs are similar; they are not completely symmetrical, having a different number of lobes and a different bronchial and vascular anatomy ***(Webb et al., 2009).***

The left lung: is subdivided into two lobes and thereby, into eight segments(fig.1):

- Left upper lobe: Left upper lobe proper: apicoposterior, anterior segments.
- Lingula: superior lingular, inferior lingular segments.
- Left lower lobe: superior segment or apical segment, and inferior segment or basal segment, which is further subdivided into: anteromedial segment, lateral segment, and posterior segment ***(Webb et al., 2009).***

The right lung is subdivided into three lobes with ten segments (fig. 1):

- Right upper lobe: apical segment, anterior segment, and posterior segment.
- Right middle lobe: medial segment, and lateral segment.
- Right lower lobe: superior segment or apical segment, and inferior segment or basal which further subdivided into: anterior segment,medial segment,lateral segment,& posterior segment***(Webb et al., 2009).***

<u>Lung Fissures:</u> Lung fissures (fig. 2, 3) are a double-fold of visceral pleura that either completely or incompletely invaginate lung parenchyma to form the lung lobes. Each lung has an oblique fissure separating the upper lobes from the lower lobes and the right lung has a horizontal fissure that separates the right upper lobe from the right middle lobe (***Hayashi et al.,2001***).

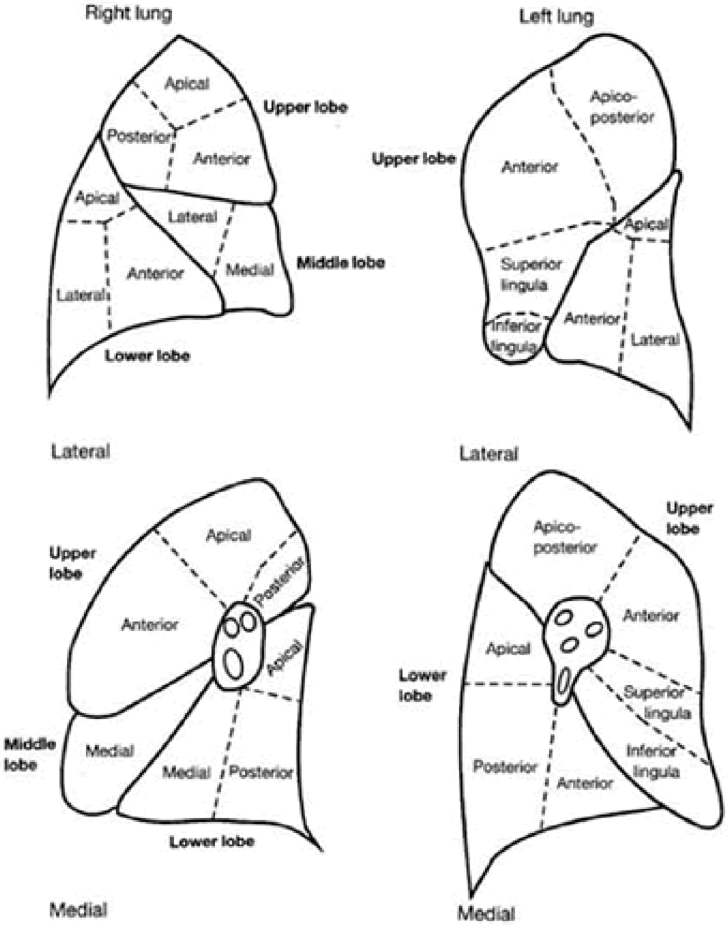

Fig. 1: Lung segments ***(Quoted from Webb et al., 2009).***