دور الفلورين ف.د.ج باستعمال البوزيترون المقطعي في تحديد درجة المرض و متابعة أورام الثدي

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٢٠٠٩

The Role of F-18 FDG-PET and PET/CT in Staging and Follow Up Breast Cancer Patients

Assay

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Master degree in Nuclear Medicine
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2009

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Introduction

Breast cancer has become a major health problem affecting each twelfth of all women during their lifetime; it is now the most frequently occurring malignant disease in women. Breast cancer can occur in men, although the incidence is much lower, amounting to around 1% of all breast cancers.

Overall, the incidence of breast cancer rises with age, increasing rapidly during the fourth decade of life and continuing to increase thereafter, but more slowly in the fifth, sixth and seventh decades. The effect of family history on breast cancer risk believed to be due primarily to genetic factors. ***(Jemal et al., 2004)***

Mammography and ultrasound considered as the main diagnostic imaging tools for the diagnosis of primary breast cancer. ***(Samson et al, 2002)***

FDG-PET may be useful in the noninvasive characterization of the indeterminate lesions by providing metabolic information. FDG-PET is superior in detecting tumor-involved lymph nodes, particularly those that are normal in size radiologically and is superior in characterizing enlarged lymph nodes as positive or negative. ***(Avril et al, 2007)***

FDG-PET scanning has been demonstrated to be accurate in the diagnosis of metastatic and recurrent disease not recognized by conventional imaging methods. ***(Jadvar et al, 2003)***

FDG-PET has been compared with bone scan in the detection of osseous metastases. PET and bone scan appear to offer similar sensitivity in this regard, but PET provides a specificity advantage over bone scan. ***(Kao,2000)***

An integrated PET/CT system offers several advantages, by allowing a fast and relatively low-noise transmission scan, a short scanning time, and in achieving additional anatomical and diagnostic information. In breast cancer, an increase in diagnostic accuracy is expected, for both primary staging and restaging. ***(Rosen et al, 2007)***

Aim of Work

The purpose of the work is to assess the implementation of FDG-PET and PET/CT in clinical routine and evaluate their role in breast cancer primary staging, restaging and therapy monitoring.

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List of abbreviations

%	percentage
~	Approximately
<	Less than
>	More than
^{11}C	Carbon
^{13}N	Nitrogen
^{15}O	Oxygen
^{18}O	Oxygen
^{18}F	Radioactive Fluorine
^{18}F-FDG	2-{ Flourine-18} Flouro-2-deoxy-D-glucose
^{68}Ge	germanium-68
2D	Two Dimensional
3D	Three Dimensional
ACF	Attenuation correction factors
ADC	Apparent Diffusion Coefficient
AJCC	American Joint Committee on Cancer
AND	Axillary node dissection
ALND	axillary lymph node dissection
Au198	Radioactive isotope
BGO	Bismuth germinate
BRCA	Gene breast cancer
BSA	Body surface area
cc	Milliliter
CIS	Carcinoma in situ
cm	centimeter

CT	Computerized tomography
CTAC	Computerized tomography attenuation corrected
DCIS	Ductal carcinoma in situ
DTPA	Diethylene triamine penta acetic acid
e-	Electron
e.g	Example
e+	Positron
EIC	Extensive intraductal component
ER	Estrogen Receptor
FDA	Food and Drug Administration
FDG	Fluorodeoxyglucose
FES	Fluoroestradiol
FLT	fluorothymidine
FOV	Field Of View
FWHM	Full width at half maximum
g	gram
Gd	Gadolinium
Glut	glucose transporter
GSO	Gadolinium oxyorthosilicate
h	Hour
HER-2/neu	Human epidermal growth factor receptor gene
HGF	Hematopiotic growth factor
i.e	Example
I.V	intra venous
IDC	Invasive ductal carcinoma
ILC	Invasive lobular carcinoma
KeV	Kilo electron Volt

keV/c^2	Kilo electron Volt ,c is the velocity of light
Kg	Kilogram
Km	Kilometer
LCIS	Lobular carcinoma in situ
LOR	Line of response
LSO	Lutetium oxyorthosilicate
mA	Milliamperage
MBq	Mega Becquerel
mCi	milli curie
MDP	Methylene diphosphonate
Mg/dl	A measure of concentration (mass per unit volume)using milligrams per decilitre (One-tenth of a litre)
min	minute
MIP	Maximum intensity projection
mm	Millimeter
mm^2/s	Millimeter square per second
MRI	Magnetic resonance imaging
mRNA	messenger ribonucleic acid
MRS	Magnetic Resonance Spectroscopy
mSv	Millisevert
NaI (TL)	Thallium-activated sodium iodide crystals
NPV	Negative predictive value
P53	Tumor protein 53
PEM	Positron Emission Mammography
PET	Positron Emission Tomography
PPV	Positive predictive value

PVE	Partial volume effect
ROI	Region of interest
sec	Second
Sesta MIBI	Sesta methoxy isobutyl isonitrile
SLN	Sentinel lymph node
SN	Sentinal Node
SNB	Sentinal Node biopsy
SPECT	Single Photon Emission Computerized Tomography
SUV	Standardized Uptake Value
Tc 99 m	Technetium 99 m
TDLU	Terminal ductal-lobular unit
TNM	Tumor, nodal metastases, distant metastases
US	Ultrasound
Ve	electron neutrino
WB	Whole body
Y	Photon

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Discussion and Conclusion

Discussion and Conclusion

Breast cancer is the most common malignant tumor among women. It is the leading cause of cancer death in women after lung cancer. **(*Schwartz et al, 1999)***

Detection and treatment of breast cancer at an early stage is the only method with proven potential for lowering the death rate from the disease. Axillary lymph node involvement is the most important prognostic factor for determining survival from breast cancer. ***(Alder et al, 1997)***

Imaging in breast cancer has an important role to play at all stages of the disease from initial screening of women who are unaware they may have the disease, to symptomatic women who present with a lump or other symptom of breast disease, to those with established breast cancer.

After confirming the diagnosis, imaging has a vital role in staging the disease and assessing response to treatment. ***(Buscombe et al, 2004)***

Accurate staging is critical for therapeutic planning. Unfortunately, previous surgery and radiation therapy can result in scarring that can complicate the evaluation for locoregional recurrence of breast cancer-particularly in the axillary region. ***(Schwartz et al, 1999)***

Mammography is the primary screening technique for breast cancer because of its relatively low cost, high special resolution (0.1 mm), and ability to observe tumors in early stage. ***(Homer, 1984)***