

Role of Positron Emission Tomography/Computed Tomography (PET /CT) in assessment of pediatric lymphoma

ESSAY

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List of Contents

Introduction and aim of the work	1
Physical principles of Positron Emission Tomography (PET)	6
Lymphoma in children	13
Technique OF PET/CT In Lymphoma	29
PET/CT in pediatric lymphoma	81
Other Imaging Modalites of Lymphoma	116
Summary and conclusion	153
References	161
Arabic Summary	

List of Figures

No	Title	Page
1	Annihilation reaction	8
2	Uptake of FDG	10
3	Incidence of lymphoma	14
4	A schematic illustration of a PET/CT system	31
5	Current commercial PET/CT scanners from vendors of PET imaging equipment	32
6	Photograph (side view) of a hybrid PET-CT scanner	33
7	Attenuation and non attenuation corrected images	37
8	PET/CT image consisting of coronal whole-bodyCT image	39
9	Typical imaging protocol for combined PET/CT	45

10	Physiologic FDG uptake in the brain, heart, spleen, urinary collecting system and bone marrow	48
11	Physiologic FDG uptake in the tonsils	50
12	Physiologic FDG uptake in submandibular and sublingual glands	52
13	Physiologic uptake in the arytenoids muscle	53
14	Physiologic uptake in medial and lateral rectus muscles	54
15	Physiologic uptake in thymus gland	55
16	Physiologic cardiac uptake after heavy meal	56
17	FDG uptake anterior to the thoracic spine	58
18	FDG uptake in the stomach	59
19	FDG uptake in the right colon	60
20	physiologic testicular uptake	62
21	physiologic ovarian uptake	63
22	FDG uptake in ovarian corpus luteum cyst	64
23	FDG uptake in the diaphragm and intercostal muscles	66
24	FDG uptake in brown adipose tissue	67
25	diffuse skeletal and splenic FDG uptake after granulocyte CSF treatment	69

26	High-density metallic implants generate streaking artifacts and highCT numbers on CT image with rule out of this artifacts in PET	74
27	Curvilinear cold artifact	76
28	respiratory motion artifacts	77
29	61-y-old patient with lung cancer who ingestedbarium for an esophagogram 1 d before PET/CTscan	79
30	Truncation artifacts	80
31	Detection of lymphoma in a small node by PET/CT	86
32	Staging of NHL by PET/CT	87
33	Detection of nodal and extra nodal HD	88
34	Differentiation of uptake in brown fat from supraclavicular lymph nodes	89
35	No FDG increased uptake at early evaluation in HD	98
36	Increased FDG uptake at early evaluation in HD	99
37	Monitoring therapy response by PET/CT in HD	101
38	Monitoring therapy response by PET/CT a adaptive therapy in NHL	102
39	Assessment of residual lymphoma mass	104

	after completion of therapy by PET/CT	
40	Enlarging LN without FDG uptake in NHL	108
41	stable LNs with FDG uptake in NHL	109
42	NHL of the neck	122
43	HD in the spine	122
44	Burkitt lymphoma of the palatine tonsil	125
45	US and 3D power Doppler US showing HD in the cervical LN	126
46	US showing HD in the cervical LN	127
47	NHL in the right parotid gland	129
48	CT scan showing HD in the right lung	130
49	CT scan showing NHL in the mediastinum	131
50	CT scan showing NHL in the mediastinum with calcification	132
51	CT scan showing HD in the lung	134
52	CT scan showing HD in the lung with a cavitory lesion	134
53	CT scan showing HD in the lung with consolidation	135
54	US scan showing NHL in the stomach	137
55	Barium meal showing NHL in the duodenum	137
56	NHL in the bowel ,mesentery and	138

	mesenteric vessel	
57	US and CT scan showing large lymphomatous mass encasing the mesenteric vessels	140
58	US scan showing NHL with lymphomatous infiltration of the retroperitoneum	140
59	HD with splenic infiltration	142
60	NHL with hepatic, renal and splenic infiltration	144
61	US scan showing NHL with pancreatic infiltration	145
62	US scan showing NHL with peritoneal spread	146
63	US scan showing NHL with renal infiltration	147
64	CT scan showing NHL with right renal infiltration	148
65	CT scan showing NHL with bilateral renal infiltration	148
66	US and color Doppler US showing NHL in the testis	149
67	CT and MR images showing NHL in the right iliac bone	151
68	MR images showing NHL in the right humerus	152

List of Tables

No	Title	Page
1	Radioactive Isotopes Used In PET Imaging	7
2	Differential diagnosis of NHL	18
3	Classification of NHL	20
4	Differential diagnosis of HD	25
5	Ann Arbor staging classification for HD	28
6	Factors affecting the SUV	47
7	Revised Criteria For Therapy Response Assessment Of Malignant Lymphoma	93
8	Recommendations For Post-Treatment Assessment Of HD And NHL	104
9	Relative prevalences of lymphomatous involvement of organs	120

List of Abbreviations

3D	Three Dimensional
18FDG	18F- FluoroDeoxyGlucose
AC	Attenuation Corrected.
AC/AL	Attenuation correction/Alignment
BTv	Biological Target Volume
Cm	Centimeter
CT	Computed Tomography
CTV	Clinical Tumor Volume
CNS	Central nervous system
CSF	Cerebrospinal fluid
DVD	Digital video disk
EBV	Ebstein bar virus
FDG	Fluoro-Deoxy-D-Glucose
FNA	Fine Needle Aspiration
GCS-F	Granulocyte Colony Stimulating Factor
GLUT	Glucose Transporter
GTV	Gross Tumor Volume
HD	Hodgkin Disease
HRS	Hodgkin-Reed-Sternberg
IMRT	Intensity Modulated Radiotherapy
IWC	International Workshop Criteria.
KeV	Killo electron Volt
KV	Killo Volt
LCLs	Large cell lymphoma

LOR	Line Of Response
MA	Milli Ampere
MAS	Milli Ampere Second
MCi	Micro Curies
MeV	Mega electron Volt
MRI	Magnetic Resonance Imaging
NAC	Non Attenuation Corrected
NCI	National cancer Institute
NHL	Non Hodgkin lymphoma
NLPHD	Nodular lymphocyte predominant Hodgkin disease
OS	Overall Survival
PD	Progressive Disease
PET/CT	Combined Positron Emission Tomography And Computed Tomography
PET	Positron Emission Tomography
PFS	Progression Free Survival
PR	Partial Remission
PTV	Planned Target Volume
RTP	Radiotherapy Planning
SNCCLs	Small non cleaved Cell lymphoma.
SD	Stable Disease
SPD	Sum Of The Products Of The Greatest Diameters
SUV	Standardized Uptake Value
WHO	World Health Organization

β^+	Positron
β^-	Electron

INTRODUCTION

Lymphomas account for 10%-15% of all childhood cancers & are third in frequency after acute leukemia and brain tumors. It includes number of different pathologic subtypes, which arise from the constituent cells of the immune system or from their precursors. Two types of lymphomas include: Hodgkin's disease (HD) & non-Hodgkin's lymphoma (NHL) (*Pastore et al, 2001*).

Four histologic subtypes of HD in children are described: lymphocytic predominance, mixed cellularity, lymphocytic depletion and nodular sclerosis. Nodular sclerosis is the most common subtype, affecting about 60% of children. The most common subtype of NHL is Burkitt lymphoma (with the jaw and abdomen as the most common involved sites) (*Magrathl, 2002*).

HD is a nodal disease that affects lymph nodes while in NHL, the clinical presentation is much more often extranodal, the most frequently involved sites being intra-abdominal and intra-thoracic (*Hudson, 2002*).

Fortunately, HD and NHL are among the few malignancies that are potentially curable with current existing treatment modalities, even in advanced or recurrent disease. Accurate staging, early therapy monitoring and post treatment evaluation of lymphomas are important for optimum management of these patients (*Rodriguez-Vigil et al, 2006*).

Once the diagnosis of lymphoma is made, the extent and sites of disease must be determined to assess the prognosis and to plan therapy. Many conventional diagnostic imaging modalities were performed including: X-ray ,Ultrasonography (U/S),Computed Tomography(CT), Magnetic Resonance (MR) imaging, Technetium 99m bone scan for skeletal metastasis and Gallium 67 scanning for whole-body screening; however these modalities have limitations and results in a reduced sensitivity of lesion detection. Positron Emission Tomography (PET) offers a different approach in diagnosis of lymphoma (*Lavelly et al, 2003*).

In patients with lymphoma, the size of the mass is only somewhat indicative of the number of viable tumor cells, especially after therapy. Metabolic imaging with FDG PET provides a more reliable measure of cancer burden, as the intensity of uptake reflects the number of viable cancer cells. Accordingly, in the past few years, the clinical applications of PET and PET/CT for lymphoma have evolved from staging to response assessment and now to response-adapted therapy (*Kasamon et al., 2007*).

Positron emission tomography (PET) with 2-[fluorine-18] fluoro-2-deoxy-D-glucose (FDG) is increasingly being used in the evaluation of pediatric oncology patients. However, the normal distribution of ^{18}F FDG uptake in children is unique and may differ from that in adults. A number of physiologic variants are