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Value of ^{18}F -FDG PET/CT in HIV positive patients with neurological presentations

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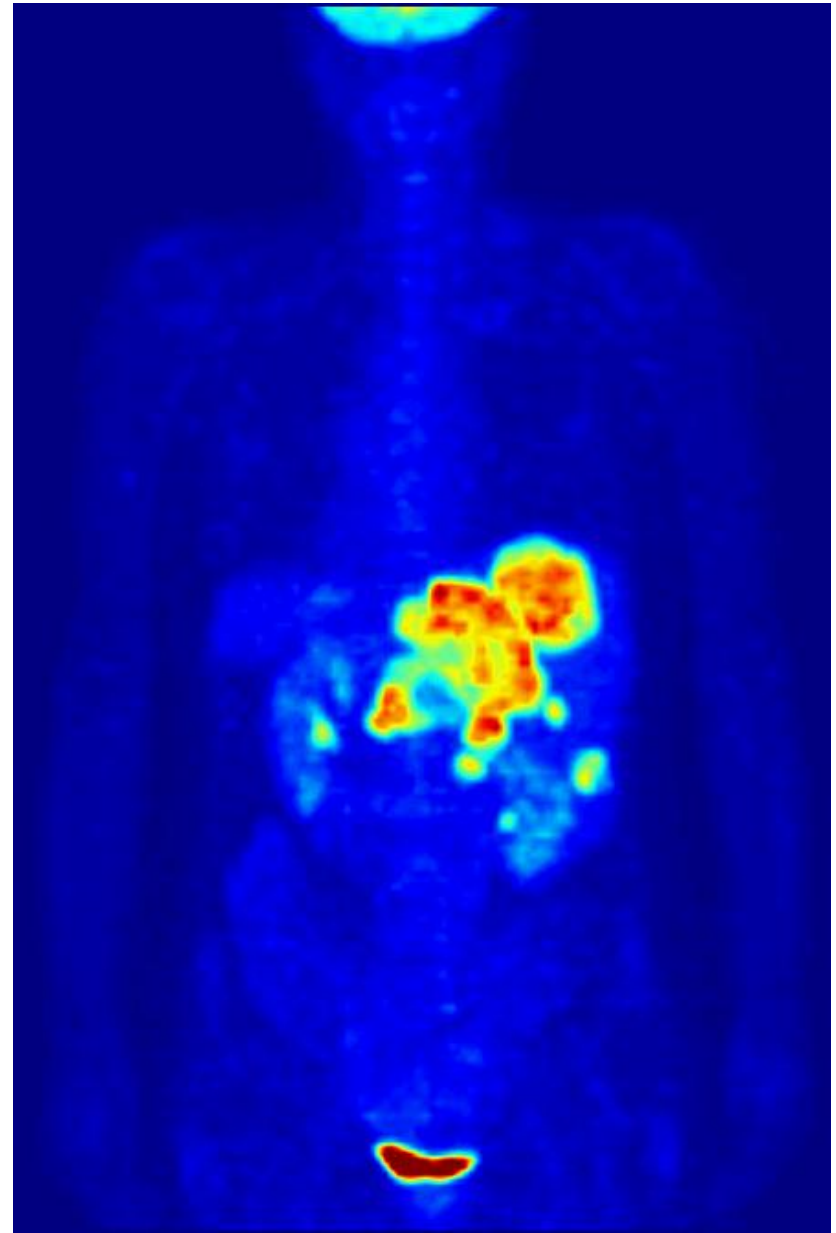
What is ^{18}F -FDG PET/CT ?

Medical imaging technique

Uses a radioactive isotope attached to a biological molecule to produce a 3D map of functional processes in the body e.g. glucose labelled with radioactive flourine - Fluorodeoxyglucose (^{18}F) or ^{18}F -FDG

3D images of ^{18}F -FDG concentration within the body are then constructed by computer analysis

3D imaging accomplished with the aid of a CT scan



Background

- Identifying the aetiology of cerebral pathology in HIV + individuals is a diagnostic challenge
- Opportunistic infections of the CNS carry a great risk of morbidity and mortality
- Several factors influence the aetiology of CNS pathology
 - CD4 cell count
 - Also ethnicity, age, risk group and geographical location

HIV-related opportunistic infections and malignancies of the CNS

Presentation	Main causes
Space occupying lesion(s)	Toxoplasmosis, PML, TB, Cryptococcus, Syphilitic gummae Primary CNS lymphoma , metastatic NHL
Encephalitis	HIV, VZV, HSV, Syphilis
Meningitis	HIV seroconversion, Cryptococcus, TB, Syphilis, bacteria (e.g. <i>Streptococcus pneumoniae</i>)
Spastic paraparesis	HIV-vacuolar myelopathy, transverse myelitis from VZV, HSV, HTLV-1, Toxoplasmosis, Syphilis
Polyradiculitis	CMV, NHL

Aim

- ^{18}F -FDG PET/CT could be a helpful tool to differentiate between malignancy and infection due to different metabolic activity
- Our aim was to evaluate the value of ^{18}F -FDG PET/CT in HIV + patients with neurological symptoms

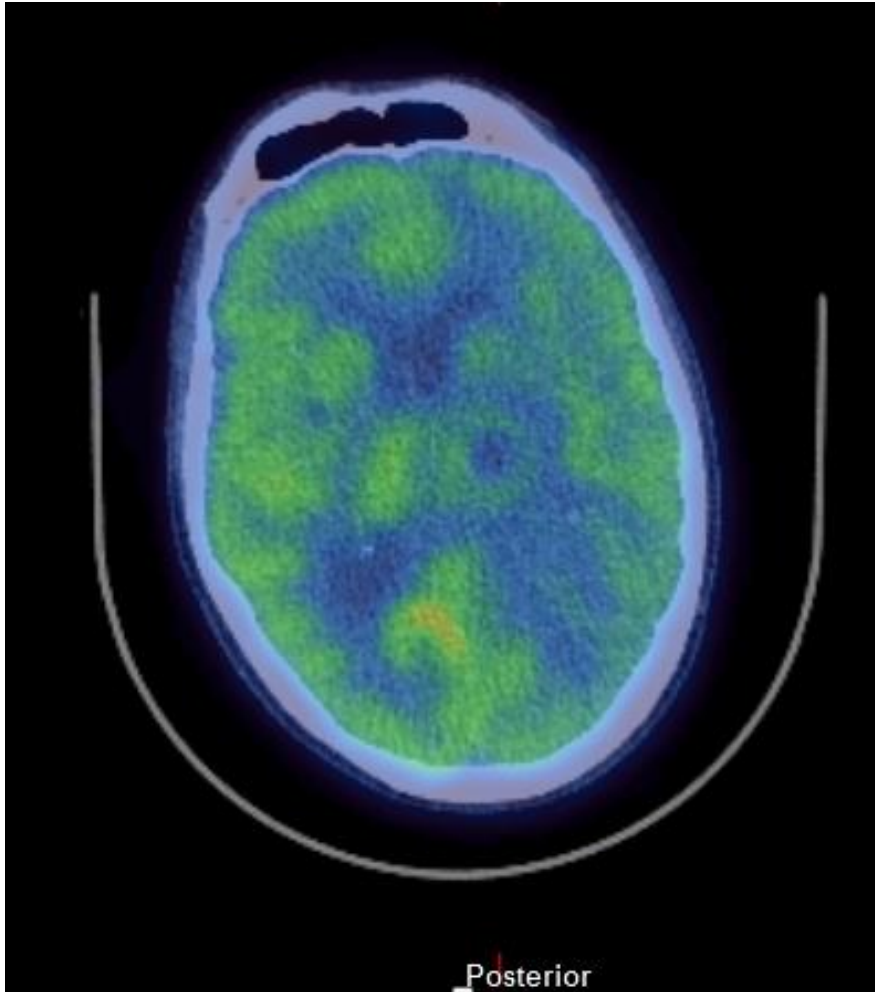
Methods

- Retrospective review of ^{18}F -FDG PET/CT brain scans at Guys & St Thomas' on HIV+ patients presenting with cerebral symptoms and signs, between January 2005 to March 2012
- PET scan results correlated with the final clinical diagnosis
- Patient management and outcomes reviewed from the patient's hospital records.
- The final diagnosis was based on clinical and/or imaging improvement following empirical therapy, biopsy results or documentation in the patients' medical records.

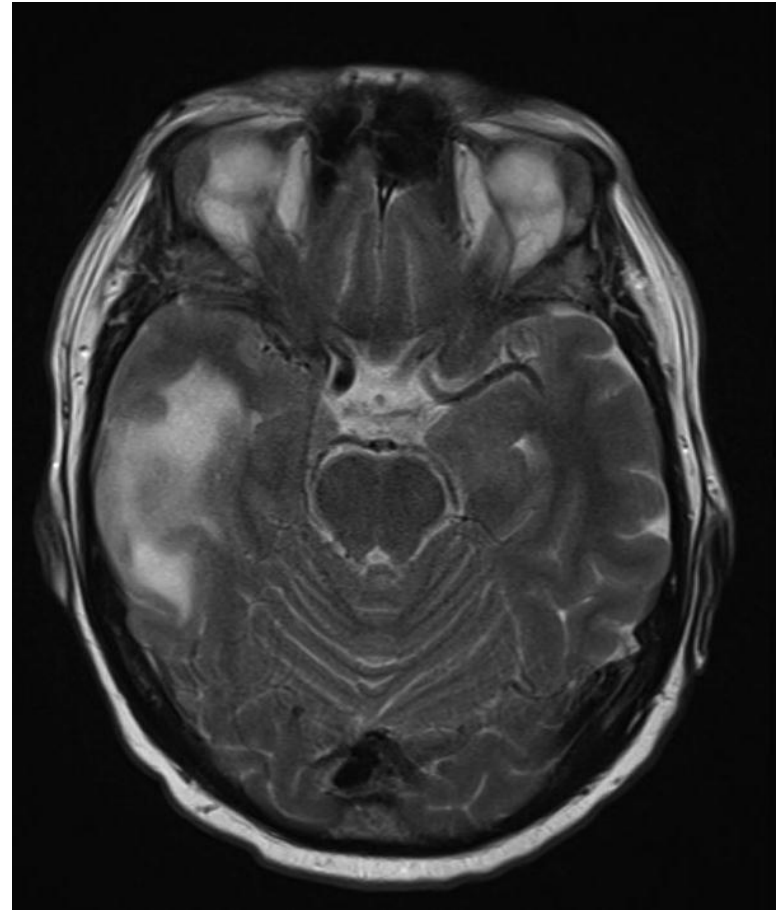
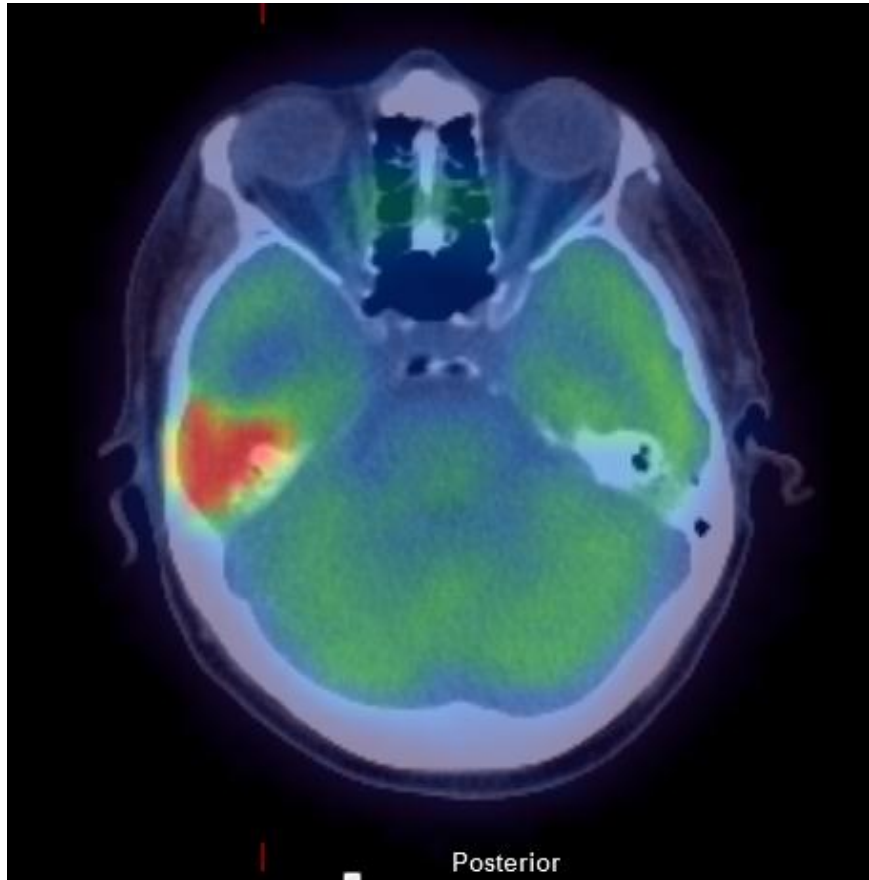
Interpretation on PET scan

- Low-grade or reduced focal ^{18}F -FDG uptake in space occupying lesions compared to normal cortex were interpreted as infection
- High-grade or increased focal ^{18}F -FDG uptake were interpreted as lymphoma
- When diffuse low-grade ^{18}F -FDG uptake was demonstrated, not corresponding to any focal abnormality on CT or MRI – vasculitis was described

Toxoplasmosis



Primary CNS lymphoma



Results 1

- Among 29 patients, 22 (76%) were male, mean age of 47 years (range 25-79 years)
- All presented with neurological symptoms and signs
- 25 of 29 (86%) were referred to distinguish infection from malignant lesions
- 3 of 29 (10%) had memory problems
- All had prior CNS imaging with MRI (n=25) or CT (n=4)
- 22 of 29 patients had additional full body PET/CT imaging

Results 2

¹⁸F-FDG PET/CT brain scan characteristics

¹⁸ F-FDG PET pattern	Number of patients	Final Diagnosis	Radiology CT/MRI	CD4 (mean & range)	HAART (no of patients)
High-grade focal uptake	4	PCNSL	Lymphoma (2) Non specific (2)	398 (3-823)	4
Low-grade focal uptake	9	Toxoplasmosis	Toxo (2) PCNSL (1) Non specific (6)	175 (15-400)	3
	1	PML	Non specific	63	1
Low and high-grade focal uptake	1	Toxoplasmosis and PCNSL	Toxo	68	1

Results 2

¹⁸ F-FDG PET pattern	Number of patients	Final Diagnosis	Radiology CT/MRI	CD4 (mean & range)	HAART (no of patients)
Normal	1	Toxoplasmosis	Toxoplasmosis	21	0
	1	CVA	CVA	721	1
	1	Syphilis	Neuritis	557	1
	1	HIV encephalitis		618	1
Vasculitis pattern	4	Vasculitis	Vasculitis (1) Non specific (3)	306 (31-569)	3
	1	Corticobasillar dementia	Atrophy	353	1
Variable LG uptake	2	NSCLC	Non specific (2)	346	2
	1	TB	Non specific	-	0
Other -Diffuse low-grade/AD	1	Alzheimer's	Normal	214	1
	1	TB	Non specific	-	1

Results 3

Characteristics of whole-body ^{18}F -FDG PET/CT scans

^{18}F -FDG PET pattern	Number of patients	Final diagnosis of extracranial lesions	Corresponding brain pathology final diagnosis
Normal	8		Toxo (3) Lymphoma (2) Syphilis (1) Vasculitis (1) TB (1)
Low grade lymphadenopathy	6	HIV lymphadenopathy (6)	Toxo (4) Lymphoma (1) HIV encephalitis (1)

Results 3

Characteristics of whole-body ¹⁸F-FDG PET/CT scans

¹⁸ F-FDG PET pattern	Number of patients	Final diagnosis of extracranial lesions	Corresponding brain pathology final diagnosis
Lung lesions	7	Infective cavitating lesions (3) Infective consolidation (1) NSCLC (1) TB (1) Kaposi sarcoma (1)	Toxo/lymphoma (1) PML (1) Vasculitis (1) Toxo (1) NSCLC mets (1) TB (1) Lymphoma (1)
Adrenal lesion	1	Benign	Toxoplasmosis

Conclusion

- We could accurately differentiate between infection and PCNSL in all cases
 - Significant differences in uptake as measured by SUVmax distinguishing PCNSL from infection
- ^{18}F -FDG PET/CT is valuable in differentiating Toxo & PCNSL and can act to guide biopsy

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