Focal Pituitary gland uptake on 18F-FDG PET/CT; Rare incidental finding or a more routine observation with modern scanning techniques?

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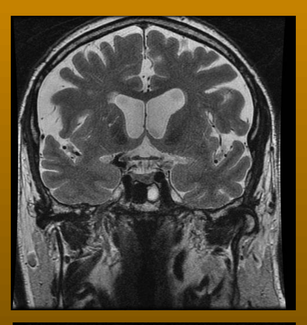
N. Ahmed [1], M.J Akbar [1] , G. Avery [1], S. Usmani [2], C. Binns [1], G. Woolley [1]

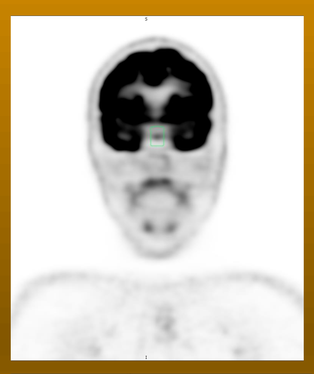
[1]Jack Brignall PET/CT Centre, Castle Hill Hospital, Cottingham.

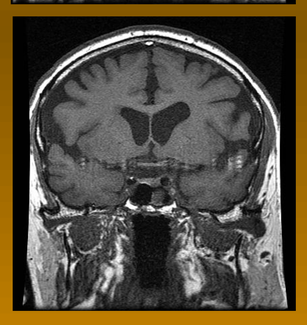
[2]Kuwait Cancer Control Centre, Kuwait.

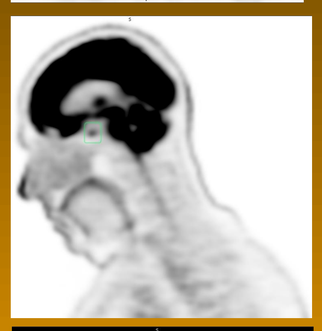
PURPOSE

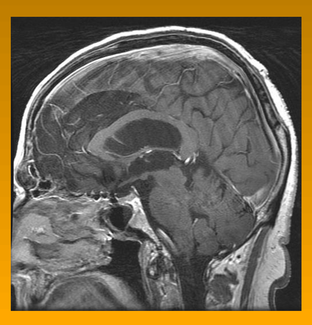
To assess the spectrum of focal pituitary uptake on routine imaging with modern PET/CT scanners and reconstruction algorithms.











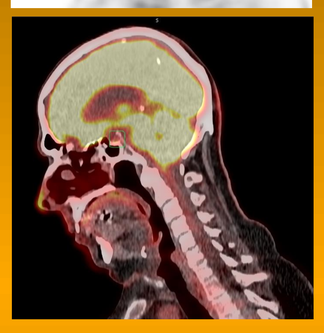


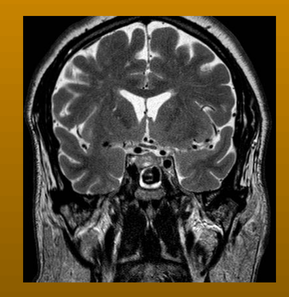
Fig 1. FDG PET/CT in a 70 year old male for staging of high risk melanoma demonstrate focal increased pituitary uptake (SUVmax 4.3). Coronal T1W and T2W and Sagittal post gadolinium MRI images show a small T1 and T2 hypointensity in the left lobe of pituitary ,which also shows less enhancement then the surrounding pituitary tissue on post contrast imaging, consistent with a small microadenoma.

PATIENTS AND METHODS

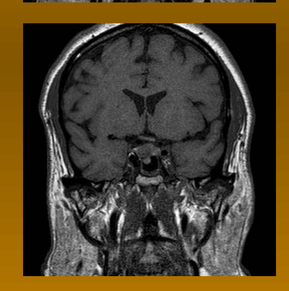
- Retrospective analysis of imaging in patients undergoing routine FDG PET/CT between Jan–Dec 2015 and in whom contemporaneous MRI of brain was performed within 1 year of the PET/CT study.
- 195 eligible patients were identified. 17 brain MRI studies were deemed unsuitable to adequately assess the morphology of the pituitary gland , due to artefacts or lack of at least 3 multiplanar T1W / T2W sequences [1] and these were excluded.
- All PET/CT studies were undertaken on a Siemens Biograph mCT Flow Edge™ with Ultra-HD™ reconstruction.
- All MRI examinations were undertaken either on a 1.5 T Philips Achieva or 1.5 T GE 450W MRI scanners.
- For all patients, standardised region of interest tool [2] was used to calculate Pituitary, Mediastinal blood pool (MBP) and Liver background (LB) SUVmax.

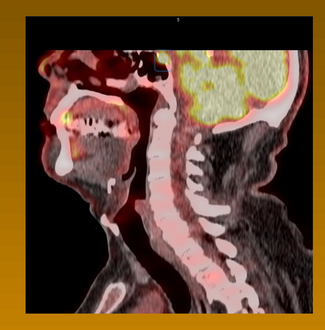
RESULTS

- 178 patients were included in the analysis, mean age 59 years, of which 81 were males and 97 females.
- 173/178 patients had morphologically normal (MN) pituitary glands on MRI (Table 1). Pituitary SUVmax in 147/173(84.9%) was above MBP and in 69/173(39.8%) was above LB.
- 5/178 patients had morphologically abnormal (MA) MRI (Table 2). 3 of these had microadenomas and 1 macroadenoma on MRI. In one of these patients (Figure 3) no significant uptake was seen in an abnormal pituitary gland and this was thought to be a case of hypophysitis.











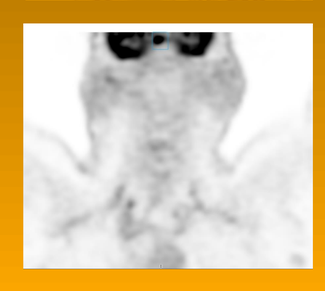


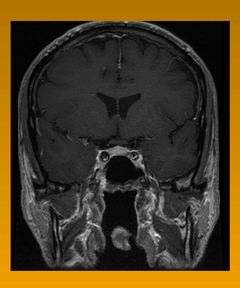
Fig 2. FDG PET/CT in a 71 year old male for staging of left upper lung tumour shows incidental focal increased pituitary uptake (SUVmax 14.0). Coronal T1W and T2W and Sagittal TW2 post gadolinium MRI images demonstrate a mass in the right lobe of pituitary with heterogeneous T2W signal and poor contrast enhancement, imaging features consistent with a macroadenoma. The lesion abuts and possibly invades the right cavernous sinus.

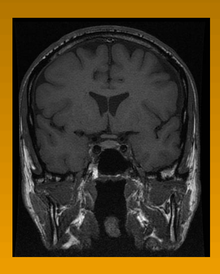
Pituitary SUVmax		Mediastinal blood pool SUVmax		Liver background SUVmax	
Mean	Range	Mean	Range	Mean	Range
3.91	2.1- 5.2	2.23	1.9 – 3.2	3.56	2.7 - 4.1

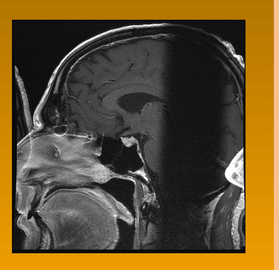
Table 1: Summary of SUVmax in morphologically normal pituitary glands on MRI.

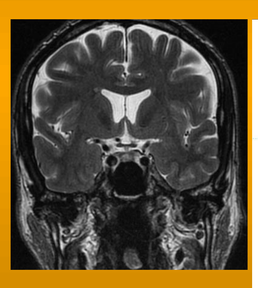
Pituitary SUVmax		Mediastinal blood pool SUVmax		Liver background SUVmax	
Mean	Range	Mean	Range	Mean	Range
16.3	2.5 - 42.7	1.7	1.6 -2.2	2.5	2.3 – 3.1

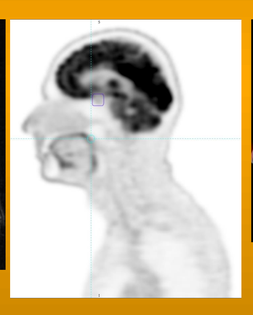
Table 2: Summary of SUVmax in abnormal pituitary glands.

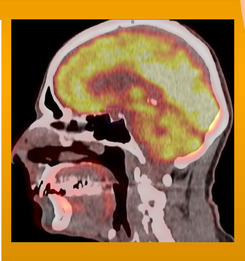






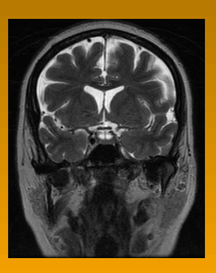


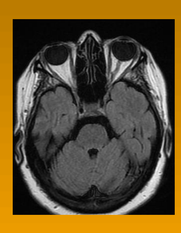




- No statistically significant correlation could be established in predicting MA when the pituitary SUVmax was compared to the MBP and LB activity.
- Of interest in our dataset, the range of inherent activity in some of the MN glands (Fig 4) was higher then the reference values (SUVmax 4.1) quoted in prior studies (3) thought to be statistically significant in predicting the presence of abnormal pituitary glands.











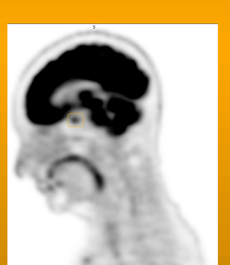


Fig 3. MRI in a 67 year old female demonstrates bulky pituitary gland with uniform T1W and some heterogeneous T2w signal but with uniform enhancement on coronal and sagittal post gadolinium sequences. FDG PET/CT for melanoma staging did not show significant uptake (SUVmax 2.1) in this region despite intensely FDG avid disease elsewhere. The pituitary appearances were thought to represent hypophysitis.

TAKE HOME MESSAGE

Base of skull and other midline structures are important review areas while reporting whole body FDG PET/CT examinations [4] .

Our results demonstrate that on contemporary scanners and reconstruction algorithms, focal pituitary gland uptake can be quite conspicuous with normal SUVmax somewhat higher than previously reported in the literature.

With advances in diagnostic imaging including PET/CT, incidentalomas of the pituitary gland have been described with increasing frequency [5]. Reporters should familiarise themselves with the range of normal pituitary uptake in their routine clinical practice particularly if there is any change in equipment.

Fig 4. FDG PET/CT in a 59 year old female for staging of high risk melanoma showed focal increased pituitary activity, SUVmax 5.3 with no other evidence of metastatic melanoma. An MRI examination demonstrate normal appearances of the pituitary fossa with no abnormal morphological features. The patient did not have any biochemical abnormality of the pituitary axis and since had a follow-up FDG PET with no evidence of progressive disease

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