**Outcome of incidental high SUV area on PET-CT scans organised for investigation of Head and Neck malignancy**

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**ABSTRACT**

Outcome objectives: Position Emission Tomography (PET) scans show highlight areas of increased FDG uptake outside the head and neck (H&N) region. These may represent a synchronous malignancy or an area of inflammation or infection. Our study aims to investigate the rate of increased FDG uptake in PET scans organised for the investigation of Head and Neck Squamous Cell Carcinoma (HNSCC) and report on the outcome of these FDG-avid areas.

Methods: A prospective database of PET scans maintained by the West of Scotland PET centre was reviewed to identify all scans organised by the H&N team between January 2008 and December 2011. Areas with high FDG uptake were noted for half of the body tissues on which the radiologists advised further investigation, were noted. Case notes were reviewed and relevant H&N teams contacted to identify further investigations and outcome of these FDG-avid areas. The list of patients with HNSCC of unknown primary who had a PET scan was obtained from the head and neck specialist nurses. The respective MDT coordinators where patient’s cases were discussed were contacted to find the MDT outcome of these discussions.

Results: Of 299 PET scans during the study period, 40 FDG-avid areas outside the H&N and lung were identified, the majority originating in the colon (56%) followed by the prostate and pelvic region. There were 2 confirmed secondary tumours (2.5%), which is a significant proportion of the group, and half of the group had an incidental high SUV (negative investigation). Eleven patients were not investigated due to poor health and palliative management.

Conclusions: All increased SUV areas outside the head and neck region should be investigated to identify a synchronous primary which may determine patient’s overall management and long-term outcome.

**INTRODUCTION**

The increasing use of ¹⁸F-labelled Fluorodeoxyglucose Positron Emission Tomography (FDG-PET) scans in the investigation of patients with Head and Neck Squamous Cell Carcinoma (HNSCC) has highlighted FDG-avid areas outside the H&N region. This raises the question of how to manage these incidentalomas.

The main aim of our study is to investigate the rate of high standardised uptake values (SUV) areas outside the head and neck region on PET scans organised for the investigation of Head and Neck malignancy and report on the outcome of these FDG-avid areas. This study will also investigate the rate of a second primary in our head and neck cancer cohort. A second primary, cancer, is defined as one with histology proven malignancy, geographically separate from the first primary and not a metastasis of the first primary (Warren and Gate 1932).

**METHODS**

A prospective database of PET scans maintained by the West of Scotland PET centre was reviewed to identify all the PET scans organised by the Head and Neck cancer teams between January 2008 and December 2011, including the indications for the requests. The report of all scans was reviewed and areas with SUV level above the normal limits for different body tissues which the radiologists advised further investigation were noted. The patients’ case notes were reviewed and the relevant head and neck cancer teams contacted to identify further investigations carried out in order to elicit the cause of these FDG-avid areas.

**RESULTS**

In our cohort of 299 PET scans, 40 incidental high SUV areas outside the upper aerodigestive tract and lung were identified. The majority of the FDG-avid areas originate in the colon (56%) followed by the prostate and pelvic region (Figure 1).

There were 9 confirmed secondary tumours (22.5%), which is a significant proportion of the group, and half of the group had an incidental high SUV (negative investigation). Eleven patients were not investigated due to poor health and palliative management.

Figure 1: Pie chart showing the range of high SUV areas outside the head and neck (absolute numbers in brackets).

**DISCUSSION**

FDG uptake reflects cellular metabolism. FDG-avid areas outside the H&N area may represent a second malignancy or an area of inflammation or infection. PET is not free of false positives which make cyonics claim that these are costing the national healthcare system. Asymptomatic patients with an FDG-avid area in their sigmoid colon for instance will require as a minimum an outpatient appointment with a Colorectal surgeon ± colonoscopy or sigmoidoscopy. The literature quotes an average US $1350 to $2000 per scan.

FDG-PET however has been shown to be superior to conventional clinical and radiological evaluation in the detection of a second primary tumour (Stokkel 1999). It has also been observed that there is no significant difference between PET and PET/CT in terms of lesion detectability (p = 0.21) in a cohort of 682 H&N cancer patients. In 98 patients, 111 synchronous cancers were diagnosed. Oesophageal cancer was diagnosed as the most synchronous cancer (57 lesions), followed by gastric cancer (20 lesions), lung cancer (9 lesions) and head and neck cancer (8 lesions). PET or PET/CT was performed in 82 of the 98 patients. PET or PET/CT detected 34 out of 94 (36.2 %) synchronous cancers (Yabuki 2013).

Our findings mirror the results of a retrospective study carried out by the senior author showing the presence of a second primary tumour in 21% of the West of Scotland head and neck cancer population (n=518, from 1970 to 1988). The longer patients survived after the index primary is diagnosed and managed, the more prevalent the rate of having a second primary. This figure rose from 9% at year 1 to 21% by year 11 (McGarry 1992, McGarry 1994). The lung accounted for the vast majority of all second primaries whether synchronous (diagnosed at the same time or shortly after the index primary site) or metachronous (diagnosed 6 months after), but a gastrointestinal (GI) index site accounted for 15% of the group. The predominant histological type was Adenocarcinoma. These findings suggest that surveillance colonoscopy in newly diagnosed head and neck cancer patients especially in those with GI symptoms should be considered.

Our study highlighted 4 focal thyroid incidentaloma (FTI). Recent systematic review and meta-analysis of the literature have identified a clinically significant FTI prevalence with a high associated risk of malignancy amongst adults on ¹⁸FDFG PET scans. Treglia et al have demonstrated a pooled prevalence of 1.92% (95% CI: 1.87-1.99%) in 34 studies comprising 215,057 patients. Of the 1522 FTIs undergoing histopathology evaluation, pooled risk of malignancy was 36.2% (95% CI: 33.8-38.6%), without significant differences among various geographic areas. Nayan et al have demonstrated similar results.

**CONCLUSIONS**

All increased SUV areas outside the head and neck region should be investigated to identify a synchronous primary which may determine patient’s overall management and long-term outcome. This outweighs the cost implications of PET incidentomalomas.