Parotid incidentaloma detected during thoracic PET imaging: how should these lesions be managed?

Introduction

Preoperative positron emission tomography (PET) scanning of three patients with lung cancer revealed increased unilateral focal activity in a parotid gland. Further investigation with ultrasound and core biopsy confirmed benign parotid neoplasm in all three cases. The phenomenon of imaging-related incidentaloma is increasingly recognized and further investigation of these lesions remains controversial. This article discusses PET incidentaloma in the parotid, why tracer uptake may occur and how these lesions may be managed with changes in patient management that ensue.

Figure 1. A sagittal positron emission tomography with radiolabeled [18F]-2-fluorodeoxy-D-glucose study with a large arrow emphasizing focal uptake in the left parotid gland, and a smaller arrow highlighting normal physiological uptake within the adjacent submandibular gland.

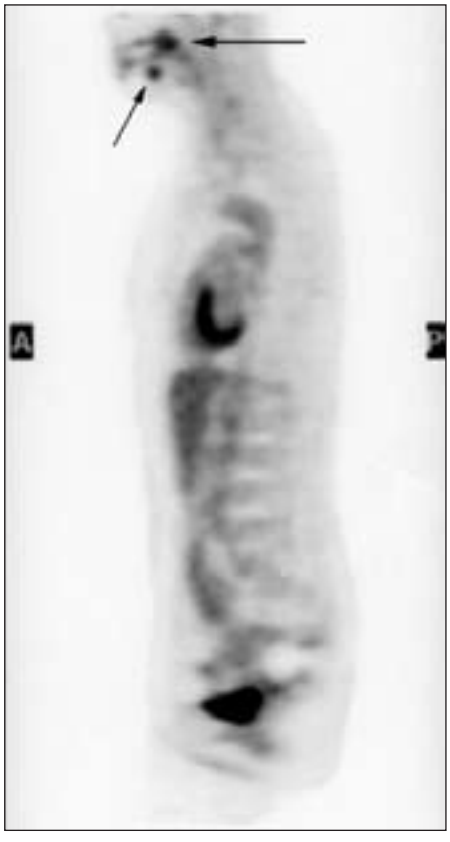
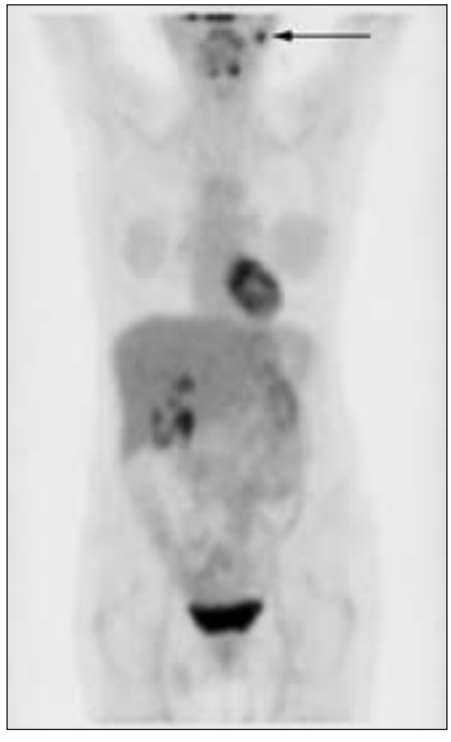


Figure 2. A coronal image from a positron emission tomography with radiolabeled [18F]-2-fluorodeoxy-D-glucose study showing increased focal uptake in the lower pole of the left parotid



Discussion

An incidentaloma is a lesion discovered during an unrelated procedure or investigation, which may be surgical or radiological (Silver and Paranji, 2004). In a series of over 1000 patients having whole body computed tomography scanning in health screening, the incidence of incidentalomas was reported as 37% (Furtado et al, 2005). This phenomenon is likely to rise with the increasing use of PET scanning as well as other imaging modalities, and especially with the increased use of diagnostic and screening centres. How this phenomenon is investigated and dealt with is extremely important in the subsequent management of the patient.

In the context of the parotid gland, bilateral minimal to low uptake on PET

Cases

Three patients (two female, one male) were aged between 60 and 78 years with no significant previous medical history. In all three cases the patients had histopathological and radiological diagnosis of non-small cell lung cancer and the staging computed tomography scans showed no evidence of metastatic disease. These patients were considered to be potential surgical candidates in view of their spirometry and general health, and therefore proceeded to positron emission tomography as part of the preoperative work-up. In each patient unilateral intense focal uptake was reported in the parotid gland (with no evidence of other metastases) and this was deemed to be of uncertain significance (*Figures 1* and *2*).

There was diagnostic uncertainty as to whether the uptake represented another malignancy, metastasis or benign parotid disease. In each case high-resolution ultrasound was undertaken for further evaluation of the parotid gland combined with ultrasound-guided core biopsy (18G needle) of the focal lesion demonstrated. Ultrasound confirmed focal hypoechoic lesions in the parotid gland in each case, corresponding with the location on positron emission tomography imaging. Sonographic differences between patients were noted, as demonstrated in *Figures 3* and *4*. Histology from the core biopsy confirmed a diagnosis of Warthin's tumour in two patients and pleomorphic adenoma in the third. The patients were referred to ear, nose and throat surgery for further management of these lesions.

All patients were deemed to have resectable lung cancer and were referred on for thoracic surgical assessment.

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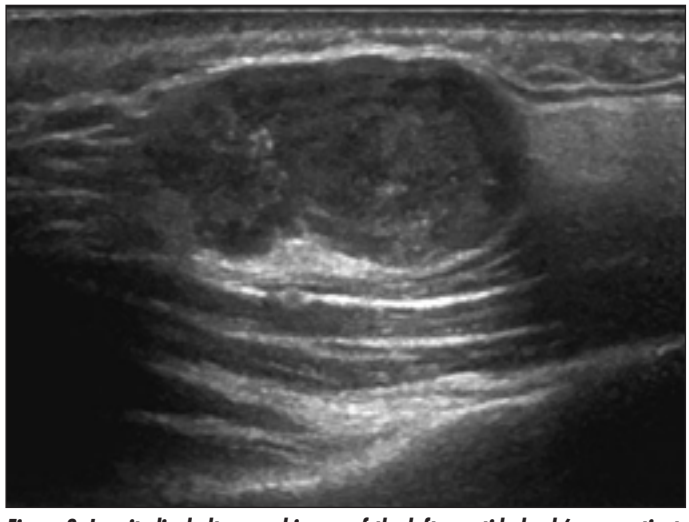

Figure 3. Longitudinal ultrasound image of the left parotid gland (same patient as **Figure 1***) confirms a focal, lobulated hypoechoic lesion demonstrating central mixed echotexture. This corresponds with the area of increased positron emission tomography activity, and biopsy confirmed a diagnosis of Warthin's tumour.*

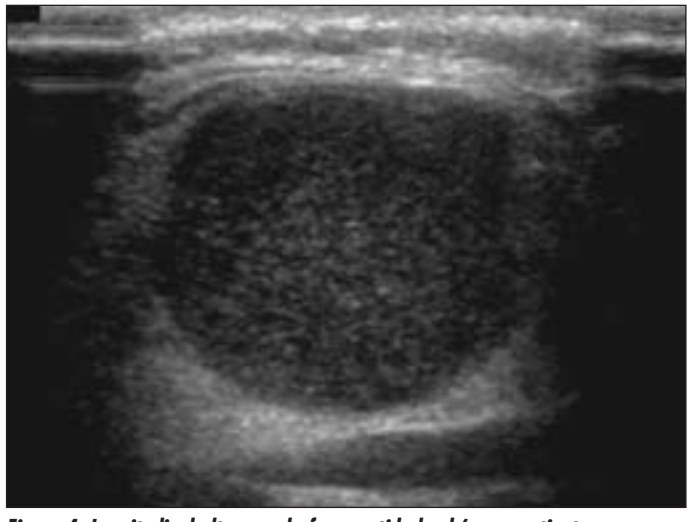

Figure 4. Longitudinal ultrasound of a parotid gland (same patient as **Figure 2***) demonstrates a circumscribed, homogenous hypoechoic lesion with distal wall enhancement. This corresponds with the area of increased positron emission tomography activity, and biopsy confirmed a diagnosis of pleomorphic adenoma.*

scanning can commonly be seen in inflammation of the glands and is also a physiological variant (Keyes et al, 1994). Unilateral high grade uptake, however, should be investigated further, and the exact pathology underlying this activity needs to be elucidated. In a retrospective series looking at 2000 patients' staging PET scan images, 25 had increased fluorodeoxyglucose (FDG) uptake in the parotid glands. Of these only five patients had asymmetric focal FDG uptake in one of the parotid glands. Subsequent investigation (magnetic resonance imaging or computed tomography) demonstrated focal lesions and fine needle biopsy revealed either primary parotid tumour or metastasis (Basu et al, 2008). The finding of both benign (pleomorphic adenoma and Warthin's) and malignant disease adds weight to the concept that uptake on PET is sensitive but non-specific in such circumstances (Okamura et al, 1998).

FDG is a glucose analogue taken up physiologically by tissues with high glucose dependence (e.g. brain), and pathologically by cells with high mitotic activity (e.g. tumours). Attached to the positron-emitting radio-isotope fluorine-18, 18F-FDG can localize organ-specific pathology. Tracer uptake is proportional to tumour activity and this is calculated by measuring the maximum standardized uptake value (SUV_{max}). In a study of 10 patients, pleomorphic adenomas demonstrated an average uptake of 6.8 g/dl, while Warthin's tumours were higher, demonstrating an average SUV_{max} of 13.7 g/dl (Lee et al, 2009).

Pleomorphic adenomas are the commonest type of benign parotid tumour with pre-malignant potential in 20%. Histologically they comprise mitochondrial-rich myoepithelial cells with high glucose turnover, and can become locally infiltrative with increase mitotic activity. Warthin's tumours are entirely benign, and the mechanism of FDG accumulation is based on hypothesis. Histologically, Warthin's tumour consists of ductal epithelium and dense lymphoid stroma. In response to chronic irritation (e.g. tobacco exposure), there is focal metaplasia and lymphoid reactive change promoting epithelial proliferation. FDG accumulates in mitochondrial-rich epithelial cells and within reactive lymphoid tissue (Horiuchi et al, 1998).

Parotid lesions can be easily assessed with sonographic accuracy and fine needle aspiration also provides greater diagnostic accuracy (Howlett et al, 2007). Further imaging (usually magnetic resonance imaging) is indicated for large or potentially malignant lesions, and those in the deep lobe that are not well demonstrated with ultrasound. Once a diagnosis is achieved treatment may vary. In the case of Warthin's tumour a 'watch and wait' policy is frequently adopted (especially in high-risk groups) whereas a pleomorphic adenoma is usually excised as it is potentially pre-malignant.

Conclusions

A benign parotid tumour is an important finding so that 'over-staging' of a patient with carcinoma of the lung by PET can be avoided. If these lesions were to be interpreted as a metastatic deposit, the patient may be denied potentially curative treatment. Therefore, with the low sensitivity of PET imaging, appropriate use of further imaging and needle biopsy is key to the management decision-making process. **BJHM**

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