Diabetes insipidus, a pituitary stalk lesion and fluorodeoxyglucose-positron emission tomography scanning

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Fluorodeoxyglucose-positron emission tomography (FDG-PET) should be considered in the assessment of patients presenting with central diabetes insipidus (DI) when the cause is otherwise unclear.

Case history

A 47-year-old man presented with a three-month history of polyuria and polydipsia, reduced libido and generalized lethargy. Physical examination was unremarkable with no clinical signs of endocrinopathy and normal fundoscopy. His fasting plasma glucose was 5.2 mmol/L (3.5–6). His 24 hour urine volume was 4.3 litres with a urine osmolality of 146 mOsm/kg and serum sodium of 147 mmol/L (135–145 mmol/L). Renal function was normal. A clinical diagnosis of central DI was made on the basis of these findings and his polyuria and polydipsia resolved on treatment with desmopressin 100 μg twice daily.

His pituitary profile also indicated partial anterior pituitary failure, with secondary hypogonadism: serum testosterone 6.8 nmol/L (8.64–29 nmol/L), luteinizing hormone 3.8 IU/L (1–10 IU/L), follicle stimulating hormone 3.5 IU/L (1–8 IU/L) and secondary hypothyroidism: thyroid stimulating hormone 2.14 mU/L (0.27–4.2 mU/L), FT4 6.8 pmol/L (12–22 pmol/L). An initial 09:00

Figure 1
Gadolinium enhanced magnetic resonance imaging pituitary showing a uniformly enhancing lesion on the pituitary stalk measuring 5.5 mm

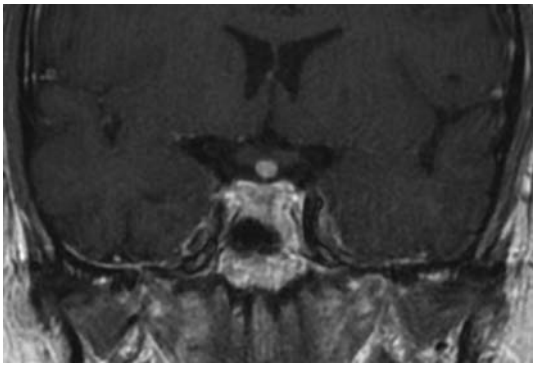


Figure 2
High-resolution computed tomography scan showing erosion of the C7 transverse process with sclerotic residual bone

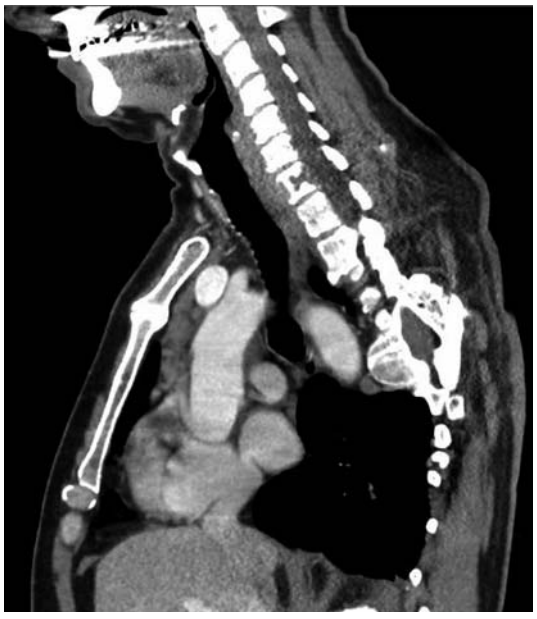


Figure 3
Uptake of fluorodeoxyglucose-positron emission tomography demonstrated within the pituitary stalk lesion

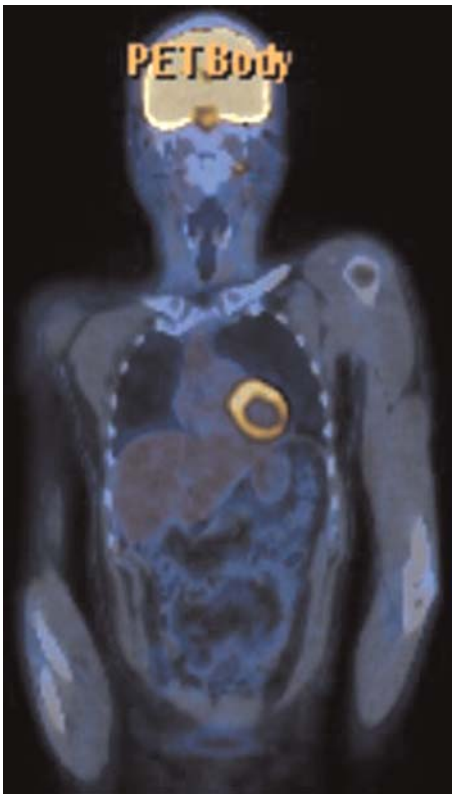
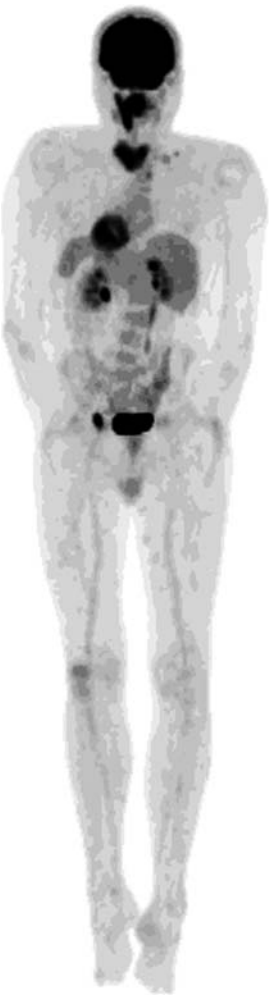


Figure 4
Fluorodeoxyglucose-positron emission tomography scan showing multiple areas of high uptake including the C7 vertebral body and surrounding tissue, pituitary, left parietal bone, tongue and left hip

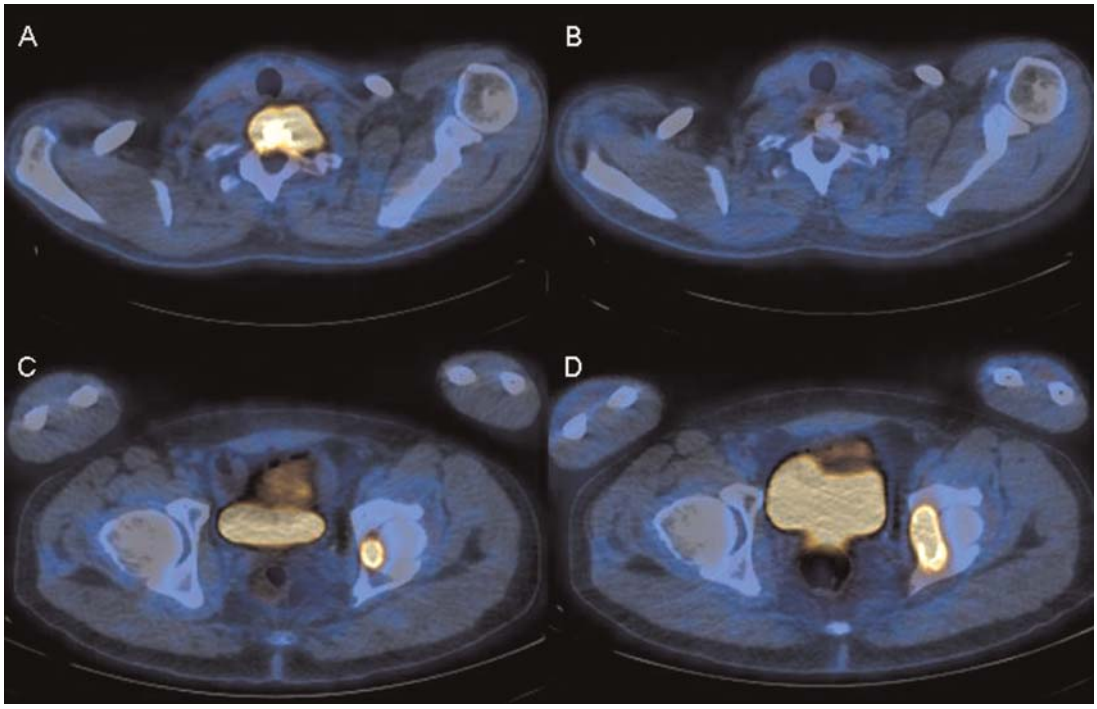


cortisol was 385 nmol/L (150–650 nmol/L) rising to 966 nmol/L after a short synacthen test. His prolactin was modestly elevated at 867 mU/L (0–331 mU/L). A gadolinium enhanced magnetic resonance imaging (MRI) of the pituitary showed a uniformly enhancing 5.5 mm nodule on the pituitary stalk (Figure 1).

A germ cell tumour was obviously considered in the differential diagnosis but serum and cerebrospinal fluid (CSF) alphafetoprotein and Beta-human chorionic gonadotropin were normal and CSF placental alkaline phosphatase was negative, thus making this unlikely. Pituitary stalk biopsy was considered but deferred due to the neurosurgical opinion that the procedure would carry a significant risk of complete stalk severance. The initial management plan was to monitor him with serial imaging of the pituitary and clinical assessment. The stalk lesion remained static on three MRI scans over five months.

He regained full health on treatment with thyroxine, testosterone and desmopressin and returned to full time work as a decorator. However, six months after initial presentation he developed neck pain. A high-resolution computed tomography (CT) scan revealed a lytic lesion replacing the body of C7, with soft tissue involvement (Figure 2).

Figure 5
Images A and C are taken from his initial fluorodeoxyglucose-positron emission tomography and B and D from the second scan. Image A illustrates high uptake in C7, a marked reduction in metabolic activity is seen in image B following radiotherapy. C shows minor left hip uptake on the initial scan and D increased activity on development of his hip symptoms



A FDG-PET scan demonstrated multiple areas of increased tracer uptake, including the C7 vertebral body and surrounding soft tissue, the pituitary (Figure 3), left parietal bone, tongue and left hip joint (Figure 4). A biopsy of the parietal lesion was performed and a diagnosis of Langerhans cell histiocytosis (LCH) was confirmed with positive immunostaining for CD1A and langerin.

He received localized radiotherapy to his cervical spine with resolution of symptoms. Two months subsequently however he developed left hip pain and another FDG-PET scan was arranged. This scan showed a significant reduction in metabolic activity of the C7 lesion but a marked increase in activity in the left hip (Figure 5).

Discussion

LCH is a heterogeneous disease diagnosed on histology and characterized by the proliferation of epidermal antigen presenting cells (Langerhans cells) on a background of haematopoietic cells. Although central DI is the commonest endocrine manifestation of LCH,[1] it is very unusual for LCH to present with central DI as the inaugural symptom without evidence of disease elsewhere.[2] Patients presenting with central DI and a pituitary stalk lesion raise a diagnostic challenge. The initial differential diagnosis in this case was broad and included germ cell tumour, LCH, granulomatous disease such as sarcoid, malignancy, tuberculosis and other infection. Our patient however responded extremely well to pituitary hormone replacement, initially returned to full health and had no clinical evidence for any systemic disease process at presentation. As it was felt that attempted pituitary stalk biopsy to attain a tissue diagnosis carried with it significant risk the initial management plan was for close clinical observation and serial imaging. With the benefit of hindsight we would now however propose

that FDG-PET scanning be part of the routine assessment in patients presenting with central DI when the cause is not otherwise obvious. Although the appearances on FDG-PET are not disease specific, it was in our case able to identify areas of disease more amenable to biopsy when that of the pituitary stalk was hazardous.

Baseline imaging in LCH typically includes a radiological skeletal survey and Tc whole body bone scintigraphy. However a study in 1996 illustrated that 29% of bony lesions identified on scintigraphy were not seen on X-ray skeletal surveys and *vice versa* 19% of lesions visualized on X-ray were not seen on scintigraphy.[3] In addition, these imaging techniques have limitations with regard to disease monitoring as they illustrate bone healing rather than eradication of active disease. FDG-PET scanning has been reported previously in the paediatric literature as potentially a better imaging modality in LCH than the more commonly used Tc whole body bone scintigraphy. In one study FDG-PET was used to monitor response to therapy in five paediatric patients with LCH and the authors concluded that FDG-PET is clinically useful for identifying sights of metabolically active disease.[4] These findings were supported by another study of 44 patients whose response to therapy was assessed using FDG-PET which was shown to detect LCH activity with more accuracy than other imaging modalities.[5]

In our case FDG-PET was sensitive to both bony lesions and soft tissue disease of LCH, the latter being often not well identified on scintography.[5] Furthermore this case not only illustrates the value of FDG-PET in assessing extent of disease but also its great potential utility in precise monitoring of disease progression and response to treatment in patients with LCH.

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