

Imaging of PARP upregulation in small cell neuroendocrine lung carcinoma with [¹²³I] I-PARPi SPECT/CT

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INTRODUCTION

PARP (poly(ADP-ribose) polymerase) inhibitors (PARPi) are effective oncology agents for tumours harboring certain genetic mutations that make them resistant to conventional therapies such as chemotherapy and radiotherapy. We demonstrate, for the first time, that iodine-123 radiolabelled PARPi SPECT/CT imaging can be used as a marker of PARP upregulation and a predictor of chemotherapy resistance in a patient with small cell neuroendocrine tumour.

METHODS

We present the case of a 61-year-old male with an inoperable small-cell neuroendocrine carcinoma of the right lung who was referred for [¹⁸F] FDGPET/CT staging. As part of the standard workup, he had an initial staging, interim after three cycles of chemotherapy, and end of therapy [¹⁸F] FDG PET/CT scans. He was enrolled in an ongoing study on [¹²³I]I-PARPi SPECT/CT in solid tumors, which correlates with immunohistochemical evaluation for PARP upregulation.



Fig.1

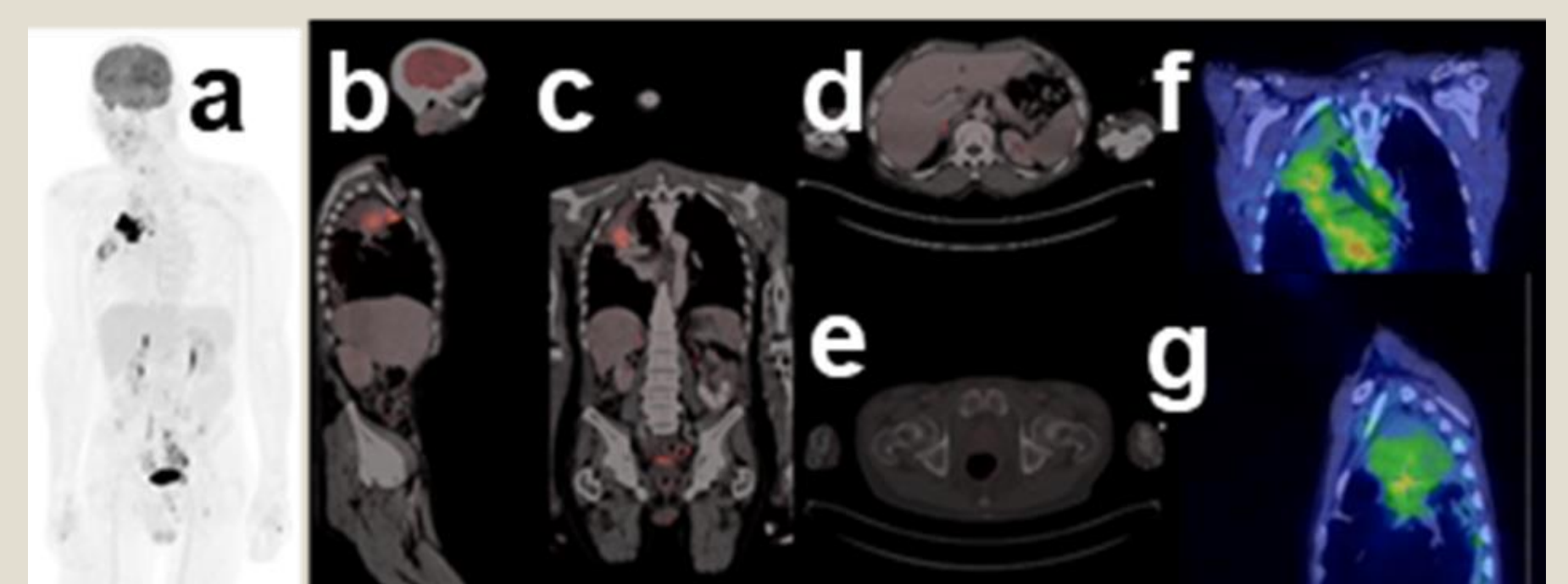


Fig.2

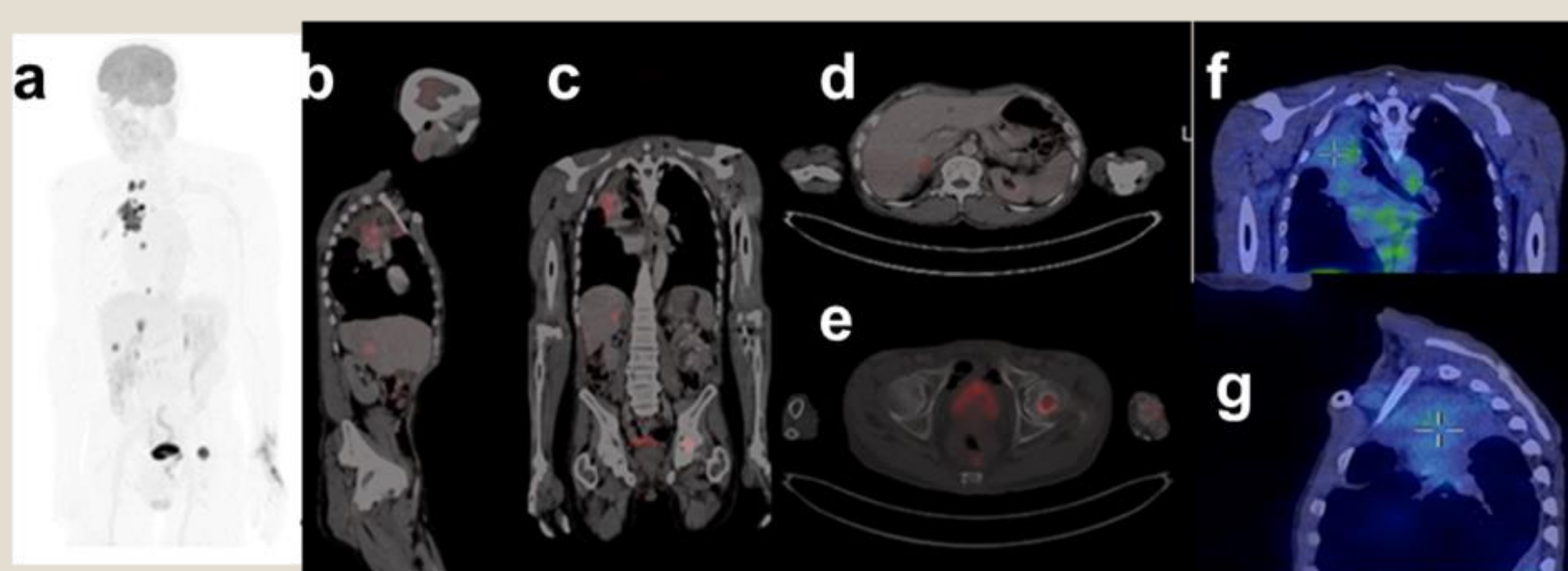


Fig.3

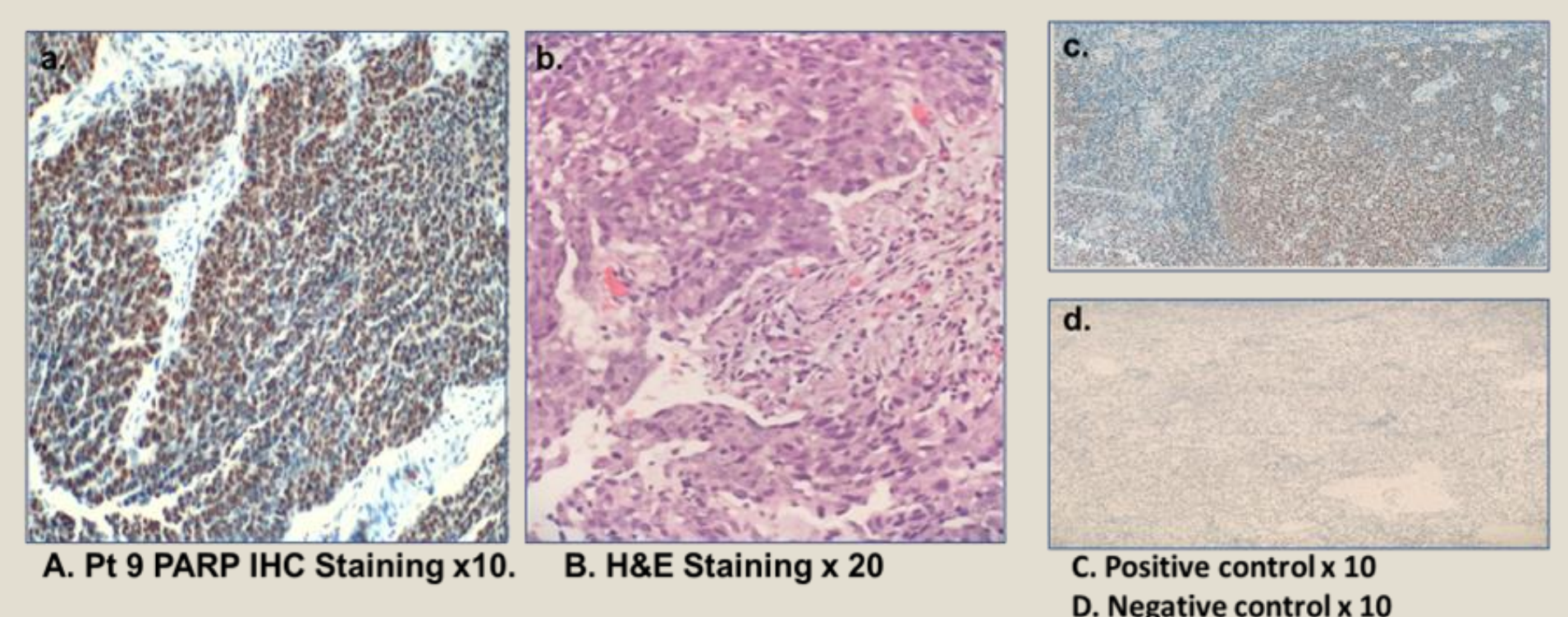


Fig. 4

RESULTS

The patient had [¹⁸F]FDG-PET/CT scans and [¹²³I]I-SPECT/CT imaging at baseline, interim, and end-of-treatment. The SPECT/CT scans were performed 1,4 and 24 hours after [¹²³I]I-PARPi injection, which was well tolerated with no side effects. Baseline PET/CT(Fig 1 a-e) revealed a metabolically active right apical lung mass with ipsilateral mediastinal lymph node metastases. Subsequent PET/CT scans(Fig 2 a-e and Fig 3 a-e)revealed that the disease was progressing, with a new right adrenal gland and left head of the femur osteolytic skeletal metastases. SPECT/CT imaging done at respective time intervals revealed uptake of [¹²³I]I-PARPi on both the primary and metastases across all time intervals(Fig 1 f and g; Fig 2 f and g; and Fig 3 f and g). Immunohistochemistry confirmed PARP upregulation(Fig 4

CONCLUSION

[¹²³I]I PARPi SPECT/CT is feasible, safe, and may be a valuable non-invasive tool for assessing PARP upregulation and predicting response to therapies with no PARPi in non-small cell neuroendocrine carcinoma. In this patient with progressive disease on chemotherapy, it demonstrated persistent uptake in the primary tumor and metastatic [lesions providing a possibility of radioligand therapy with auger electrons or alpha and beta-targeted therapies