Brain Metastasis from Neuroblastoma Depicted by ^{18}F -DOPA PET/CT

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A 12-year-old boy with stage 4 neuroblastoma (NB), treated according to the SIOPEN-HR-NB-01 protocol [1], presented with recent onset of headache and vomiting at the end of the last cycle of immunotherapy with *cis*-retinoic acid, IL2 and CH14-18 anti-GD2 monoclonal antibody.

Images from ^{18}F -dihydroxyphenylalanine (^{18}F -DOPA) positron emission tomography (PET) maximum intensity projection (MIP) (Fig. 1a, b), PET (Fig. 1c, d) and fused ^{18}F -DOPA PET/computed tomography (CT) (Fig. 1e, f) showed an area of intense tracer uptake corresponding to an inhomogeneous, partly haemorrhagic, intra-axial mass lesion located in the left temporal pole, as demonstrated by the CT component of the ^{18}F -DOPA PET/CT study (Fig. 1g). Increased uptake was also observed in the adjacent sphenoid bone (Fig. 1f), with CT evidence of lytic changes along the left greater sphenoid wing (Fig. 1h, *thin arrow*). This constellation of findings was consistent with skull base and CNS metastases from NB.

The patient was then treated with chemotherapy, and a post-contrast follow-up brain CT performed 4 weeks later

showed reduction in size of the brain lesion (Fig. 1i, *thick arrow*) with ex vacuo enlargement of the left temporal horn (Fig. 1i, *open arrow*).

Central nervous system (CNS) metastases in patients with NB are rare and usually result from the direct extension of skull or dural metastatic lesions [2]. At present, magnetic resonance imaging (MRI) and CT are the techniques of choice in the evaluation of CNS involvement, whereas nuclear medicine procedures, such as ^{123}I -meta-iodobenzylguanidine (MIBG) scan, have limited diagnostic value in detecting CNS lesions [3].

^{18}F -DOPA-PET/CT has been proved to be a very sensitive technique for assessing disease extent in patients with relapsed/refractory stage 4 NB [4–7]. Nevertheless, CNS lesions have never been reported.

This is the first description of a brain metastasis from NB diagnosed by ^{18}F -DOPA PET/CT. Our case highlights the potential of ^{18}F -DOPA PET/CT to delineate CNS involvement, and supports the growing evidence of its value in NB diagnosis, prognosis and surveillance [8, 9].

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Fig. 1 Diagnostic images of ^{18}F -DOPA PET MIP (a, b), PET components of ^{18}F -DOPA PET/CT (c, d), fused ^{18}F -DOPA PET/CT (e, f), plain CT components of ^{18}F -DOPA PET/CT (g, h) and post-contrast brain CT (i). ^{18}F -DOPA PET/CT was carried out 20 min after injection of 185 MBq of ^{18}F -DOPA. Data were acquired in three-dimensional mode

on a dedicated PET/CT system (Discovery ST, GE Medical Systems, Milwaukee, WI, USA) with a scanning time of 30 min. The patient fasted for 4 h before ^{18}F -DOPA PET/CT. Carbidopa premedication was not utilised

Conflict of Interest Arnoldo Piccardo, Giovanni Morana, Michela Massollo, Marco Pescetto, Massimo Conte and Alberto Garaventa declare that they have no conflict of interest.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from the legal guardians of the patient.

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