



[¹⁸F]mFBG long axial field of view PET-CT without general anaesthesia reveals concise extension of neuroblastoma in a 9-month-old boy

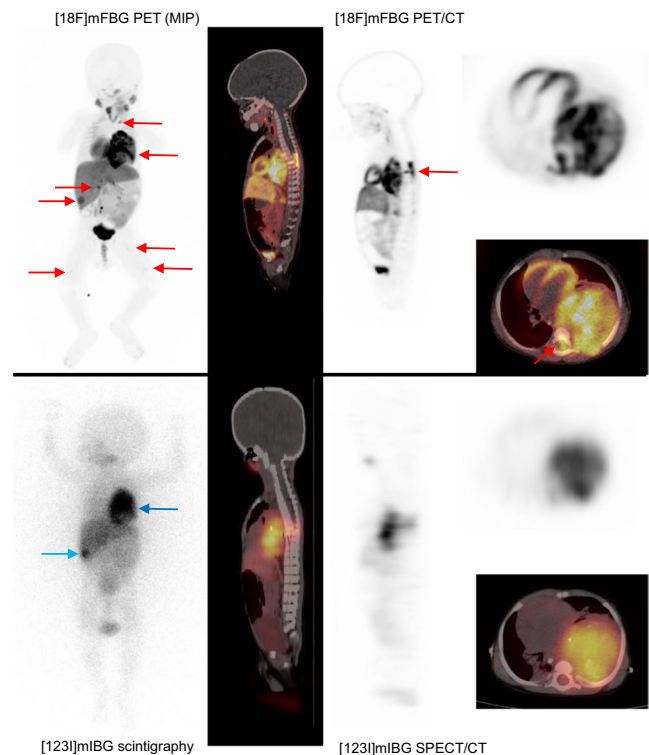
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A 9-month-old boy presented with severe acute respiratory compromise. A chest x-ray and CT demonstrated a large thoracic tumour, suspicious of neuroblastoma (NB) with liver metastases, subsequently biopsy-verified. Due to his respiratory status, he was not eligible for general anaesthesia (GA)/sedation. Hence, standard diagnostics with MRI and [¹²³I]mIBG-scintigraphy was not feasible [1]. Instead, the tumour extension was assessed with [¹⁸F]mFBG long axial field of view (LAFOV)-PET/CT (106 cm) without GA/sedation [2, 3], acquired 62 min p.i. of 30 MBq (3 MBq/kg) [4]. CT was performed as ultra-low-dose, followed by PET acquisition of 10 min in list mode, with only 2 min reconstruction required in order to provide a clinically useful image without motion artefacts. The scan showed [¹⁸F]mFBG uptake in a 9.5 × 7 × 7 cm tumour in the left hemithorax with intraspinal involvement between Th4 and Th8 (red arrows), a left-sided cervical lymph node (red arrow), several liver lesions (red arrows), and in the bone marrow (BM) of Th6 (red arrow) and bilateral femurs (red arrows). Chemotherapy was started immediately. Three days later, the patient was clinically stable, and as part of a prospective study comparing the two scans, [¹²³I]mIBG-scintigraphy-SPECT/LDCT could be performed, showing only a large thoracal tumour (blue arrow) and a single certain liver metastasis (blue arrow). The spinal involvement was unclear, and the BM involvement,

the cervical lymph node and several liver lesions could not be identified. The BM biopsy taken from the iliac crests was negative using standard staining, but a novel more sensitive GD2-antigen test (oncofoetal glycolipid antigen) verified bilateral BM involvement [5].

In conclusion, a fast [¹⁸F]mFBG-LAFOV-PET/CT without GA in a critically ill 9-month-old boy revealed a concise extension of neuroblastoma relevant for staging and treatment.



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Declarations

Ethical approval All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (H-21009982) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the prospective clinical study, including the patient presented in this case report. A separate written consent from the parents of the patient was obtained for publication of the case report.

Conflict of interest The authors declare no competing interests.

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References

1. Bar-Sever Z, Biassoni L, Shulkin B, Kong G, Hofman MS, Lopci E, Manea I, Kozirowski J, Castellani R, Boubaker A, Lambert B, Pfluger T, Nadel H, Sharp S, Giammarile F. Guidelines on nuclear medicine imaging in neuroblastoma. *Eur J Nucl Med Mol Imaging*. 2018;45(11):2009–24.
2. Pauwels E, Celen S, Vandamme M, Leysen W, Baete K, Bechter O, Bex M, Serdons K, Laere KV, Bormans G, Deroose GM. Improved resolution and sensitivity of [18F]MFBG PET compared with [123I]MIBG SPECT in a patient with a norepinephrine transporter-expressing tumour. *Eur J Nucl Med Mol Imaging*. 2021;48:313–5.
3. Samim A, Blom T, Poot AJ, Samim A, Blom T, Poot AJ, Windhorst AD, Fiocco M, Tolboom N, Braat AJAT, Viol SLM, Rooij RV, Noesel MM, Lam MCEH, Tytgat GAM, Keizer B. [18F]mFBG PET-CT for detection and localisation of neuroblastoma: a prospective pilot study. *Eur J Nucl Med Mol Imaging*. 2022. <https://doi.org/10.1007/s00259-022-06063-6>.
4. Pandit-Taskar N, Zanzonico P, Staton KD, Carrasquillo JA, Reidy-Lagunes D, Lyashchenko S, et al. Biodistribution and dosimetry of 18F-meta-fluorobenzylguanidine: a first-in-human PET/CT imaging study of patients with neuroendocrine malignancies. *J Nucl Med*. 2018;59:147–53.
5. Sabbih GO, Danquah MK. Neuroblastoma GD2 expression and computational analysis of aptamer-based bioaffinity targeting. *Int J Mol Sci*. 2021;22(16):9101.

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