

Prospective assessment of [¹¹C]MET PET-MRI performance to localize corticotroph pituitary microadenomas

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Introduction : Reliably identifying the localization of a corticotroph adenoma increases surgical outcome. Nevertheless, it remains challenging since pituitary MRI accuracy is around 75%. Retrospective studies suggested that functional imaging with [¹¹C]methionine ([¹¹C]MET) PET combined with MRI could improve localization of corticotroph microadenomas (1,2). The aim of this study was to prospectively assess the performance of [¹¹C]MET PET-MRI to localize pituitary ACTH-secreting microadenomas.

Material and methods : We included patients with biologically confirmed Cushing disease and typical microadenoma on MRI or petrosal sinus sampling indicative of corticotroph adenoma for which surgery was indicated. Patients were naive of pituitary targeted treatment or previous surgery. All patients underwent [¹¹C]MET PET-MRI (Biograph mMR Siemens). The gold standard was the anatomopathological analysis of the surgical specimen. PET and MRI were independently reviewed by 2 nuclear physicians and a radiologist blinded of clinical information. If adenoma was identified, its localization was classified as left, right or median.

Results : 30 patients were included (8 males and 22 females). The mean age was 40 years old (range, 20-68). Pathology confirmed pituitary adenomas in 28 patients (93.3%), localization was right for 12 (40%), left for 11 (36.7%) and median for 5 (16.7%). Adenoma was identified in 28 (93.3%) MRI and 27 (90%) PET. Pituitary localization in MRI and PET were respectively right for 11 (36.7%) vs 9 (30%), left for 12 (40%) vs 11 (36.7%) and median for 5 (16.7%) vs 7 (23.3%). MRI and PET sensitivities were 76.7% and 37.7% (p<0.05). Short-term follow-up revealed 86.7% surgical cure with low cortisol levels and normal cortisol function in 20 (66.7%) and 6 (20%) patients respectively and persistent disease in only 4 (13.3%).

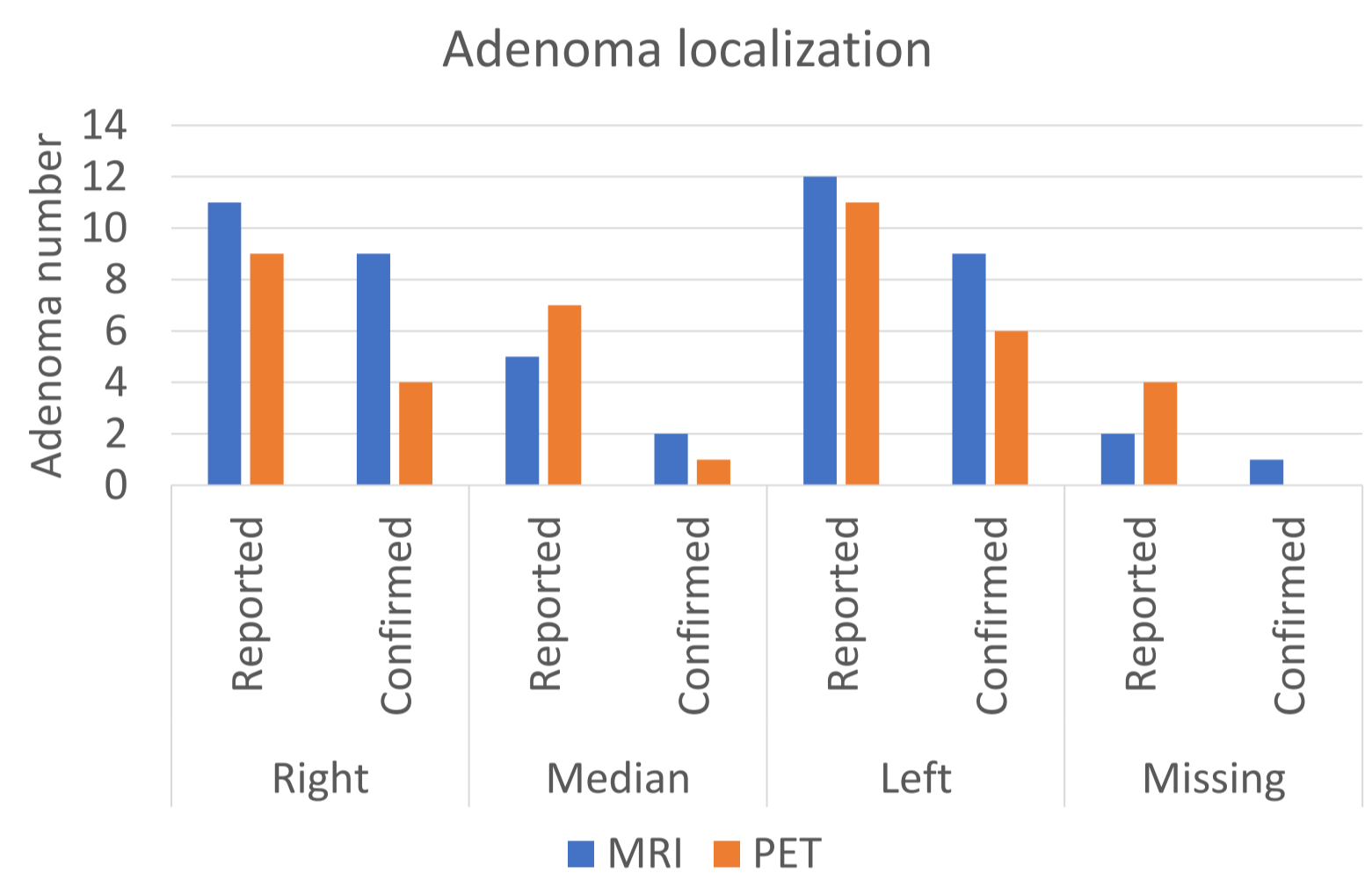


Figure 1 : Localization of micro-adenoma as reported using MRI or [¹¹C]MET PET and pathological confirmation

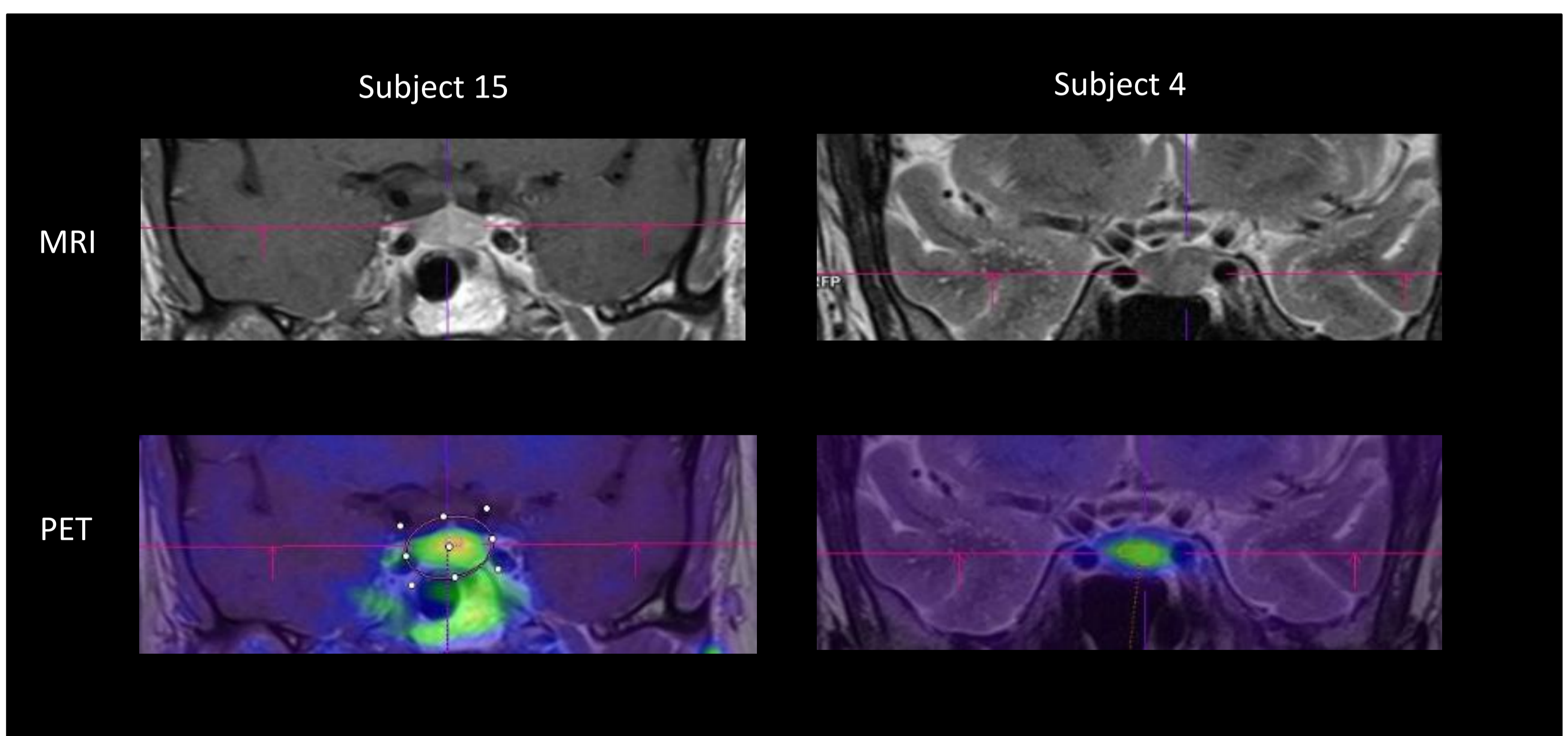


Figure 2 : MRI and [¹¹C]MET PET from subject 4 and 15. MRI and PET were concordant for subject 4 showing a left adenoma. MRI and PET were discordant for subject 15 : a left high focal uptake was seen on PET whereas MRI revealed a right adenoma, the latter was concordant with pathological finding.

Conclusion : Our result did not confirm the additional value of [¹¹C]MET PET to localize corticotroph adenoma. As suggested in Koulouri's study (2) additional post processing of [¹¹C]MET PET images may be necessary to improve the diagnostic performance of [¹¹C]MET PET-MRI, which in our experience was limited by the physiological uptake of the pituitary gland. Despite absence of formal preoperative image, surgical experience allowed a high cure rate in Cushing disease.

References :

- Ikeda H, Abe T, Watanabe K. Usefulness of composite methionine-positron emission tomography/3.0-tesla magnetic resonance imaging to detect the localization and extent of early-stage Cushing adenoma: Clinical article. *JNS*. 2010;112:750-755.
- Koulouri O, Steuwe A, Gillett D, et al. A role for 11C-methionine PET imaging in ACTH-dependent Cushing's syndrome. *European Journal of Endocrinology*. 2015;173:M107-M120.