Comparative analysis and experience of various amino acid PET tracers in a tertiary neurooncology centre – indications, patterns, advantages and pitfalls.

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Introduction

Molecular imaging has been increasingly used in supplementing MRI imaging, for there clinical management, hence PET provides understanding beyond MRI into the biology and treatment response of gliomas which may be used for non-invasive grading, differential diagnosis, delineation of tumor extent, surgical and radiotherapy treatment planning, post treatment surveillance, and prognostication.

Objectives

The major objectives of the study were :

1)To see the patterns of radiotracer uptake in brain tumours.

2) To compare the radiotracers to one another for pitfalls and advantages.

Materials and Methods

- ***169*** glioma patients were retrospectively analyzed.
- The main radiotracers used were: ***N13 ammonia, F18 choline, C11 methionine, F18 DOPA and F18 FET.***
- Each scan was assessed for recurrence/radiation necrosis by a trained nuclear medicine physician and a radiologist.
- We have correlated and standardized our findings with advanced MRI techniques and FDG pet which is standard of care in a neuro-oncology case

Results

N13 ammonia (3)

- Uptake is by passive diffusion, physiological distribution involved the grey matter, basal ganglia, dural venous sinuses, pituitary gland and lacrimal glands.
- 3 cases in our centre showed intense uptake in the recurrence concordant with MRI.
- Major pitfall was the intense background uptake, pituitary uptake and a short half life.

F18 Choline, C11 methionine (110)

- uptake by LAT1, physiological distribution cerebral cortex, vascular structures, basal ganglia, cerebellum, scalp and salivary glands (parotid gland), pituitary gland, pineal body, choroid plexus and bone marrow (temporo-mandibular joint and vertebral bodies).
- 110 cases showed increased uptake in the lesion.
- Pitfall was could not be used for pituitary and short half life.

F18 FET (56 cases)-currently in use

- Uptake by LAT 1, physiological distribution seen in vascular structures, basal ganglia, cerebellum, scalp, sinus mucosa, temporalis and pterygoid muscles, eyelids, optic nerve and optic chiasma, salivary glands, pineal body, choroid plexus and clivus bone marrow, extraocular muscles of the eye.
- 53/56 cases showed MRI concordant recurrence, and 3/56 showed discordant uptake.
- Advantageous as no pituitary uptake and longer half life.

Conclusion

The present analysis shows a trail of radiotracers that were used for neuro-oncology and left for specific reasons as mentioned above; hence emphasizes the evolution of radiotracers in oncology over time.

References

1)aw I, Albert NL, Arbizu J, Boellaard R, Drzezga A, Galldiks N, la Fougère C, Langen KJ, Lopci E, Lowe V, McConathy J, Quick HH, Sattler B, Schuster DM, Tonn JC, Weller M. Joint EANM/EANO/RANO practice guidelines/SNMMI procedure standards for imaging of gliomas using PET with radiolabelled amino acids and [^{18}F]FDG: version 1.0. Eur J Nucl Med Mol Imaging. 2019 Mar;46(3):540-557. doi: 10.1007/s00259-018-4207-9. Epub 2018 Dec 5.

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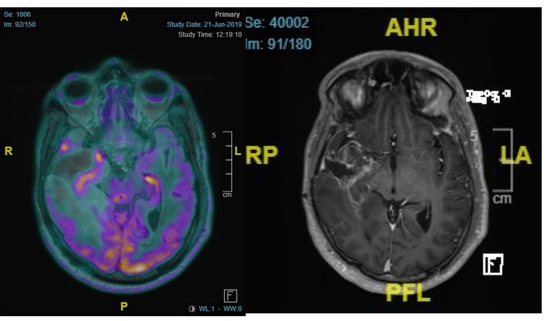

Fig 1: N13 ammonia PET showing increased radiotraceruptake in the periphery of the post-operative cavity, with CE-MRI showing in creased contrast .
Note: the increased background uptake of the radiotracer

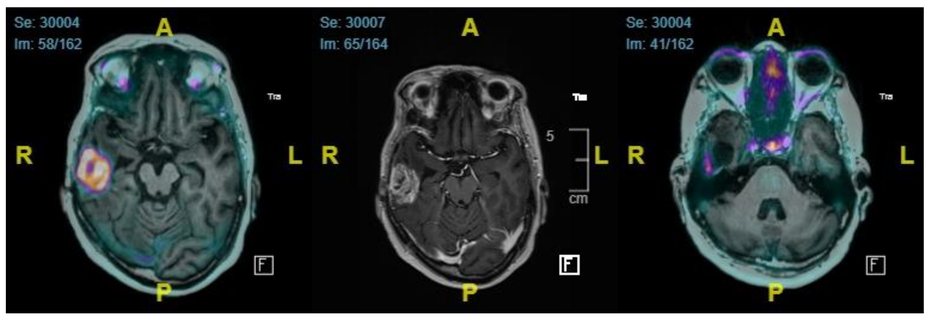

Fig 2: F18 Choline PET showing increased radiotracer uptake on PET, with corresponding increased in CE-MRI in middle figure.
Note: Increased Pituitary Uptake in the right figure.

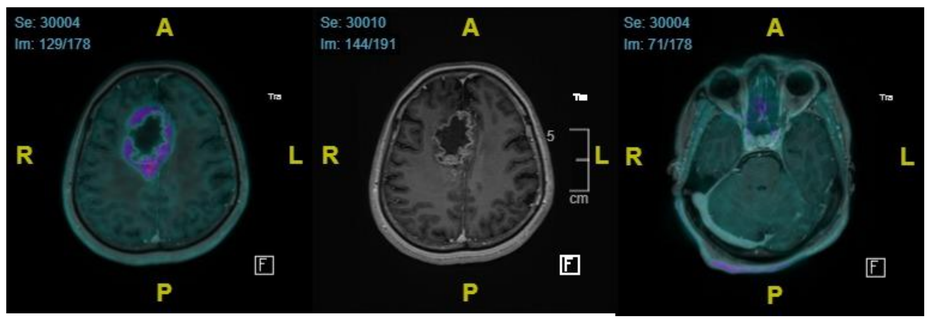

Fig 3: F18 FET PET showing increased radiotracer uptake on PET, with corresponding increased in CE-MRI in middle figure.
Note: Absent Pituitary Uptake in the right figure.