

ADVANCED MAGNETIC RESONANCE IMAGING AND THE CONTRIBUTION OF BRAIN SPECT IN THE DIFFERENTIAL DIAGNOSIS OF CEREBRAL TUMORS

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Purpose

The exciting new advances in MRI and Nuclear Medicine and the growing demands in Neuro-oncology make the need for diagnostic information combination evident. Under this perspective a protocol of pre-surgical brain tumor evaluation is applied in collaboration of the Medical Physics/Radiology/Neurosurgery/Nuclear Medicine departments of the University of Thessaly, which aims to correlate advanced MR techniques and Brain SPECT for the optimization of differential diagnosis.

Materials-Methods

22 patients (5 meningiomas, 9 high-grade gliomas, 3 metastases, 2 oligodendrogliomas, 1 neurocytoma, 1 lymphoma, 1 gliosarcoma) were included in the pre-surgical imaging protocol. Image fusion of the data derived from the advanced MRI techniques and brain SPECT was performed in Xeleris workstation (GE Healthcare).

MRI techniques

The study was performed on a 3-Tesla MRI whole body scanner (GE, Healthcare, Signa® HDx) using a standard birdcage phased-array head coil and on a Functional Imaging Scanner (GE, Infinia II gamma-camera). The MRI protocol included a standardized series of brain sequences as well as ¹HMRS, DWI, DTI and PWI.

Brain SPECT

The Brain SPECT was obtained 20–30 min after iv injection of 925 MBq (25 mCi) tracer activity. The radiopharmaceutical was prepared using Myoview™, (GE Healthcare Ltd) that was reconstituted with technetium-99m pertechnetate (^{99m}TcO₄⁻) sterile solution in the Department of Nuclear Medicine.

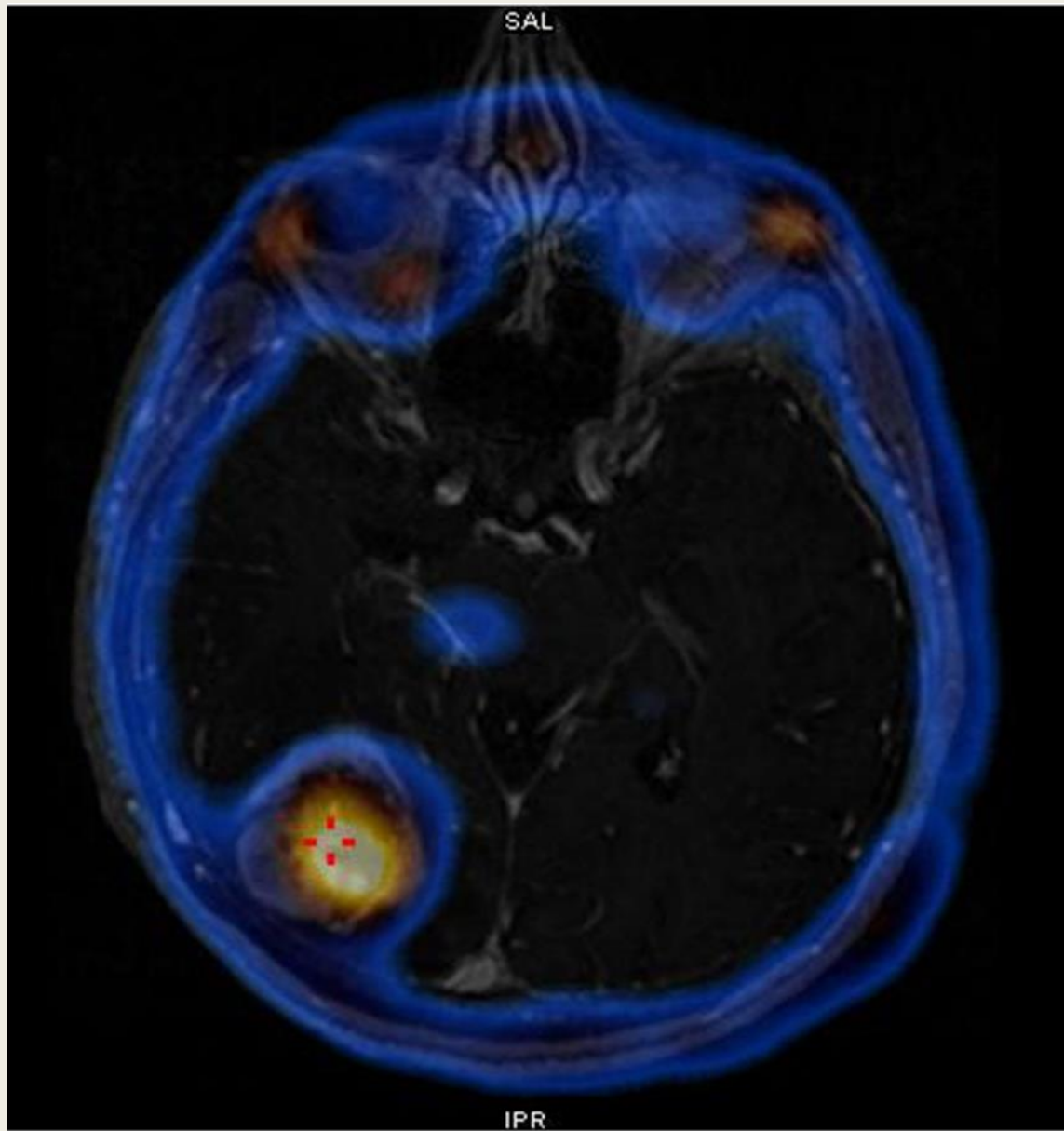


Image 1: Brain SPECT and MRI fusion image of gliosarcoma

Results

Our preliminary results show positive correlation between ^{99}Tc uptake and MR Spectroscopy and DSC MRI. Furthermore, brain SPECT gives additional diagnostic information and may help considerably in the differential diagnosis between metastases and gliomas as well as between atypical meningiomas and high-grade gliomas.

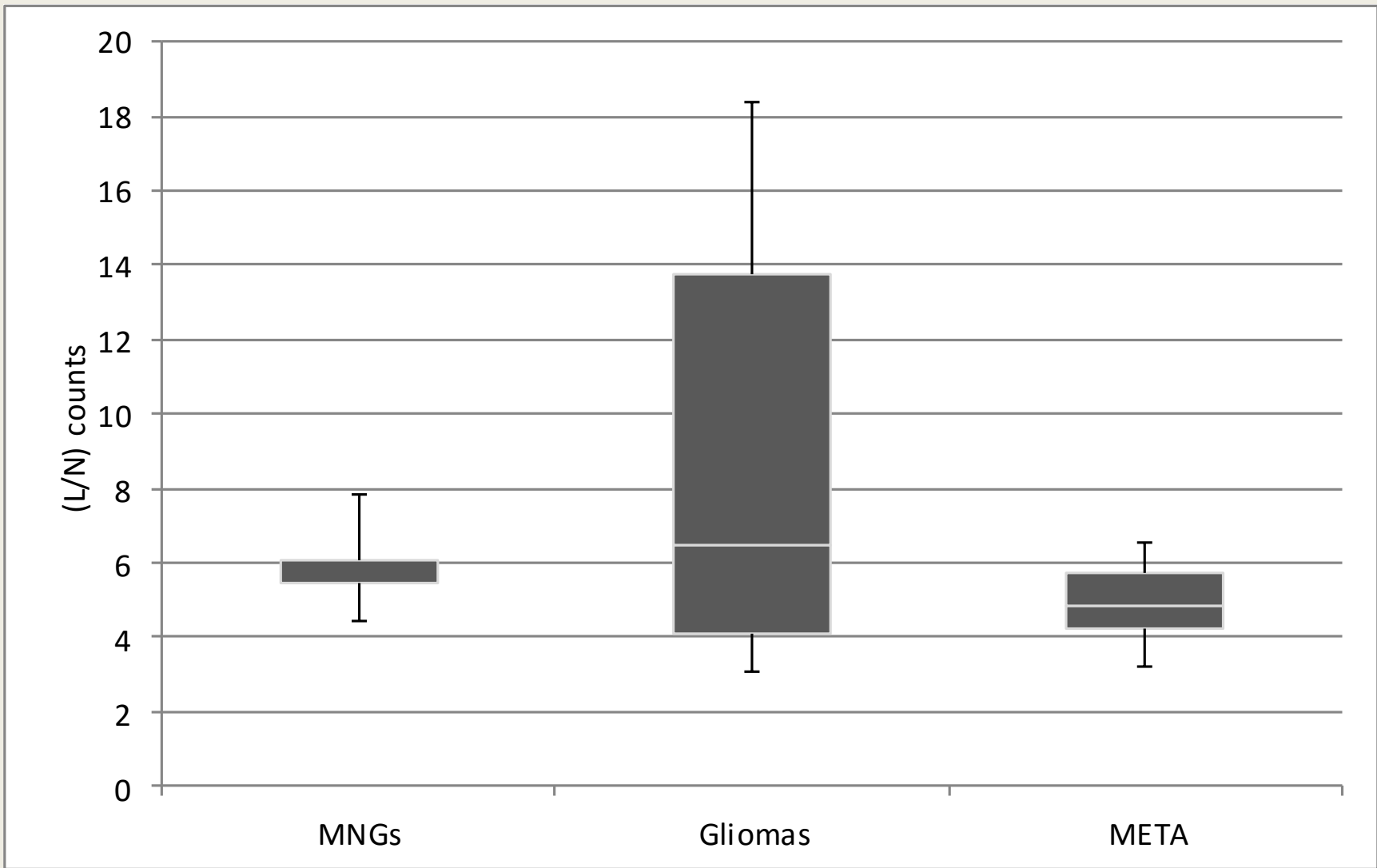


Figure 1: Lesion to normal brain average count ratios for meningiomas, gliomas and metastases

Conclusion

Image fusion of advanced MR techniques and brain SPECT using Tc-99 gives the opportunity of a more realistic approach and hence may optimize patient treatment.