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1041 Impact of Spectral Contamination and Anatomical Location on Diagnostic Accuracy of Single-Voxel Spectroscopy in Pre-Operative Glioma Characterisation

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Aim: Single-voxel spectroscopy (SVS) discriminates amongst brain tumours by measuring metabolite variations reflective of malignant transformation. However, spectral contamination may affect diagnostic accuracy, impacting radiological opinion of regions of interest (ROI) required to determine extent of surgical resection.

Method: A single-centre, retrospective, observational study, including 93 SVS meaningfully interpretable examinations between 2012 and 2018. Accuracy of lesion classification was assessed by comparison of histological diagnosis as reference standards against discrimination between entities and tumour grades by SVS, with consideration for voxel location, volume, and proximity to the calvaria or ventricular system. Quantification of metabolites was recorded as ratios, and visual inspection, qualitative and descriptive analysis were undertaken.

Results: SVS demonstrated high entity accuracy (100%) but lower grade accuracy (87%), ranging from periventricular (73%) vs non-periventricular (90%), and subcalvarial (86%) vs subcortical (88%) voxels. CSF contamination caused metabolite dilution and/or enhanced lactate signals from sub-arachnoid or ventricular CSF, especially in areas of increased brain-skull distance; lipid contamination from peri-calvarial fat and subcutaneous tissue resulted in enhanced lipid signals neighbouring areas of increased brain-scalp distance. Misclassified lesions were located regions of increased cranial concavity, reduced cerebral cortical thickness and inappropriate outer volume suppression (OVS). Voxel volume variation had no impact across cerebral coordinates (p=0.605), calvaria proximity (p=0.127) or ventricular proximity (p=0.367).

Conclusion: Spectral contamination significantly impacted grade accuracy, with metabolite dilution and enhance lactate and lipids signals leading to radiological under- and overestimation of glioma grade, respectively, thus indicating that avoidance of contaminating tissues and OVS are pivotal to adequate spectral quality for diagnostic accuracy.