Application Of Decision Tree For Differentiating High Grade From Low Grade Glioma Using Advanced 3T MRI.

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Purpose: To evaluate the use of diffusion-weighted, perfusion , chemical shift and DTI in an effort to develop a decision tree for classification of high grade gliomas (HGG) and low-grade gliomas (LGG).

Methodology: Seventeen patients underwent advance neuroimaging protocol at 3T MRI between 2014 and 2017. Eight histologically proven HGG and nine LGG underwent advance imaging at 3T . Mean ADC, rCBV, FA and signal loss ratio (SLR) were calculated .

Results: Mean tumour ADC ratio of HGG was significantly lower than LGG (1.21 Vs 2.02, p< 0.05). ROC analysis shows threshold ADC ratio of 1.44 (87%sensitivity ,88% specificity in determining HGG) .Mean tumour FA values of HGG were higher than LGG, the ratio to the NAWM was significantly different. (0.397 vs 0.187). With threshold FA ratio of 0.244, the sensitivity and specificity to determine HGG were 87% and 77% respectively. The mean rCBV tumour/NAMW ratio for HGG and LGG were significantly different (8.3 vs 1.57). A cut-off rCBV (tumour/NAWM) ratio of 2.08 provide 100% sensitivity and 88% specificity to determining HGG. The mean rCBV tumour/caudate ratio for HGG and LGG were significantly different (4.93 and 0.72).
The SLR (IOP sequence) at solid component for HGG was higher than LGG. Mean solid component SLR for HGG and LGG were 0.1 and 0.06 respectively (p : 0.013). A threshold SLR of 0.075 provide 75% sensitivity and 88% specificity to determining a HGG. Finally, a decision tree provides 100% accuracy to determine HGG using initial cut-off ADC ratio of 1.66 and completed by second cut-off rCBV ratio of 2.01.

CONCLUSION
Advanced MR imaging parameters improves diagnostic accuracy in grading gliomas. The combination of ADC and rCBV is most useful in differentiating HGG from LGG. Based on this we formulated a decision tree in differentiating these two entities.