

8<sup>th</sup> Global Experts Meeting on

## ADVANCES IN NEUROLOGY AND NEUROPSYCHIATRY

August 27-28, 2018 Tokyo, Japan

**The role of structural MRI and functional MRI in brain tumor characterization**

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**Purpose:** To evaluate the effectiveness of using functional MRI in differentiation of brain tumors, using Apparent Diffusion Coefficient (ADC) values.

**Material & Method:** 3T brain MR images were reviewed retrospectively in 66 patients with 73 brain tumors comprised of different types of malignant tumors. The MR protocol included T1w, T2w, T1w+C and DW-MRI was performed using single-shot Echoplanar (EPI) sequence with b gradient factor value of 0, 500 and 1000 s/mm<sup>2</sup> in the three orthogonal axes. Five Regions Of Interest (ROI) with volume of 5±1.5 mm<sup>3</sup> were placed on tumor areas and the minimum Apparent Diffusion Coefficient (ADC<sub>MIN</sub>) values were obtained, necrotic and vasogenic edema area and correlated with the histopathology results. ADC<sub>MIN</sub> values between Lymphoma vs. GBM, Atypical Meningioma vs. Meningioma, Lymphoma vs. Demyelination, GBM vs. metastatic tumor, Low Grade Glioma vs. High Grade Glioma, were compared using Mann-Whitney test. The ADC<sub>MIN</sub> values in different types of gliomas were assessed using Kruskal-Wallis test with pairwise multiple comparison.

**Results:** The mean ADC<sub>MIN</sub> is significantly lower in patients with Lymphoma (0.716x10<sup>-3</sup> mm<sup>2</sup>/sec) than GBM (1.052x10<sup>-3</sup> mm<sup>2</sup>/sec) (p=0.001); the mean ADC<sub>MIN</sub> of Atypical Meningioma (0.755x10<sup>-3</sup> mm<sup>2</sup>/sec) is significantly lower than Meningioma (1.114x10<sup>-3</sup> mm<sup>2</sup>/sec) (p=0.012); the mean ADC<sub>MIN</sub> of Lymphoma (0.716x10<sup>-3</sup> mm<sup>2</sup>/sec) is significantly lower than Demyelination (1.832x10<sup>-3</sup> mm<sup>2</sup>/sec) (p=0.057). The mean ADC<sub>MIN</sub> values between GBM (1.052x10<sup>-3</sup> mm<sup>2</sup>/sec) and metastatic tumor (0.8-1.1x10<sup>-3</sup> mm<sup>2</sup>/sec) were similar, which cannot be used to differentiated (p=0.910). Regarding gliomas, the mean ADC<sub>MIN</sub> of high grade gliomas (1.064x10<sup>-3</sup> mm<sup>2</sup>/sec) is significant lower than that of low grade gliomas (1.455x10<sup>-3</sup> mm<sup>2</sup>/sec) (p=0.001). The mean ADC<sub>MIN</sub> of necrotic tumors is 2.234mm<sup>2</sup>/sec and the mean ADC<sub>MIN</sub> vasogenic edema is 1.319 mm<sup>2</sup>/sec.

**Conclusion:** The ADC<sub>MIN</sub> values provide practical information which can be used for the differentiation of specific brain tumor histology as well as glioma types. DWI can improve imaging diagnosis in the clinical setting, compared to using structural MRI scans alone.

**Biography**

Yi Wah Eva Cheung has completed her MSc in Biomedical Engineering from Chinese University of Hong Kong and MSc in Medical Engineering and Physics from King's College London, UK. Currently, she is pursuing her PhD in University of Hong Kong. She is a Senior Clinical Associate in Tung Wah College, teaching BSc in Radiation Therapy at Tung Wah College, Hong Kong.

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