DIAGNOSTIC VALUE OF PERITUMORAL MINIMUM APPARENT DIFFUSION COEFFICIENT FOR DIFFERENTIATION BETWEEN GLIOBLASTOMA MULTIFORME AND SOLITARY METASTATIC LESIONS

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INTRODUCTION

Glioblastomas and metastasis are the most common brain tumors. Since each pathology has completely different means of clinical assessment as well as significantly varied therapeutic intervention, early diagnosis is crucial.

Both tumors have indistinguishable T1, T2, and FLAIR signals therefore process of identifying GBMs from brain metastases can be problematic, especially when a single brain lesion, suspected for a high-grade neoplasm, is discovered in a patient without a known original tumor. They are both surrounded by extensive peritumoral edema, where it is essentially vasogenic in metastatic tumors. However in GBM infiltrating neoplastic cells is reported. Therefore the key to distinguish between the two tumors lies in detecting the changes within the peritumoral edema. Differentiation between them is attempted through DWI. Several studies have shown that peritumoral ADC is useful for distinguishing between GBM and metastatic tumors.

AIM OF THE WORK

The aim of this work was to determine the diagnostic value of peritumoral minimum apparent diffusion coefficient for differentiation between glioblastoma multiform and solitary brain metastasis.

SUBJECTS AND METHODS

PATIENTS: Our study was conducted on 25 patients including 13 patients diagnosed with GBM and 12 patients diagnosed with brain metastasis.

METHODS:

I- Full history taking **II-** Thorough clinical examination. **III-** Imaging.

Conventional MRI**:**

Brain MRI was performed on a 3 T (Signa HDxt, General Electric, Milwaukee, USA) closed configuration whole body scanner using a standard quadrature head coil in the 25 patients.

-T1WI, T2WI, FLAIR, Post contrast T1, SWI, MRS, DWI and ADC maps

IV- Statistical analysis

RESULTS

The mean minimal ADC value in peritumoral edema of the GBM was significantly lower than that in the metastasis while the mean tumoral ADC values showed no significant difference between the two groups.

Table1: Comparison between the two studied groups according to ADC_{min} value

ADC_{min} value x 10-3 mm^2/s	GBM (n = 13)	Metastasis (n = 12)	p
Peritumoral (x 10^{-3} mm^2/s)			
Mean ± SD.	1.22 ±0.10	1.48 ±0.12	<0.001*
Tumoral (x 10^{-3} mm^2/s)			
Mean ± SD.	1.02 ±0.11	1.01 ±0.14	0.861

A cutoff value of 1.35 x10^{-3} mm^2/s for the peritumoral ADC_{min} generated the best combination of sensitivity 92.31 % and specificity 75%. With PPV.

Table 2: Prognostic performance for peritumoral ADC_{min} to discriminate GBM patients (n = 13) from metastasis patients (n = 12)

	AUC	P	95% C.I	Cut off	Sensitivity	Specificity	PPV	NPV
PeritumoralADC_{min} value x 10^{-3} mm^2/s	0.939	<0.001*	0.851 – 1.027	≤1.35	92.31	75.0	80.0	90.0

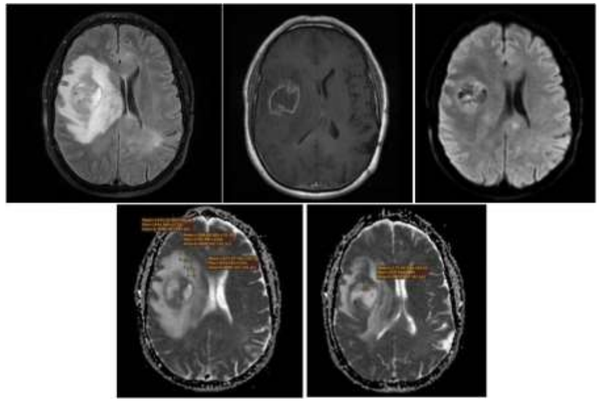

Figure: Case 1:A 56 years old male patient presented with a left sided weakness and headache

A well-defined right fronto-parietal hypointense lesion, shows heterogeneous hyperintenisty on Axial FLAIR (a), surrounded by moderate peritumoral edema. Axial T1 post contrast (b) show peripheral enhancement of the lesion. DWI / ADC maps (c,d,e) show heterogeneous restriction of the lesion. ROIs show regions of interest on the **ADC map** Measured ADC_{min} within peritumoral area was 1.568 × $10^{-3}$$mm^2/s$.

Provisional diagnosis: Metastatic versus GBM (equivocal)

Diagnosis according to the peritumoral ADC_{min} value: Metastasis

Histopathology: Metastatic rectal carcinoma

CONCLUSION

-ADC maps can be used to differentiate between GBM and solitary brain metastasis

-The use of the cut off value of1.35 x 10^{-3} mm^2/s for the lowest ADC can be confidentially used in differentiation between GBM and solitary brain metastasis