Diffusion tensor imaging may be useful to differentiate between intracranial dural metastases and meningiomas

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Background and Purpose: It is a diagnostic dilemma, to preoperatively differentiate between intracranial dural based metastases and meningiomas, on conventional MR images. The purpose of this study was to evaluate the utility of diffusion tensor imaging (DTI) with regard to this differentiation.

Method and materials: Retrospectively, 21 patients with histology confirmed meningiomas and 18 cases of intracranial dural based metastases were enrolled in this study. The studies had been done on a 1.5T GE scanner with pre-contrast DTI protocol that included TR/TE = 12000/101.7 ms, FOV = 24 x 24 cm^2. Matrix = 128 x 128, thickness = 3 mm and gap=0 mm using 25 noncollinear gradient directions with a *b*-value of 1000 sec/mm^2. Another 3 images were acquired without the use of a diffusion gradient (b = 0 sec/mm^2). The mean trace apparent diffusion coefficient (trace ADC), minimum ADC, mean fractional anisotropy (FA) and maximal FA were calculated for all lesions. For statistical evaluation we used Mann-Whitney U test and the receiver operating characteristic (ROC) analyses to determine the lesion separating threshold.

Results: The mean FA and maximal FA values of meningiomas (0.256±0.066 and 0.375±0.085, respectively) were significantly higher than for intracranial dural based metastases (0.126±0.024 and 0.161±0.036, respectively), $p<0.001$. There was no significant difference in mean ADC and minimal ADC values between these two types of tumors ($p>0.05$). The maximal FA showed a slightly higher sensitivity while the specificity was the same for both maximal FA and mean FA in distinguishing intracranial dural based metastases from meningiomas (Table 1).

Conclusions: The results suggest that mean and maximal FA values can be helpful adjuvant imaging parameters to differentiate between intracranial meningiomas and dural based metastases

Table 1: Statistical analysis of imaging parameters in differentiating between meningiomas and intracranial dural based metastases.

Index	meningiomas (Mean±SD)	intracranial dural metastases (Mean±SD)	*p* value of M-W Test	Area under curve	Cutoff value	Sensitivity	Specificity
Mean FA	0.256±0.066	0.126±0.024	$p<0.001$	0.94	0.157	0.96	0.889
Maximal FA	0.375±0.085	0.161±0.036	$p<0.001$	0.98	0.213	0.982	0.889
Mean ADC	0.836±0.024	0.992±0.283	0.133	0.343	0.825	0.509	0.333
Minimal ADC	0.722±0.123	0.78±0.23	0.874	0.483	0.714	0.526	0.444