

SQUAMOUS CELL CARCINOMA OF THE HEAD AND NECK: CAN DIFFUSION WEIGHTED IMAGING (DWI) PRE-TREATMENT AND DURING EARLY TREATMENT WITH CHEMORADIATION PREDICT THERAPEUTIC RESPONSE?

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Introduction: Diffusion-weighted imaging (DWI) is a MR technique that has been shown to be useful in the characterization of lesions. Despite DWI imaging in the head and neck region is challenging because of large susceptibility difference in the tissues, early reports have shown that it can be successfully employed in this region (1-5). The aim of the study was to determine if DWI performed pre-treatment and early during the course of chemoradiotherapy can be used to predict tumor response of head and neck squamous cell carcinoma (SCC).

Materials and Methods: Patients with newly diagnosed squamous cell carcinoma of the head and neck selected for chemoradiation, with a primary tumor or metastatic cervical lymph node underwent DWI on a 1.5 T whole-body MRI system. An ROI was drawn around the tumor on the apparent diffusion coefficient (ADC) map and ADC values were calculated for (a) the whole lesion and (b) a single slice which was selected because it contained the largest solid component, excluding any necrotic areas as judged from the T2 and T1 weighted post contrast MR images. The ADC values at (1) diagnosis and (2) change between diagnosis and two weeks after the start of treatment were correlated with tumor response. Tumor response was assessed 6 weeks after the end of treatment by MRI using tumor measurements expressed as a % change in tumor size and responders vs. non-responders. The presence of residual tumor, based on histology, endoscopy or serial increase in size on imaging, also was assessed during clinical and radiological follow-up. Statistical analysis was performed using simple and logistic regression and a p-value of < 0.05 was considered statistically significant.

Results: 31 patients (29 males, 2 females, mean age 56 range 43-73 years) underwent DWI. Patients were followed up for 2-39 months, mean 18 months. 9 patients were non responders based on change in size at 6 weeks and 6 patients were eventually proven to have residual disease at the site DWI. The pre-treatment mean ADC values of the whole lesion and single slice through the lesion were 1.16 (range 0.88-1.53) and 1.09 (range 0.77-1.51) $\times 10^{-3}$ mm²/sec respectively. The 2 week after the start of treatment mean ADC values of the whole lesion and single slice through the lesion were 1.46 (range 1.15-2.00) and 1.5 (range 0.54-1.86) $\times 10^{-3}$ mm²/sec respectively. The p values for correlation of ADC values and tumor response are shown in the Table 1.

Conclusion: ADC values from DWI of SCC decrease early in the course of treatment but the pre treatment ADC value and early change in ADC values does not predict tumor response.

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	Tumour Response		
	% reduction in size on MRI 6 weeks after the end of treatment	Responders vs non – responders based on size on MRI 6 weeks after the end of treatment	Residual disease proven during follow-up (histology, endoscopy or serial increase in size on imaging)
Pre treatment			
Whole lesion	0.13	0.12	0.10
Single slice through lesion	0.80	0.43	0.10
Change between pretreatment and 2 week ADC			
Whole lesion	0.38	0.19	0.07
Single slice through lesion	0.52	0.19	0.48

Table 1. P-values for correlation of ADC values and tumor response.