Extramural Depth of Tumor Invasion at Thin-Section MR in Rectal Cancer: associating with prognostic factors and ADC value

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Target audience: Radiologist; Colorectal Surgeon

Purpose: To assess the value of maximal extramural depth (EMD) of T3 tumor spread on MRI as a potential noninvasive imaging biomarker of tumor aggressiveness in rectal cancer, by analyzing the relationship between tumoral EMD values and clinical or histological prognostic parameters.In addition,we try to investigate the relationship between EMD and apparent diffusion coefficient (ADC) values.

Methods: Ninety rectal cancer patients who underwent primary MRI staging and diffusion weighted imaging (DWI) as T3 tumor were included. Tumor EMD was measured and the EMD values of the subgroups based on pretreatment CEA,CA19-9 levels, N stage and histological parameters were compared. The correlation between EMD and ADC values was compared.

Results: Tumor EMDs differ between CEA <5 ng/mL versus≥5 ng/mL(P=0.013), CA19-9<27U/mL versus≥27 U/mL(P=0.012) , the groups of cN0 versus cN+ cancers (P=0.049), and between the several groups of histological differentiation grades (P=0.033).There was no significant difference in EMDs between the various groups of vessel carcinoma embolus and neural invasion. A significant negative correlation (r=-0.581; P=0.001) between ADC and EMD values was found.

Discussion: In our study, pretreatment mean EMD was significantly higher for tumors with CEA≥5.2 ng/mL or CA199≥27U/mL and tumors with positive nodal disease. This is an interesting finding as it is proven that CEA≥5.2 ng/mL or CA199≥27U/mL, and positive lymph nodes are powerful predictors of a local recurrence and distant metastases. The presence of any correlation between EMD and CEA, CA19-9,or nodal status, therefore, suggests that EMD on itself correlates with prognosis.This is further supported by the finding that less well differentiated tumors would show relatively high EMDs;again suggesting that high EMD values are associated with an unfavorable tumor profile.Our findings also showed a significant correlation between the EMD and ADC values with higher EMD values associated with a lower ADC value. Previous studies have found that lower ADC correlated with cancers with poorer prognosis and ADC resulted in discovering an imaging biomarker of tumor biological profile. The presence of correlation between EMD and ADC, therefore, suggests that higher EMD on itself correlates with poorer prognosis.

Conclusion: Significant correlations were found between EMD values and CEA,CA19-9 level, differentiation grade and ADC value. As been found,higher EMD values were associated with a more aggressive tumor profile and therefore EMD has the potential to become an imaging biomarker of tumor aggressiveness indicator.