Can quantitative CT texture analysis differentiate fat poor renal angiomyolipoma from renal cell carcinoma on non-contrast enhanced computed tomography?

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Purpose:
To evaluate the accuracy of texture analysis to differentiate fat poor angiomyolipoma (fp-AML) from renal cell carcinoma (RCC) on non-contrast enhanced computed tomography (NECT).

Method:
In this REB-approved, retrospective case-control study, patient with AML and RCC were identified from the pathology database; 16 patients with fp-AML (no visible fat on NECT) and 68 patients with RCC were identified. Texture analysis was performed on axial NECT images for each renal lesion. The most discriminative features were used to generate a support vector machine (SVM) classifier. Diagnostic accuracy of textural features were assessed and 10-fold cross validation was performed. NECT for each patient was independently reviewed by two blinded abdominal radiologists who subjectively graded lesion heterogeneity on a 5-point scale.

Results:
Texture features related to lesion homogeneity and entropy were evaluated. There was lower lesion homogeneity and higher lesion entropy in RCCs, \( p < 0.0001 \) and \( p = 0.0001 \) respectively. A model incorporating several texture features resulted in an AUC of 0.87, and was able to correctly identify RCC with 79% sensitivity and 81% specificity. The average SVM accuracy of textural features ranged from 81-85% (post 10-fold cross validation). An optimal subjective heterogeneity rating of \( \geq 2 \) was identified as a predictor of RCC for both readers (sensitivity 47% and 56%; specificity 88% and 75%), with no difference in AUC between readers, \( p = 0.71 \). The textural-based classifiers were more accurate than both radiologists subjective heterogeneity ratings, with \( p<0.0001 \) and \( p=0.0001 \) for the model incorporating a subset of four different texture features.

Conclusion:
CT texture analysis may be useful for differentiating fp-AML from RCC at NECT.