Differentiating lipid poor adrenal adenomas and malignant adrenal neoplasms by combination of dynamic contrast enhanced T1 weighted 3-D gradient echo sequences and single shot T2WI :Prelimanary results

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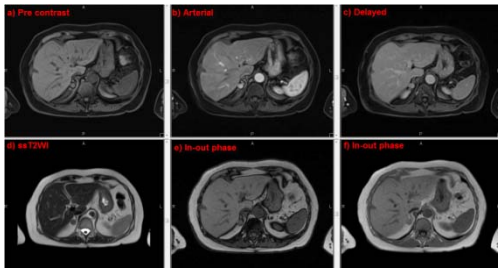
PURPOSE: To evaluate the utility of dynamic contrast enhanced MRI in combination with single shot T2-weighted (ssT2) sequences in the differentiation of lipid poor adrenal adenomas (AA) from malignant adrenal neoplasms (MA).

METHOD AND MATERIALS: Study IRB-approved, HIPPA compliant. Inclusion criteria selected 58 patients with MRI demonstrating a lipid-poor adrenal lesion with either i) 24 month stability on follow-up imaging or ii) surgical resection. All MR exams obtained with standard abdominal protocol, including dynamic multiphase gadolinium contrast-enhanced T1-weighted 3D gradient echo sequences and axial ssT2 images. All images were reviewed in blinded fashion by two radiologists with 13 and 5 years experience in abdominal MRI. Each adrenal lesion was categorized for i) pattern of arterial enhancement and ii) T2 signal. Adrenal lesions were categorized as AA if a) it demonstrated homogenous enhancement in arterial phase and washout on delayed phase, AND b) T2 signal isotense to normal adrenal gland. If both criteria were not met, the adrenal lesion was classified as potentially MA.

RESULTS: In 58 patients, there were total of 58 adrenal lesions. 19/58 (32.8%) were lipid-poor adrenal adenomas based on stability (n= 15) or surgical resection (n = 4), while 39/58 were malignant tumors based on interval growth (n=2) or surgical resection (n=37). Sensitivity of MRI for diagnosis of lipid-poor adrenal adenoma was 89.5% (17/19), specificity 94.9% (37/39), positive predictive value 89.5% (17/19) and negative predictive value 94.5% (37/39). 5.1% (2/39) of MA were incorrectly categorized as lipid-poor adrenal adenomas based on enhancement features and ssT2 signal; both lesions were pathology-proved metastatic HCC. 10.5% (2/19) of lipid poor adrenal adenomas were incorrectly categorized as non-adenomas based on abnormal dynamic enhancement features. 100% (19/19) of lipid poor adenomas demonstrated T2 signal isointense to normal adrenal gland.

CONCLUSION: Lipid poor AA may be distinguished from malignant adrenal lesions with high specificity through combined assessment of dynamic, postcontrast 3D T1W and ssT2 sequences. Excluding metastatic HCC, there is a 100% PPV for distinguishing lipid poor adrenal adenoma from MA.

CLINICAL RELEVANCE/APPLICATION: Single shot T2W images and dynamic post-contrast gadolinium enhanced MR are helpful tools in differentiating between lipid poor adrenal adenomas and malignant adrenal neoplasms.



LEGEND: Right adrenal adenoma- a & b) Avid homogenous arterial enhancement with washout on delayed phase c) is seen. Lesion is isointense on ssT2WI d) ; No lipid is shown on chemical shift imaging e& f)

REFERENCES: 1) Inan N, Arslan A, Akansel G, et al. Dynamic contrast enhanced MRI in the differential diagnosis of adrenal adenomas and malignant adrenal masses. Eur J Radiol 2008; 65:154-62.

2. Hönigschnabl S, Gallo S, Niederle B, et al. How accurate is MR imaging in characterisation of adrenal masses: update of a long-term study. Eur J Radiol 2002; 41:113–22.

3. Elsayes KM, Mukundan G, Narra VR, et al. Adrenal masses:MR imaging features with pathologic correlation.Radiographics 2004; 24.73–86.

4. Boland GW, Blake MA, Hahn PF, et al. Incidental adrenal lesions: principles, techniques, and algorithms for imaging characterization. Radiology 2008; 249:756–75.

5. Schindera ST, Soher BJ, Delong DM, et al. Effect of echo time pair selection on quantitative analysis for adrenal tumor characterization with in-phase and opposed-phase MR imaging: initial experience. Radiology 2008; 248:140–47.