Lipid-poor adrenal adenoma versus metastasis in lung cancer: Diagnosis by "comparative enhancement" at multiphasic MR imaging

Sir,

Lung cancer spreads frequently to the adrenal gland;[1,2] at this side, the prevalence of an incidental lesion ranges from 0.4%–5% of radiologic studies by computed tomography (CT) imaging.[3,4]

Although in the setting of oncologic patients, the term "incidentaloma" may not be appropriate, a tremendously discovered adrenal lesion by radiologic studies in the 20% of the cases is a probable metastasis.[4] The increase in the prevalence of incidentally adrenal masses is parallel to the ample use of imaging and represents a clinical problem;[5] in addition, the imaging procedures have a fundamental role to establish the nature of very unusual lesions in other sites.[6,7]

In daily clinical practice, in patients with lung cancer, the differentiation by imaging of a small (2–3 cm) incidental nonfunctioning adrenal nodule from metastasis is crucial in the treatment decision-making. Particularly, the main diagnostic challenge is to differentiate lipid-poor adenoma from metastasis.[8]

The abundance of lipids in the adrenal adenoma determines attenuation values of <10 HU and is suggestive of a benign adenoma at CT.[9] Conversely, in the lipid-poor adenomas (10%–40% of all adrenal adenomas),[10] similarly to the metastasis, the lipids are scarce, higher attenuation values are revealed at CT and may be indistinguishable from malignancy.[11] Calculation of contrast washout rate by CT allows the diagnosis of lipid-poor adenoma; however, this methodology is not always possible: many CT examinations do not undergo unenhanced or delayed (15 min) contrast-enhanced CT.

Magnetic resonance (MR) imaging is equivalent to CT for characterizing adenomas measuring 20 HU or less. MR imaging is less sensitive than CT for lipid-poor adenomas measuring > 20 HU.[12] The accuracy of the MR imaging in diagnosis of lipid-poor cortical adrenal adenoma is of 91.3%–93.5%.[13] On diffusion-weighted MR imaging, the adenomas similarly to the adrenal metastasis demonstrate restricted diffusion.[14]

Incidental non-functioning adenoma is a circumscribed expansile of the adrenal cortex with a similar structure to that of normal tissue of the adrenal cortical gland in terms of vascularization and amount of lipid droplets (lipid-rich and lipid-poor).[15]

Based on this histopathologic data, we believe that the "comparative enhancement" at multiphasic MR imaging can be a reliable method to determine the vascularization of the normal adrenal cortex and to distinguish lipid-poor adenoma from metastasis when a nodule is revealed in patients with lung cancer.

Comparative enhancement represents an innovative approach for the quali-quantitative assessment of the vascularization of the normal adrenal cortex contralaterally or ipsilaterally to the adrenal cortical nodule. The quantitative analysis of enhancement is performed positioning a circular region-of-interest into a magnified image of adrenal gland (contralaterally or ipsilaterally to the adrenal nodule) and into a homogeneous area of the adrenal nodule on unenhanced and in post-contrast arterial, venous and delayed (5 min) phase MR imaging. Time-signal intensity curve (TIC) from multiphasic MR imaging for normal adrenal gland and adrenal lesion is determined, and the patterns of TIC

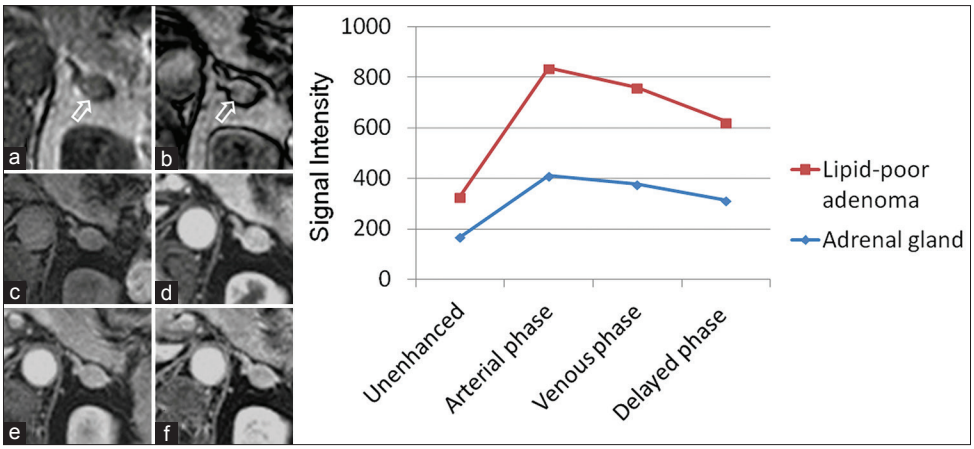

Figure 1: Lipid-poor adenoma in a 64-year-old female with lung cancer. Chemical shift axial in-phase magnetic resonance image (a) shows left adrenal nodule (arrow) and axial opposed-phase magnetic resonance image, (b) does not show signal-dropped area within the lesion (arrow). On axial T1-THRIVE unenhanced (c) and contrast enhanced in arterial (d), venous (e), and delayed (f) phase magnetic resonance images, the nodule shows a maximum peak in the arterial phase followed by a decline with a time-signal intensity curve profile similar to that of adrenal gland

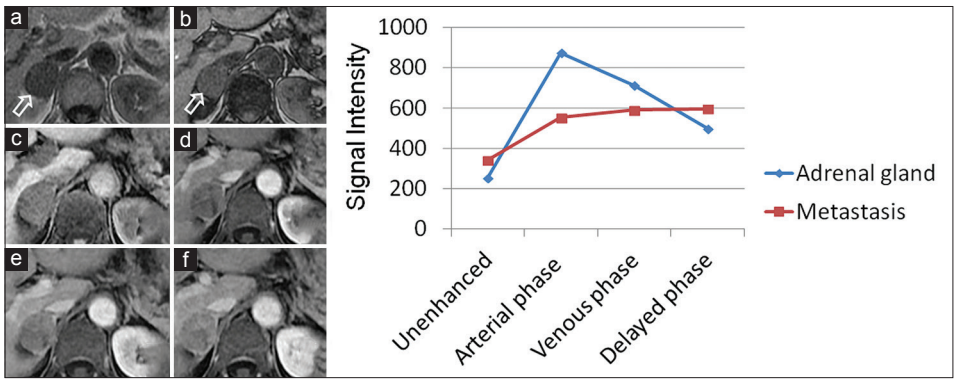

Figure 2: Metastasis in a 71-year-old female with lung cancer. Chemical shift axial in-phase magnetic resonance image (a) shows right adrenal nodule (arrow), and axial opposed-phase magnetic resonance image (b) does not show signal-dropped area within the lesion (arrow). On axial T1-THRIVE unenhanced (c) and contrast enhanced in arterial (d), venous (e), and delayed (f) phase magnetic resonance images, the nodule shows a progressive and persistent time signal intensity curve profile that was different from that of adrenal gland

for normal adrenal gland and adrenal cortical nodule are compared.

We retrospectively analyzed the multiphasic MR imaging at 1.5 T and 3 T of 24 patients with nonenlarged, normal adrenal gland and of 17 patients with lung cancer in which a small(≤3cm) incidentaloma (lipid-poor adenoma [n = 8] and metastases [n = 9]) was detected and confirmed by histology or follow-up imaging. Our preliminary results demonstrated that normal adrenal gland contralaterally or ipsilaterally to the adrenal cortical nodule exhibits similar profile of TIC in comparison to lipid-poor adenoma (TIC with a maximum peak in arterial phase followed by a decline) [Figure 1] and different to progressive and persistent TIC of metastasis [Figure 2].

Our preliminary results demonstrate that in clinical practice, comparative enhancement is a reliable and effective tool for differentiating lipid-poor adenoma from metastasis in patients with lung cancer.

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Conflicts of interest
There are no conflicts of interest.

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