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Adrenal Masses in Lung Cancer: Sonographic Diagnosis and Follow-up

Christian Goerg, Wolf B. Schwerk, Martin Wolf and Klaus Havemann

Ultrasound has become an important diagnostic modality in the staging of patients with lung cancer. Between 1980 and 1990, 410 patients with histologically proved lung cancer were evaluated. In 44 patients (11%) an adrenal mass was discovered on ultrasound; in 13 patients it was isolated, and in 31 further evidence of abdominal disease was shown. Sonographic follow-up examinations of adrenal masses showed changes of size in all but 2 patients, and were therefore found to be adrenal metastases. In the 2 patients with isolated and stable adrenal disease, fine-needle biopsy revealed adenomas. Adrenal masses in patients with lung cancer are more likely to be metastatic than benign. The existence of neoplastic adrenal disease can be retrospectively confirmed by changes of size during sonographic follow-up examinations in almost all patients. Histologically verification would only appear necessary in stable adrenal disease and in cases with isolated adrenal disease in which prompt diagnosis affects treatment decision.
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INTRODUCTION

THE ADRENAL glands are the most common site of extranodal spread from primary lung cancer. Lung tumour metastases may involve adrenal glands when other metastases are absent. Autopsy series have shown common occurrence of metastases to the adrenal gland in patient with bronchogenic carcinoma, ranging from 35–38% [1, 2]. However, these patients had late or disseminated disease.

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With the increasing use of ultrasound and computed tomography for staging of bronchogenic carcinoma, many adrenal masses are now being detected. Benign clinically apparent adenomas of the adrenal are quite common with a prevalence from autopsy series ranging from 1.4–8.7% [3, 4].

When an adrenal mass is found in the staging of patients with bronchogenic carcinoma, the question arises whether it is an adrenal metastasis or a benign adenoma. This study has two goals: the first was to define the incidence of adrenal masses found by sonographic staging examination in patients with lung cancer, and the second to evaluate the utility of sonographic follow-up examinations and percutaneous ultrasound-guided fine-needle biopsy in diagnosing diseases in adrenal tissue.

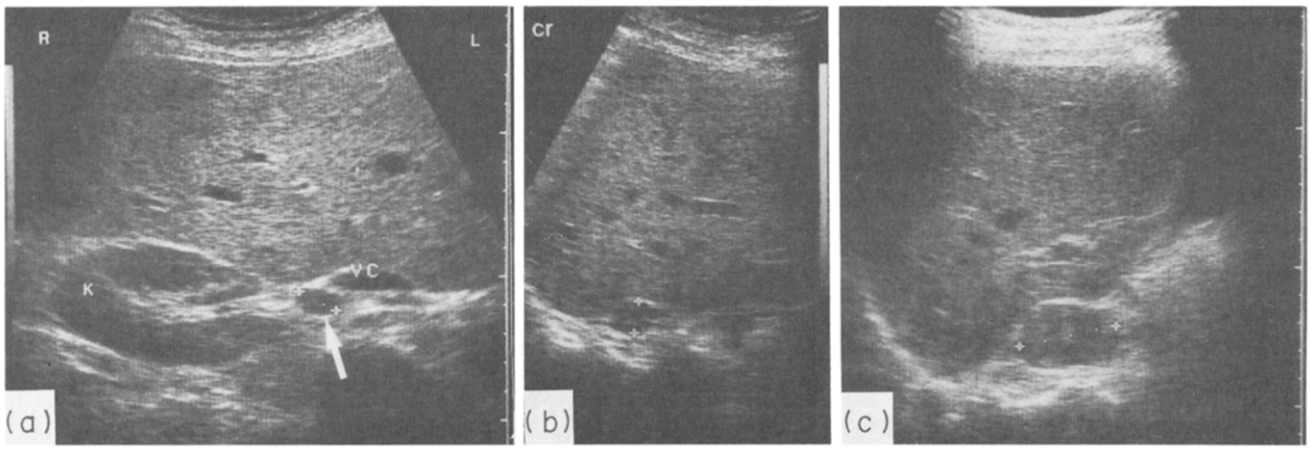

Fig. 1. Subcostal (a) and intercostal (b) sonogram in a patient with lung cancer shows a small round, hypoechoic, isolated adrenal lesion at initial presentation (arrow). Follow-up examination 5 weeks later (c) revealed tumour progression. k = kidney, vc = vena cava.

MATERIALS AND METHODS

From January 1980 to December 1990, 410 patients with lung cancer underwent routine abdominal ultrasound examination as a part of initial staging. Histological proof of the primary tumour was obtained in all cases by bronchoscopy, mediastinoscopy or surgery. In 44 patients (11%) an adrenal mass was discovered on ultrasound.

Sonographic examination was performed using an electronic real-time scanner with 3.5-MHz and 5-MHz linear and curved-array transducer (LSC 7000, Picker; Sonoline 8000, Siemens).

Size, structure and reflectivity of all adrenal lesions were assessed. Abnormal gland size was calculated by measuring the largest diameter of the mass. Lesion shape was noted as round, ovoid, or irregular.

Ultrasound guided fine-needle biopsy of the adrenal tumours was performed with a 18–20 gauge needle. Puncture of right adrenal masses was performed either from the lateral approach through intercostal spaces or from an anterior approach. Either way, the liver was often crossed, while the right kidney was carefully avoided via a transhepatic approach. Biopsy of the left adrenal gland was via anterior or posterior approach to avoid crossing the kidney or the spleen, as described by Montali *et al.* [5]. Sonographic follow-up examinations were performed in all patients every 4 weeks between 2 and 12 months.

RESULTS

44 patients aged between 40 and 81 years with histologically confirmed lung cancer exhibited adrenal masses. 39 patients were male and 5 female. 13 demonstrated isolated adrenal masses without further evidence of disease in the abdomen. The others had extensive disease with diffuse metastasation.

Six masses were 2 cm or less (Fig. 1), 18 were between 2 and 4 cm in diameter, while 20 measured over 4 cm (Fig. 2). 12 patients had bilateral lesions (Fig. 3). Echocharacteristics of adrenal lesion which includes structure (36 ovoid vs. 8 round) and reflectivity (42 hypoechoic vs. 2 hyperechoic, 42 homogeneous vs. 2 heterogeneous) were not helpful in predicting malignancy vs. benignancy.

42 adrenal masses (95%) (11 isolated, 31 with further evidence of abdominal disease) proved to represent malignant adrenal metastases, confirmed by progression (n = 36) (Figs 2, 4, 5) or regression (n = 6) (Fig. 6) during sonographic follow-up examinations. In 9 cases with isolated adrenal disease on abdominal ultrasound further staging procedures revealed extensive disease for cerebral metastases and/or bone marrow infiltration. Eight lesions were proved by ultrasound guided fine-needle biopsy. Two of these follow-up examinations revealed no change in size of adrenal lesions and histological proof showed benign adenomas. The other six fine-needle biopsies confirmed malignant disease of the adrenal glands.

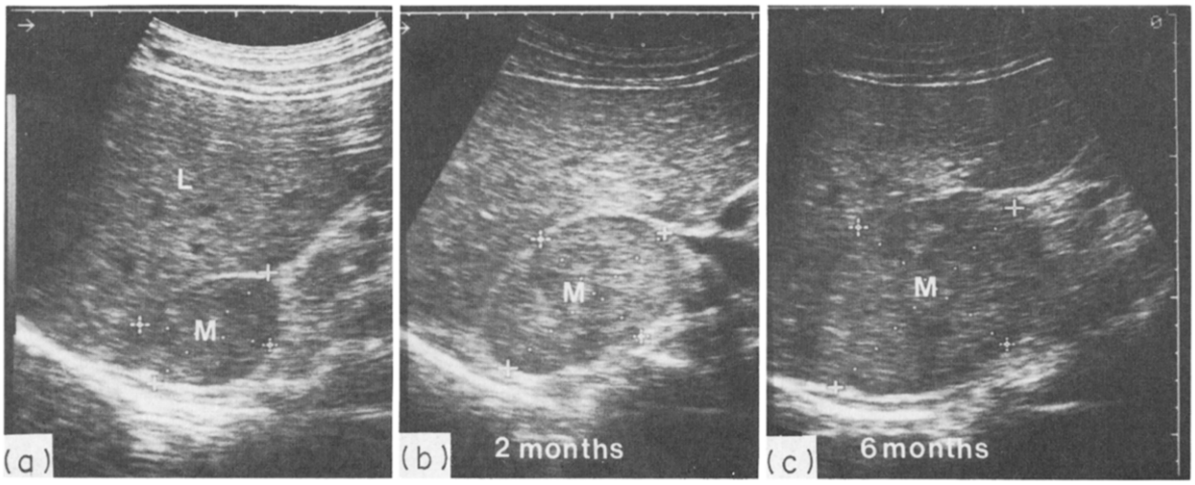

Fig. 2. Initial intercostal sonogram (a) in a patient with lung cancer shows large predominantly round, homogeneous, hypoechoic adrenal tumour. Follow-up examination 2 (b) and 6 months (c) later revealed tumour progression. m = metastasis, l = liver.

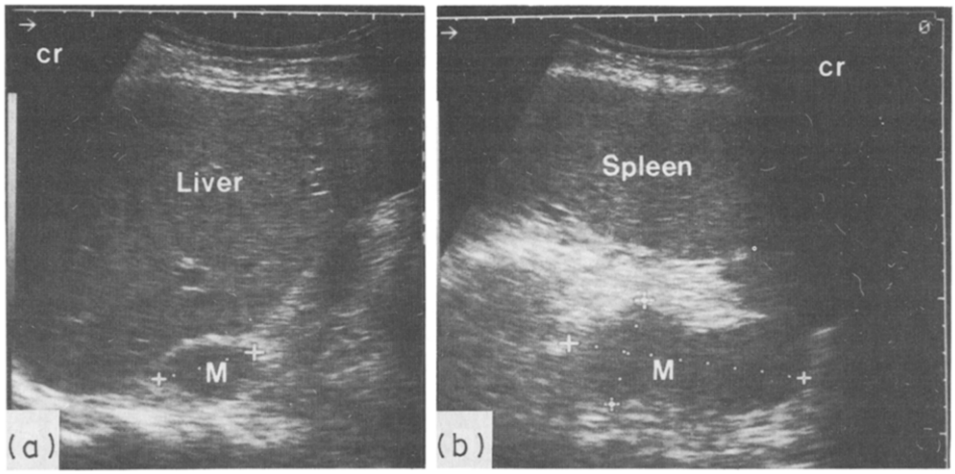

Fig. 3. Sonogram in a patient with lung cancer shows predominantly round tumour of the right (a) and irregular delineated mass of the left adrenal gland (b). m = metastasis.

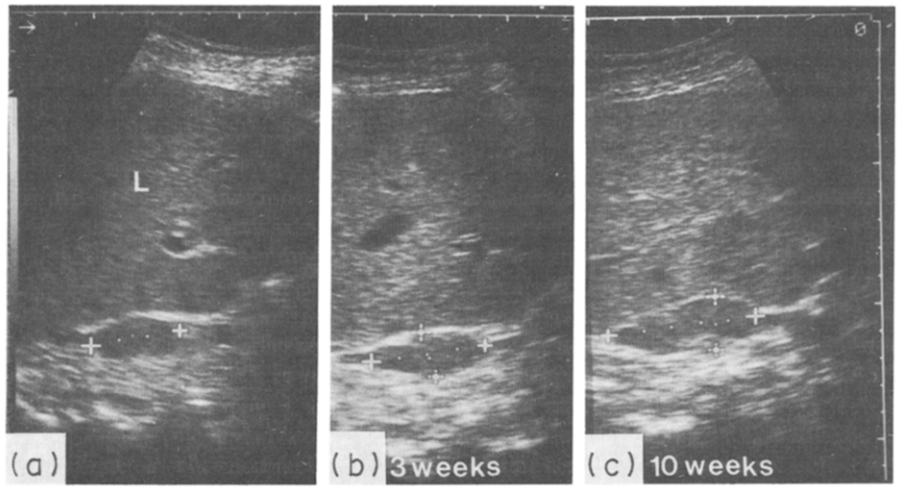

Fig. 4. Initial intercostal sonogram (a) in a patient with lung cancer shows isolated, small ovoid, homogeneous, hypoechoic adrenal lesions. 3 (b) and 10 weeks later (c) increase of size could be demonstrated. l = liver.

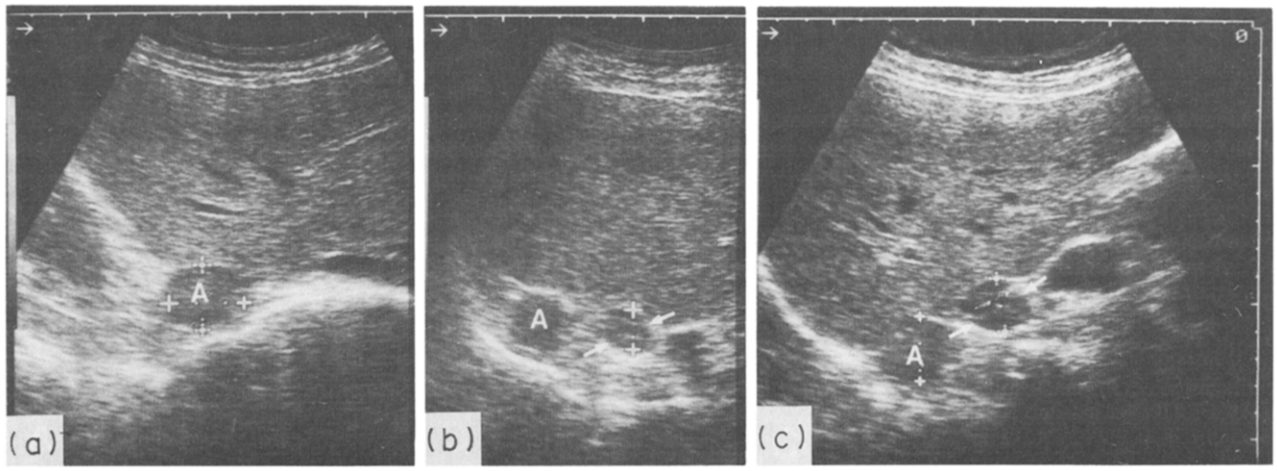

Fig. 5. Sonograms in a patient with lung cancer. (a) Before diagnosis of bronchogenic carcinoma adrenal lesion was found constant in size and therefore found to be an adenoma (A). (b) On diagnosis of bronchogenic carcinoma additionally lesion (arrow) was found. (c) Follow-up examination revealed increase of size and lesion was therefore found to be malignant.

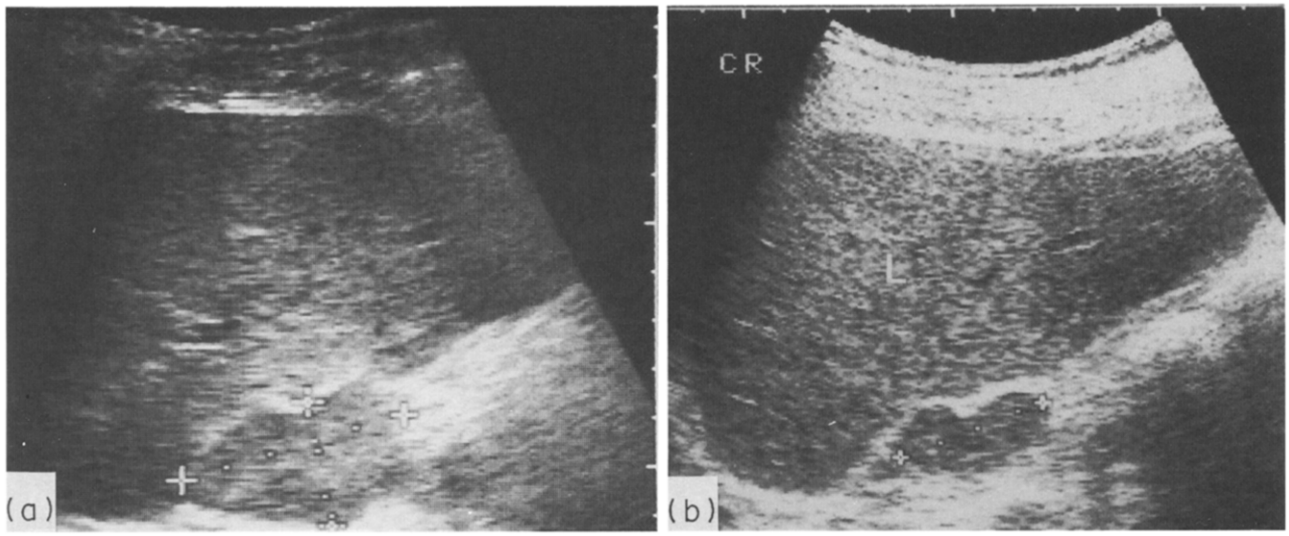

Fig. 6. Initial sonogram (a) in a patient with lung cancer shows irregular delineated adrenal lesion. Follow-up examination after the first cycle of chemotherapy (b) revealed tumour regression. l = liver.

DISCUSSION

Lung cancer remains the number one cause of death from cancer in men and is becoming increasingly more common in women. Whereas therapeutic success may be achieved at limited tumour stages [6, 7], the treatment of metastatic disease is one of the most frustrating areas in oncology. In particular, it seems almost impossible to demonstrate sufficient therapeutic benefits in patients with abdominal metastases [8]. Approximately 10% of all patients with lung cancer demonstrate adrenal metastases on diagnosis [9], but in autopsy series, a higher incidence of metastases to the adrenal glands has been found [1, 2].

Obviously, the concept of limited vs. extended forms of the disease, especially in small cell lung cancer, is artificial and results of staging depend heavily on our capability to detect metastases.

Since the development of real-time ultrasound and computed tomography, visualisation of adrenal lesions has considerably improved. In recent series ultrasound had a specifity of 80–95%, and a sensitivity of 75–90% in detection of adrenal masses and an overall accuracy of 70–90% [10–12]. Since lung carcinoma patients do not have surgical biopsy of their adrenal glands for staging purposes, the ultimate proof of the accuracy of ultrasound in diagnosing adrenal metastases has been lacking.

In patients with cancer, sonographic diagnosis of adrenal masses poses a problem: isolated adrenal masses in lung cancer cannot be assumed to represent metastasis, because 2–9% of the general population has been shown to harbour benign adenomas [4, 13–15]. Structure and echocharacteristics of adrenal masses are of no value in differentiating benign from malignant lesions at initial presentation. In a study of isolated adrenal masses in non small-cell lung cancer, only 25% were metastases [16]. The researchers concluded that an isolated adrenal mass is more likely benign than metastatic, and biopsy is advocated prior to withholding surgery [16]. On the other hand, bilateral or non-isolated adrenal masses in patients with lung cancer may be regarded as neoplastic with a high degree of certainty. The existence of neoplastic deposits on the adrenal glands could be retrospectively confirmed in our patients by the change of size under sonographic follow-up examination. In our experience, only size change on follow-up can be used as an alternative to histological proof in these patients. Thus, as a rule, verification by means of sonographically guided fine-needle biopsy would not appear necessary, and should only be performed in cases in which prompt diagnosis affects treatment decision.

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