

A Minute Small-Cell Lung Cancer Showing a Latent Phase Early in Growth

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A minute small-cell lung cancer measuring 8×5 mm was detected and serially imaged by computed tomography for about a year preceding resection. Although this solid nodule showed a short overall doubling time (76 days), the growth curve included an early phase without apparent growth prior to the phase of rapid growth. Accordingly, lung cancer cannot be ruled out when a small nodule (<10 mm) does not enlarge in the first several months of computed tomographic follow-up. (Ann Thorac Cardiovasc Surg 2007; 13: 254–257)

Key words: computed tomography, growth curve, imaging, lobectomy, small-cell lung cancer

Introduction

Since small-cell lung cancers (SCLCs) usually grow very rapidly, most patients are in advanced stages at the time of diagnosis.¹⁾ Recently, however, we encountered a rare minute peripheral SCLC of the chest that we monitored by computed tomography (CT) for about a year. We report the radiographic appearance and a nonuniform growth rate of this very early SCLC.

Case Report

A 75-year-old man undergoing follow-up evaluation during treatment for prostatic hypertrophy as an outpatient showed a small solid left upper lobe lung nodule measuring 8×5 mm according to high-resolution CT (HRCT; Fig. 1A). The patient had quit smoking 5 years previously after having smoked 40 cigarettes daily for 50 years. The nodule was homogenous in density, with a well-defined margin lacking indentations, spicules, or lobulation. Be-

cause the patient declined to undergo excisional biopsy using video-assisted thoracoscopic surgery (VATS), the lesion was monitored by HRCT. Compared to the nodules, initial CT measurements (CT on days 85 and 161 of the follow-up period) showed the nodule as slightly smaller (7×4 mm). Later, on day 328, CT showed the lesion to be much larger (18×12 mm; Fig. 1, B to D). No lymph node or distant metastases were detected by total-body imaging, including fluorodeoxyglucose positron emission tomography (Fig. 2). An examination of a transbronchial biopsy specimen led to a definitive diagnosis of SCLC. A left upper lobectomy with lymph node dissection was performed on day 381. The pathological diagnosis of the resected tumor was SCLC at pathological stage IA (Fig. 3, A and B). The overall tumor growth curve was exponential, with an initial latent phase followed by a phase of rapid growth (Fig. 4). The calculated tumor-doubling time (TDT)²⁾ was 76 days.

Comment

Screening by chest CT using current technology frequently detects small lung nodules with diameters below 10 mm. In addition to SCLCs, small solid nodules may represent peripherally located lymph nodes, tuberculous granulomas, benign tumors, squamous cell carcinomas, poorly differentiated adenocarcinomas, or metastatic lung tumors. On the other hand, nodules showing “ground glass” opacity include focal inflammation, atypical adenomatous

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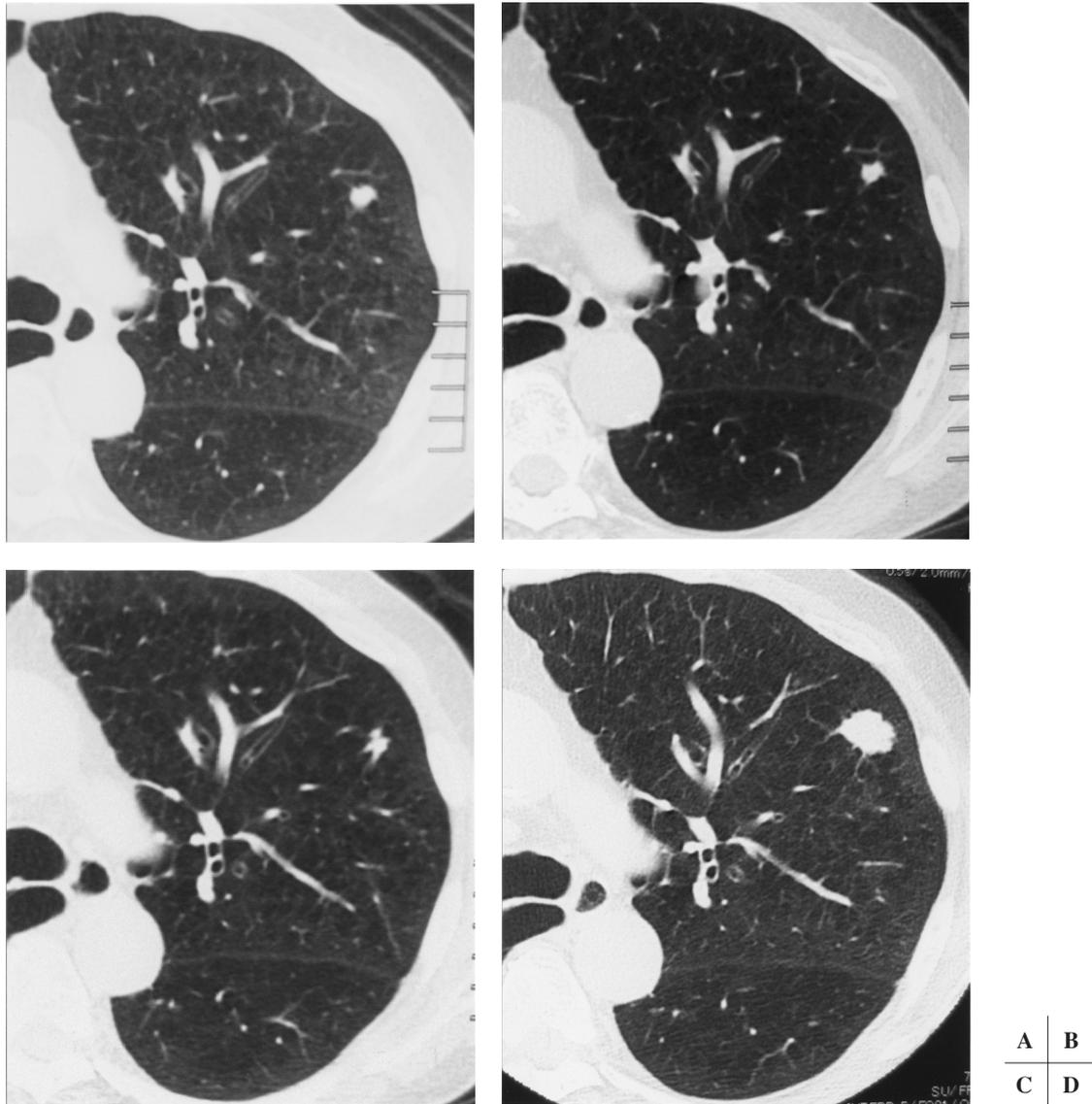


Fig. 1. Findings obtained by high-resolution chest computed tomography (HRCT) on days 0 (A), 85 (B), 161 (C), and 328 (D) after initiating follow-up. The 8×5 mm nodule in the left upper lobe did not enlarge for about 5 months. Growth was first detected on day 328.

hyperplasia, and bronchioloalveolar carcinoma.³⁾

A differentiation of small solid nodules by CT findings alone is difficult, since these lesions lack specific radiographic features.⁴⁾ Although percutaneous needle biopsy or wedge resection by VATS might permit definitive diagnosis, the most common initial strategy is to monitor nodule size by CT. Among lung cancers, SCLCs generally grow more rapidly than most other histological types. In a study of 237 patients with lung cancer, mean TDTs were 86 days for SCLC, 222 for adenocarcinoma,

115 for squamous cell carcinoma, and 68 for large-cell carcinoma.⁵⁾ TDT has been closely linked with prognosis in lung cancer.^{6,7)} Based on the tumor growth curve in our patient, we suspect that some lung cancers, including SCLCs, can grow remarkably slowly until reaching 10 mm in size. Besides characteristic exponential cell proliferation, cell-cycle acceleration reflecting an accumulation of genetic aberrations in tumor cells may explain sudden rapid growth after a latent phase. We believe that a routine CT follow-up for small lung nodules (<10 mm)



Fig. 2. Fluorodeoxyglucose positron emission tomography (FDG-PET) before surgery showed an intense accumulation of glucose in the left upper lobe, suggesting the lesion to be a rapidly growing tumor at that time. No lymph node or distant metastases were found.

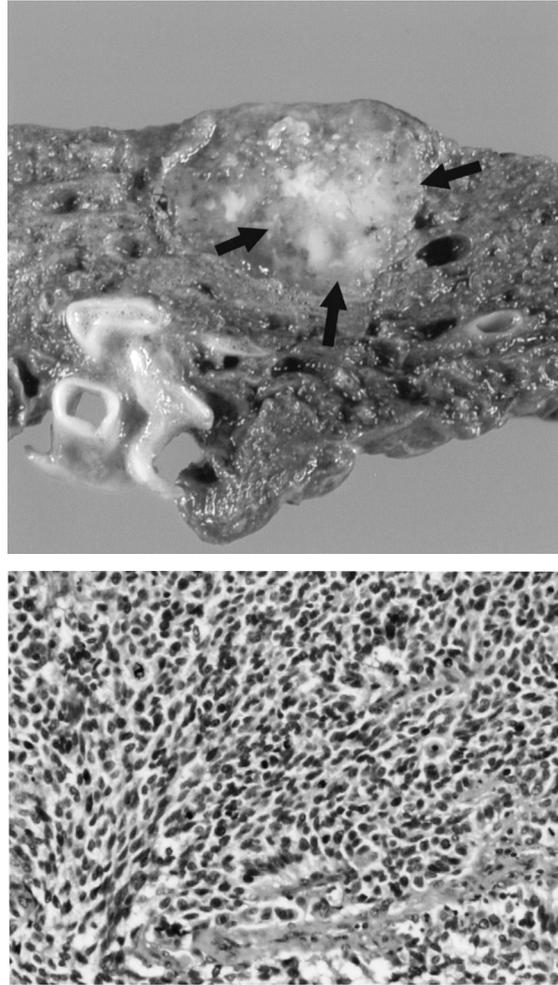


Fig. 3. Findings in the resected lung specimen.
A: Macroscopically, the tumor then measured 23×17 mm (arrows).
B: Microscopically, the tumor consisted of densely packed small cells with scant cytoplasm, finely granular nuclear chromatin, and absence of nucleoli. The pathological diagnosis was small-cell lung cancer (hematoxylin-eosin stain, ×400).

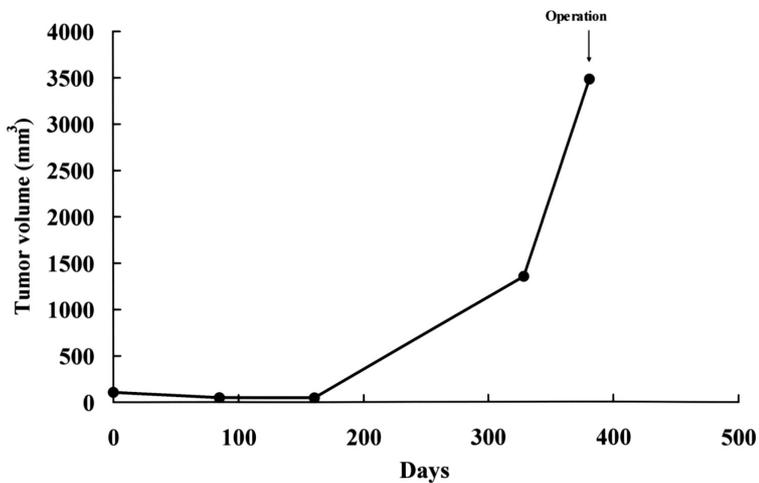


Fig. 4. Tumor growth curve demonstrating an initial latent phase. Tumor volume was calculated as $1/6 \times \pi \times ab^2$, a indicating the longest dimension and b , the shortest. Tumor-doubling time was calculated as $t \times \log 2 / (\log V_t/V_0)$, t indicating time, V_t tumor volume at the specific time point, and V_0 tumor volume at time 0.

every 3 months for at least 1 year is necessary to diagnose lung cancers in their earliest stages.

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