tions of a preexisting enterocolitis indicates that invasive gastrointestinal aspergillosis may precede the usual pattern of presentation with pulmonary densities.

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Atelectatic Lung Escaping Radiation Pneumonitis*
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An 80-year-old man was admitted to our division because of hemoptemus, cough, and chest pain for three months. A chest roentgenogram, chest CT scanning, and bronchoscopic examinations revealed adenocarcinoma of the lung with atelectasis of the right upper lobe. The patient developed radiation pneumonitis after receiving radiation therapy (5,100 cGy) for lung cancer. At the same time, the right upper lobe atelectasis improved and movement of infiltrates consistent with radiation pneumonitis to the middle lung fields occurred. A chest roentgenogram taken when the atelectasis had improved revealed the absence of pneumonitis shadows in the right upper lobe, suggesting that the atelectatic lung escaped radiation pneumonitis. (Chest 1992; 101:579-90)

CT = computed tomography

Severe radiation pneumonitis is an uncommon complication in patients receiving radiation therapy for intrathoracic malignancies in whom a localized disease is sometimes seen. The clinical syndrome that results consists of two phases: radiation pneumonitis, which occurs 6 to 12 weeks after radiation therapy, and radiation fibrosis, which occurs subsequently. Symptomatic radiation pneumonitis is a sporadic illness, which varies in severity from a troublesome cough to severe respiratory distress and even death. The changes in radiation pneumonitis generally are confined to only that part of the lung included in the radiation fields.

CASE REPORT
In March 1990, an 80-year-old man was diagnosed as having adenocarcinoma of the right upper lung with atelectasis and hilar-paratracheal adenopathy (T2N2M0, clinical stage 3), based on a chest roentgenogram (Fig 1, A), chest CT scanning and a transbronchial lung biopsy. The patient received radiation therapy (Fig 1, A, area within rectangle) for the intrathoracic disease from March 19, 1990. When a total dose of 5,100 cGy in 25 fractions was delivered to the right upper lung fields and hilar disease by 10-mV linear accelerator x-ray, the patient complained of cough and mild dyspnea on exertion. Physical examination revealed a temperature of 37.9°C and a few fine crackles over the right upper lung fields. A chest roentgenogram taken on May 14, 1990, showed paramediastinal fluffy infiltrates which approximated the radiation therapy fields (Fig 1, B). These infiltrates were not present on earlier chest roentgenograms, including one performed on March 12 (Fig 1, A). Arterial blood gas levels on room air showed a PaO2 of 71 mm Hg, PaCO2, 41 mm Hg, and pH, 7.43. At this time, no clinical symptoms consistent with respiratory tract infections appeared. Extensive infectious evaluation was nondiagnostic. An empiric trial of antibiotic therapy was without clinical improvement. Radiation therapy was discontinued. A chest roentgenogram taken on May 23 revealed disappearance of the right upper lobe atelectasis and movement of infiltrates consistent with radiation pneumonitis to the right middle lung fields (Fig 1, C). A lateral view chest roentgenogram taken at the same time also showed infiltrates consistent with radiation pneumonitis in the right middle lobe (data not shown). Seventy days later, however, a chest roentgenogram taken on August 2 showed recurrence of the right upper lobe atelectasis due to tumor regrowth and movement of fluffy shadows to the right paramediastinal site (Fig 1, D). After two weeks there was resolution of all symptoms consistent with radiation pneumonitis and then the patient was discharged. However, the patient died of carcinomatous pleuritis and bacterial pneumonia on January 19, 1991.

COMMENT
Our results suggest that an atelectatic lung, despite being within radiation therapy fields, may escape radiation pneumonitis. During radiation therapy for intrathoracic malignancies x- or y-rays excite electrons by collision with them. The accelerated electrons generate ion pairs and thence free radicals. In predominantly aqueous solution at neutral pH, similar to the cytoplasm of pulmonary parenchyma, the most abundant products are, in order, OH-, e-, H2O2, H+, and H2O. Free radicals such as OH· are very energetic and can produce breakage of covalent bonds in all molecules, small and large. Some of these changes are reversible but if oxygen is present, peroxidation of the molecular lesion may occur, leading to pulmonary damage. In our case, paramediastinal fluffy infiltrates should be distinguished from bacterial pneumonia. However, no clinical symptoms consistent with respiratory tract infections appeared through the patient's clinical course. Furthermore, extensive infectious evaluation was nondiagnostic and an empiric trial of antibiotic therapy was without clinical improvement.

There is considerable speculation concerning the effect

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of oxygen tension in the atelectatic lung. The bronchial circulation can maintain oxygen delivery to the atelectatic lung. However, alveolar air spaces in the atelectatic lung are collapsed and alveolar oxygen is missing. Based on our patient's results, we believe an atelectatic lung, due to the absence of air (oxygen) in alveolar spaces of the lung, escapes radiation pneumonitis. This case is useful for a better understanding of the mechanism of pneumonitis induced by irradiation.

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