A 63-year-old white man was referred for evaluation of a right upper lobe mass discovered on routine chest radiograph. His past medical history was significant for multiple episodes of pneumonia over the four years prior to presentation. The patient previously worked for four years as a laborer in an asbestos shingle factory and for the last 27 years as an argon welder in a foundry. In addition, he had a 25 pack-year history of cigarette smoking. Currently, he had no pulmonary complaint and his physical examination was remarkable only for decreased breath sounds anteriorly over the right upper chest. All laboratory values were within normal limits.

The posteroanterior chest radiograph (Fig 1) revealed a 3 cm mass lesion in the right mid-lung field with blunting of the right costophrenic angle. Computerized axial tomography of the chest was obtained to further delineate the extent and location of this density.

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Diagnosis: Rounded atelectasis of the right upper lobe with bilateral pleural thickening

Rounded atelectasis is a form of peripheral lung collapse that can mimic a pulmonary neoplasm. The chest CT appearance of the lung lesion in our patient (Fig 2 and 3) fulfills many of the diagnostic radiographic criteria for rounded atelectasis. These criteria include: 1) peripheral location in the lung; 2) formation of an acute angle with the pleura; 3) location adjacent to thickened pleura; 4) greatest density at the periphery; and 5) a “comet tail” extension composed of bronchi and blood vessels radiating from the mass toward the hilum. In addition to the above criteria, which Doyle and Lawler have labeled as major features of rounded atelectasis, several other radiographic abnormalities have been described. These include hyperinflation of lung adjacent to the area of atelectasis, thickening of the interlobar fissures, bilateral lesions and radiographic stability of the density over time.

Although the radiographic features of rounded atelectasis have been well established in the literature, debate still surrounds its pathogenesis. Hanke and Kretzschmar have hypothesized that rounded atelectasis occurs when a peripheral portion of lung collapses and becomes trapped within a pleural effusion. A fibrinous exudate subsequently forms over the upward tilted cleft of collapsed lung and seals it intraparenchymally. After the effusion resolves, the atelectatic lung remains trapped and adjacent normal lung hyperinflates to fill the remaining space. However, several recent authors have disputed this hypothesis since many patients develop rounded atelectasis without ever having had a documented pleural effusion. Schneider and coworkers refuted Hanke and Kretzschmar’s hypothesis of rounded atelectasis after finding no evidence of free pleural fluid in five patients prior to the development of rounded atelectasis. They believed that irregular pleural thickening from fibrinous pleuritis was a more important factor in the development of rounded atelectasis. The study by Mintzer and associates of seven patients with asbestos-related pleural disease and rounded atelectasis supports the viewpoint of Schneider et al. They found that pleural abnormalities in their patients were associated with pleural plaques rather than pleural effusions. They proposed that asbestos-induced thickening of the interlobar fissure precipitated peripheral collapse of a neighboring portion of the lower lobe. The lower lobe remains fixed by asbestos pleural plaques, and as the pleural disease progresses, additional lung tissue becomes trapped within the layers of thickened pleura.

Tylén and Nilsson studied 12 patients with rounded atelectasis and found results similar to Mintzer. Seventy-five percent of these patients had a significant history of asbestos exposure and were found to have marked pleural thickening and plaque formation. Free pleural fluid was identified in only one patient. The authors concluded that asbestos was an important causative factor in the development of rounded atelectasis by inducing pleural irritation ranging from hyaline pleural plaques to exudative pleuritis.

Regardless of the pathogenesis of rounded atelectasis, the majority of patients are clinically asymptomatic. Rarely, patients may complain of cough or chest pain or have symptoms related to the underlying disorder responsible for the pleural irritation. In addition to asbestos exposure, rounded atelectasis has been reported with several other conditions such as tuberculosis pleurisy, iatrogenic pneumothorax, post-myocardial infarction, and following a pulmonary infarction.

Computed tomography of the chest has been suggested as the preferred imaging modality for diagnosing rounded atelectasis. Tylén and Nilsson compared conventional chest radiography to computed tomography in studying rounded atelectasis in 12 patients, nine of whom had significant exposure to asbestos. Pleural thickening, intraparenchymal extension of fibrous strands, convergence of blood vessels and bronchi towards the mass, and lung hyperinflation were all easily identified on chest CT. In all cases, CT

FIGURE 2

FIGURE 3

Roentgenogram of the Month (Green, Criner, Siegal)
provided valuable information for evaluating the extent of pleural and parenchymal changes associated with rounded atelectasis.

The majority of cases reported in the literature have described rounded atelectasis as a pleural-based density connected to the lower lobes. The right upper lobe location of rounded atelectasis in our patient is atypical and obscured the correct diagnosis on original presentation. Hillerdal and Hemmingsson,7 however, reported ten patients with rounded atelectasis and found that eight had lesions located in the upper lobes. The majority of their patients had significant exposure to asbestos and the authors suggested that the upper lobe may be particularly susceptible to asbestos-related abnormalities. As our case illustrates, we believe that the site of development of rounded atelectasis is determined by the location of the pre-existing pleural disease rather than having a predilection for a specific region of the lung.

The importance of this disorder is that clinicians must be cognizant of its radiographic features in order not to confuse it with a neoplasm. To date, we are unaware of any reports of malignancy developing within an area of rounded atelectasis. Recognition of its characteristic radiographic features in the appropriate clinical setting allows one to diagnose this benign condition without the need for further invasive diagnostic procedures.

REFERENCES
1. Doyle TC, Lawler GA. CT features of rounded atelectasis of the lung. AJR 1984; 143:225-28