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Pulmonary Carcinosarcoma: Radiologic and Pathologic Findings in Three Patients

OBJECTIVE. The purpose of this study was to describe the radiologic and pathologic features of pulmonary carcinosarcoma in three patients.

CONCLUSION. The tumors measured 9–14 cm in diameter, had inhomogeneous contrast enhancement, and in two cases had invaded the mediastinum or chest wall extensively. Carcinosarcomas are rare tumors that tend to be large, necrotic, enhancing, and locally invasive.

Carcinosarcomas are uncommon tumors that have both malignant epithelial and mesenchymal elements. Because of the difficulty in distinguishing these rare tumors from the more common spindle cell carcinomas of the lung [1], the World Health Organization added the corollary that pulmonary carcinosarcomas should show differentiation of the mesenchymal component into specific heterogeneous tissues, such as neoplastic bone, cartilage, or striated muscle, by light microscopy [2]. Carcinosarcomas account for 0.2–0.3% of all lung tumors and occur in the same age group as the more common forms of lung cancer [3, 4].

Although carcinosarcomas are well recognized in the pathology literature, limited information is available about the radiologic findings [1, 4, 5]. We reviewed the radiographic, CT, and pathologic findings of three patients with pulmonary carcinosarcoma confirmed by histologic and immunohistochemical analysis.

Materials and Methods

Review of the records of the Department of Pathology at our institution from 1985 to 1996 revealed three patients with pulmonary carcinosarcoma who had definite histologic proof of diagnosis and preoperative radiographs and CT scans available for review. The patients included two women and one man and were 40–79 years old. All patients were smokers.

All patients underwent posteroanterior and lateral chest radiography and 10-mm-collimation CT scanning through the chest (9800 scanner; General Electric Medical Systems, Milwaukee, WI). The CT scans were obtained with IV contrast enhancement. Spin-echo MR imaging of the chest was performed in one patient (Signa 1.5 T; General Electric Medical Systems): T1-weighted imaging (800/20 [TR/TE]), proton density–weighted imaging (2400/20), and T2-weighted imaging (2400/80).

Pathologic examination was by surgical resection of the tumor mass in two patients and open lung biopsy in one patient.

Results

Radiographic findings consisted of a round mass measuring 9 cm in diameter in one patient (Fig. 1) and extensive opacification of the hemithorax in two patients because of obstructive pneumonitis and atelectasis (Fig. 2) or a large pleural effusion (Fig. 3).

CT scans showed large, round parenchymal masses measuring 9–14 cm (mean, 11 cm) in diameter (Table 1 and Figs. 1–3). The tumors showed inhomogeneous contrast enhancement at the periphery of the tumor and decreased attenuation centrally. In one patient, mottled calcifications were identified on CT scans and shown histologically to represent ossification in

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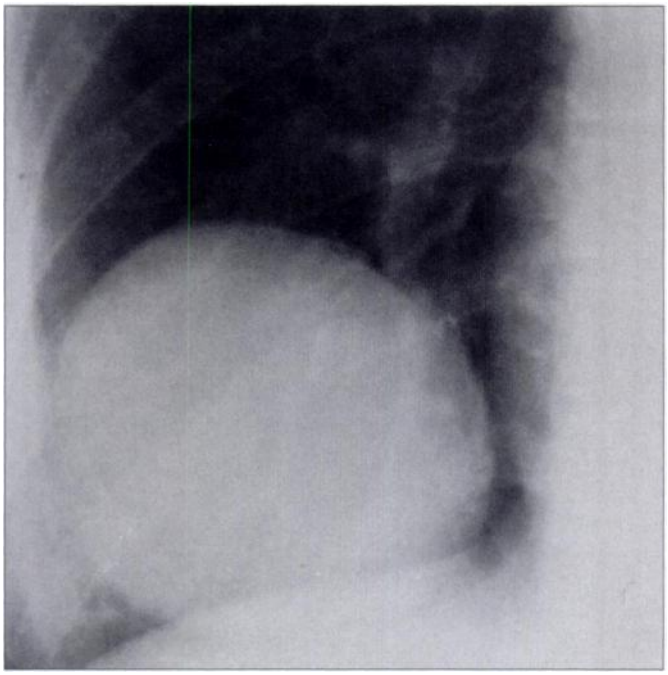

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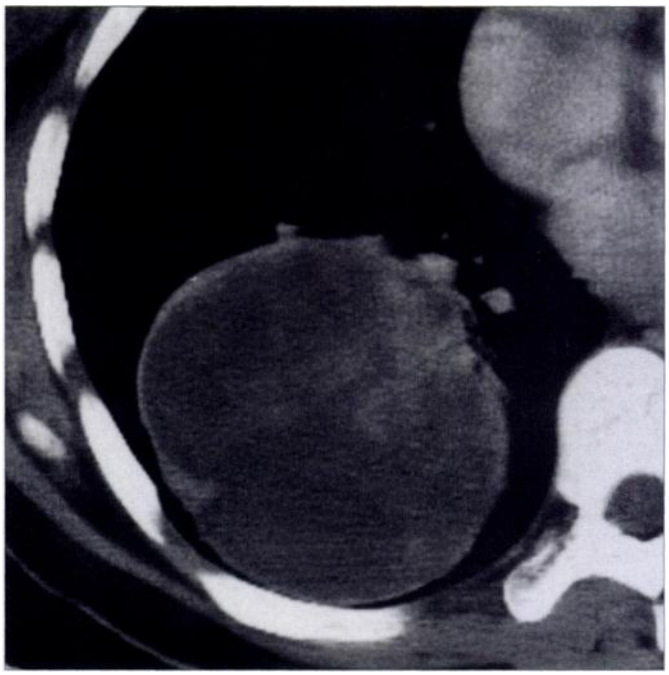

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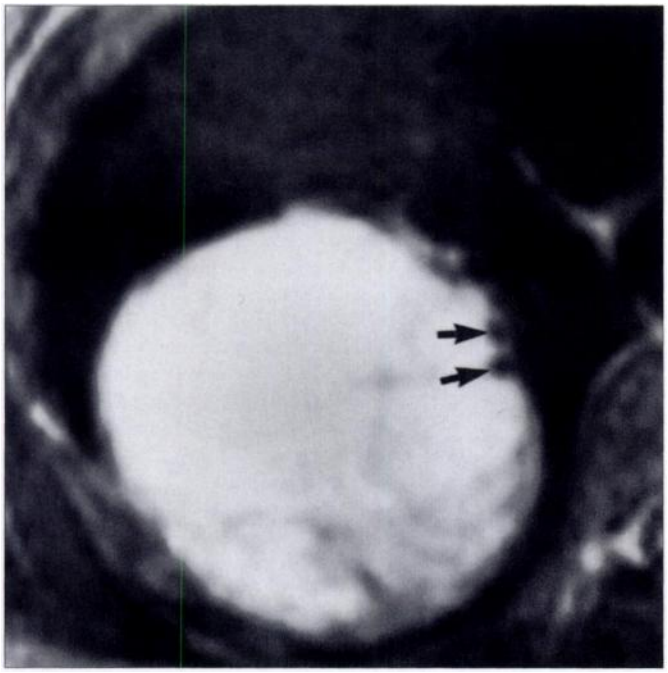

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Fig. 1.—Carcinosarcoma in 40-year-old woman.
A, View of right lung from posteroanterior chest radiograph shows round 9-cm-diameter mass in right lower lobe.
B, CT section after IV contrast administration shows inhomogeneous enhancement of mass. Large areas of low attenuation were shown histologically to represent areas of necrosis.
C, T2-weighted MR image (2400/80 [TR/TE]) shows high signal intensity and small inhomogeneous areas with low signal intensity. Two small areas of signal void shown at medial periphery of mass (*arrows*) represent encased pulmonary artery and bronchus.

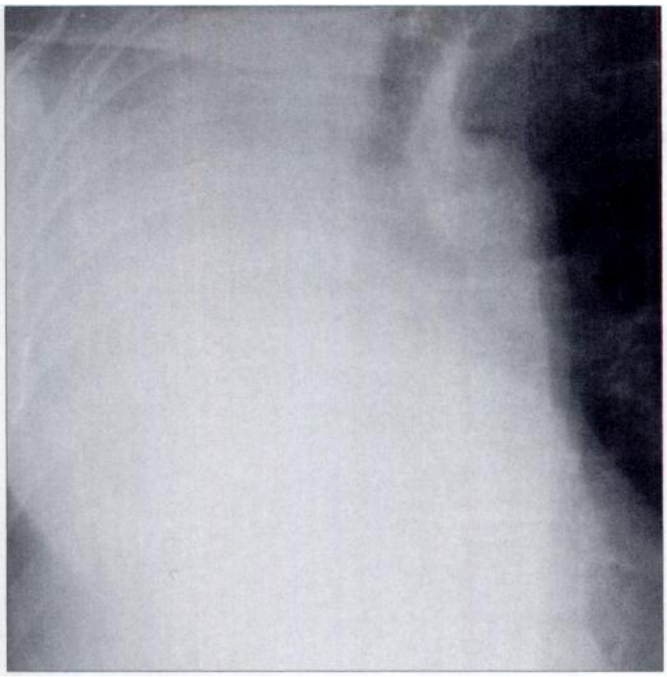
the osteosarcomatous component of the tumor (Fig. 2). In one patient local invasion into the anterior chest wall was evident on CT scans, and in one patient invasion into the pericardium and pulmonary vein was evident on CT scans. These findings were confirmed at surgery. In one patient the large tumor mass extended into the right main bronchus, causing obstructive atelectasis of the right lung. Pleural effusion was identified on CT scans in two patients, and pericardial effusion was identified in one.

MR imaging of the 59-year-old man showed the signal of the mass on T1-weighted imaging to be isointense with that of skeletal muscle and inhomogeneous centrally. Signal intensity was inhomogeneous and higher than that of skeletal muscle on proton density– and T2-weighted imaging (Fig. 1).

Histologic diagnosis included admixtures of adenocarcinoma and rhabdomyosarcoma in one patient, squamous cell carcinoma and rhabdomyosarcoma in one patient, and combined squamous cell carcinoma and osteosarcoma in one patient (Table 1).

Discussion

Pulmonary carcinosarcomas are defined by the World Health Organization as tumors consisting of an admixture of malignant epithelial and mesenchymal elements similar to those seen in well-defined carcinomas and sarcomas [6].



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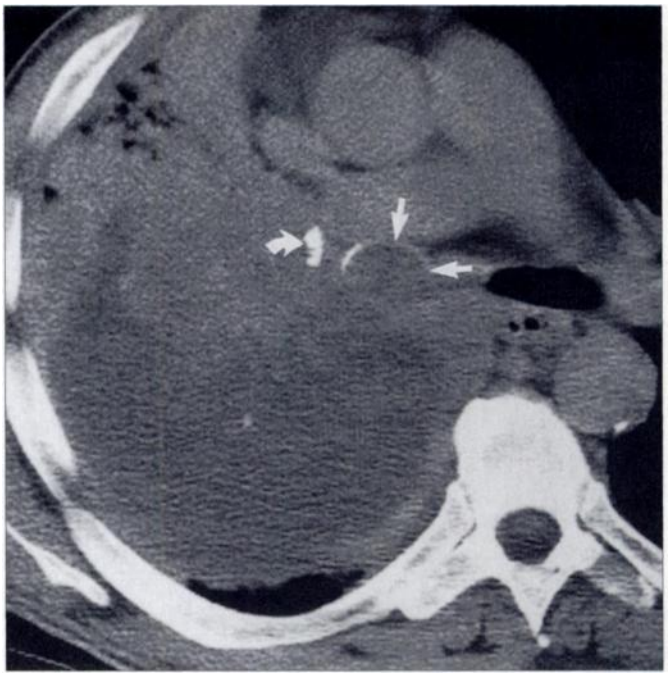

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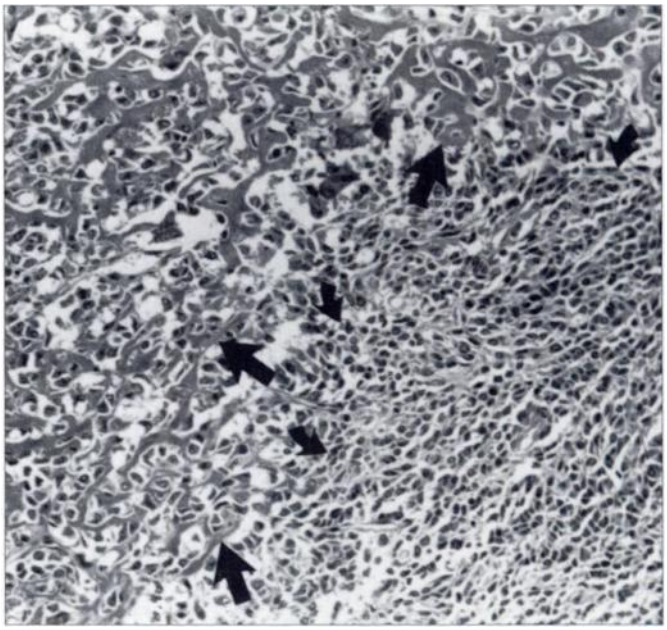

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Fig. 2.—Carcinosarcoma with component of squamous cell carcinoma and osteosarcoma in 59-year-old man.

A, Posteroanterior chest radiograph reveals opacification of entire hemithorax. Note ipsilateral deviation of mediastinum.

B, CT scan (10-mm collimation) obtained after IV contrast administration shows 14-cm-diameter enhancing mass with inhomogeneous areas of low attenuation. Right main bronchus (*straight arrows*) is obstructed by tumorous mass. Note focal calcification (*curved arrow*) within tumorous mass. On histologic section, areas of calcification on CT scan were shown to represent ossification of osteosarcomatous component.

C, Histologic specimen shows that tumor is biphasic, with poorly differentiated squamous cell carcinoma (*curved arrows*) and component of osteosarcoma (*straight arrows*). Note abundant malignant osteoid and marked cellular pleomorphism.

The histogenesis of these tumors is controversial. The sarcomatous component probably arises from a previously existing carcinoma through mesenchymal metaplasia or some other process [7]. The development of these tumors seems to be strongly associated with cigarette smoking [4, 7]. They have also been described with asbestosis [8].

Initially, Moore [9] reported that carcinosarcomas of the lung appear to occur as two distinct groups, a central endobronchial type and a peripheral invasive type. Several investigators maintain that central endobronchial tumors have a better prognosis than do peripheral invasive tumors [9, 10]; however, as more cases accumulate, this opinion appears to be true only when the tumor is small (<3 cm) and when no metastases are present [7]. The seemingly better prognosis for central endobronchial lesions may result from the earlier development of symptoms that leads to earlier medical attention. Ishida et al. [1] concluded that the presence of definitive sarcomatous differentiation was associated with a poor prognosis. Only 27% of patients survived more than 6 months, and fewer than 10% survived 2 years [3, 11]. Metastases may be sarcomatous, epithelial, or, as in the primary tumor, a combination of both [12]. Radiographic findings are nonspecific and reflect the location of the tumor, with tumors having the intrabronchial component causing atelectasis or obstructive pneumonitis and tumors in the parenchyma presenting as a nodule or mass [1, 4, 5].

The radiographic findings of the three tumors in the current study consisted of a solitary large mass or extensive opacity due to associated obstructive pneumonitis and atelectasis or

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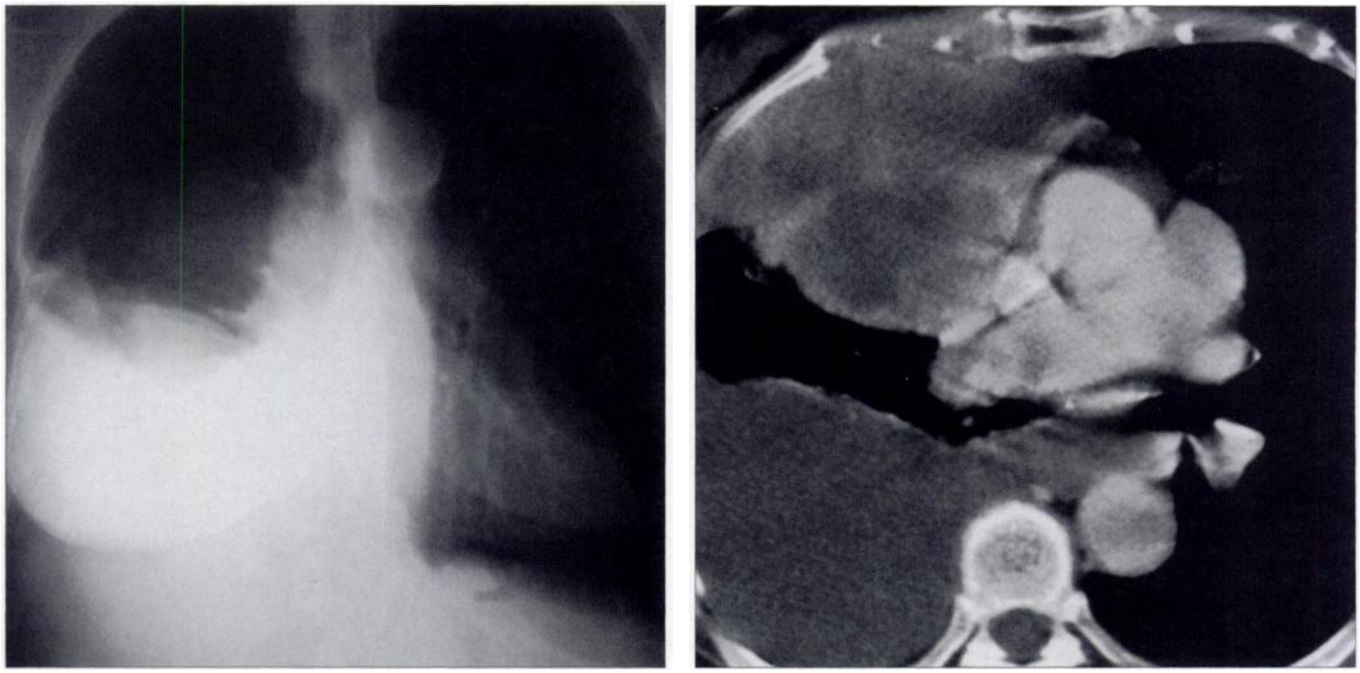

Fig. 3.—Carcinosarcoma in 79-year-old woman.
A, Posteroanterior chest radiograph shows opacification of right lower lung and pleural effusion.
B, CT scan (10-mm collimation) after IV contrast administration reveals 11-cm-diameter enhancing mass with areas of inhomogeneous low attenuation. Note large right pleural effusion. Surgical biopsy found invasion into anterior chest wall.

TABLE 1 CT and Pathologic Findings in Three Patients with Pulmonary Carcinosarcoma

Patient			Mass Location	Size (cm)	Local Invasion	Contrast Enhancement	Internal Architecture	Histologic Findings
No.	Age (yr)	Sex						
1	40	Female	Right lower lobe	9	No	Moderate	Inhomogeneous, necrotic	Squamous cell carcinoma, rhabdomyosarcoma
2	59	Male	Right lower lobe	14	Pericardium	Moderate	Inhomogeneous, necrotic, calcifications	Squamous cell carcinoma, osteosarcoma
3	79	Female	Right middle lobe	11	Chest wall	Mild	Inhomogeneous, necrotic	Adenocarcinoma, rhabdomyosarcoma

a large pleural effusion. CT allowed distinction of the large masses from the associated pleuroparenchymal changes and showed extensive tumor necrosis as well as local invasion. In one patient, intratumorous calcifications on CT scans corresponded to ossification in the osteosarcomatous component.

We conclude that carcinosarcomas tend to be large, necrotic, and locally invasive tumors.

References

1. Ishida T, Tateishi M, Kaneko S, et al. Carcinosarcoma and spindle cell carcinoma of the lung: clinicopathologic and immunohistochemical studies. *J Thorac Cardiovasc Surg* **1990**;100:844–852
2. Tumors of the lower respiratory tract. In: Colby TV, Koss MN, Travis W, eds. *Atlas of tumor pathology*. Washington, DC: Armed Forces Institute of Pathology, **1994**:411–416
3. Cabarcos A, Gomez-Dorronsoro M, Lobo-Beristain JL. Pulmonary carcinosarcoma: a case study and review of the literature. *Br J Dis Chest* **1985**;79:83–94
4. Davis MP, Eagen RT, Wiland LH, Pairolero PC. Carcinosarcoma of the lung: Mayo Clinic experience and response to chemotherapy. *Mayo Clin Proc* **1984**;59:598–603
5. Meade P, Moad J, Fellows D, Adams CW. Carcinosarcoma of the lung with hypertrophic pulmonary osteoarthropathy. *Ann Thorac Surg* **1991**;51: 488–490
6. Sobin LH, Yesner R. Histologic typing of lung tumors. In: *International histologic classification of tumors*, 2nd ed. Geneva: World Health Organization, **1981**:19–20
7. Rainosek DE, Ro JY, Ordonez NG, Kulaga AD, Ayala AG. Sarcomatoid carcinoma of the lung: a case with atypical carcinoid and rhabdomyosarcomatous components. *Am J Clin Pathol* **1994**;102: 360–364
8. Farrell DJ, Cooper PN, Malcolm AJ. Carcinosarcoma of lung associated with asbestosis. *Histopathology* **1995**;27:484–486
9. Moore TC. Carcinosarcoma of the lung. *Surgery* **1961**;50:886–893
10. Razzuk MA, Urschel HC, Race GJ, Arndt JH, Paulson DL. Carcinosarcoma of the lung: report of two cases and review of the literature. *J Thorac Cardiovasc Surg* **1971**;61:293–302
11. Gebauer C. The postoperative prognosis of primary pulmonary sarcomas: a review with a comparison between the histologic forms and the other primary endothoracic sarcomas based on 474 cases. *J Thorac Cardiovasc Surg* **1982**;16: 91–97
12. Fraser RG, Paré JAP, Paré PD, Fraser RS, Genereux GP. *Diagnosis of diseases of the chest*, 3rd ed. Philadelphia: Saunders, **1988**:1605–1607