胸腔影像學概論
Chest imaging

【胸部X光片 V】

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學習目標

- 胸部X光的基本判讀
- 肺部所生結節性病變
- 單一及多變性結節的型態及分布認識
- 結節的鑑別診斷

Reference

- **Jud W. Gurney ... et al. (2006). *Diagnostic imaging*. Salt Lake City, Utah: Amirsys.**
- **Jannette Collins, Eric J. Stern. (1999). *Chest radiology : the essentials* . Philadelphia : Lippincott Williams & Wilkins.**
- **Alfred P. Fishman; section editors, Jack A. Elias ... et al. (1998). *Fishman's pulmonary diseases and disorders*. New York：McGraw-Hill, Health Professions Division.**
- 江自得（**2003**）。實用胸腔**X**光診斷學。臺北：力大。
- 葉育文（譯）**(2005)**。胸部**X**光臨床判讀（原作者：**Paul F. Jenkins**）。台北：合記。

對於單一結節

- 邊緣是否清楚？
- 結節的體積是否迅速變大？
- 結節中是否有鈣化？
- 病灶是否伴隨著明顯的塌陷？
- 是否有合併肋膜、淋巴結、骨性疾病？

圓形陰影

- 微小結節陰影：

  這些小圓狀陰影的直徑為＜1.5 mm
- 結節陰影：直徑可達2 cm
- 大的圓型陰影：直徑＞2 cm

微小結節

- 粟狀肺結核 (miliary tuberculosis)

小結節性

- 矽肺症
- 肺轉移

大結節性

- 肺轉移

邊緣模糊的陰影

- 邊界不清楚的陰影

Popcorn Calcification

- **Harmatoma**

鈣化

- 結節中央鈣化或爆玉花狀鈣化多半表示良性
- 老片子比較，沒有變化才敢說良性機會較大
- 若有生長最好開刀拿掉
- 離心性鈣化之結節絕不可將惡性之可能性除掉。

TABLE 7-1

CAUSES OF SOLITARY PULMONARY NODULES

Neoplastic: Malignant
- Bronchogenic carcinoma
- Solitary metastasis
- Lymphoma
- Carcinoid tumor

Neoplastic: Benign
- Hamartoma
- Benign connective tissue and neural tumors (e.g., lipoma, fibroma, neurofibroma)

Inflammatory
- Granuloma
- Lung abscess
- Rheumatoid nodule
- Inflammatory pseudotumor (plasma cell granuloma)

Congenital
- Arteriovenous malformation
- Lung cyst
- Bronchial atresia with mucoid impaction

Miscellaneous
- Pulmonary infarct
- Intrapulmonary lymph node
- Mucoid impaction
- Hematoma
- Amyloidosis
- Normal confluence of pulmonary veins

Mimics of SPN
- Nipple shadow
- Cutaneous lesion (e.g., wart, mole)
- Rib fracture or other bone lesion
- "Vanishing pseudotumor" of congestive heart failure (loculated pleural effusion)

SPN, solitary pulmonary nodule.

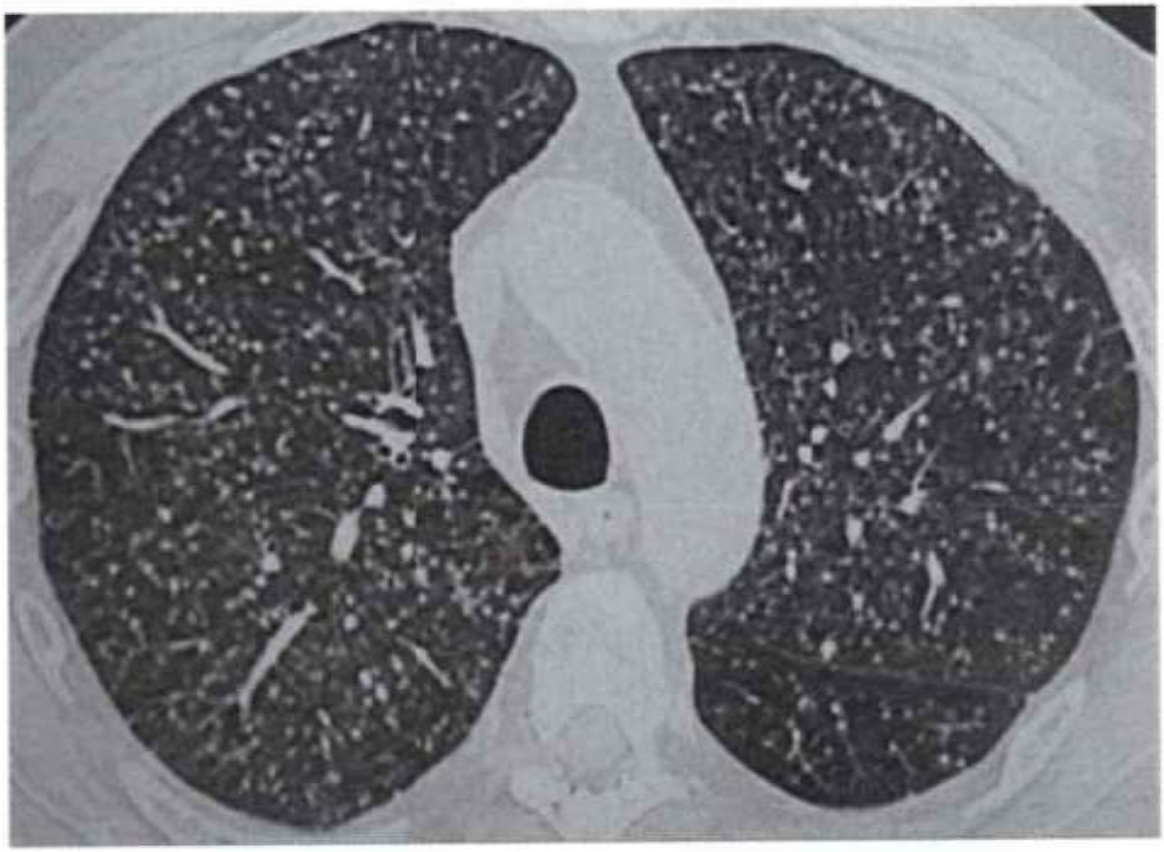

FIGURE 2-31. Random nodular pattern. CT scan of a patient with miliary tuberculosis shows a pattern of diffuse, randomly distributed, well-defined small pulmonary nodules. Some of the nodules appear centrilobular and some are subpleural in location. The same pattern can be seen with fungal infection or pulmonary metastases.

TABLE 7-2

FAST-GROWING PULMONARY METASTASES

"Loves to Multiply Swiftly"
Lymphoma
Testicular germ cell tumor
Melanoma
Soft tissue sarcoma (osteosarcoma)

that up to half of nodules showing the tail sign represent benign granulomas (16), and therefore the tail sign is a nonspecific feature of peripherally located pulmonary lesions that cannot be used to distinguish a benign from a malignant lesion. Lobulation and notching are seen with both benign and malignant nodules and are not very useful discriminating features (Figs. 7-12 and 7-13). A well-defined, smooth, nonlobulated edge is most compatible with hamartoma, granuloma, or metastasis. However, a smooth margin does not indicate benignity, as up to one third of malignant lesions have smooth margins

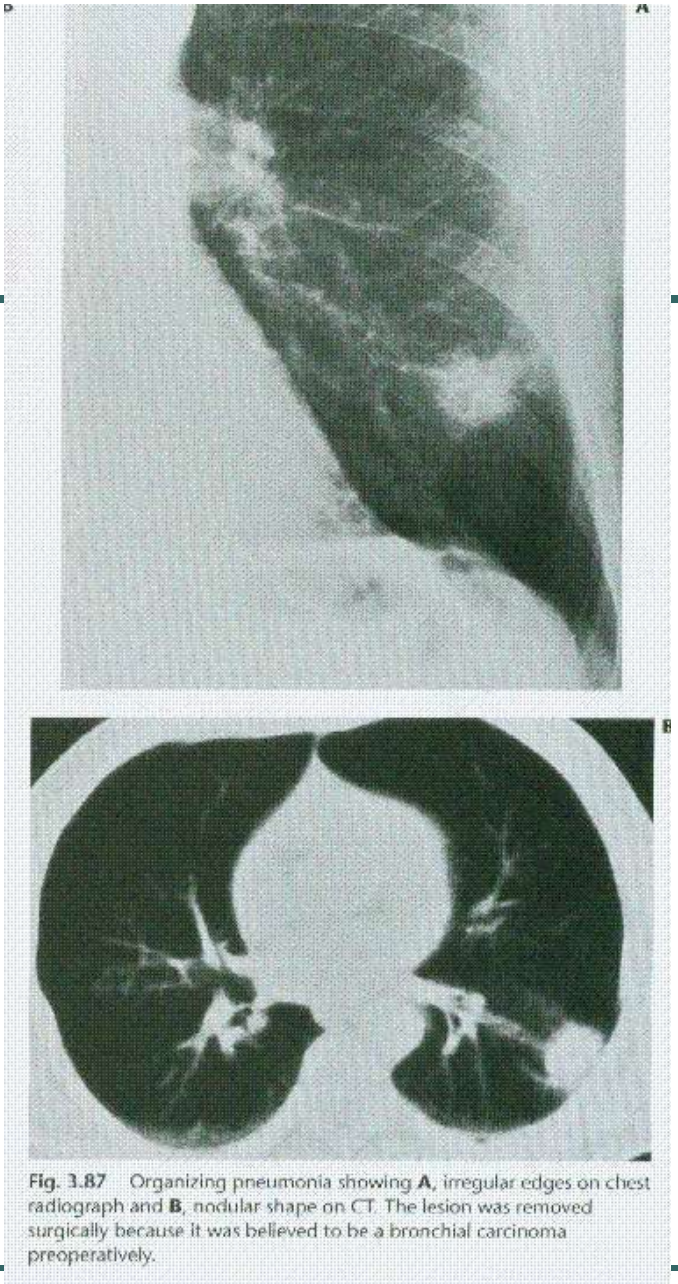

Fig. 3.87 Organizing pneumonia showing **A**, irregular edges on chest radiograph and **B**, nodular shape on CT. The lesion was removed surgically because it was believed to be a bronchial carcinoma preoperatively.

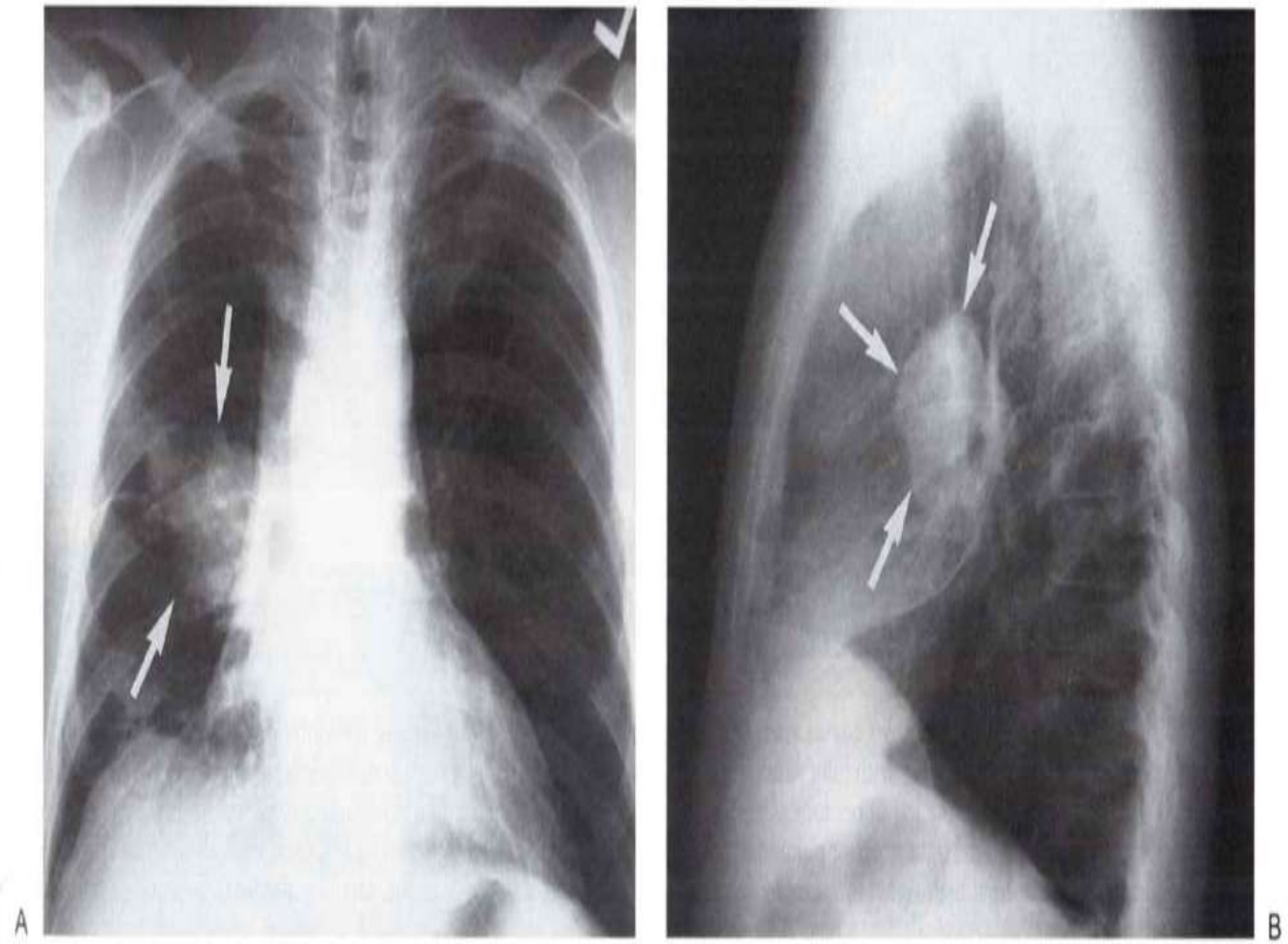

FIGURE 7-29. **Metastatic osteosarcoma. A:** PA chest radiograph of a 57-year-old man with cough and hemoptysis and a history of mandibular resection for chondroblastic osteosarcoma 7 years prior shows a large lobulated right hilar mass (*arrows*). **B:** Lateral view confirms the hilar location (*arrows*). (*Continued*)

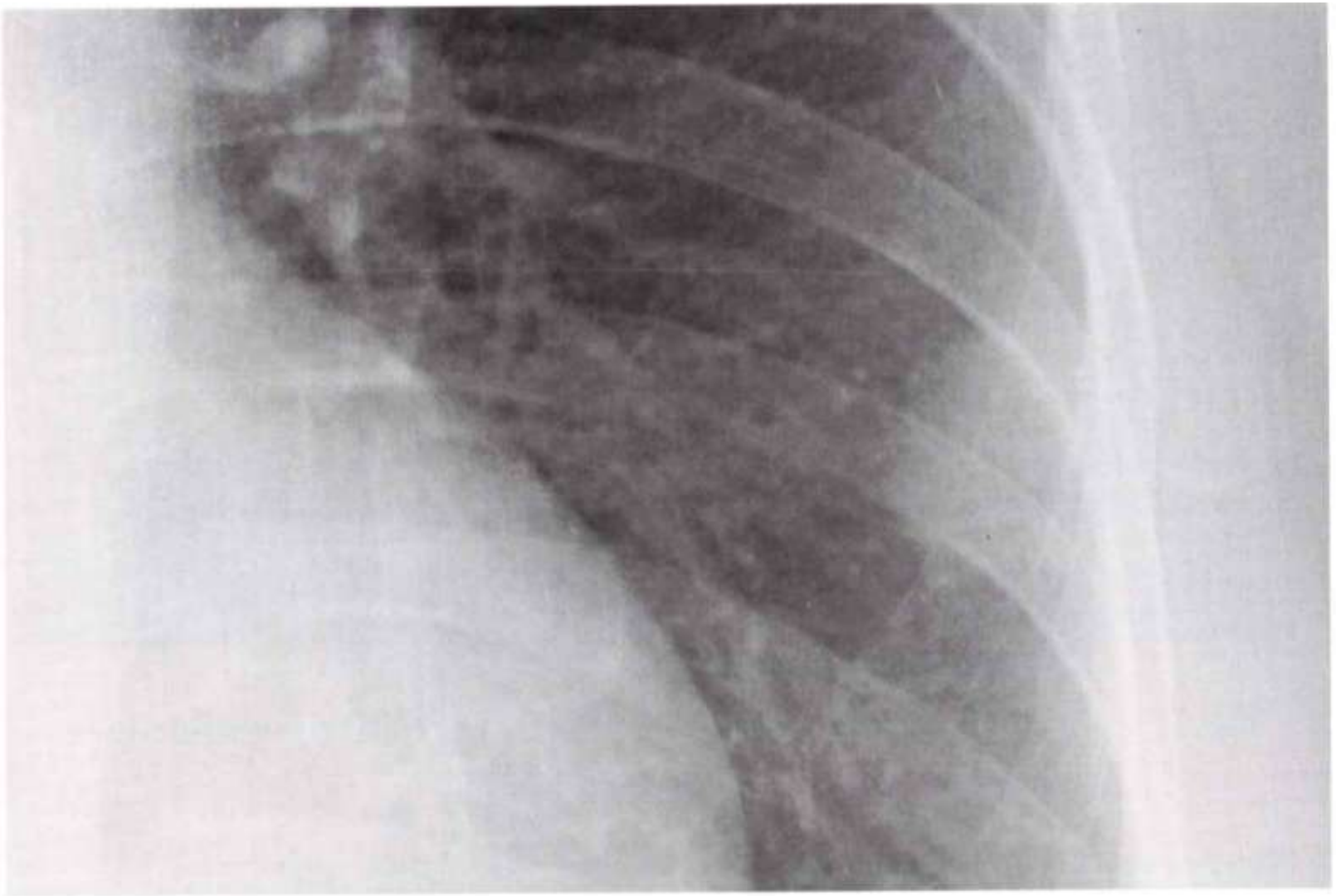

Fig 7-2a Adenocarcinoma of lung，腫瘤小，周緣模糊

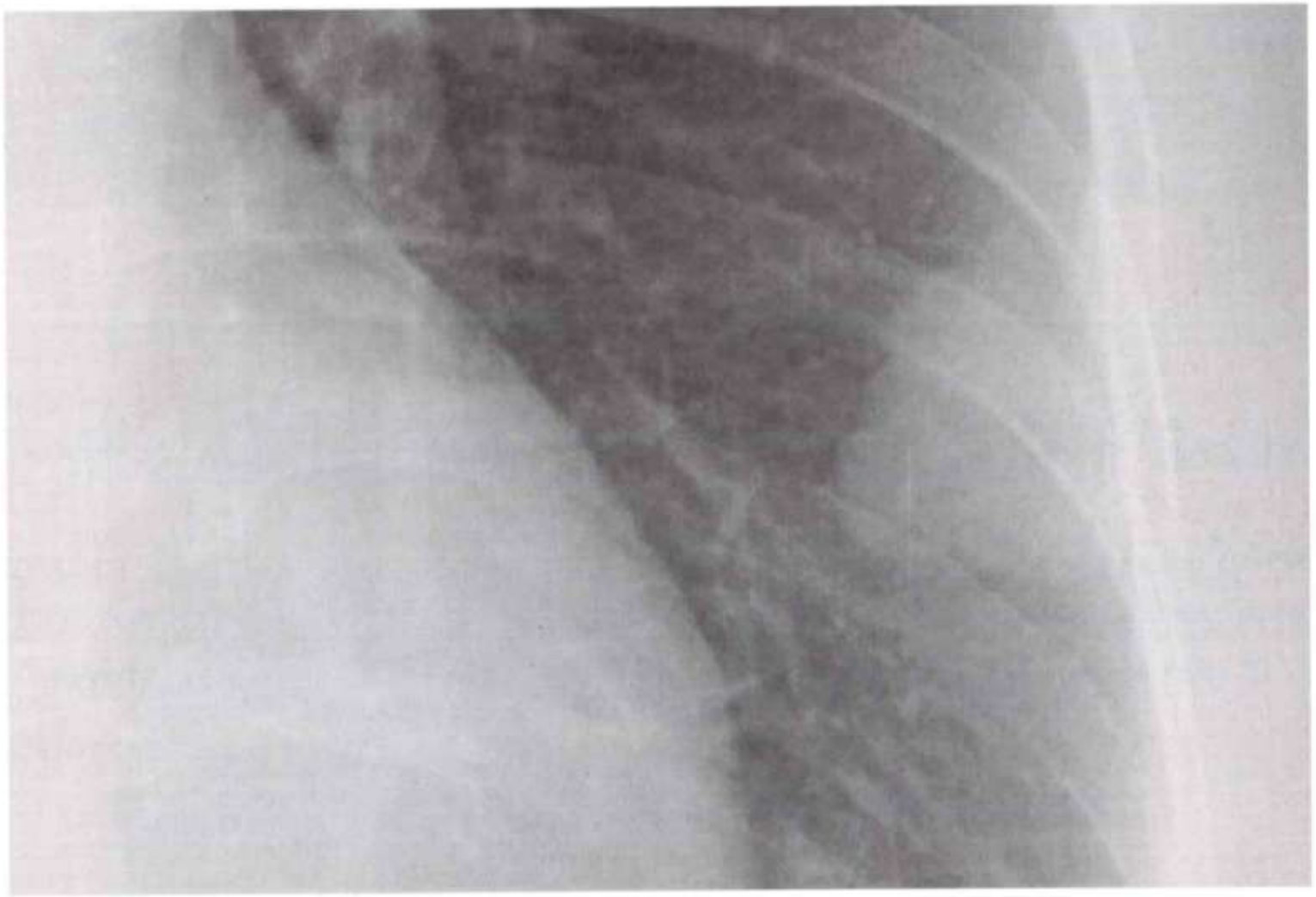

Fig 7-2b Adenocarcinoma，一年後腫瘤變大，且周緣變更清晰

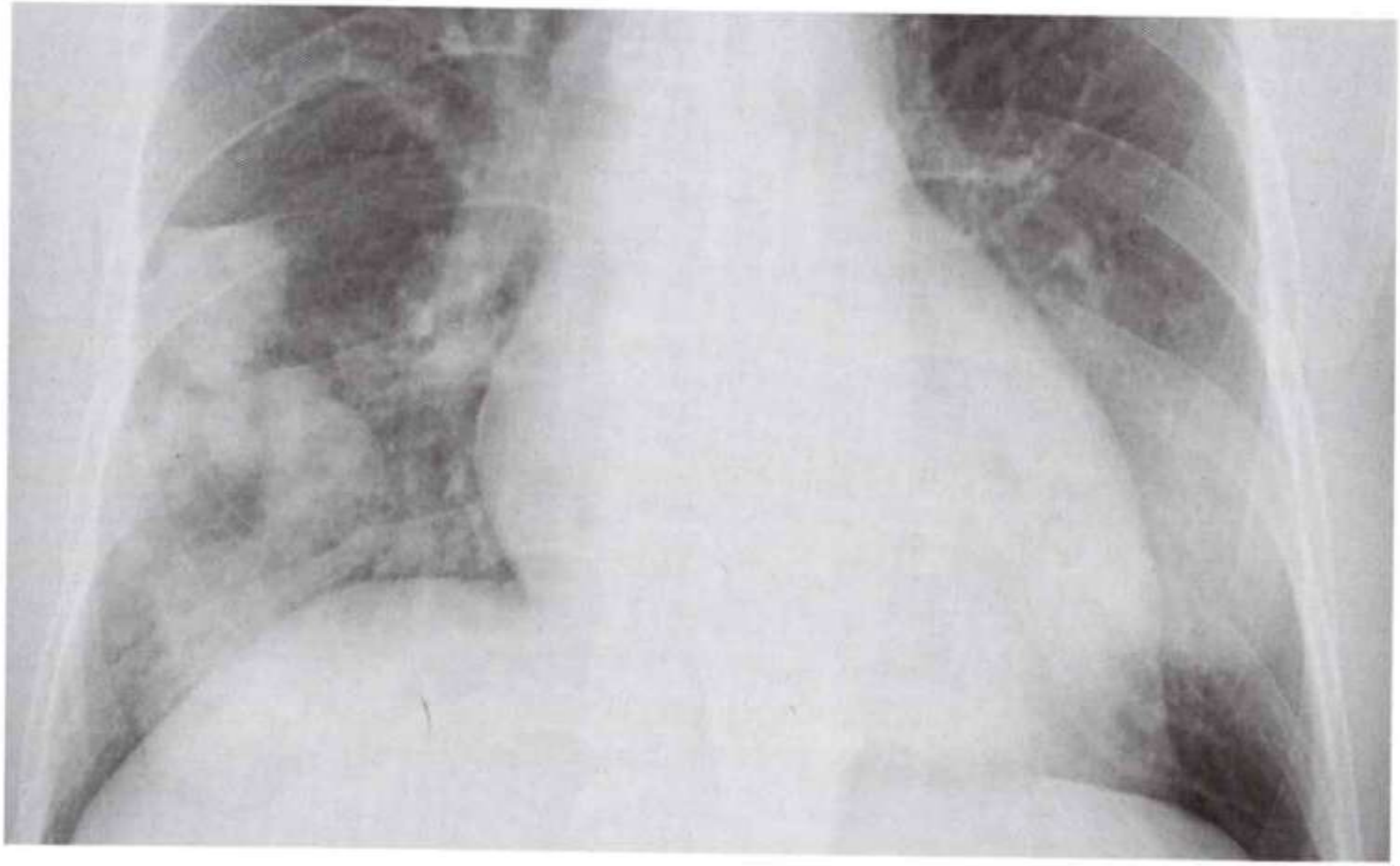

Fig 7-3 Cryptococcosis，兩側下葉病灶，周緣relatively well-defined

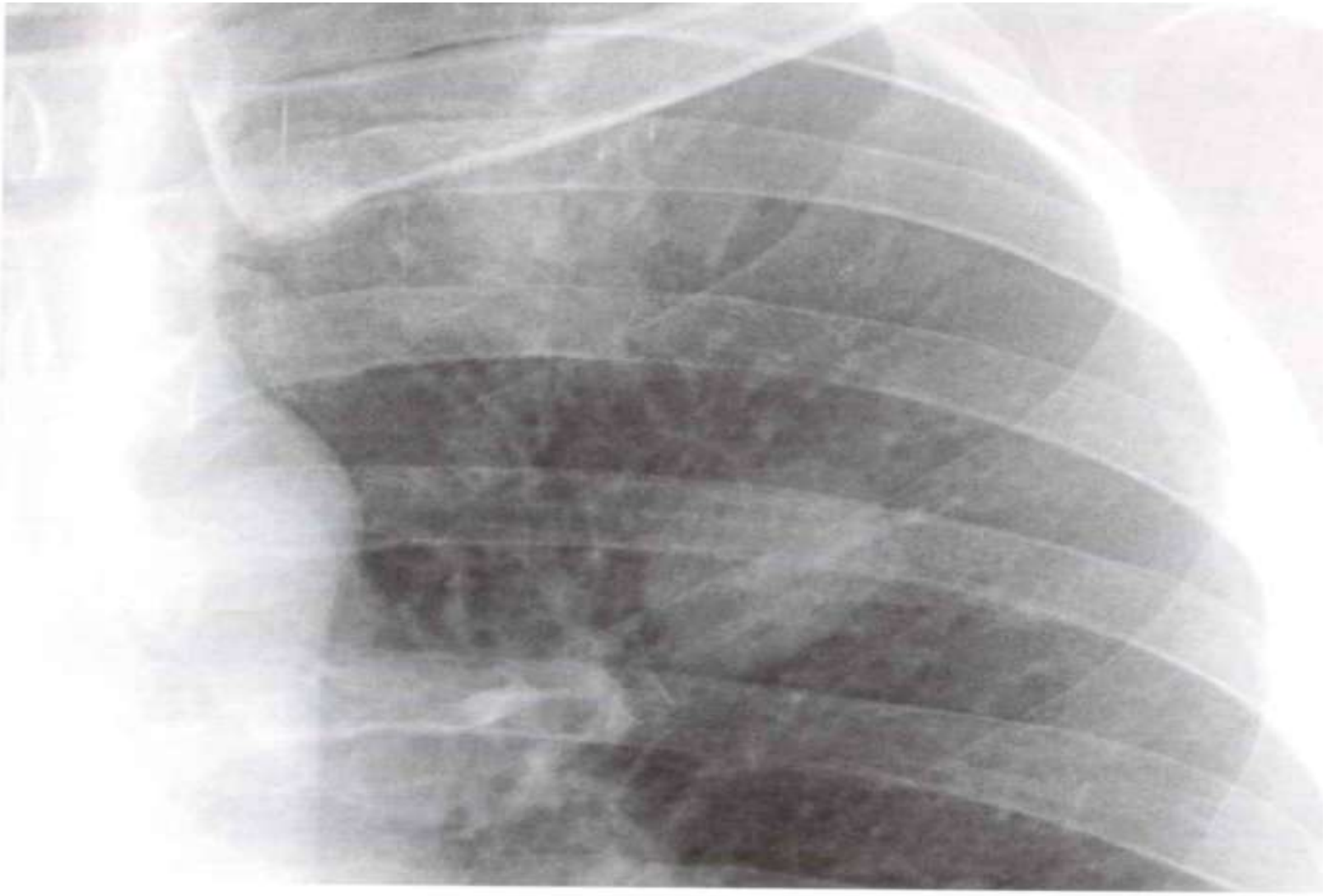

Fig 7-4 Tuberculoma，周緣相當清晰

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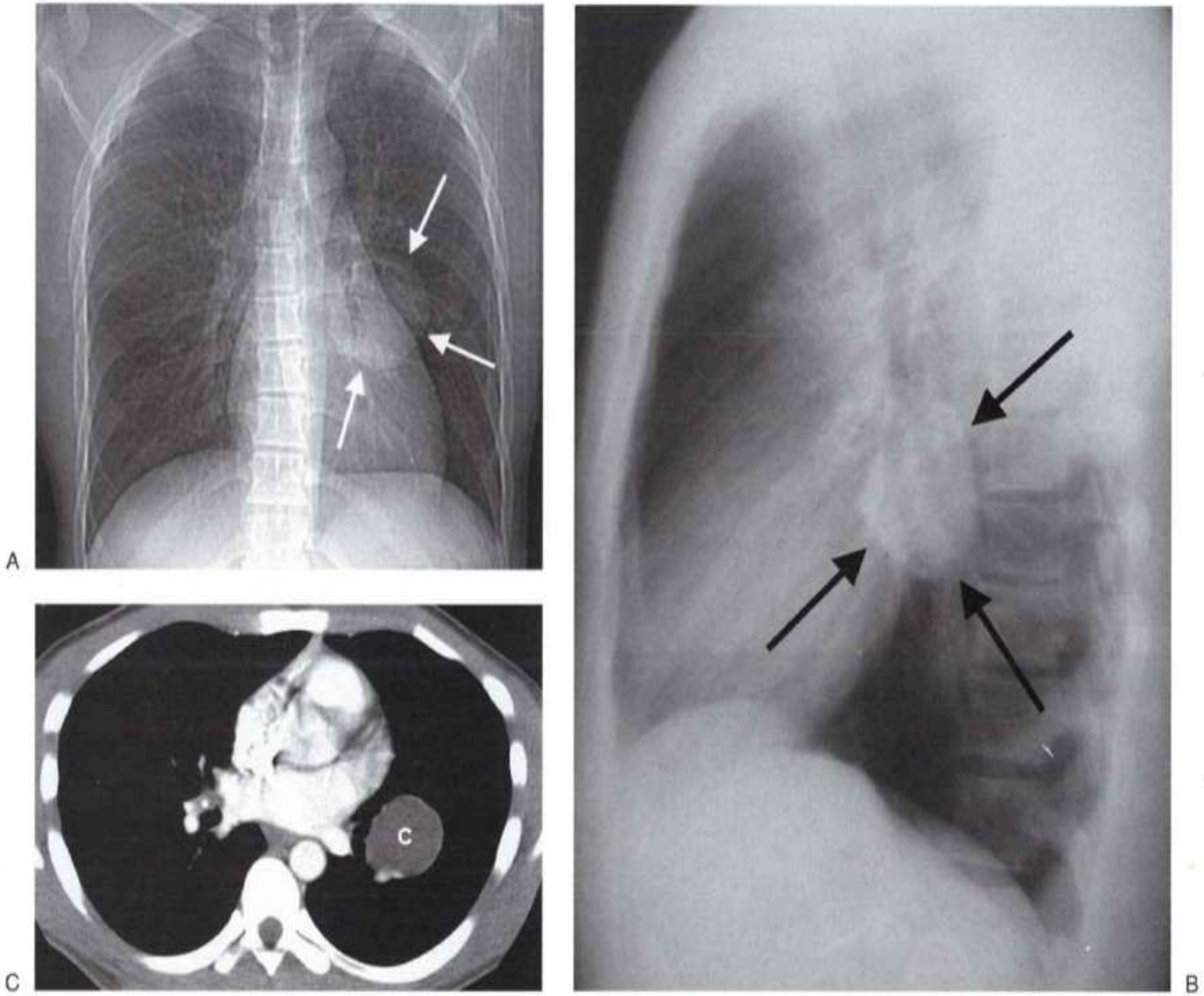
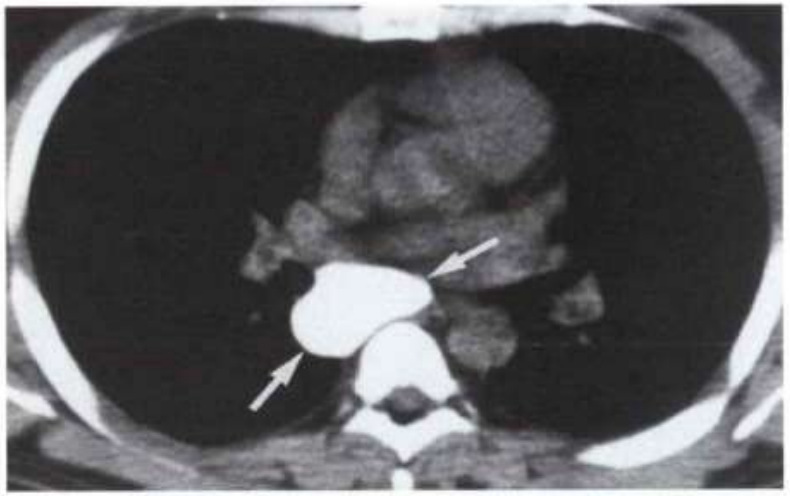


FIGURE 6-30. **Bronchogenic cyst.** PA (**A**) and lateral (**B**) chest radiographs of a 23-year-old man show a round mass in the left medial hemithorax (*arrows*). **C:** CT scan shows that the nonenhancing left hilar mass is of homogeneous fluid attenuation, consistent with a cyst (*C*).



C

FIGURE 6-31. (*Continued*) **C:** CT scan shows that the mass is extremely dense throughout, consistent with milk of calcium (*arrows*).

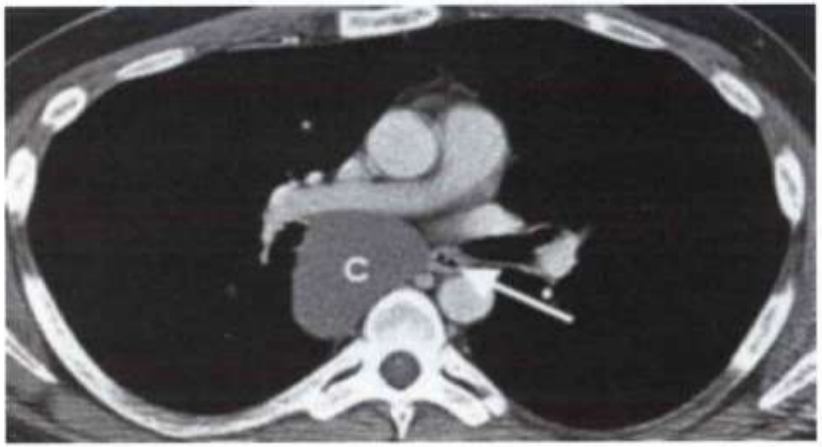


FIGURE 6-32. **Esophageal duplication cyst.** CT scan of a 45-year-old woman shows a subcarinal cystic structure (*C*) of homogeneous fluid attenuation in contact with the esophagus (*arrow*). The appearance is indistinguishable from that of a bronchogenic cyst.

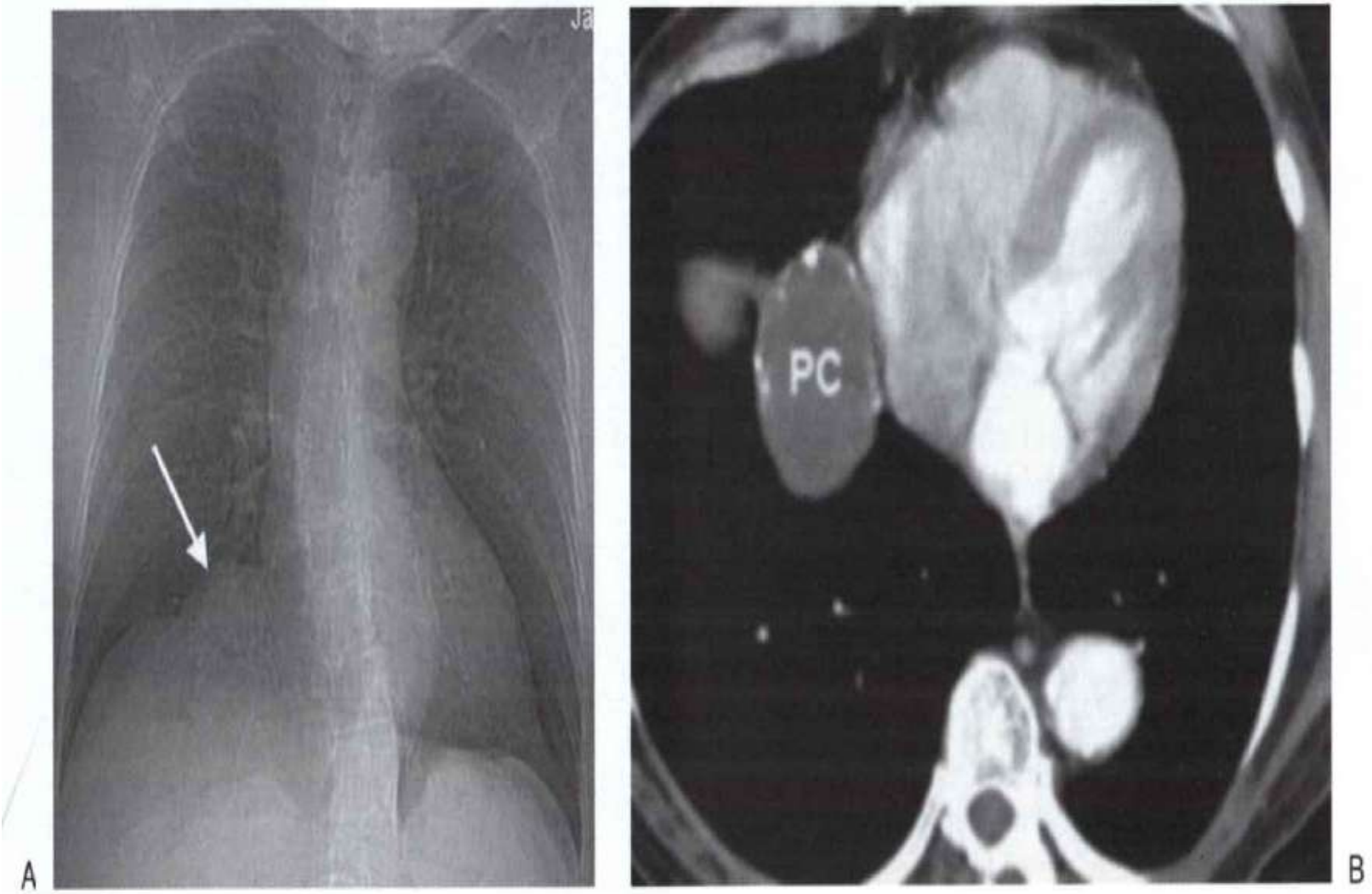


FIGURE 6-33. Pericardial cyst. **A:** PA chest radiograph shows a round opacity (*arrow*) at the right cardiophrenic angle. **B:** CT scan shows the mass (*PC*) to be of homogeneous fluid attenuation with rim calcification.

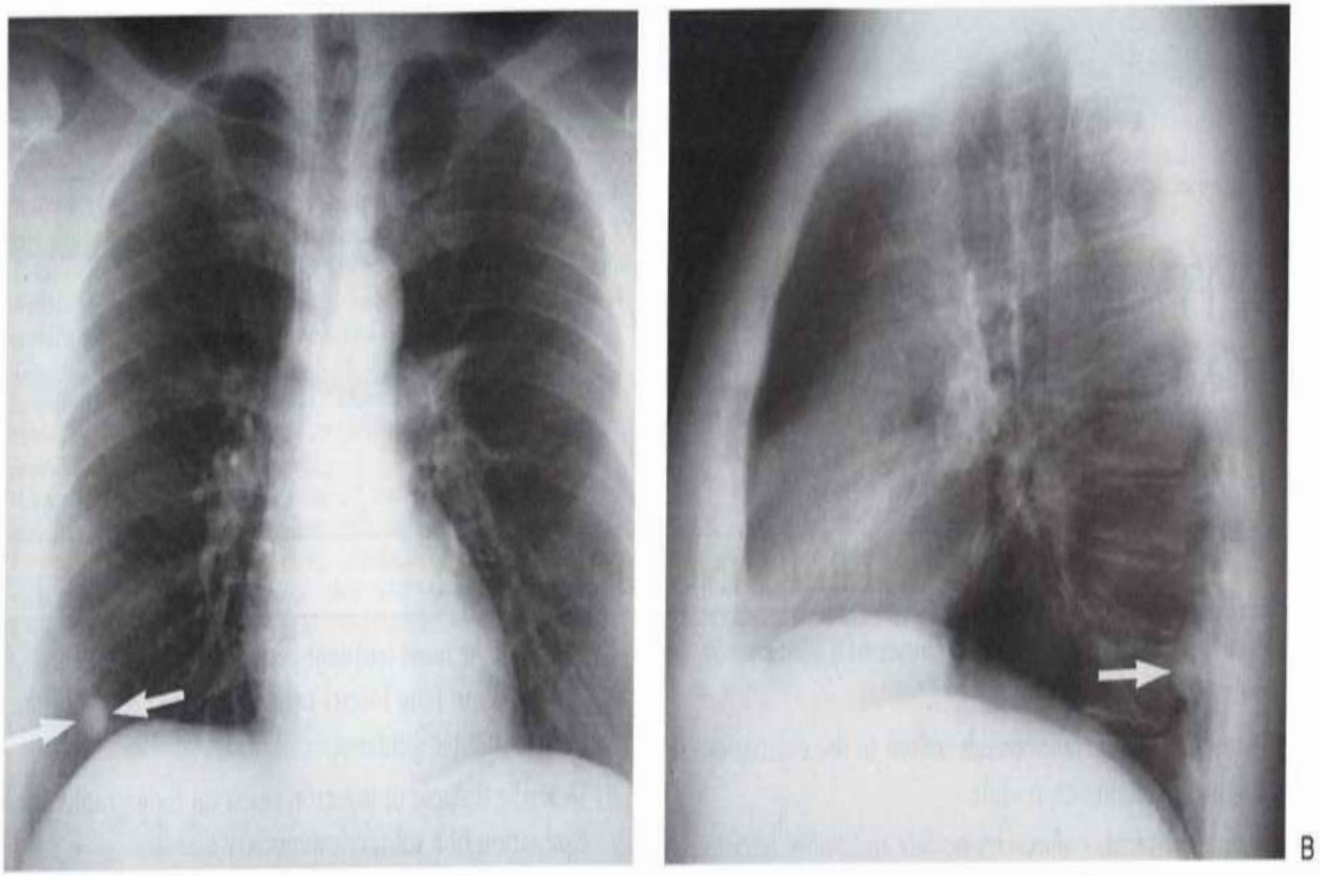


FIGURE 7-1. **Granuloma.** **A:** PA chest radiograph shows a small, well-circumscribed, round opacity at the right lung base (*arrows*). **B:** Lateral view shows that the opacity is within the lung on two views (posterior segment of the right lower lobe) and thus represents a pulmonary nodule (*arrow*). The high density of the nodule relative to its small size indicates that it is densely calcified. The appearance is characteristic of a benign calcified granuloma, and no further evaluation of the nodule is needed (an exception would be in a patient with a known calcium-producing primary tumor, such as osteosarcoma, which can lead to calcified pulmonary metastases; in this case, older radiographs confirmed over 2 years of stability of the granuloma).

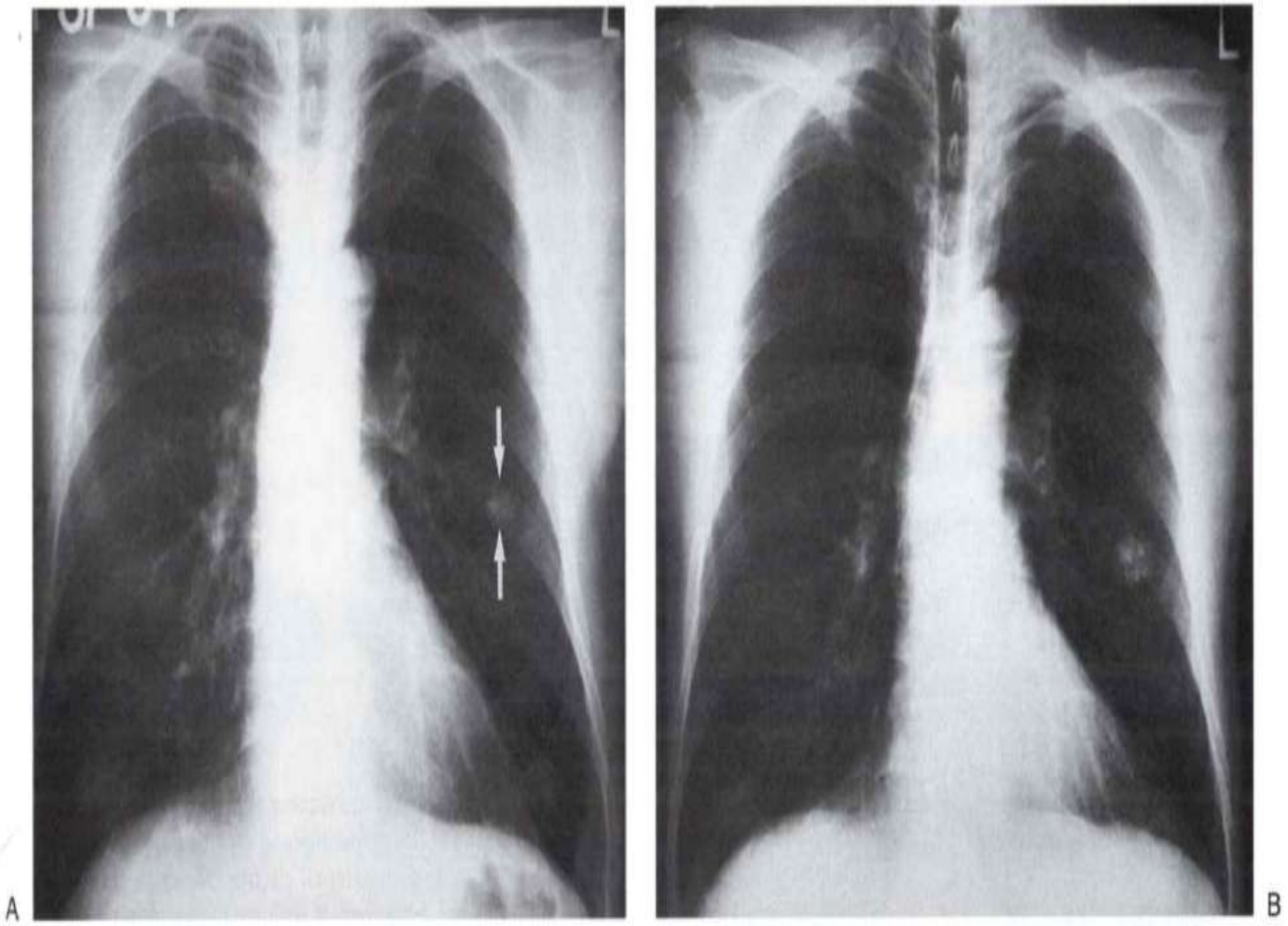


FIGURE 7-4. Hamartoma. A: PA chest radiograph shows a rounded opacity in the left middle lung with calcification (*arrows*). B: PA chest radiograph obtained 5.5 years later shows enlargement of the nodule, which has doubled in volume. The randomly distributed calcifications, arranged in overlapping rings, now have the typical "popcorn" appearance described with hamartomas. It is not unusual for hamartomas to enlarge; unlike malignant nodules, however, the growth rate is slow, with doubling occurring in more than 18 months' time.

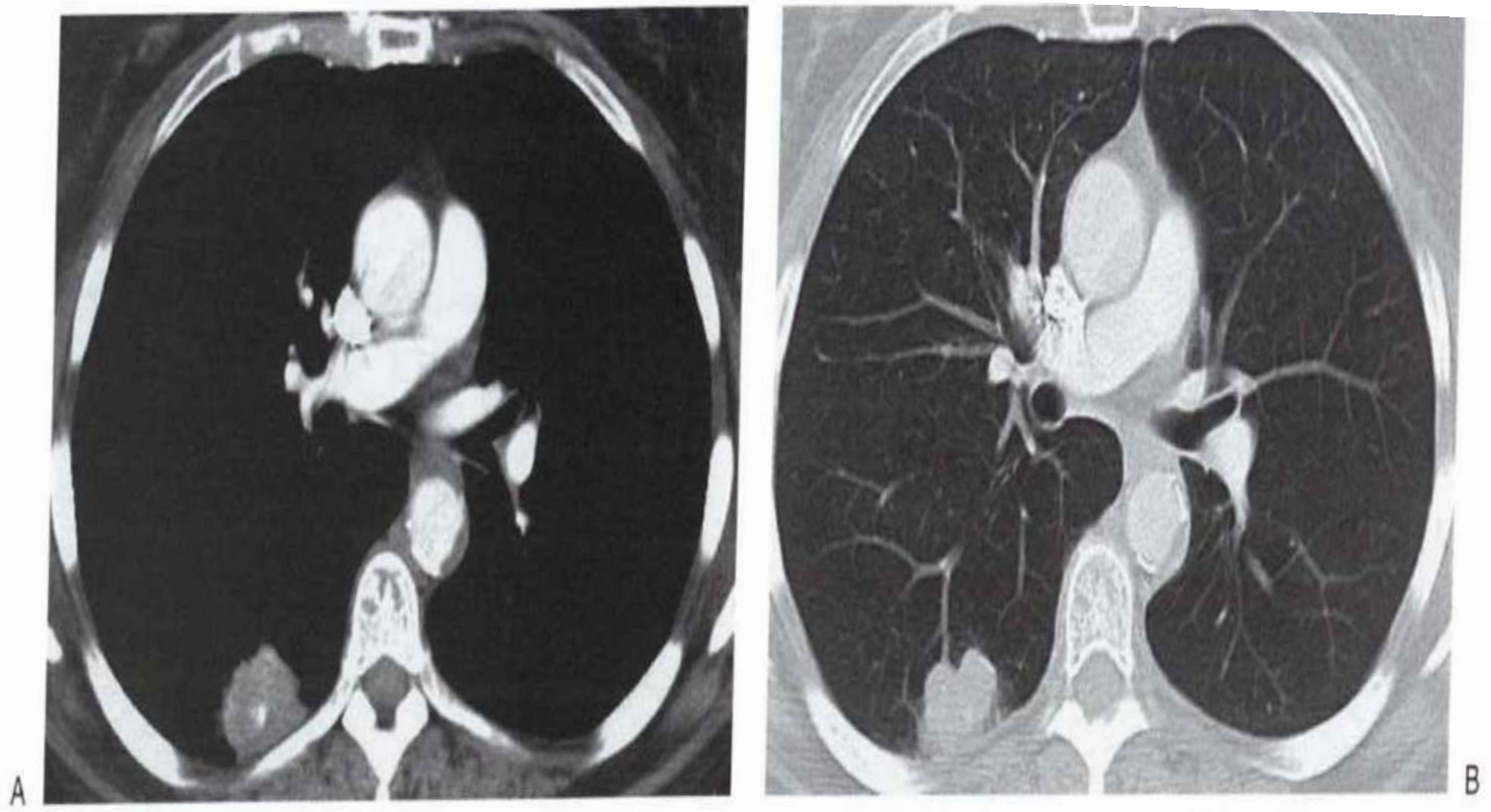


FIGURE 7-5. Small-cell carcinoma. **A:** CT image shows an irregular, calcified, round nodule in the right lower lobe. The pattern of calcification is not definitely benign and the nodule's irregular margin makes it suspicious for neoplasm. **B:** CT scan with lung windowing shows the nodule to have a lobulated contour.

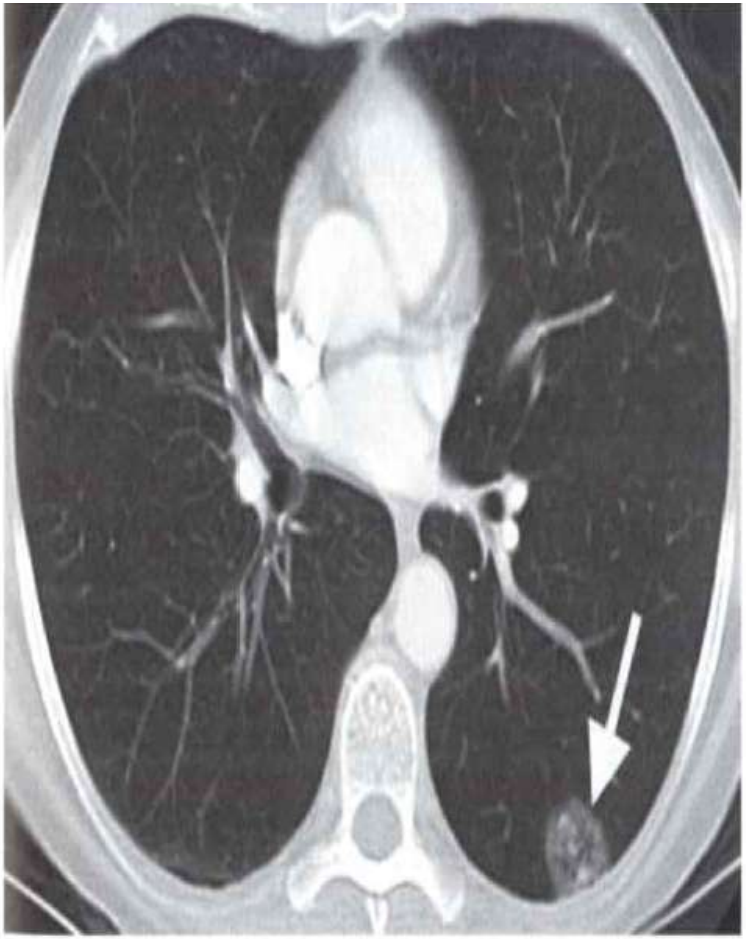


FIGURE 7-8. **Bronchioloalveolar cell carcinoma.** CT scan shows a mixed solid/ground-glass nodule in the periphery of the left lower lobe (*arrow*). Internal "bubble" lucencies are a characteristic feature of this type of neoplasm.

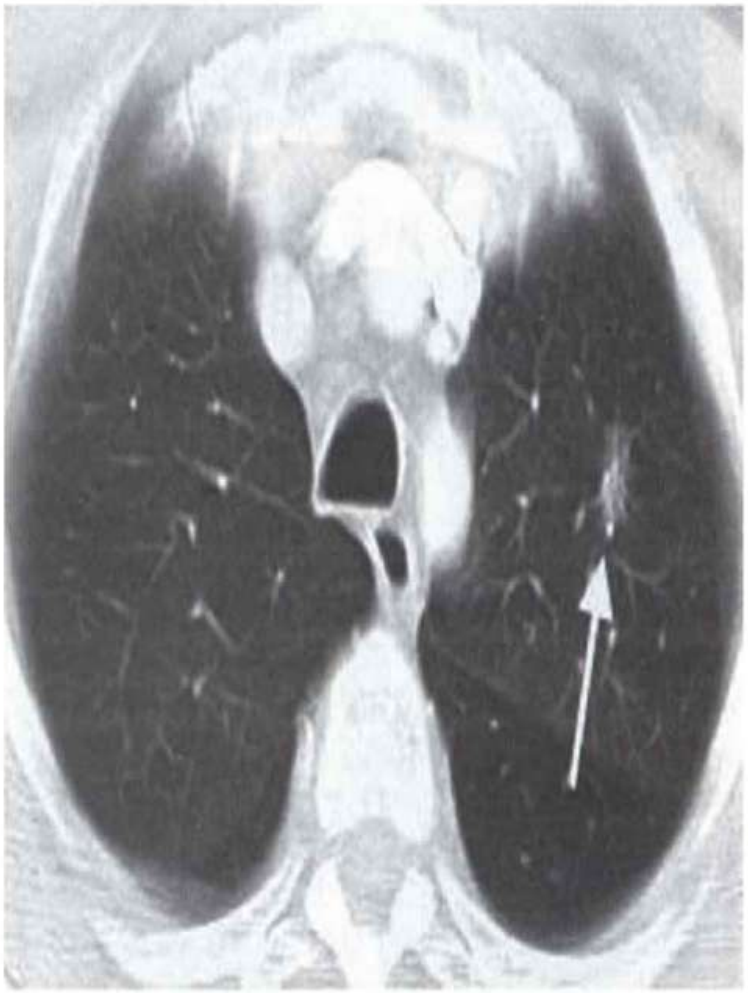


FIGURE 7-9. **Bronchioloalveolar cell carcinoma.** CT scan shows a mixed solid and ground-glass nodule in the left upper lobe (*arrow*).

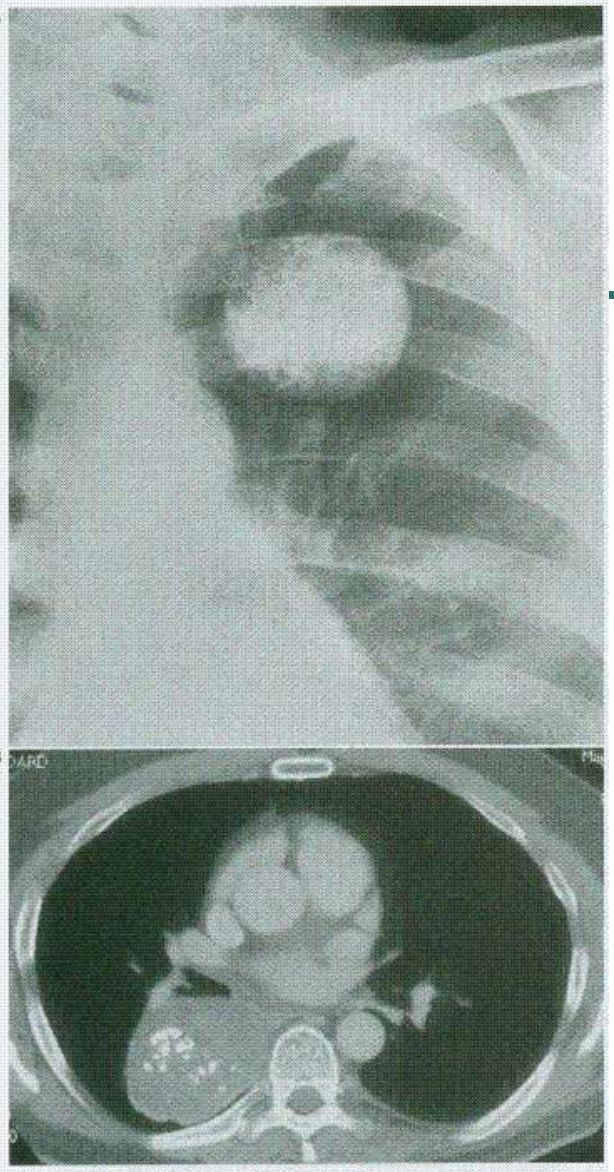


Fig. 3.76 Popcorn calcifications in pulmonary hamartoma: **A**, on chest radiography; **B**, on CT.

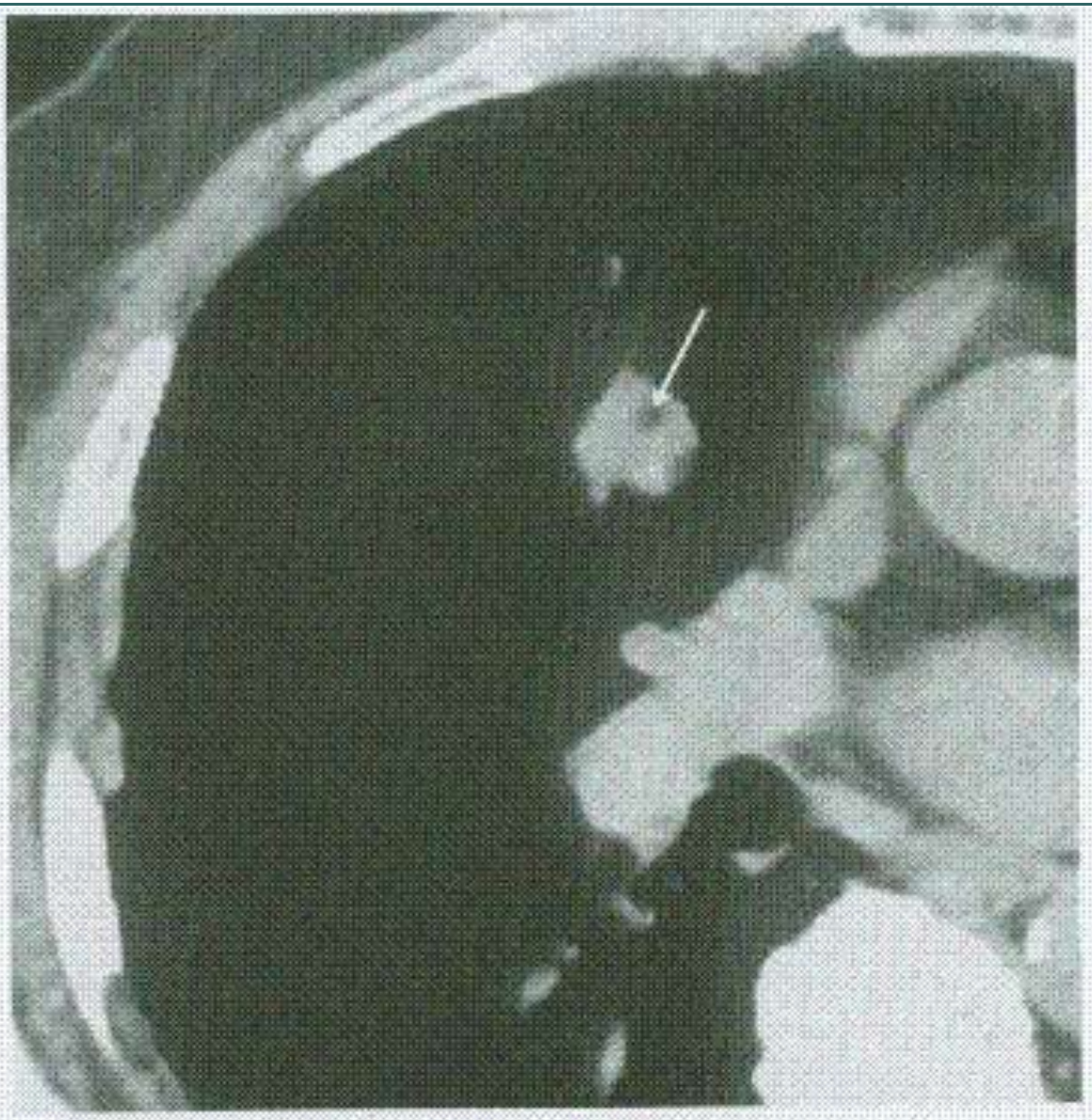


Fig. 3.81 Fat within a hamartoma (arrow).

Calcification in Carcinoma

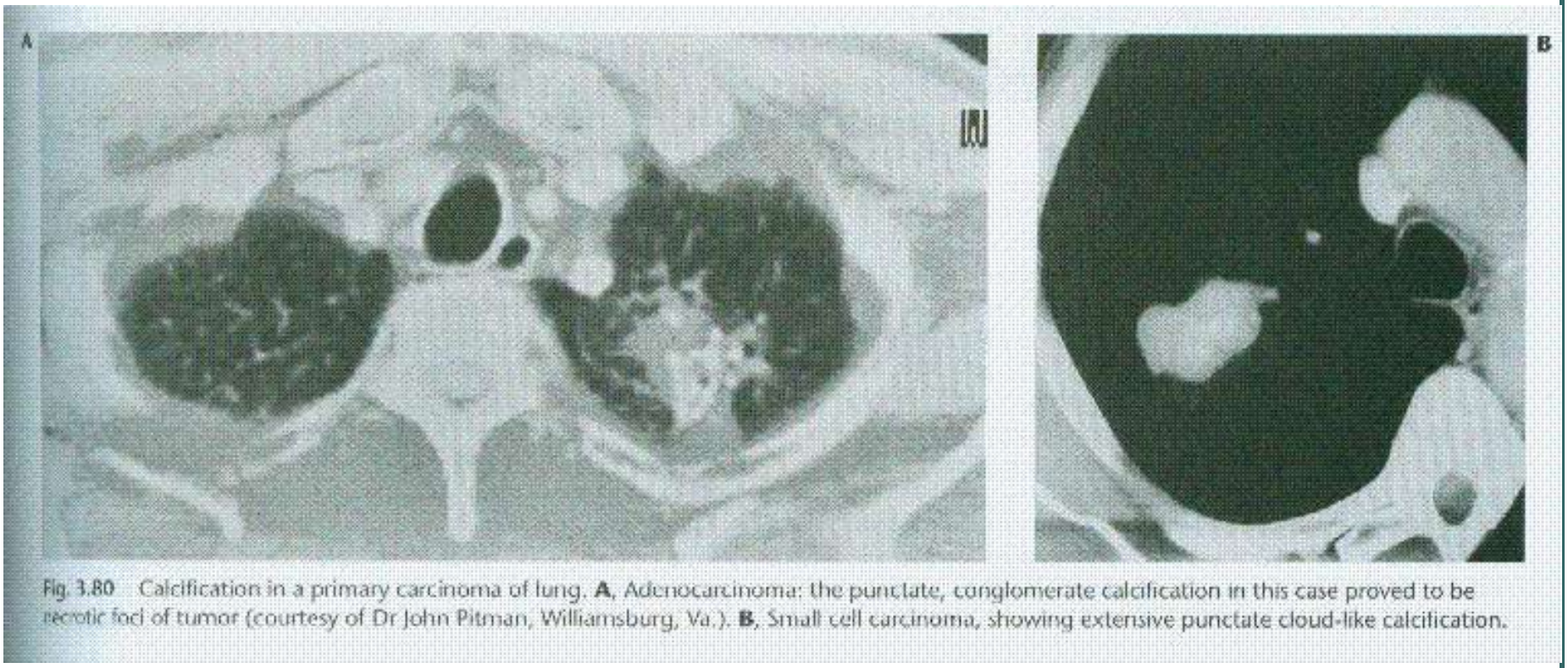


Fig. 3.80 Calcification in a primary carcinoma of lung. **A**, Adenocarcinoma: the punctate, conglomerate calcification in this case proved to be necrotic foci of tumor (courtesy of Dr John Pitman, Williamsburg, Va.). **B**, Small cell carcinoma, showing extensive punctate cloud-like calcification.

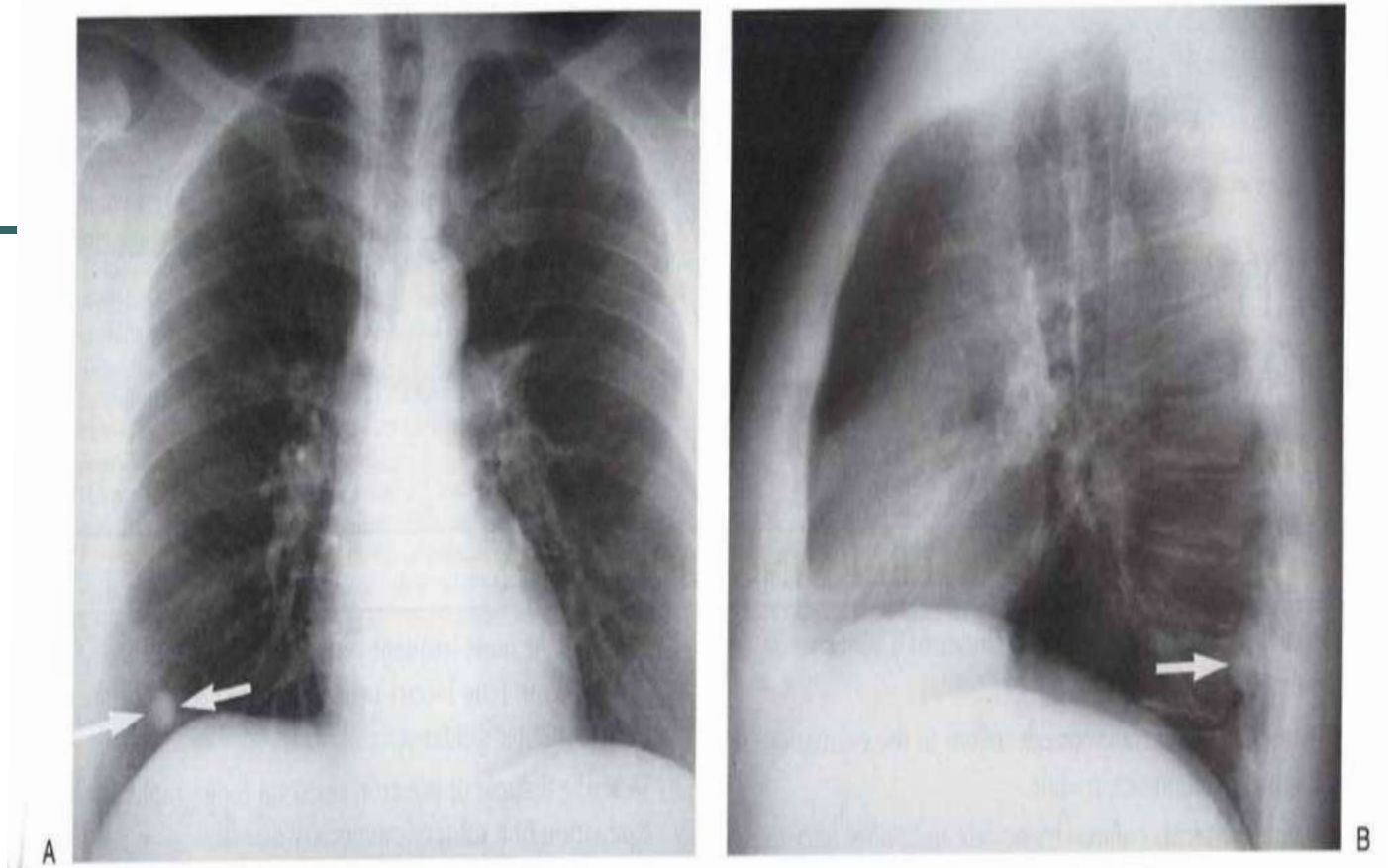
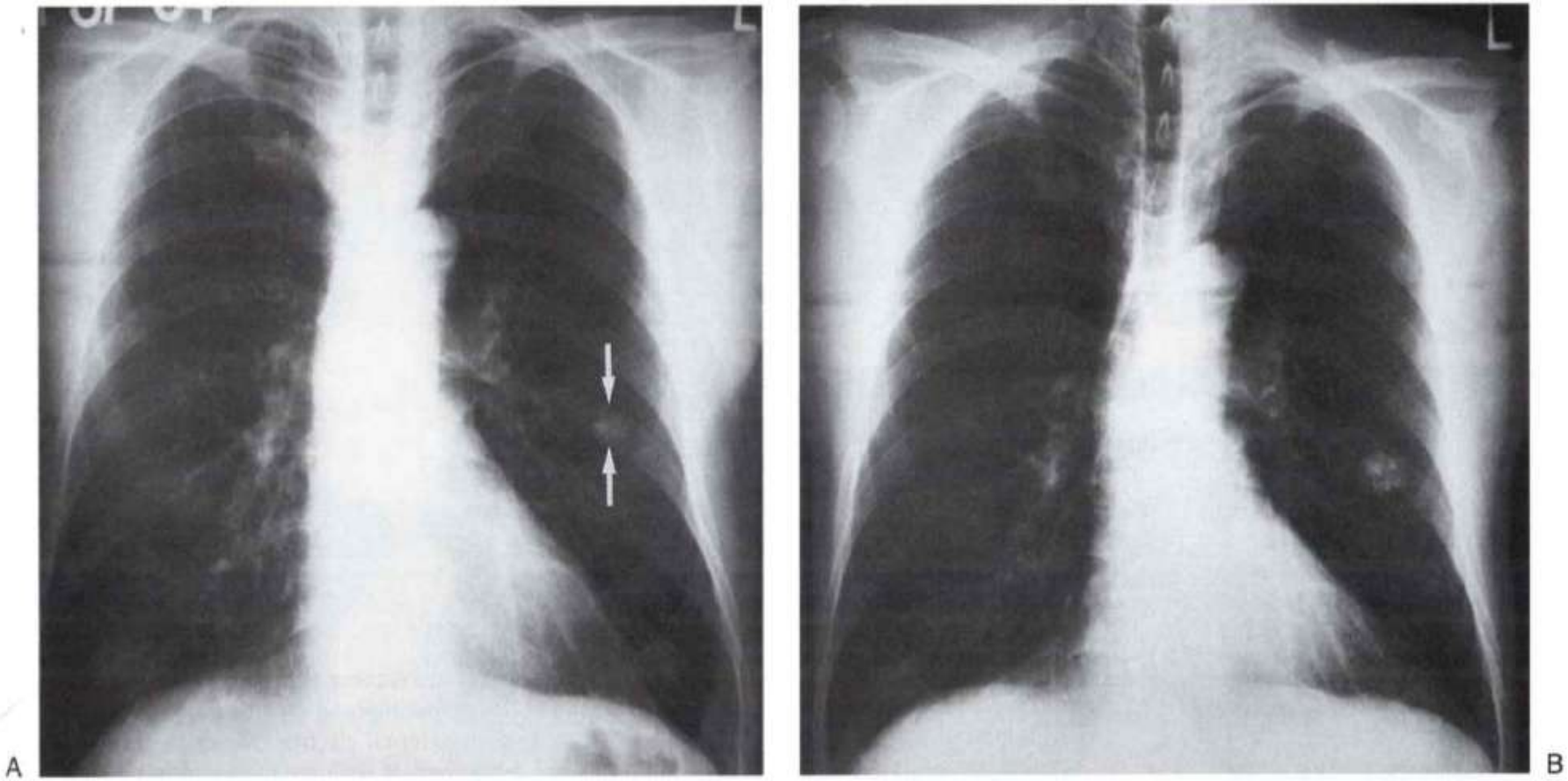


FIGURE 7-1. Granuloma. A: PA chest radiograph shows a small, well-circumscribed, round opacity at the right lung base (*arrows*). **B:** Lateral view shows that the opacity is within the lung on two views (posterior segment of the right lower lobe) and thus represents a pulmonary nodule (*arrow*). The high density of the nodule relative to its small size indicates that it is densely calcified. The appearance is characteristic of a benign calcified granuloma, and no further evaluation of the nodule is needed (an exception would be in a patient with a known calcium-producing primary tumor, such as osteosarcoma, which can lead to calcified pulmonary metastases; in this case, older radiographs confirmed over 2 years of stability of the granuloma).



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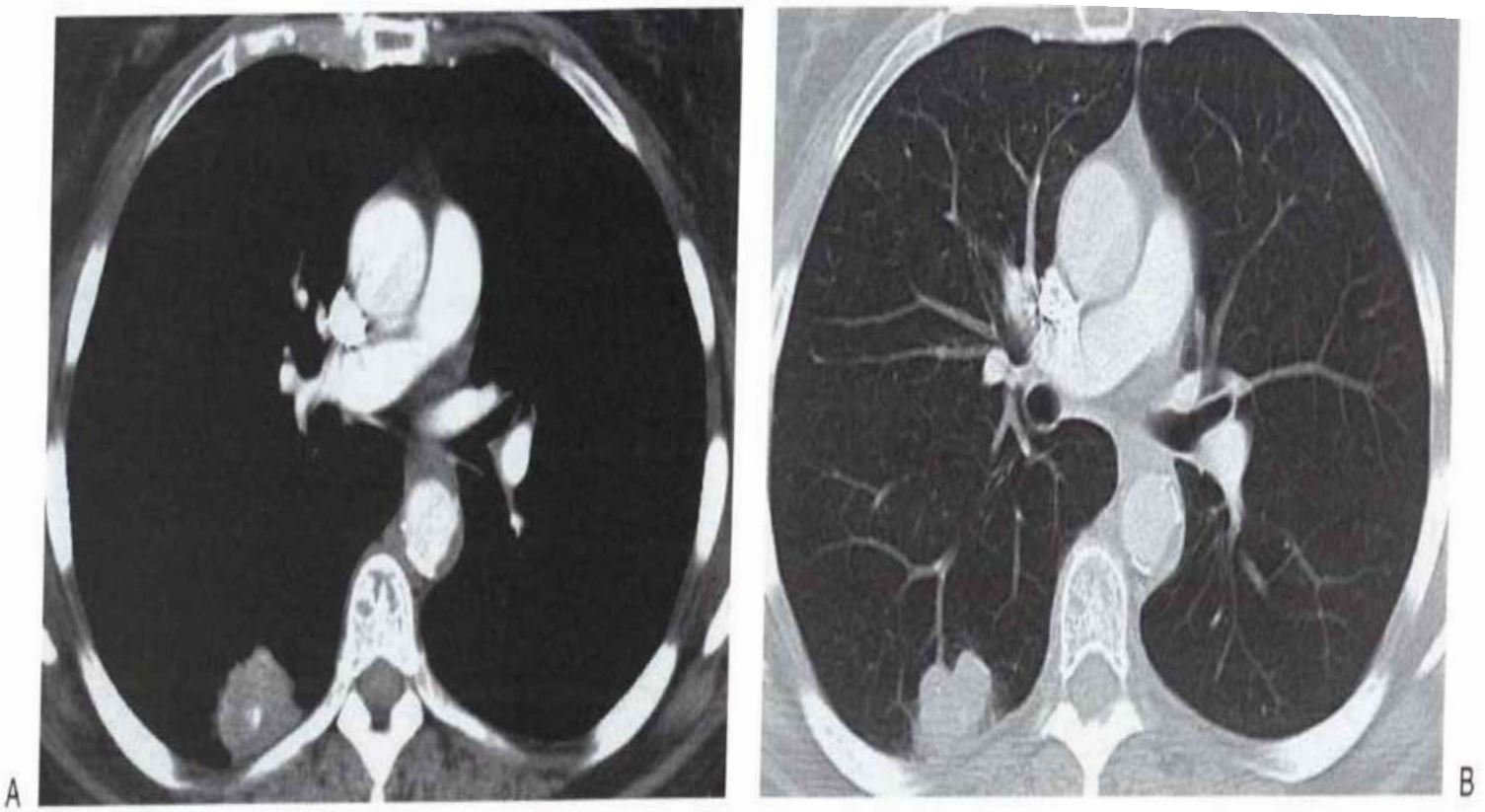

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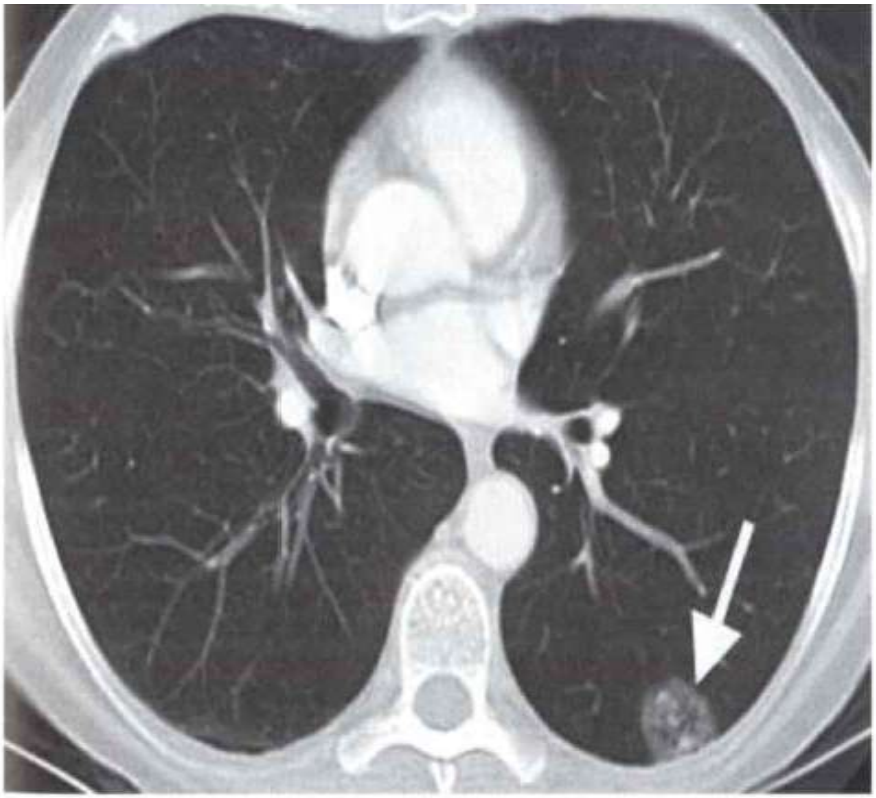


FIGURE 7-8. **Bronchioloalveolar cell carcinoma.** CT scan shows a mixed solid/ground-glass nodule in the periphery of the left lower lobe (*arrow*). Internal "bubble" lucencies are a characteristic feature of this type of neoplasm.

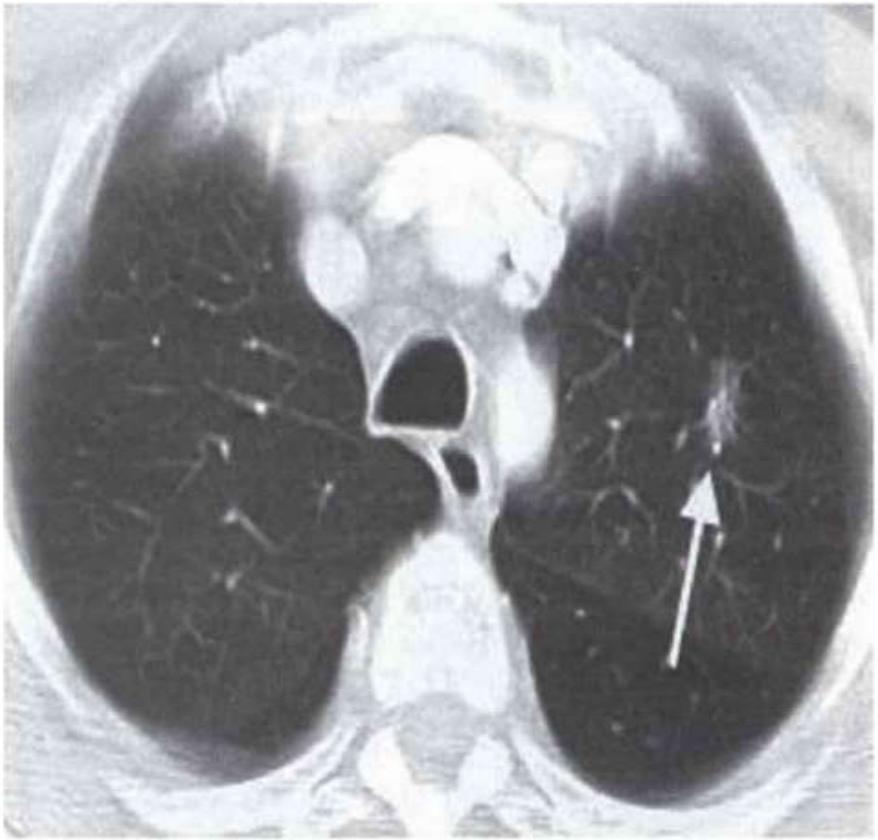


FIGURE 7-9. **Bronchioloalveolar cell carcinoma.** CT scan shows a mixed solid and ground-glass nodule in the left upper lobe (*arrow*).

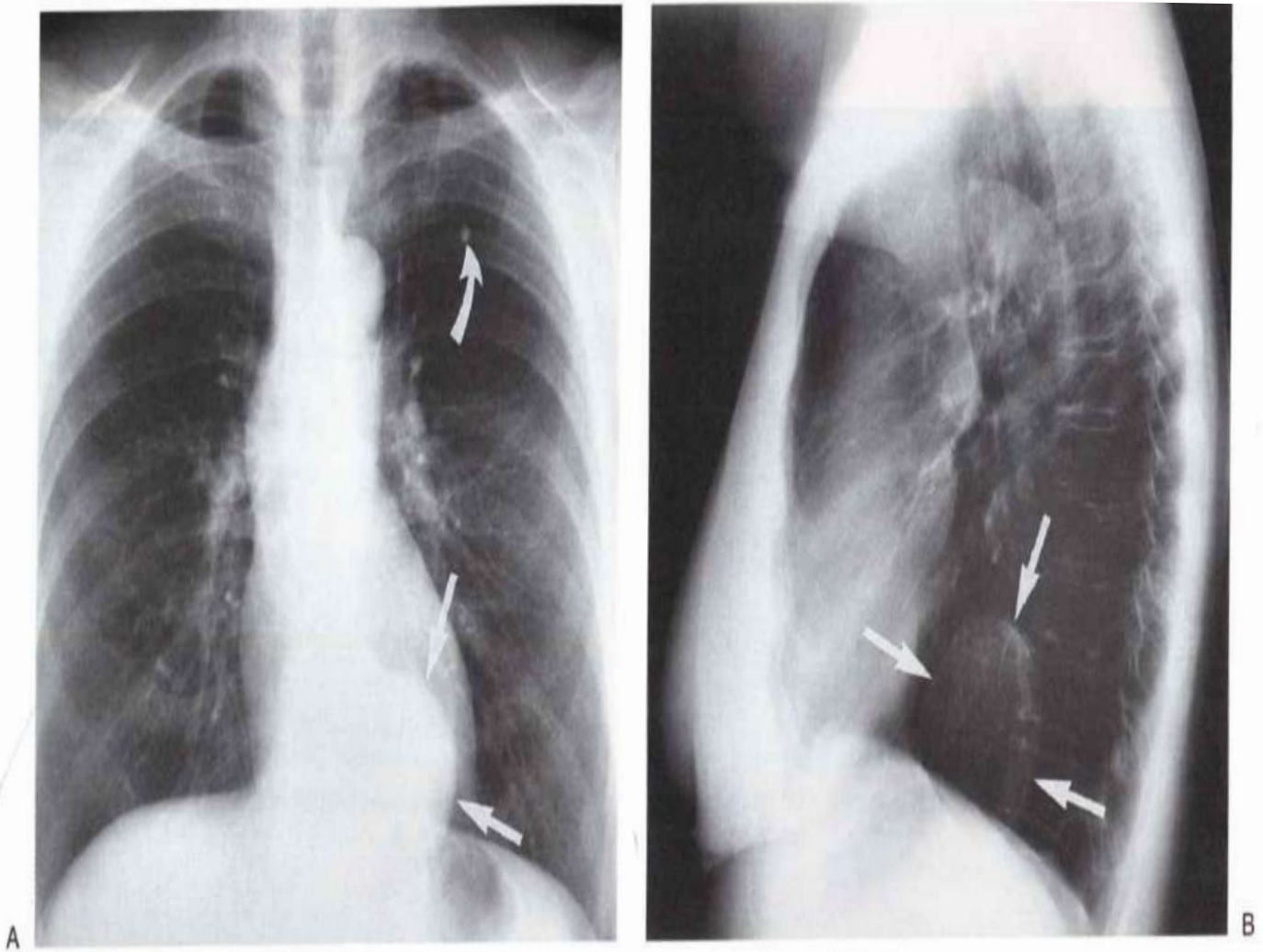


FIGURE 6-36. Descending thoracic aortic aneurysm. **A:** PA chest radiograph of a 69-year-old woman shows a rounded mass in continuity with the descending aorta (*straight arrows*). Incidental note of calcified granuloma in the left upper lobe (*curved arrow*). **B:** Lateral chest radiograph shows curvilinear rim calcification within the wall of the aneurysm (*arrows*).

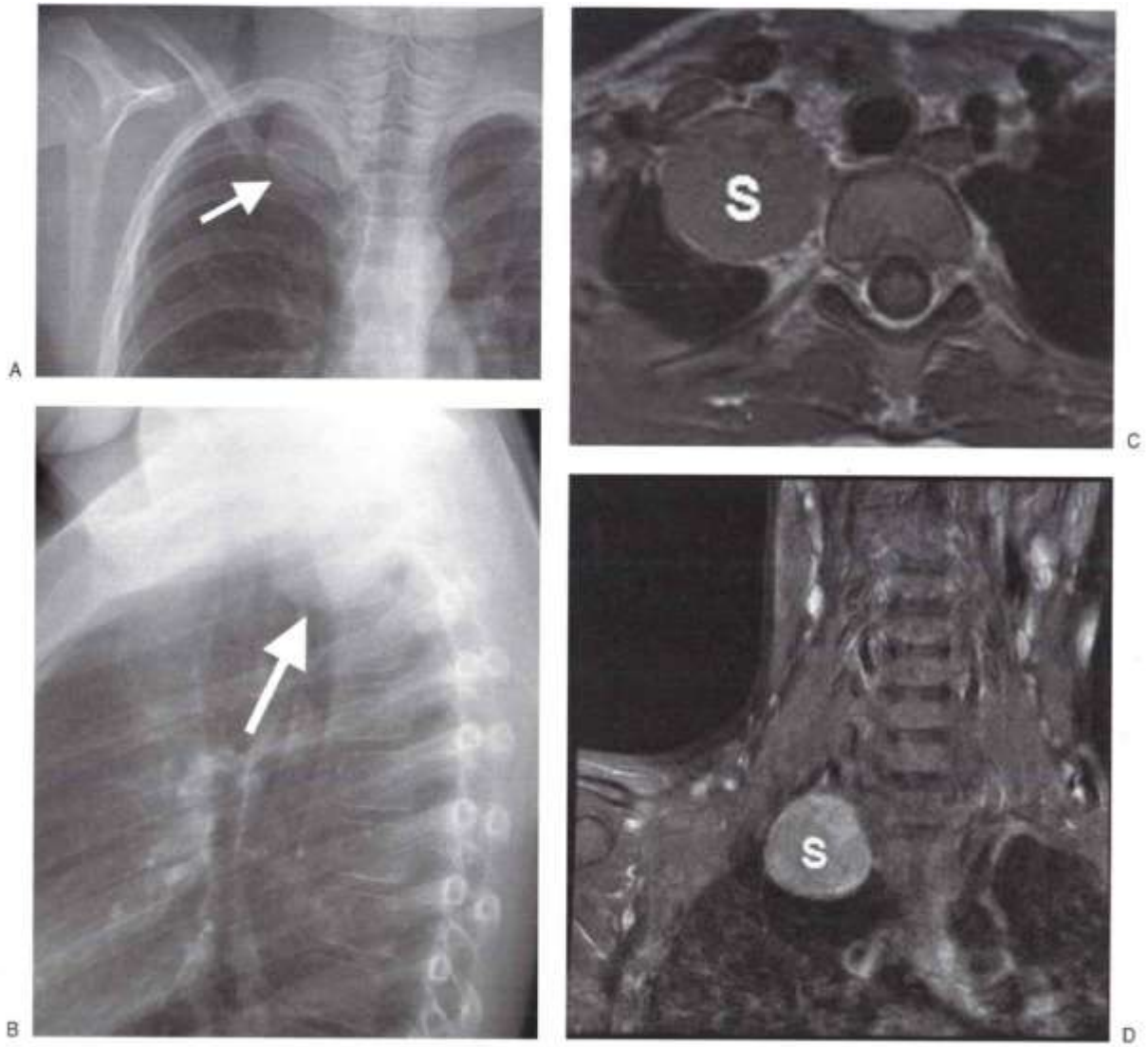


FIGURE 6-39. Benign schwannoma. PA (**A**) and lateral (**B**) chest radiographs of a 9-year-old girl show a circumscribed mass in the right apex (*arrow*). **C:** Axial T1-weighted MRI shows the mass (*S*) is paraspinal in location and has no continuity with the spinal canal. **D:** Coronal MRI, with intravenous contrast, shows that the mass (*M*) has high signal intensity.

TABLE 7-4

CAUSES OF MULTIPLE PULMONARY NODULES

Neoplastic
- Metastases
- Malignant lymphoma/lymphoproliferative disorders

Inflammatory
- Granulomas
- Fungal and opportunistic infections
- Septic emboli
- Rheumatoid nodules
- Wegener granulomatosis
- Sarcoidosis
- Langerhan cell histiocytosis

Congenital
- Arteriovenous malformations (Osler-Weber-Rendu Syndrome)

Miscellaneous
- Hematomas
- Pulmonary infarcts
- Occupational (silicosis)

Miliary Pattern

- **Miliary TB**
- **No-TB infection**
  - **Viral infection**
  - **Nocardiosis**
  - **Cryptococcus**
  - **Histoplasmosis**
- **Diffuse panbronchiolitis**
- **Pneumoconiosis**
- **Sarcoidosis**
- **Alveolar microlithiasis**

Nodular Pattern

- **TB**

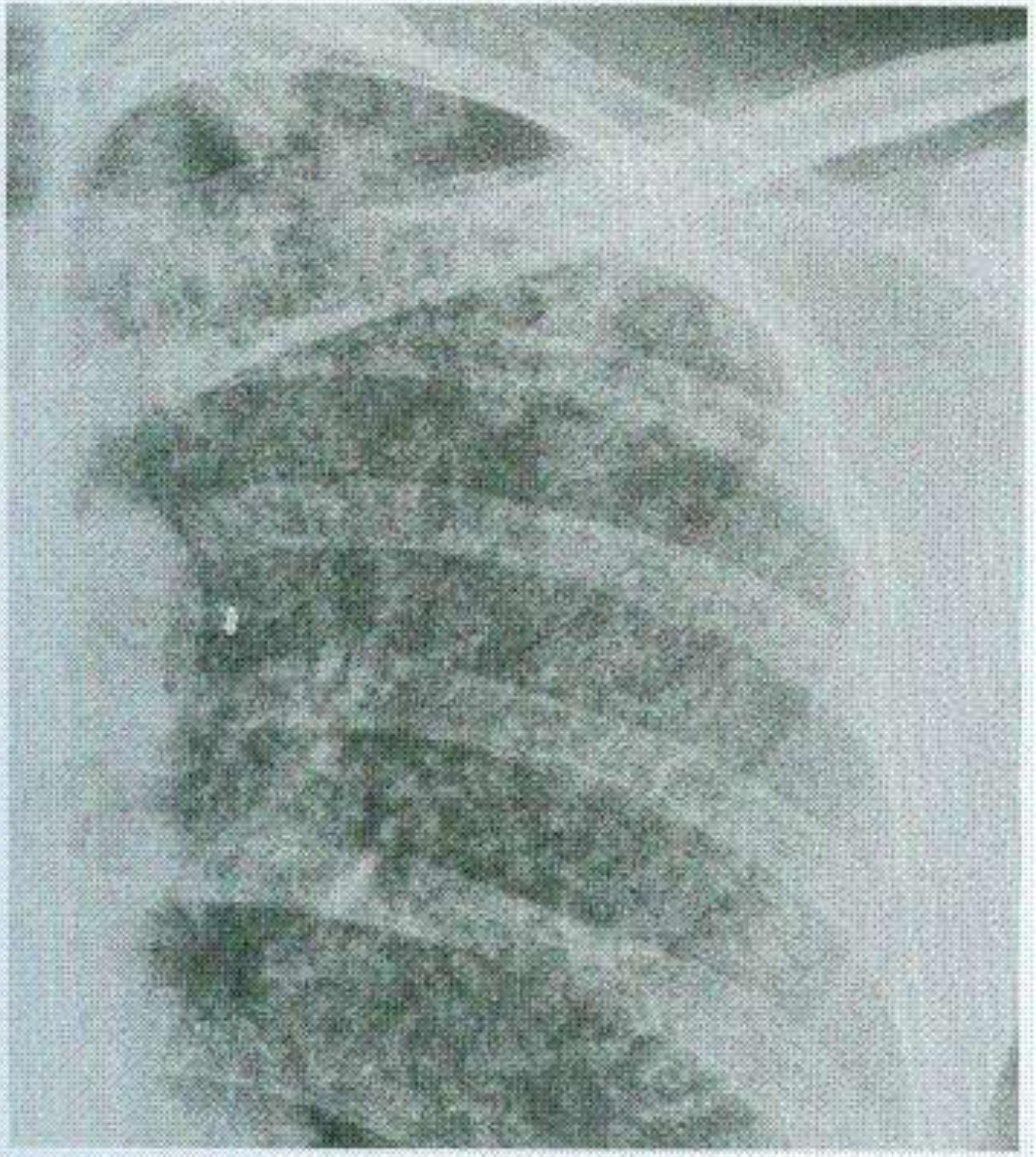


Fig. 3.104 Nodular pattern in miliary tuberculosis.

Multiple Small Calcification

- **Healed Varicella Pneumonia**

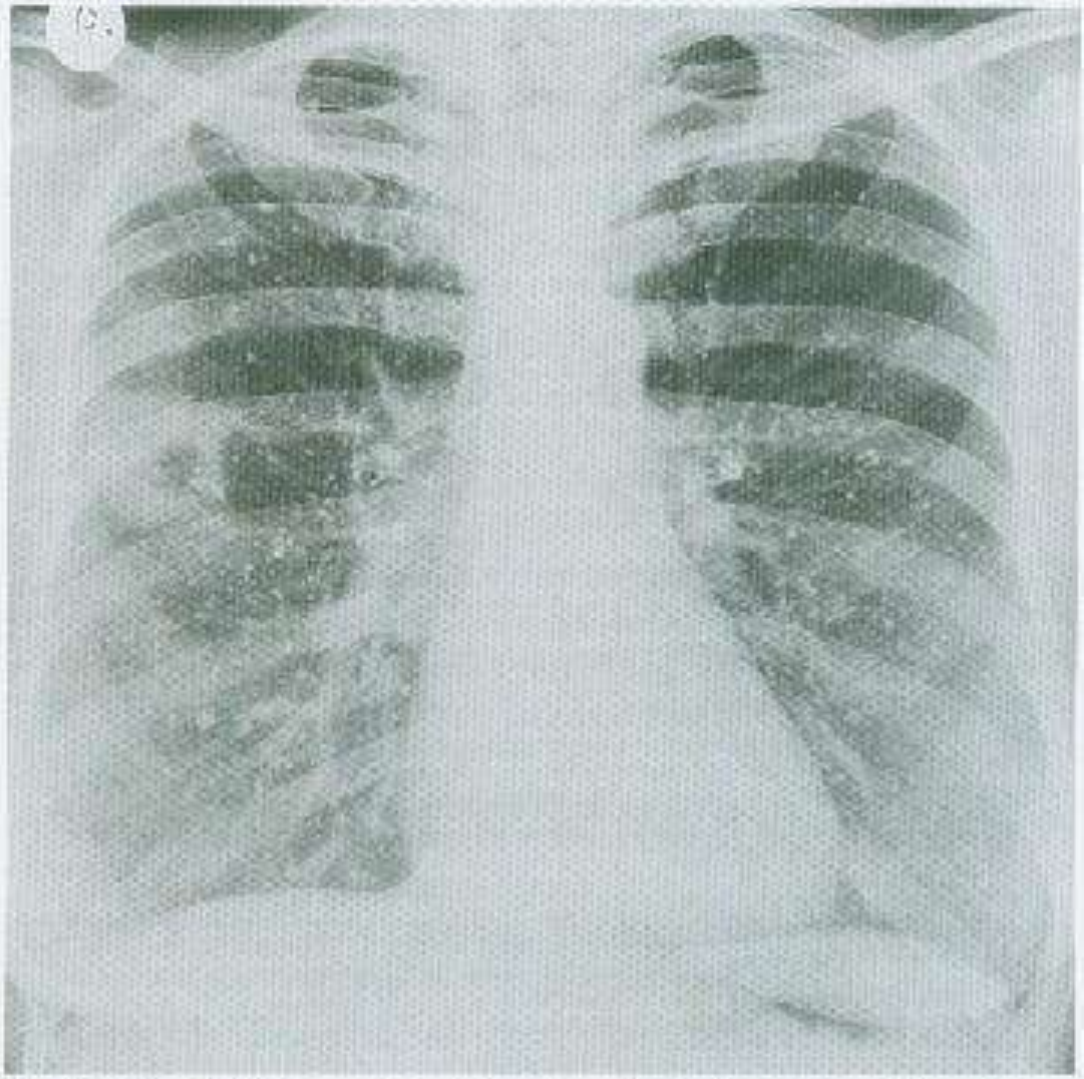


Fig. 3.116 Multiple small calcifications in the lungs caused by old healed varicella pneumonia. (The patient also has a carcinoma of the right upper lobe.)

TABLE 7-5

CAUSES OF CAVITARY PULMONARY NODULES

"CAVITY"

Carcinoma (bronchogenic, metastases—especially squamous cell)

Autoimmune (Wegener granulomatosis, rheumatoid nodules)

Vascular (bland and septic emboli)

Infection (especially mycobacterial and fungal)

Trauma (pneumatocele)

Young—i.e., congenital (sequestration, diaphragmatic hernia, bronchogenic cyst)

Reproduced with permission from Dähnert W. *Radiology Review Manual.* Baltimore: Williams & Wilkins; 1991.

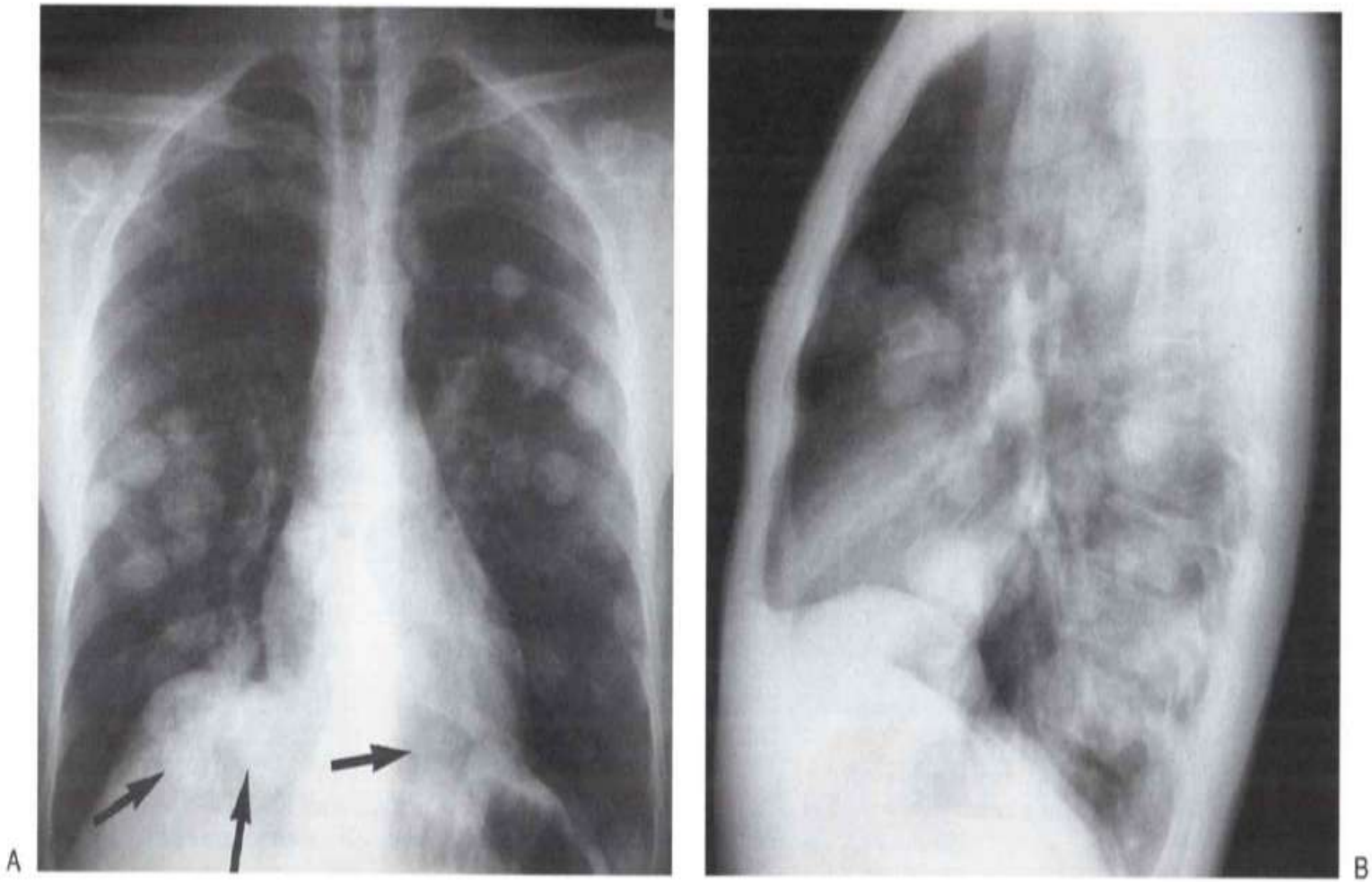
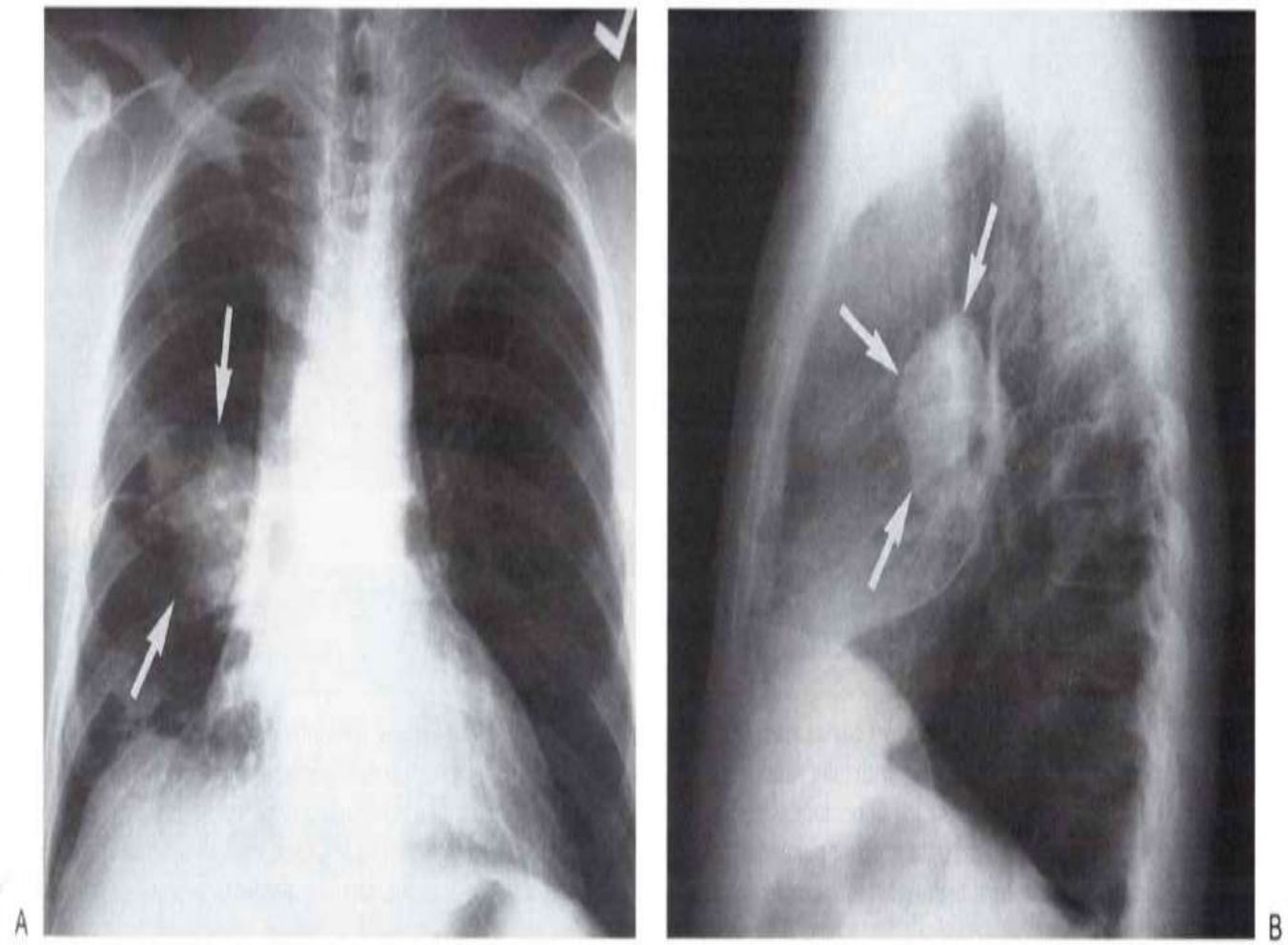


FIGURE 7-25. Metastatic testicular carcinoma. PA (**A**) and lateral (**B**) chest radiographs show numerous bilateral well-circumscribed pulmonary nodules of varying sizes, typical of pulmonary metastases. Testicular carcinoma has a high incidence of pulmonary metastases. Note on the PA view that some of the nodules are "hiding" under the diaphragm (*arrows*) in the posterior lung bases. It is important to always look carefully in this area for nodules, as they are more difficult to see when they are not contrasted with the lucency of the air-filled anterior lung.



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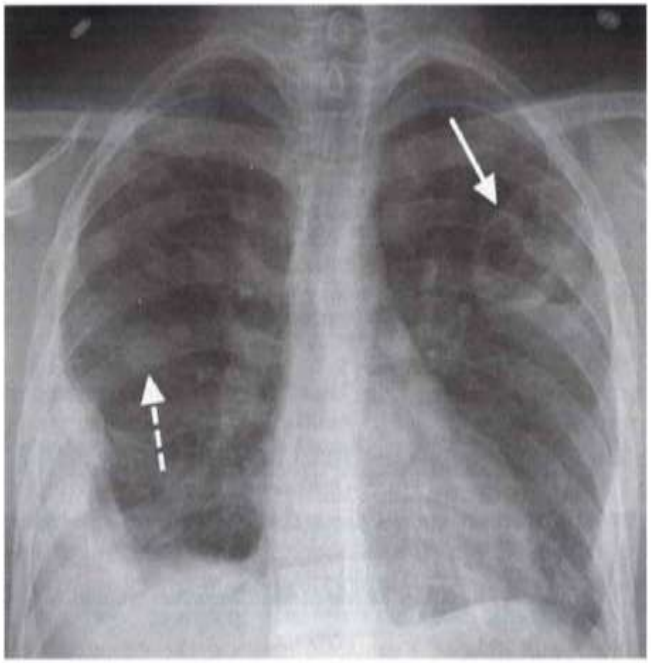
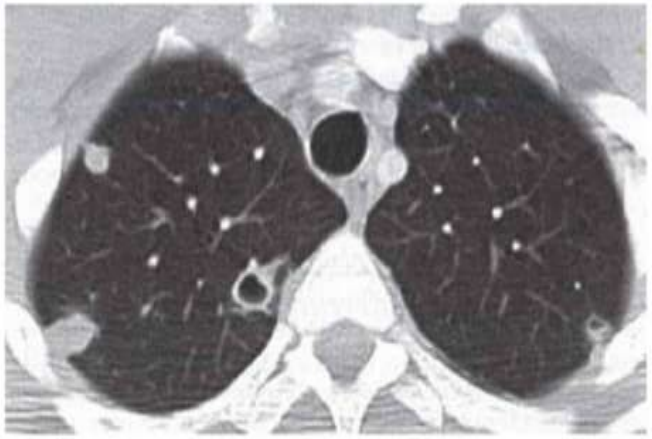
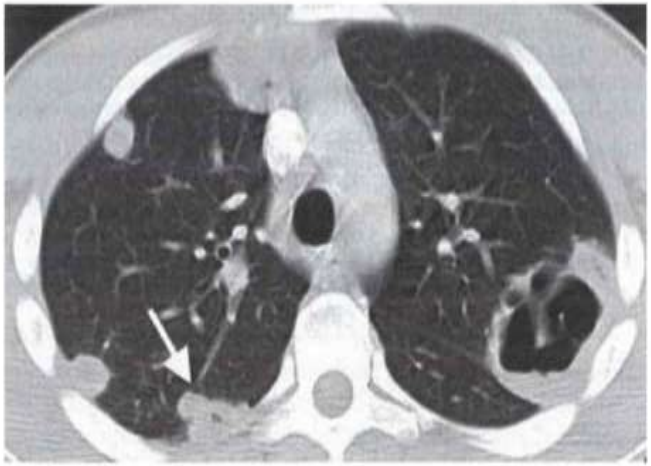


A



B



C

FIGURE 7-31. **Septic emboli. A:** PA chest radiograph shows numerous cavitary (*solid arrow*) and noncavitary (*dashed arrow*) nodules and masses in the lung and bilateral pleural effusions. **B:** CT image shows multiple nodules, some cavitary, in the periphery of the lungs, a common location for septic emboli to appear. **C:** CT at a level inferior to (B) shows multiple nodules in the right lung, the feeding vessel sign (*arrow*), and a dominant cavitary mass in the left lung.

TABLE 7-4

CAUSES OF MULTIPLE PULMONARY NODULES

Neoplastic
- Metastases
- Malignant lymphoma/lymphoproliferative disorders

Inflammatory
- Granulomas
- Fungal and opportunistic infections
- Septic emboli
- Rheumatoid nodules
- Wegener granulomatosis
- Sarcoidosis
- Langerhan cell histiocytosis

Congenital
- Arteriovenous malformations (Osler-Weber-Rendu Syndrome)

Miscellaneous
- Hematomas
- Pulmonary infarcts
- Occupational (silicosis)

Various Sized Nodule

- **Usually over lopwer lung field**
- **Hemogenic metastatic nodule should be suspected**

Hematogenic Metastasis

- **Various sized nodules**
- **Multiple lobulated lesions**
- **Prominent over lower lung field**

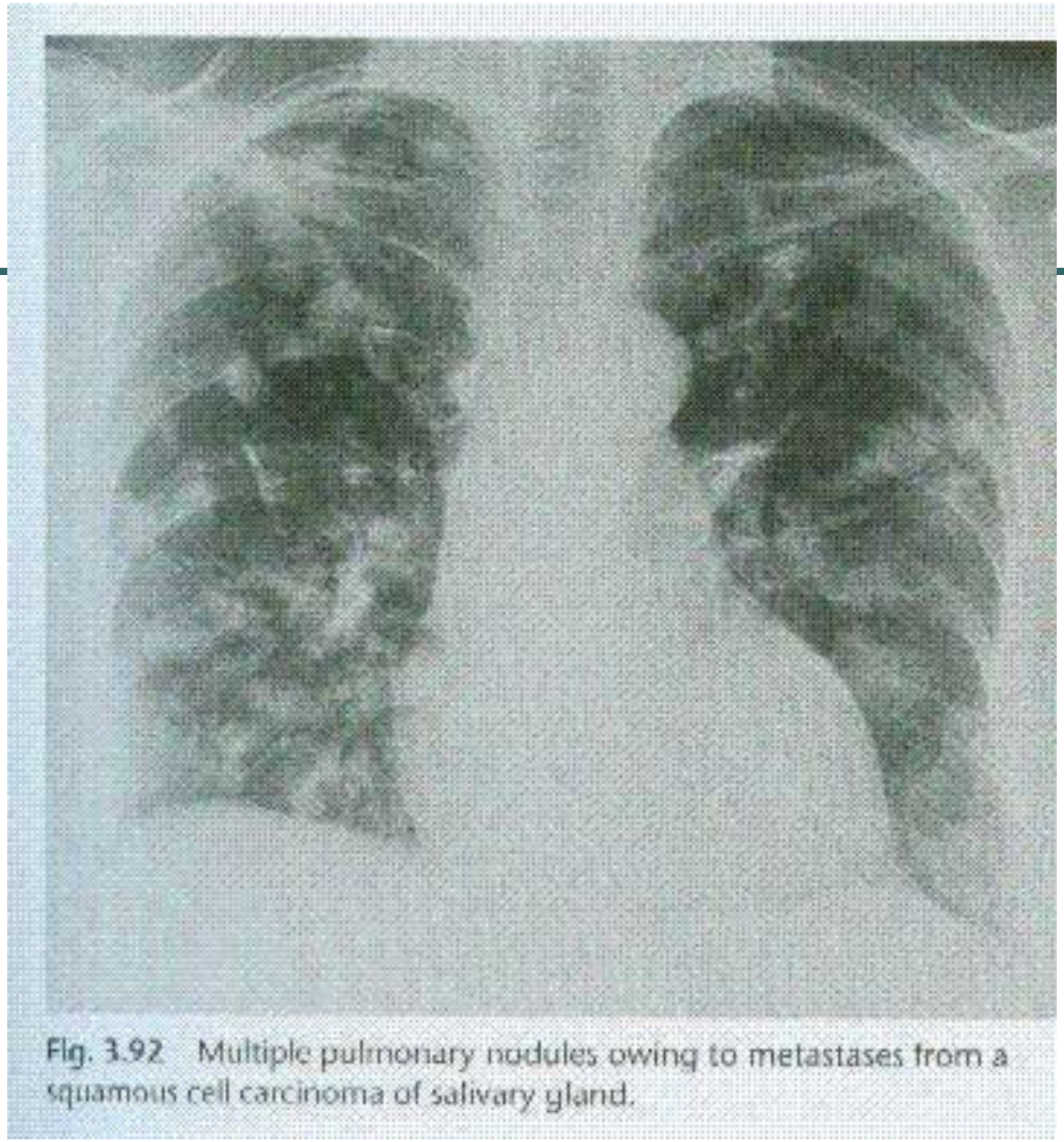


Fig. 3.92 Multiple pulmonary nodules owing to metastases from a squamous cell carcinoma of salivary gland.

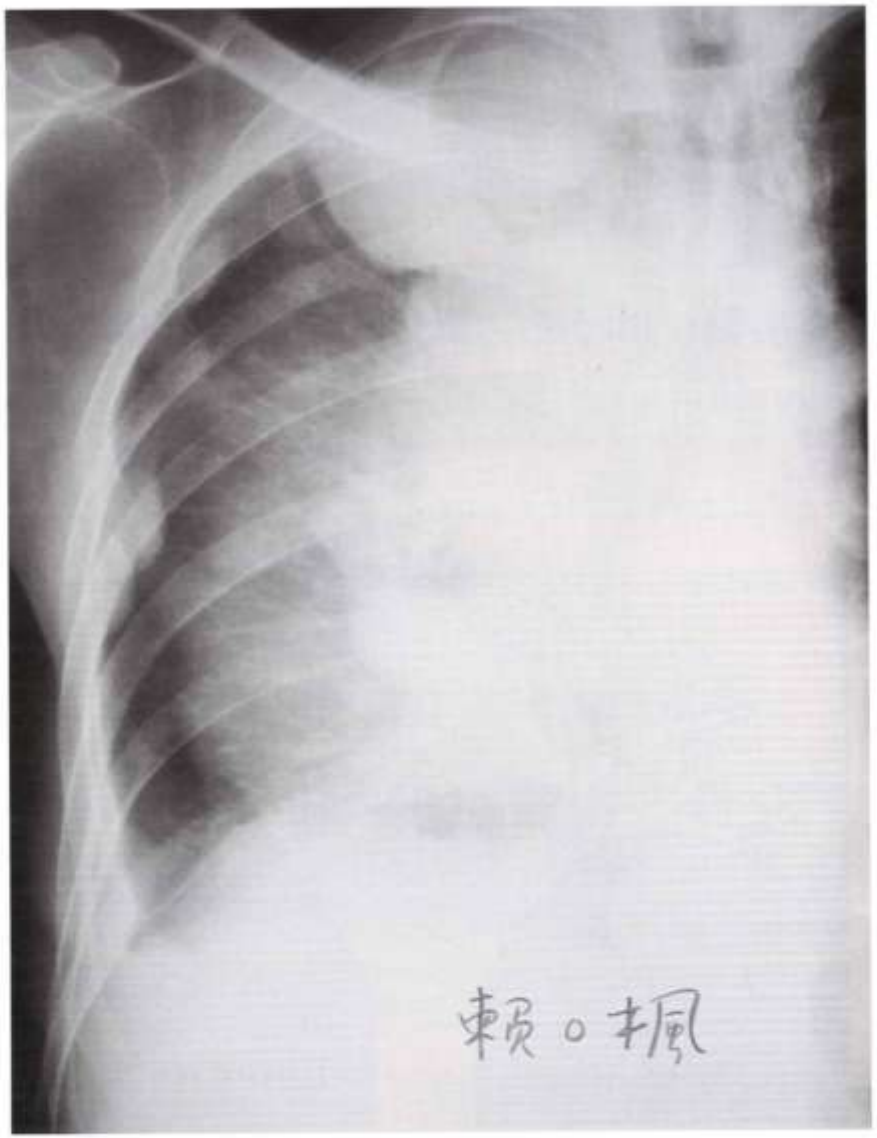


Fig 8-2 Malignant thymoma，許多結節及腫塊沿右胸壁及右側縱膈**seeding**，結節及腫塊都只見部份的**border**

Multiple calcified nodule

- **Metastasis from osteosarcoma**

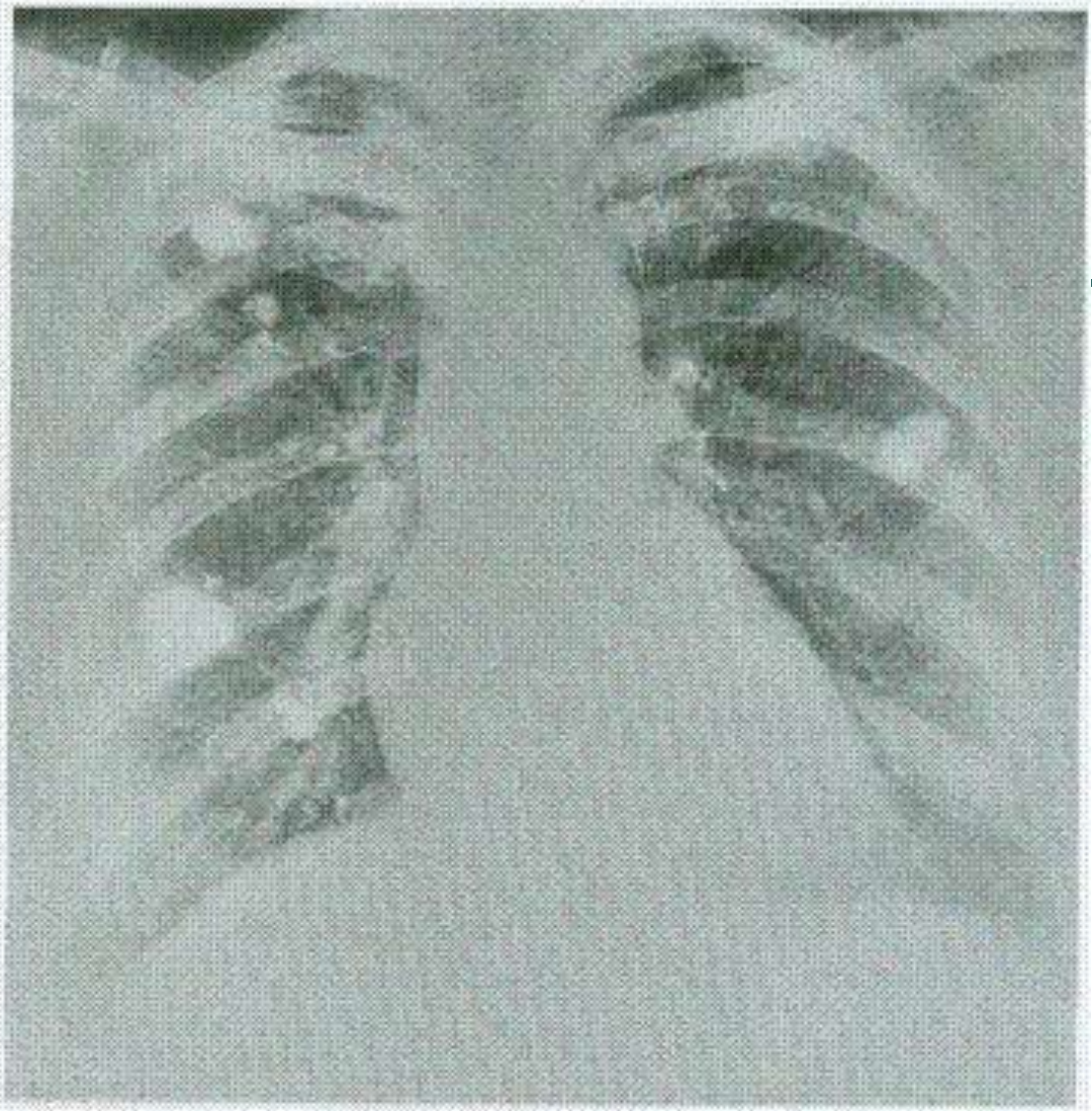
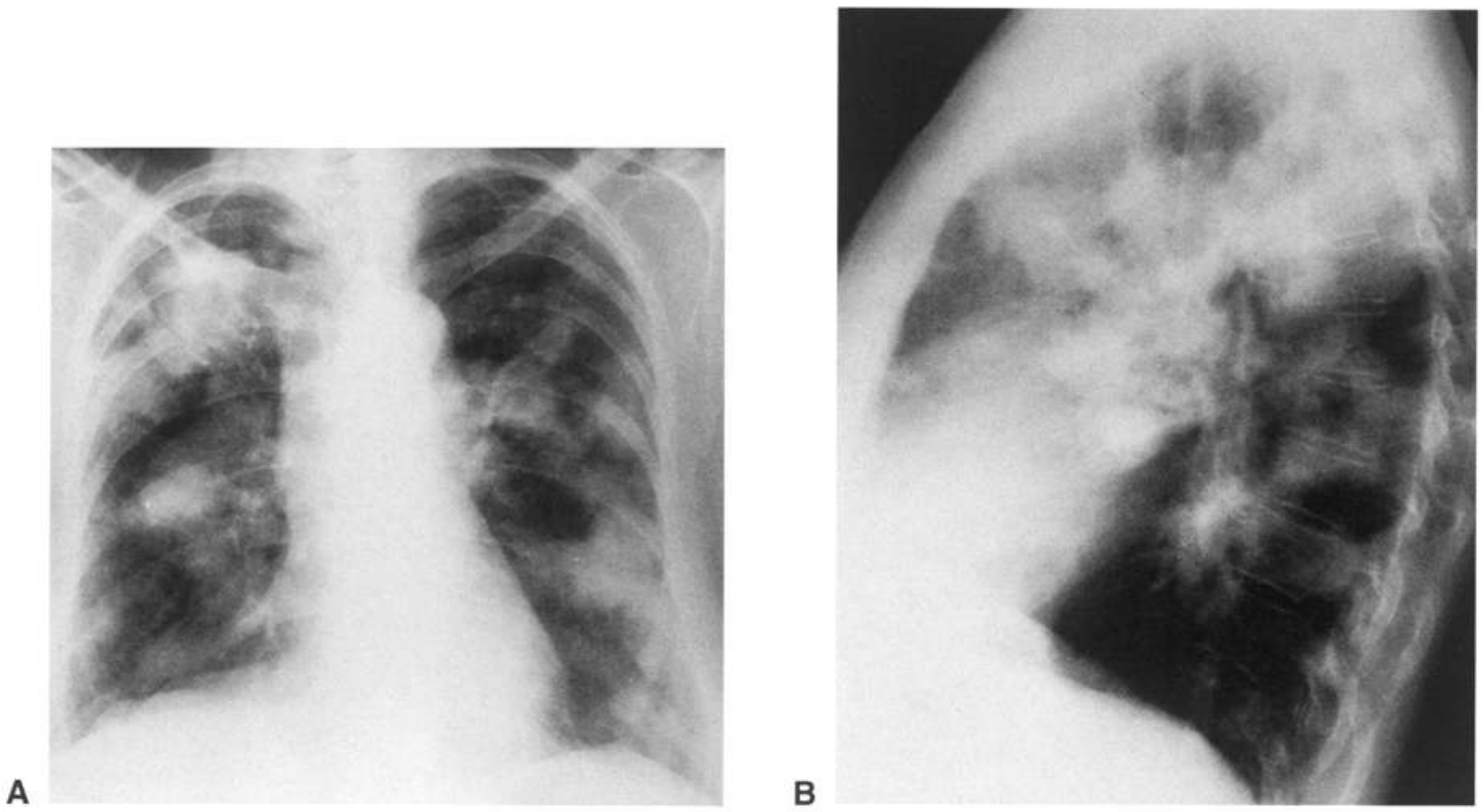
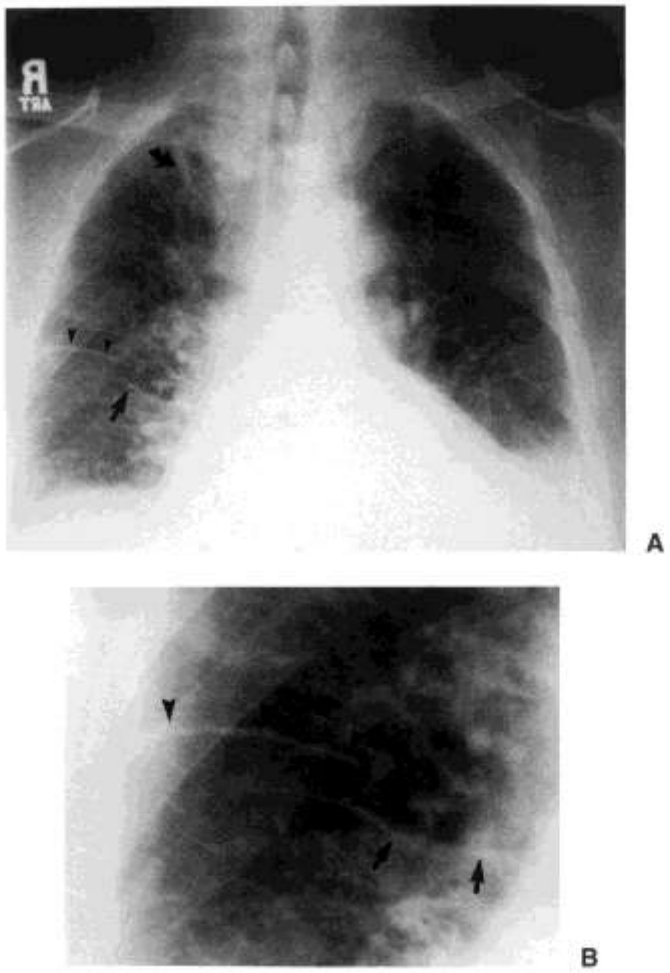


Fig. 3.93 Multiple calcified pulmonary nodules caused by metastases from an extrathoracic osteosarcoma.

Lung metastasis mass



Lymphangitic lung Metastasis



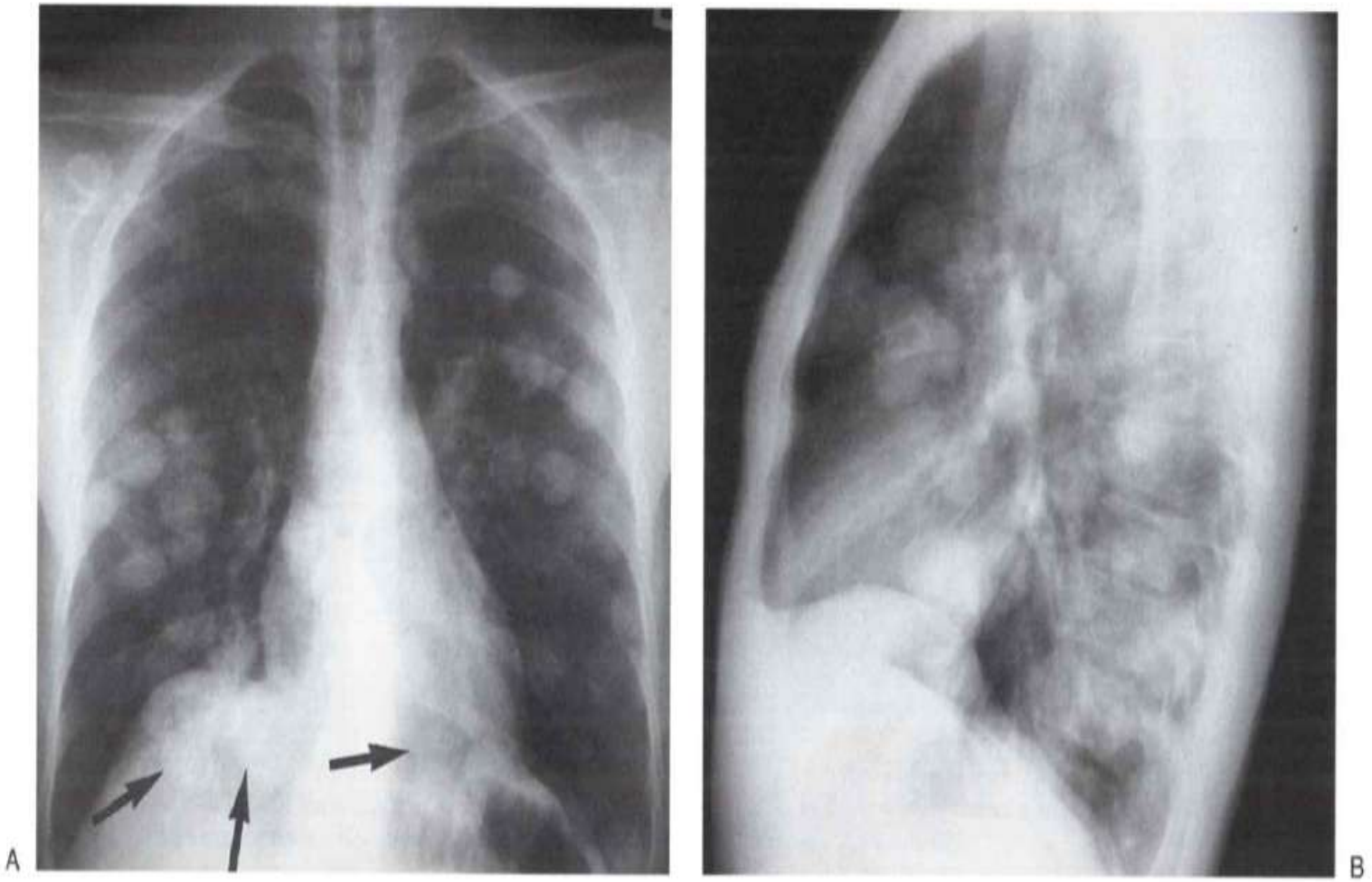


FIGURE 7-25. Metastatic testicular carcinoma. PA (A) and lateral (B) chest radiographs show numerous bilateral well-circumscribed pulmonary nodules of varying sizes, typical of pulmonary metastases. Testicular carcinoma has a high incidence of pulmonary metastases. Note on the PA view that some of the nodules are "hiding" under the diaphragm (*arrows*) in the posterior lung bases. It is important to always look carefully in this area for nodules, as they are more difficult to see when they are not contrasted with the lucency of the air-filled anterior lung.

表 5.1　肋膜積液的成因

	常　　見	不常見
滲透液 (transudate)	• 心衰竭 (heart failure) • 肝硬化 (cirrhosis of liver) • 腎病症候群 (nephrotic syndrome)	• 黏液水腫 (myxoedema) • 類肉瘤症 (sarcoidosis) • 腹膜透析 (peritoneal dialysis)
漏出液 (exudate) 感染	• 細菌性肺炎 (bacterial pneumonia) • 肺結核 (tuberculosis) • 橫膈下膿瘍 (subphrenic abscess)	• 病毒性肺炎 (viral pneumonia) • 寄生蟲肺炎 (parasitic pneumonia)
惡性	• 支氣管癌 (carcinoma of the bronchus) • 轉移癌 (secondary malignancy)	• 間皮瘤 (mesothelioma)
膠原血管性疾病	• 類風濕關節炎 (rheumatoid arthritis) • 紅斑性狼瘡 (SLE)	
肺栓塞 橫膈下病灶	• 橫膈下膿瘍 (subphrenic abscess)	• 胰臟炎 (pancreatitis)（左側較常見，因靠近小網膜）
外傷	• 血胸 (hemothorax)	• 乳糜胸 (chylothorax)

胸部X光正常的缺氧病患

- 肺血管疾病(特別是血栓性)、呼吸道疾病、多病因性肺泡炎，這些疾病在早期的胸部X光片，並不一定看得出來。

Summary

- 肺部結節的特徵及其可能疾病判讀