

12. SISE MJ, HOLLINGSWORTH P, BRIMM JE, et al: Complications of the flow-directed pulmonary artery catheter. A prospective analysis in 219 patients. *Crit Care Med* 9:315-318, 1981
13. PURI VK, CARLSON RW, BANDER JJ, et al: Complications of vascular catheterization in the critically ill. A prospective study. *Crit Care Med* 8:495-499, 1980
14. BLITT CD, WRIGHT WA, PETTY WC, et al: Central venous catheterization via the external jugular vein: A technique employing the J-wire. *JAMA* 229:817-818, 1974
15. BELANI KG, BUCKLEY JJ, GORDON JR, et al: Percutaneous cervical central venous line placement: A comparison of the internal and external jugular vein routes. *Anesth Analg* 59:40-44, 1980
16. HECKER JF: Thrombus formation on cannulae. *Anaesth Intensive Care* 8:187-189, 1980

## Metastatic Prostatic Pulmonary Nodules with Normal Bone Image

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**Asymptomatic prostatic carcinoma presented as multiple bilateral pulmonary nodules in a patient without any evidence of skeletal involvement by normal bone image. Percutaneous biopsy provided the initial clue to diagnosis. We recommend that asymptomatic prostatic carcinoma be included in the differential diagnosis of pulmonary nodules, even when there is no evidence of skeletal metastasis.**

*J Nucl Med* 24: 1026-1027, 1983

After carcinoma of the lung and bronchus, cancer of the prostate is the second most common cause of death from cancer in men (1). Metastatic lesions originating from prostatic carcinoma are most often seen in the pelvis, lumbar and thoracic spine, proximal femora, ribs, scapulae, and proximal humeri (2). Although skeletal metastases from asymptomatic prostatic carcinoma have been recorded on many occasions (3), symptomatic metastasis is relatively uncommon (4). In our case, metastases from asymptomatic carcinoma of the prostate presented with primary pulmonary symptoms and roentgenographic findings, without bony metastases detectable by normal bone image.

### CASE REPORT

A 59-yr-old black man, in usual good health, presented to our institution complaining of a productive cough. A chest radiograph (Fig. 1, left) revealed multiple bilateral pulmonary nodules of varying size, consistent with metastatic disease. Initial evaluation and work-up failed to reveal a source of primary carcinoma. Percutaneous pulmonary biopsy was subsequently performed, revealing moderately differentiated adenocarcinoma (Fig. 1, center). An excretory urogram obtained as part of the metastatic work-up revealed elevation of the floor of the bladder consistent with prostatic enlargement. Because the patient denied any genitourinary symptoms, and a bone image demonstrated only degenerative changes (Fig. 1, right), the prostate was not initially considered to be a likely source of primary adenocarcinoma. However, subsequent needle biopsy of the prostate revealed moderately differentiated adenocarcinoma histologically identical to the pulmonary biopsy (Fig. 2, left). He was treated with bilateral orchiectomy and DES therapy. A repeat chest radiograph (Fig. 2, right), obtained after initiation of treatment, showed dramatic resolution of the

pulmonary nodules with only small, scattered calcified granulomas remaining.

### DISCUSSION

Roentgenographically apparent prostatic metastases to the lungs occur in only 3% to 8% of cases, and late in the course of the disease (5,6). When metastasis does occur, it is most often in the form of lymphangitic carcinomatosis (6). The incidence of metastases to the lung from prostatic carcinoma varies in autopsy studies from 25% to 38% (5,7). The discrepancy with the far less frequent roentgenographic demonstration can be explained by the small size of the lung metastases, which often can be detected only by microscopic examination (8).

Prostatic carcinoma spreads by way of the perineural lymphatic sheaths through the capsule; then over perivascular lymphatics to regional and lumbar periaortic nodes. It is from these nodes that widespread dissemination occurs through the blood. Our case of multiple pulmonary nodules of varying size suggests a hematogenous dissemination as opposed to the more common lymphangitic mode and presentation.

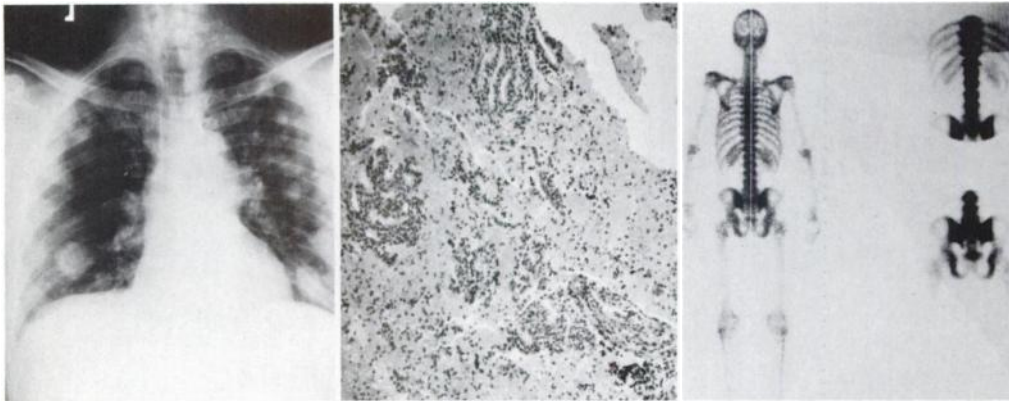
Skeletal metastases are the single most common symptomatic mode of presentation of metastatic carcinoma from the prostate (4). In no case were pulmonary metastases found in the absence of skeletal involvement from cancer of the prostate in a study of 1,000 cases (9).

Dramatic response of metastatic prostatic carcinoma to hormonal therapy and orchiectomy is well documented, as is demonstrated in our case (10). The rapid response to such therapy is characteristic and provides further evidence, in addition to the matching histology, that the pulmonary nodules were secondary to the patient's prostatic carcinoma, despite the lack of immunoperoxidase stains.

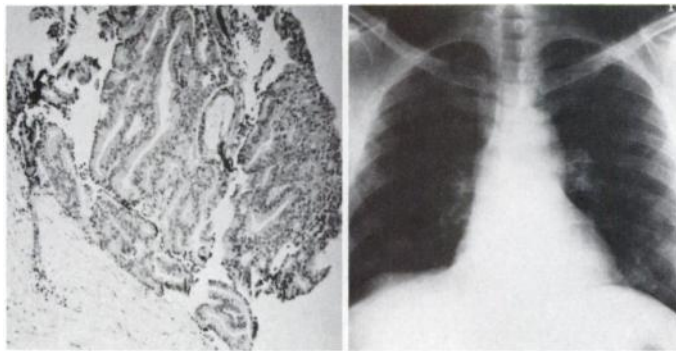
Bone images provide the most sensitive technique for demonstrating skeletal metastases, and may detect involvement in 30% to 50% of patients with normal radiographic findings (11). False-negative images are uncommon, usually less than 3% in most

Received June 4, 1982; revision accepted Apr. 28, 1983.

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**FIG. 1.** Initial chest radiograph, revealing multiple bilateral pulmonary nodules of varying size, consistent with metastases (left). Percutaneous pulmonary biopsy revealing moderately well-differentiated adenocarcinoma (center). Posterior and selected coned-down projections of Tc-99m MDP whole-body bone image, showing only degenerative changes (right).



**FIG. 2.** Tissue from needle biopsy of prostate, revealing moderately well-differentiated adenocarcinoma cells identical to those in Fig. 1 (left). Repeat chest radiograph, obtained 9 wk after that of Fig. 1, following bilateral orchiectomy and initiation of DES therapy. Note marked resolution of previously prominent masses, with only scattered small calcified granulomas remaining (right).

large series (12). Asymptomatic prostatic carcinoma should be included in the differential diagnosis of any male presenting with chest radiographic findings of multiple pulmonary nodules, even in the absence of skeletal metastases, since this may represent its mode of presentation and because appropriate therapy may result in dramatic regression of the metastatic tumors in the lungs.

#### ACKNOWLEDGMENT

The opinions or assertions contained therein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Army or of the Department of Defense.

#### REFERENCES

1. World Health Organization, *World Health Statistics*, Geneva 1980, p 108
2. JORGENS J: The radiographic characteristics of carcinoma of the prostate. *Surg Clin North Amer* 45:1427-1440, 1965
3. WILLIS RA: *The Spread of Tumors in the Human Body*. 3rd Ed., London, Butterworth & Co. Ltd., 1973, p 140
4. TOLIA BM, NABIZADEH I, BENNETT B, et al: Carcinoma of the prostate presenting as retroperitoneal mass. *Urology* 12:434-437, 1978
5. ELKIN M, MUELLER HP: Metastases from cancer of the prostate. *Cancer* 7:1246-1248, 1954
6. HAZRA TA: The role of radiotherapy for prostatic carcinoma. *Geriatrics* 28:62-64, 1973
7. HORSTMANN W: Pathologisch—Anatomische Untersuchungen über Geschwulstartige Erkrankungen der Prostata, insbesondere über das Karzinom. *Z Urol Nephrol* 45:50-59, 1952
8. BALOGH F, SZENDROI Z: *Cancer of the Prostate*. Budapest, Akademiai Kiado, 1968, p 95
9. BUMPUS HC JR: Carcinoma of the prostate; a clinical study of one thousand cases. *Surg Gynecol Obstet* 43:150-155, 1926
10. POOL TL, THOMPSON GJ: Conservative treatment of carcinoma of the prostate. *JAMA* 160:833-837, 1956
11. O'MARA RE: Bone scanning in osseous metastatic disease. *JAMA* 229:1915-1917, 1974
12. CITRIN DL, BESSERT RG, GREIG WR: A comparison of the sensitivity and accuracy of the  $^{99}\text{Tc-}m$  phosphate bone scan and skeletal radiograph in the diagnosis of bone metastases. *Clin Radiol* 28:107-117, 1977