

## The radiological appearance of metastatic cystic lesions

P Barnardt, MB ChB, Dip Oncol

J du Toit, MB ChB

Department of Medical Imaging and Clinical Oncology, Tygerberg Hospital, Parow

Corresponding author: P Barnardt (pieterb@sun.ac.za)

### Abstract

**Introduction.** Cystic and cavitary pulmonary lesions are abnormalities encountered on chest computed tomography (CT). Malignant lesions, including metastases, rarely present as cystic lesions; we report on two such cases: a man with advanced carcinoma of the left testis, and a woman with epithelioid trophoblastic tumour.

**Discussion.** The lungs are the most common site for metastases from non-pulmonary neoplasms. The appearance of cystic lesions in the lung in malignancy is rare and predisposes to spontaneous pneumothoraces. Multiple cystic lesions occur commonly in bronchus carcinoma and also sarcoma, bladder cancer and, less commonly, lymphoma and metastasis. Both chemotherapy and immune suppression can induce cavitation in malignant lesions. Tumour necrosis and tumour infiltration of air-containing spaces with a check-valve mechanism are postulated for causing these cystic lesions. Spontaneous resolution is the rule. Close follow-up is recommended as these spaces may become infected.

**Conclusion.** CT is the mainstay of diagnostic imaging in cancer patients. Cystic lung lesions are caused by a diverse array of pathological processes, and are rare in metastatic disease.

### Introduction

Cystic and cavitary pulmonary lesions are abnormalities frequently encountered on chest radiography and computed tomography (CT). A cyst is defined as any round circumscribed space that is surrounded by an epithelioid or fibrous wall of variable thickness. The underlying nature of these lesions may be apparent, as in the case of bullae associated with emphysema, but may pose a diagnostic challenge. Generally, malignant lesions including metastases rarely present as cystic lesions.<sup>1</sup> High-resolution CT of the chest helps to define

morphological features that may serve as clues regarding the nature of cystic and cavitary lung lesions. A well-established differential list for consideration exists for these radiological phenomena (Table I).<sup>1,2</sup> We report two cases of metastatic malignant tumors with cystic pulmonary lesions post-chemotherapy on radiological imaging: a man with advanced non-seminomatous germ cell tumour (NSGCT) and a woman with epithelioid trophoblastic tumour (ETT).

Prior written informed consent and local ethics committee approval was obtained.

### Case 1

A 22-year-old man presented at the Tygerberg Hospital Oncology Unit post-orchidectomy for a large left testicular mass. Clinical examination revealed a palpable para-umbilical mass of 10 x 15 cm. The post-operative blood examinations showed raised hormonal markers of alpha fetoprotein (AFP) of 15 167 µg/l (0.0 - 9.0 µg/l), β-human chorionic gonadotropin (HCG) 6104 IU/l (<5 IU/l) and a lactate dehydrogenase (LDH) value of 313 U/l (100 - 190 U/l). Staging examinations included a chest X-ray (CXR), which showed multiple bilateral lung nodules, and thoracic and abdomino-pelvic CT that confirmed multiple diffuse nodules in both right and left lungs in keeping with metastases (Fig. 1a). Significant left para-aortic and porta-hepatic lymphadenopathy was also demonstrated. These features were suggestive of metastatic testicular cancer. A brain CT was normal, with no evidence of metastatic disease.

Microscopic examination revealed tumour cells displaying a trabecular pattern with papillary and pseudoglandular structures, as well as solid areas. Extensive necrosis and haemorrhage were also seen. These changes were consistent with embryonal carcinoma and yolk sac elements, and the histological features confirmed a non-seminomatous germ cell tumour (NSGCT) of the left testis. The patient was staged according to the European Germ Cell Cancer Consensus Group as a pT2 N3 M1a S2 (Stage IIIa), intermediate risk NSGCT. He was offered

**Table I. Differential considerations for multiple cystic lung lesions**

Pulmonary Langerhans cell histiocytosis
Pulmonary lymphangioleiomyomatosis
Lymphocytic interstitial pneumonia
Pneumatoceles
Neurofibromatosis type 1
Tracheobronchial papillomatosis
Metastases (rare)

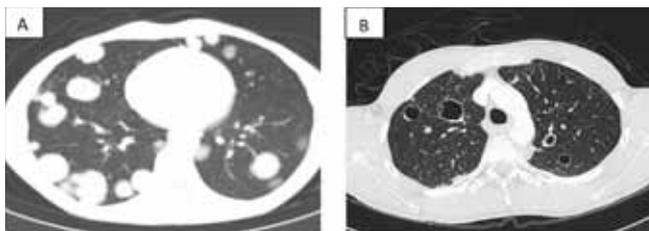


Fig. 1. Chest computed tomography of metastatic testicular cancer. (A) Pre-treatment: Note bilateral lung nodules and masses. (B) Post-treatment: Note thin-walled cystic lesions.

# CASE REPORT

systemic chemotherapy with the standard BEP regime (bleomycin 30 IU IV day 1, 8, 15; cisplatin 20 mg/m<sup>2</sup> IV day 1 - 5 and etoposide 100 mg/m<sup>2</sup> IV day 1 - 5 every 21 days) and completed 6 cycles. His hormonal markers decreased with each consecutive cycle and normalised after cycle 4.

Restaging CXR, chest CT and abdomino-pelvic CT were compared with baseline investigations. In both lungs, the majority of the previously demonstrated pulmonary lesions showed cystic degeneration and a reduction in size (Fig. 1b). Individual small solid lesions were still noted peripherally. The para-aortic lymph nodes were still present but appeared smaller, demonstrating a partial response to therapy. Owing to marker normalisation, the patient was referred to a urology-oncology surgeon for a retroperitoneal lymph node dissection.

## Case 2

A 35-year-old woman presented with a history of secondary infertility, persistent vaginal bleeding, raised  $\beta$ -HCG and an ultrasonic appearance of a molar pregnancy. Her staging examinations include a CXR revealing numerous small bilateral lung lesions and an abdominal CT that confirmed a single liver metastasis. A brain CT was normal, with no signs of metastatic disease.

Microscopic sections of the tumour showed haemorrhage, necrosis and numerous fragments of malignant trophoblastic tissue of intermediate origin. The cells were epithelioid in shape with hyperchromatic nuclei. Syncytiotrophoblastic giant cells were few. In view of the morphology and the intense positivity of p63 and K167 immunohistochemistry, the features were in keeping with an epithelioid trophoblastic tumour (ETT). According to the revised International Federation of Gynecology and Obstetrics (FIGO) classification for gestational neoplastic disease (GND), she had Stage IV disease. Chemotherapy consisted of etoposide 100 mg/m<sup>2</sup> IV day 1 - 5 and cisplatin 20 mg/m<sup>2</sup> IV day 1 - 5 every 21 days. She completed 6 cycles with a slow decline in  $\beta$ -HCG.

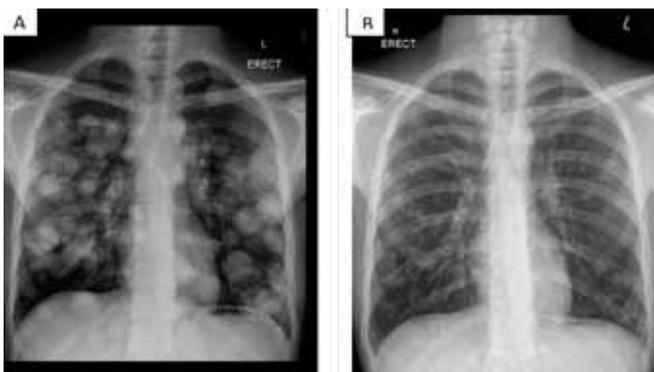


Fig. 2. Chest X-ray of metastatic liver cancer. (A) Pre-treatment: Note numerous bilateral solid nodules, and (B) Post-treatment: Note numerous bilateral pulmonary nodules that have decreased in size and density with associated cystic degeneration owing to chemotherapy.

Restaging examinations included a chest and abdominal CT. Numerous cystic metastatic lesions were detected bilaterally throughout both lung fields secondary to systemic treatment. Bilateral pneumothoraces were present (Fig. 2). A single hypodensity was detected in the periphery of the right lobe of the liver but was, however, too small to characterise and could represent either a benign cyst or a cystic metastasis. The remainder of the abdomen was clear. Currently, the patient continues with second-line multi-agent chemotherapy on a weekly basis.



Fig. 3. Lung CT of a patient with metastatic epithelioid trophoblastic tumour (ETT). Note the irregular thin-walled cystic structures with ruptured subpleural lesions, resulting in bilateral pneumothoraces.

## Discussion

The appearance of cystic lesions in the lung in malignancy is rare and best described radiologically by chest CT. Cysts appear radiologically as rounded parenchymal lucencies or as low-attenuating areas with a well-defined interface of normal lung, and are usually thin-walled (<2 mm). Cysts in the lung usually contain air but can also contain fluid or solid material.<sup>1,3</sup> Important parameters in evaluating cystic and cavitary lesions are (i) the tempo of disease (acute versus chronic) and (ii) the clinical context. A chronic process is more likely, owing to neoplastic disease, long-standing inflammatory or fibrotic disorders, and congenital lesions. The presence of cysts and cavities in the lung predisposes to the occurrence of spontaneous pneumothoraces.<sup>1,5</sup>

The lungs are the most common site for metastases from non-pulmonary neoplasms. These are typically round and well-defined; however, they may present radiologically with a spectrum of unusual appearances including cavitation, calcification or surrounding ill-defined haemorrhage. Numerous cystic and cavitary lesions occur frequently in bronchus carcinoma (10% - 15%) and are usually associated more with squamous cell carcinoma than other cell types. However, they also occur with sarcoma, transitional cell carcinoma of the bladder and, less commonly, with lymphoma and metastasis.<sup>4,5</sup> The frequency of cavitation in pulmonary metastases is approximately 4%, as opposed to 9% in primary bronchogenic carcinoma.<sup>5</sup>

Both chemotherapy and immune suppression are known to induce cavitation in malignant lesions. Several mechanisms are postulated: tumour necrosis secondary to rapid tumour kill in chemosensitive tumors, and tumour infiltration of air-containing structures with a check-valve mechanism are some.<sup>5</sup> There is a suggestion that ETT may not be as chemosensitive as other gestational trophoblastic diseases, but testis cancer is a highly chemosensitive tumour. Both our patients presented post-chemotherapy with cystic pulmonary lesions and, in the case of the ETT patient, bilateral pneumothoraces appeared as a result of ruptured cavitations. Spontaneous resolution is the rule. Close follow-up in immune-suppressed patients is recommended as these spaces may become infected.<sup>1</sup>

## Conclusion

CT is the mainstay of diagnostic imaging in cancer patients as it is non-invasive, highly sensitive, and specific for a range of diseases. Cystic

and cavitary lung lesions are caused by a diverse array of pathological processes and are rare in metastatic disease. We have described two cases of cystic pulmonary metastases post-chemotherapy, with the aim of highlighting to both clinicians and radiologists the atypical appearances of malignant disease and the associated diagnostic possibilities.

1. Ryu HJ, Swensen SJ. Cystic and cavitary lung diseases: Focal and diffuse. *Mayo Clin Proc* 2003;744-752.
2. Cantin L, Bankier AA, Eisenberg RL. Multiple cystic-like lung lesions in the adult. *AJR* 2010;194(1):1-11.
3. Hansell DM, Bankier AA, MacMahon H, et al. Glossary of terms for thoracic imaging. *Radiology* 2008;246(3):697-722.
4. Godwin JD, Webb WR, Savoca CJ, et al. Multiple, thin-walled cystic lesions of the lung. *AJR* 1980;135:593-604.
5. Topal NB, Oruc E, Gokalp G, Topal U. Atypical pulmonary metastases: Radiologic appearances. *Indian J Radiol Imaging* 2007;17:181-185.