 

IMAGING GAMUT

# Ventilation-Perfusion Scanning before and after surgery in a patient with a carcinoid tumour

Kottekkattu K Balan[1,*], L Sonada[1], Qaisar H Siraj[2]

Departments of Nuclear Medicine, [1]Addenbrookes Hospital Cambridge and [2]University College Hospital London

***Key words***: *Bronchial carcinoid, ventilation-perfusion scintigraphy, bronchoplasty*

**Background** A 50-year-old woman was admitted to the accident and emergency department with acute onset of shortness of breath. There were no other associated symptoms and her past medical and surgical history was unremarkable. The chest radiograph on admission was found to be normal (Figure 1). Ventilation-perfusion (VQ) lung scan was requested to exclude pulmonary embolism.

**Procedure** Lung ventilation scanning with $^{99m}$Tc-DTPA aerosol followed by lung perfusion scanning with $^{99m}$Tc-MAA were performed. Images were acquired in the four routine projections including the anterior, posterior, and right and left posterior oblique (Figure 2). The patient also had a CT scan performed subsequent to the VQ scan (Figure 3). Follow-up investigations included a chest x-ray 10 days after surgery with a VQ scan performed 21 days after surgery.

***Correspondence**

Dr K K Balan
Department of Nuclear Medicine
Addenbrooke's Hospital
Cambridge CB2 0QQ
Email:KK.balan@addenbrookes.nhs.uk

***Figure 1*** *Normal chest radiograph on admission*

**Findings** The initial VQ lung scan showed complete loss of ventilation and marked, diffuse reduction in perfusion in the left lung whereas the right lung appeared normally ventilated with normal perfusion. Patients with endobronchial tumours, frequently have impaired pulmonary function, usually secondary to chronic airway obstruction [1].

 2221-0288(201106/01)1:1<81:VPSBAS>2.0.TX;2-M

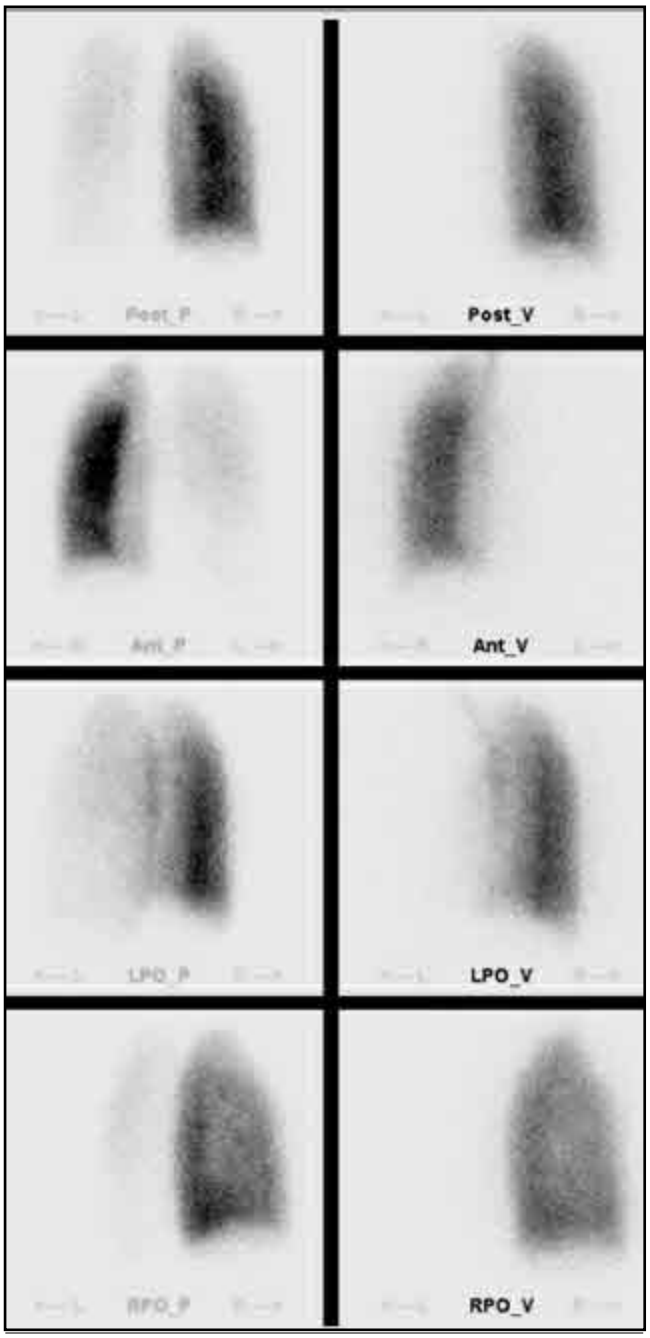


***Figure 2*** *Ventilation-Perfusion lung scan images in anterior, posterior, left posterior oblique and the right posterior oblique projections (top to bottom) with perfusion images in the left-hand column and ventilation images in the right-hand column. There is a complete loss of ventilation with faint diffuse reduction in perfusion in the left lung with normal perfusion and ventilation in the right lung*

***Figure 3*** *CT scan of the patient showing a round endobronchial lesion, 17mm in size, completely obstructing the left main bronchus (arrow) and narrowing the left pulmonary artery*

In this patient the VQ scan showed unilateral loss of ventilation in one lung with markedly diminished but better perfusion. The VQ scan appearances were highly suggestive of an endobronchial tumour primarily compromising the ventilation [2, 3]. In order to confirm this suspicion, the patient had a CT of the chest performed (Figure 3), which showed a well-defined endobronchial lesion causing complete obstruction of the left main bronchus and narrowing the left pulmonary artery with no other abnormality found elsewhere. The CT scan appearances were consistent with an endobronchial tumour.

**Conclusion** The unilateral loss of ventilation with relatively better perfusion seen on the VQ lung scan suggested the possibility of an endobronchial lesion as the underlying cause for the scan appearances. This was later confirmed by the patient's CT scan, which clearly showed an endobronchial tumour. The patient’s condition remained stable for the

***Figure 4*** *Chest radiograph showing complete collapse of the left lung*

next 24 hours while awaiting biopsy of the lesion, but then there was a quite sudden deterioration in her clinical condition. An emergency chest radiograph revealed complete collapse of the left lung (Figure 4). Bronchoplasty, which the recommended treatment of choice [4-7] was performed on an emergency basis. The patient showed rapid clinical improvement following surgery. Histological examination of the lesion confirmed the diagnosis of a bronchial carcinoid tumour.

Ventilation scintigraphy is recommended as the appropriate imaging modality for predicting postoperative lung function [8]. Follow-up VQ lung scan 3 weeks after surgery showed normal ventilation and perfusion to both the lungs (Figure 5). A chest radiography 10 days after surgery was also normal showing a fully expanded left lung (Figure 6).

**Comments** In symptomatic patients with a normal chest x-ray, the VQ lung scan is the investigation of choice in for the diagnosis of

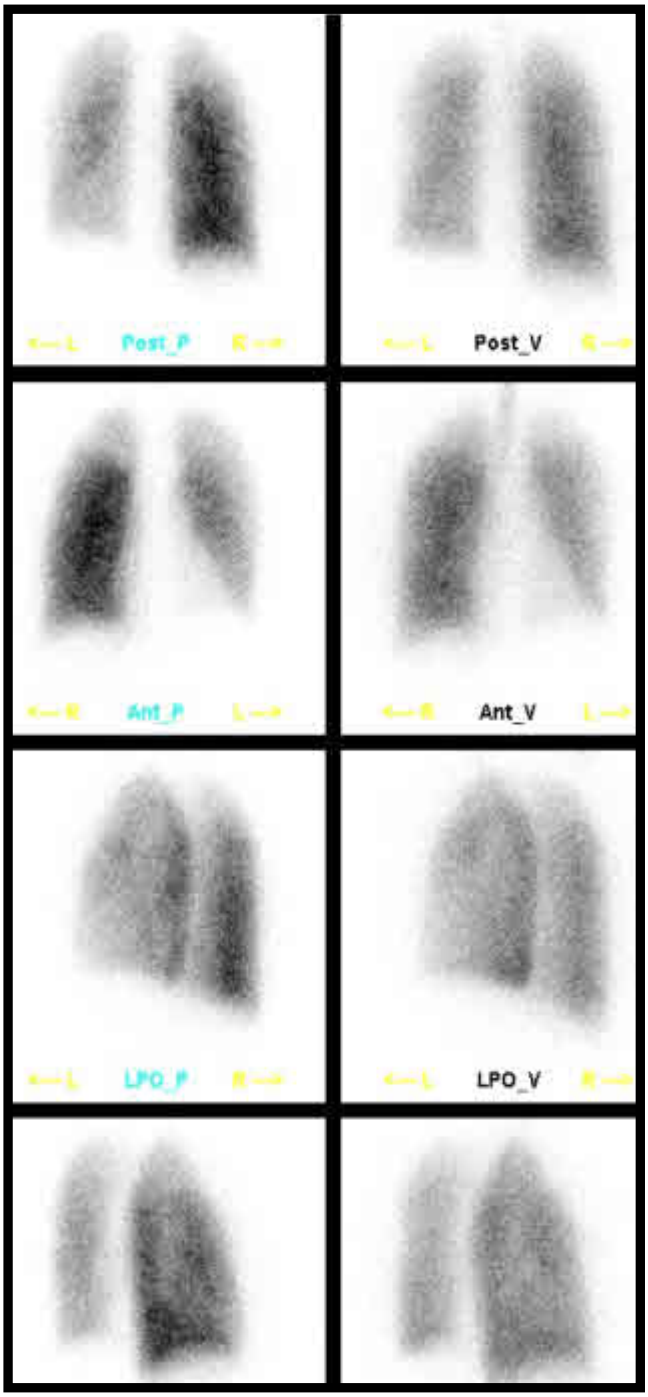


***Figure 5*** *VQ scan performed 3 weeks after surgery showing normal perfusion and ventilation in both the lungs. Top to bottom: images in anterior, posterior, left posterior oblique and the right posterior oblique projections; perfusion images on the left, ventilation images on the right*

***Figure 6*** *Chest radiograph 10 day after surgery showing a fully expanded left lung*

pulmonary embolism. However, the procedure often picks up other likely pathologies including tumours, which may primarily compromise pulmonary pulmonary perfuion or ventilation unilaterally.

A relative loss of perfusion or ventilation to a lung, may be crucial to the likely diagnosis as evidenced by this case which graphically demonstrates the value of VQ lung scanning in such a scenario. The VQ scan findings suggested an endobronchial tumour due to the loss of ventilation with relatively preserved perfusion. It is important to communicate such findings to the referring clinicians because early and timely intervention may have a dramatically successful clinical outcome. The VQ lung scan may ocasionally provide a clue to the initial diagnosis but more importantly, it is a valuable objective tool for the post-opertaive assessment of lung function.

## References


1. Legge JS, Palmer KN. Pulmonary function in bronchial carcinoma. Thorax 1973; 28:588–591].
2. Ward HE, Jones RL, King EG, Sproule BJ, Fortune RL. Reversible ventilation and perfusion abnormalities in unilateral obstructed lung. Chest 1982;81(1):11-15.
3. Hubsch JP, Zukerman C, Dumouchel A, Riquet M, Debesse B. [Reversible pulmonary hypoperfusion following proximal bronchial obstruction caused by a benign process.] Rev Pneumol Clin 1984;40(5):293-7.
4. Nistor C, Mota N, Mota C, Davidescu M, Tetu M, Vasilescu F, Horvat T. Surgical procedures in broncho-pulmonary carcinoids-our experience of 92 consecutive cases. Acta Endocrinologica (Buc) 2009;3:359-370.
5. Okike N, Bernatz PE, Payne WS, Woolner LB, Leonard PF. Bronchoplastic procedures in treatment of carcinoid tumors of tracheobronchial tree. J Thorac Cardiovasc Surg 1978;76(3):281-291.
6. Rizzardi G, Marulli G, Bortolotti L, Calabrese F, Sartori F, Rea F. Sleeve Resections and Bronchoplastic Procedures in Typical Central Carcinoid Tumours. Thorac cardiovasc Surg 2008;56(01):42-45.
7. Uchino K, Okada M, Sakamoto T, Yuki T, Mimura T, Tsubota N.. Bronchoplasty for bronchial carcinoid tumor without removing lung parenchyma. Jpn J Thorac Cardiovasc Surg 2006;54(8):345-347.
8. Win T, Tasker AD, Groves AM, White C, Ritchie AJ, Wells FC, Laroche CM et al. Ventilation-perfusion scintigraphy to predict postoperative pulmonary function in lung cancer patients undergoing pneumonectomy. Am J Roentgenol 2006;187(5):1260-1265.


 2221-0288(201106/01)1:1<81:VPSBAS>2.0.TX;2-M