

MISLEADING ISOTOPE LUNG SCANS IN THE DIAGNOSIS OF PULMONARY EMBOLISM.

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SUMMARY

Pulmonary embolism (PE) remain a common yet poorly diagnosed condition with significant morbidity and mortality. Accurate diagnosis is important as treatment with anticoagulants which can cause significant problems itself, is associated with a major improvement in survival of patients with pulmonary embolism.

Pulmonary angiography is an underused gold standard in the diagnosis of pulmonary embolism; most clinicians preferring the simpler isotope V/Q scanning which is more readily available. While it is accepted that an abnormal perfusion scan may be due to many causes other than pulmonary embolism, it is also widely accepted that a normal perfusion scan excludes this diagnosis. In Derbyshire Royal Infirmary, we conducted a retrospective study of all patients who were diagnosed as having pulmonary embolism during the period 1987-90. Results of V/Q scans and pulmonary angiography were compared a total 402 patients were suspected as P.E. and undergone a V/Q lung scan & 206 patients from the same group also under went pulmonary angiography.

Out of 402 V/Q scan, 162 (37.8%) were reported as normal, 101 (25.1%) as low probability, 66 (16.4%) as intermediate probability and 73 (18.1%) as high probability scans for P.E. Pulmonary angiography was performed on 167 patients (101 low probability V/Q scan and 66 high probability V/Q scan). An extra 37 angiographies were performed in patients whose V/Q scan were reported as normal but they continued to have persistent symp-

toms highly suggestive of P.E. In this group 3 pulmonary angiograms were highly abnormal confirming the presence of major PE.

We recommend that a normal isotope perfusion scan is only accepted as evidence for the absence of pulmonary embolism if there is no overwhelming clinical support for the diagnosis.

INTRODUCTION

Pulmonary embolism is a major clinical problem associated with significant morbidity and mortality. In the United Kingdom an estimated 20,000 patients die each year as a consequence of pulmonary embolism and approximately 40,000 have non-fatal events (1). Figures from the United States quote 650,000 symptomatic cases of pulmonary embolism with 200,000 deaths each year (2) Estimates based on autopsy studies suggest that 40-70 percent cases of fatal pulmonary embolism remain undiagnosed (3) Early institution of therapy is important as mortality may rise from 8 percent to as much as 30 percent with out it (4) On the other hand initiation of Heparin therapy should be considered carefully since Heparin provides the leading cause of drug related deaths in otherwise healthy hospitalized individuals (5) Major haemorrhagic complications have also occurred in 10-15 percent of patients receiving anticoagulation therapy (6) Accurate diagnosis is, therefore essential, not only to prevent excessive mortality from pulmonary embolism but also to avoid unnecessary and potentially harmful treatment in patients without embolism. The optimal approach for the diagnostic evaluation of patients with suspected pulmonary embolism is the subject of controversial and often conflicting opinions. It is well documented that clinical symptoms, signs and routine laboratory investigation, for example, arterial blood gases and chest

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x-rays, are of limited value because of their non-specificity and poor sensitivity (7-8). The classic triad of pleuritic chest pain, dyspnoea and haemoptysis occur in only one fifth of patients (9). Pulmonary embolism can mimic a wide variety of cardiac and lung pathologies which can lead to mis-diagnosis. The classic electrocardiographic evidence of S1, Q3, T3 with right ventricular strain is present in only approximately one quarter of massive pulmonary embolism (10).

Radionuclide imaging of lung has served as a screening test for the diagnosis of pulmonary embolism for over 20 years. However, its use has not been without controversy. There has been a considerable reliance on the results of ventilation-perfusion [V/Q] lung scanning for the subsequent management of patients without significant reference to the clinical probability of pulmonary embolism. Certainly it has an extremely high sensitivity but this is tempered by its low specificity (11).

As much as two thirds of patients with abnormal isotope V/Q scans will turn out to have normal pulmonary angiograms (12,13). Angiography provides the essential 'gold' although sensitivity is slightly reduced (11). Numerous studies point out that where the perfusion scan is normal, embolism is virtually excluded (14,15). In this study we have discovered 3 cases where isotope perfusion scans produced a normal result but the index of suspicion for pulmonary embolic disease was still high enough to merit angiography. This confirmed pulmonary embolism in all the three cases.

AIM OF STUDY

This is a retrospective study which was designed to evaluate the accuracy of a normal perfusion lungs scan in excluding the diagnosis of pulmonary embolism.

PATIENTS AND METHOD

The study was done at the Derbyshire Royal Infirmary, Derby, UK. From all record of nuclear physics department, we collected the list of all patient who had undergone ventilation / perfusion (V/Q) lung

scan for suspected pulmonary embolism during the period of 1987 till 1990. The notes were reviewed to confirm the diagnosis of P.E. According to the protocol for the diagnosis of P.E. , a high probability V/Q scan was taken as diagnostic of PE, while a scan reported as normal was considered as the one which excluded P.E. However, pulmonary angiography was performed on all the patients with V/Q scan reported as of low or intermediate probability. Furthermore, if the clinical suspicion for P.E was still strong and persistent, then a pulmonary angiography was performed even if the V/Q scan was reported as normal.

RESULTS

During the period of 1987-1990 a total 402 patients were suspected as P.E. and undergone a V/Q lung scan. During the same period, 206 patients from the same group also underwent pulmonary angiography. Angiography was performed and reported by all the 3 authors while V/Q scan was performed and reported by the nuclear physics department.

Out of 402 V / Q scan, 162 (37.8%) were reported as normal, 101 (25.1%) low probability, 66 (16.4%) intermediate probability and 73 (18.1%) high probability scans for P.E. Therefore according to the protocol, all the high probability scan patients were taken as definite P.E. while pulmonary angiography was performed on 167 Pts. (101 low probability V / Q scan and 66 high probability V/Q scan).

An extra 37 pulmonary angiography were performed in patients whose V/Q scans were reported as normal but they continued to have persistent symptoms highly suggestive of P.E and no alternate explanation.

Therefore a total of 206 pulmonary angiography were performed. In the low probability V/Q scan group 10/101 (9.9%) angiography were positive for P.E. In the intermediate V/Q scan group, 39/66 (59%) angiograms were positive for P.E. Three out of 37 pulmonary angiograms performed on patients with normal V/Q scans were highly abnormal confirming the presence of major P.E.

CASE 1

This 70 year old female [MM] had a documented pulmonary embolism in September 1986 which complicated an episode of superficial thrombophlebitis. After 9 months of anticoagulant therapy she had improved with few complaints and the treatment was stopped. One month later she was re-admitted with episodic dyspnoea, cyanosis and fainting. The clinical diagnosis was of further pulmonary emboli. However, a perfusion scan was normal. Due to the high index of suspicion, pulmonary angiography was carried out and widespread intravascular filling defects were shown due to extensive PE's. She had severe pulmonary hypertension. Treatment with anticoagulants was recommenced but in spite of this she continued to deteriorate and died. Autopsy confirmed the presence of widespread thrombo-embolic problems of varying ages.

CASE 2

67 year old man [HS] admitted with 3 weeks history of progressive dyspnoea, anorexia, dark stools and chest pain. Past medical history notable for myocardial infarction in 1971 and hiatus hernia. On examination he was anemic with tachycardia, epigastric tenderness and malena on rectal examination. His haemoglobin was 5.9 g/dl. Six units of blood was transfused. Subsequent endoscopy revealed acute gastritis with erosion. Five days after admission he developed sudden onset of pleuritic chest pain. Pulmonary embolism was suspected but the isotope perfusion scan was normal. Angiography revealed evidence of extensive pulmonary embolism with increase right heart pressure. Six months later he was well with normal right heart pressures and anticoagulation was stopped.

CASE 3

28 years old female [DA] admitted with sudden onset of left sided pleuritic chest pain, dyspnoea and transient dizziness. She was on the oral contraceptive pill and smoked 20 cigarettes per day. Examination revealed a pleuritic rub in the left upper zone anteriorly. The isotope perfusion scan showed slightly patchy perfusion of both lungs which was thought to

be consistent with her being a smoker. Angiography confirmed 2 large vessels in the left upper zone containing intra-luminal filling defects with good distal perfusion, consistent with pulmonary embolism.

She was fully anticoagulated. Subsequently she was found to have clotting tendency with prolonged pre and venous occlusion Euglobulin clot Lysis time. Therefore, life-long warfarin therapy was recommended.

DISCUSSION

In general, the diagnosis of pulmonary embolism from a perfusion scan focuses on the size, location and number of defects and the presence or absence of corresponding ventilation defects. The method devised by Biello et al has been the standard for interpreting V/Q scans (12). According to his scheme, scans can be divided into 4 groups, that is normal, low, intermediate and high probability scans. The sensitivity of V/Q scans is generally agreed but its specificity is quite controversial and false positive scans are exceedingly common (16). In several large series of patients with clinical diagnosis of embolism and abnormal perfusion scans, angiography was normal in 60-83 percent of cases (11, 17). In one study in normal volunteers, 5 percent of scans exhibited major perfusion abnormalities indistinguishable from large pulmonary embolism (18).

The probability of pulmonary embolism is quite high if V/Q scan shows a large perfusion defect that is not matched by a corresponding ventilation defect. However, the majority of scans are reported as intermediate, low probability or indeterminate scans. Amongst these 3 groups in a study by McBride et al, pulmonary angiography demonstrated emboli in 62.5%, 13.6% and 18.4% respectively (13).

The major value of V/Q scanning has generally been considered to be when they are completely normal. Many workers believe that a normal perfusion virtually excludes the diagnosis of pulmonary embolism. Although this is true for the majority occasionally a patient with even massive pulmonary embolism can

exhibit a normal perfusion scan. The possible explanations for this are three-fold. Firstly if there is a partial occlusion by the clot. This then allows not only for the flow of contrast around the obstruction during angiography but also the macro-spheres in the perfusion scanning. Secondly, if there is diffuse symmetrical small artery obstruction throughout both lungs leading to even distribution of the isotope. Thirdly, recanalisation of the clot may allow the isotope to flow through. Another special situation in which a V/Q scan could be normal in the presence of a major PE is the saddle embolus sitting across the pulmonary artery at bifurcation and causing only partial occlusion.

The Hypothesis that pulmonary angiography is not indicated in a setting of a normal perfusion scan is incorrect. Angiography should be performed if clinical suspicion is strong as exhibited by our 3 cases.

Pulmonary angiography is undoubtedly the 'gold standard' for the diagnosis of pulmonary embolism. It is safe (17,19) and reproducible with less than a 6 percent chance of inter-observer disagreement as compared to 67 percent for V/Q scans (17).

In spite of the general acknowledgement of the value of pulmonary angiography, this investigation is performed in relatively few patients. This is mainly because of its invasive nature and expense. Facilities to perform pulmonary angiography are not widely available but should be. Even the V/Q scan facilities are restricted to only the major teaching hospitals in Pakistan. In some suspected cases the diagnosis of thrombo-embolic episodes can be established by performing bilateral proximal lower limb venography. This facility is available in almost all District General Hospitals and at least one third of patients with pulmonary embolism and abnormal V/Q scans show positive venograms. In these patients, therefore, the need for pulmonary angiography can be avoided (16). However, this does not necessarily establish the diagnosis of pulmonary embolism as venous thrombosis may have occurred with other primary lung diseases, for example pneumonia. In these cases close

monitoring of the respiratory illness is essential

Isotope lung scanning is our first-line investigation in patients suspected of pulmonary embolism. If perfusion scan is normal, we stop anticoagulation therapy and look for an alternative diagnosis. However, if a strong clinical suspicion of pulmonary embolism persists, then we always perform pulmonary angiography – the gold standard for diagnosis of pulmonary embolism. We recommend that this policy be considered in such situations.

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