

# Utilization Of Ventilation / Perfusion Lung Scan In A Cancer Hospital

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## Citation

A Huaranga, A Darwish, C Jiménez, E Delpassand, M Haro. *Utilization Of Ventilation / Perfusion Lung Scan In A Cancer Hospital*. The Internet Journal of Pulmonary Medicine. 2007 Volume 9 Number 2.

## Abstract

Malignant neoplasms have been frequently associated with pulmonary embolism (PE). Ventilation/perfusion lung scan (V/Q) is the most frequent initial imaging study requested by clinicians for the evaluation of PE. Because our institution is dedicated to cancer care, we decided to study the utilization of V/Q scan and evaluate the rationale for its use and outcome of patients. We reviewed all the cases of patients who had a V/Q scan done between January 1994 to June 1995 and obtained the following results:

293 patients had V/Q scan performed: 29 high probability, 13 intermediate, 134 low probability, and 117 were read as normal. Only 5 angiograms were done (3 PE), and 6 autopsies (1 PE found).

We conclude that the V/Q scan was overutilized in our Institution and its results in our unique cancer population did not alter final outcome.

## INTRODUCTION

Pulmonary embolism (PE) has traditionally been considered a discrete syndrome that requires its own specific methods of diagnosis<sup>1</sup>. Although a number of tests have been used for diagnosis of PE, the ventilation/perfusion lungs scans id the most frequent initial imaging study requested by clinicians as a noninvasive diagnostic procedure for evaluation of PE

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The association between malignancy and thrombosis has been recognized since Trousseau described the syndrome oOf recurrent migratory thrombophlebitis in patients with cancer over a century ago<sup>7</sup>. Since that time, the presence of a malignant neoplasm was considered to be an important predisposing factor for PE<sup>8 9 10 11 12 13 14 15</sup>.

The diagnosis of PE in patients with malignant disorders is difficult because the presentation of PE may mimic other complications of malignancy such as metastasis, pneumonia, pleural effusion, etc. ; and due to the inherent anxiety PE may tend to be overdiagnosed.

The diagnosis of PE in cancer patients requires high degree of accuracy to avoid the potentially life-threatening complications of long-term treatment with anticoagulants<sup>5, 16</sup>.

Clinical and radiological evaluation of patients may suggest

the possibility of pulmonary embolism, but cannot reliably make or exclude the diagnosis. The V/Q scan reflects the characteristic physiologic derangement in pulmonary thromboembolism (lack of perfusion of ventilated lung segments), it is safe and more accurate than any other noninvasive method<sup>17</sup>.

Pulmonary angiography remains the most specific and sensitive diagnostic procedure available to diagnose pulmonary embolism. However, it carries significant morbidity and mortality<sup>18</sup>.

The purpose of this study was to review the incidence, clinical characteristics, and radiological findings of suspected PE in malignant disorders as well as the accuracy of V/Q lung scan as a diagnostic tool.

## RESULTS

We reviewed 293 cancer patients who had V/Q lung scan done at M.D. Anderson Cancer Center during a 18 month period, due to suspicion of pulmonary embolism. Of these 293, 158 were female (53.9%) and 135 male (46.1%), their ages ranged from 13 to 89 years with mean values 54.86 6 14.55 years.

As shown in Table I, only 29 out the 293 (9.9%) cases had high probability V/Q scan and 251 (85.6%) had either

normal of low probability V/Q scan.

**Figure 1**

Table 1: V/Q lung scan results in 293 cancer patients with clinically suspected pulmonary embolism.

V/Q scan results	Number	%
Normal	117	39.9
Low probability	134	45.8
Intermediate probability	13	4.4
High probability	29	9.9
Total	293	100 %

Table II reveals the V/Q lung scan results according to the different types of malignancy, Lymphoma, breast CA, and pulmonary CA were the most frequent types of malignancies, while brain tumors (CNS CA) and melanoma (5cases) & multiple myeloma (2 cases) were the least frequent cancers. The ratio high probability scans/total scans (incidence of PE per type of malignancy) was maintained in all the different categories.

No significant relationship was found between the presence of metastasis and the V/Q scan probability for PE (table III).

**Figure 2**

Table 2: V/Q lung scan result and its relationship with type of malignancy.

Type of malignancy	Normal	Low	Intermediate	High	Total (%)
Lymphoma	24	13	2	4	43 (14.6)
Breast CA	20	15	2	5	42 (14.3)
Pulmonary CA	10	21	1	4	36 (12.2)
Leukemia	18	11	1	-	30 (10.2)
GIT CA	9	14	1	2	26 (8.8)
Urinary CA	5	10	2	5	22 (7.5)
Sarcomas	8	8	1	2	19 (6.5)
Miscellaneous CA	6	10	-	2	18 (6.1)
Prostatic CA	5	10	-	1	16 (5.4)
Female genital	2	6	-	3	11 (3.7)
Liver & biliary & Pancreas CA	4	7	-	-	11 (3.7)
Ovarian CA	4	3	1	-	8 (2.7)
Melanomas & Mult. Myeloma	2	5	-	-	7 (2.4)
CNS CA	-	1	2	1	4 (1.4)
Total No (%)	117 (39.9)	134 (45.8)	13 (4.4)	29 (9.9)	293 (100.0)

**Figure 3**

Table 3: V/Q lung scan results in suspected PE in relation to detection of metastasis.

	V/Q lung scan results in suspected PE				Total N (%)
	Normal	Low	Intermediate	High	
Absent metastasis	66	74	7	10	157 (53.6)
Present metastasis	51	60	6	19	136 (46.6)
Total No. (%)	117 (39.9)	134 (45.8)	13 (4.4)	29 (9.9)	293 (100.0)

$$\chi^2 = 4.77$$

$$p = 0.19 \text{ i.e. NS as } p > 0.05$$

No significant relationship was found between the presence of metastasis and the V/Q scan probability for PE (Table III).

The clinical characteristics (symptoms and signs) and their association with high probability V/Q scans are shown in Table IV. Dyspnea and chest pain were the symptoms that revealed highly significant association with PE.

Among the signs, tachycardia, crackles, tachypnea, hypotension, and the presence of deep venous thrombosis (DVT) were highly significant related to high probability V/Q scan.

**Figure 4**

Table 4 : Frequencies of clinical characteristics of malignant patients with suspicion of PE in relation to V/Q lung scan probabilities for PE.

Clinical Characteristics	V/Q lung scan probabilities for PE				Total N (%)	I <sup>2</sup>	p value
	Normal	Low	Intermediate	High			
SYMPTOMS							
Dyspnea	54	103	11	25	193(65.9)	34.80	***
Hemoptysis	1	5	-	1	7 (2.4)	2.67	NS
Chest pain	18	53	6	16	93(31.7)	26.81	***
LowLimb edema	8	9	1	11	29	#	
Upper L. edema	57	3	-	1	65	#	
SIGNS							
Fever	22	24	3	10	59(20.1)	4.36	NS
Tachycardia	27	55	4	20	106(36.3)	23.57	***
Wheezes	13	26	1	9	49 (16.7)	8.36	*
Crackles	20	52	4	18	94 (32.1)	26.82	***
Pl. Effusion	15	27	-	8	50 (17.1)	7.33	NS
Tachypnea	24	59	6	22	111(37.9)	35.30	***
Hypotension	13	12	1	5	31 (10.6)	23.44	***
DVT	84	23	-	15	122(41.8)	86.62	***

# No statistical correlation performed.  
 NS Non significant ( $p > 0.05$ )  
 \* Significant ( $p < 0.05$ )  
 \*\*\* Highly significant ( $p < 0.001$ )

**Figure 5**

Table 5: Chest roentgenographic findings in our population, in relation to V/Q scan results.

CXR finding	V/Q lung Scan prob. for PE				Total N (%)	chi sq.	p value
	Normal	Low	Intermediate	High			
Normal	50	23	3	5	81(27.6)	22.38	***
Elevated hemidiaphragm	4	12	1	1	18 (6.1)	3.82	NS
Right pleural effusion	10	18	2	4	34(11.6)	1.82	NS
Right consolidation Seg. Lobe, more	8	18	1	5	32(10.9)	4.23	NS
Right atelectasis Seg. Lobe, more	13	30	2	11	56(19.0)	12.72	*
Left pleural effusion	8	8	-	2	18(6.1)	0.99	NS
Left consolidation Seg. Lobe, more	7	20	1	4	32(10.9)	5.51	NS
Left atelectasis Seg. Lobe, more	9	31	2	8	50(17.0)	12.54	*
Bilateral pleural effusion	13	25	1	6	45(15.4)	3.82	NS
Other	47	46	5	8	106(36.2)	1.96	NS

NS Non significant (p > 0.05)  
 \* Significant (p < 0.05)  
 \*\*\* Highly significant (p < 0.001)

The different chest roentgenographic finding are illustrated in Table V. Eighty two cases (27.9%) had normal CXR and five of them had high probability for PE, this result was highly significant (p< 0.001). Atelectasis either right or left and segmental or larger was the most common radiological abnormality which was also significant (p<0.05). Pleural effusion either right or left was the least frequent CXR finding and the rest of the findings were non significant. Other radiological findings did not show relationship with the V/Q probability.

When the reasons for requesting a V/Q lung scan were complied and compared with results, dyspnea, chest pain, hypoxemia, and DVT were significantly associated with the highest diagnostic yield, as depicted in Table VI.

**Figure 6**

Table 6 : Reasons for requesting a V/Q scan and results.

Reason for request	V/Q lung Scan prob. for PE				Total N (%)	chi sq.	p value
	Normal	Low	Intermediate	High			
Dyspnea	47	94	10	24	175(59.7)	32.4	***
Abn. CXR	3	20	1	4	28 (9.6)	11.4	*
Chest pain	14	47	6	14	81 (27.6)	26.7	***
DVT	68	21	3	11	103(35.2)	50.1	***
Hypoxemia	11	40	3	14	68(23.2)	26.5	***
Other	8	17	6	3	34(11.6)	17.9	***

\* Significant (p < 0.05)  
 \*\*\* Highly significant (p < 0.001)

**Figure 7**

Table 7: Relation of V/Q lung scan prob. For PE and therapy that patients Received within the last three months.

Therapy	V/Q lung Scan prob. for PE				Total N (%)	r <sup>2</sup>	p value
	Normal	Low	Intermediate	High			
Chemotherapy	72	52	6	9	139(47.4)	16.47	***
Radiotherapy	7	6	-	3	16(5.5)	2.40	NS
Surgery	20	49	5	14	88(30.0)	17.07	***
Non specific or No therapy	18	27	2	3	50(17.1)	2.08	NS
Total	118	134	13	29	294(100.0)		

NS Non significant (p > 0.05)  
 \*\*\* Highly significant (p < 0.001)

As illustrated in Table VII, chemotherapy and surgery disclosed a highly significant correlation with the V/Q lung scan probability (p<0.001).

Pulmonary angiography was done in five patients (one with high probability V/Q lung scan and four with intermediate probability) and it was positive in three (one high and two with intermediate probability).

Autopsy was performed in six patients (3 normal and 3 with low probability V/Q lung scan), and one, who had low probability V/Q, revealed autopsy findings compatible with PE (which had low V/Q).

## References

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