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**=Abstract=**

**Clinical characteristics and predictors of in-hospital mortality  
for patients with acute major pulmonary embolism**

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**Background** : Pulmonary embolism is a relatively common disease but may also be manifested as a lethal disease.

Most previous studies on pulmonary embolism included hemodynamically stable patients who were able to tolerate a confirmative diagnostic workup, including ventilation-perfusion lung scan or pulmonary angiography. However, in most cases of acute massive pulmonary embolism, patients are unstable to tolerate a confirmative diagnostic workup. Studies of only stable patients with pulmonary embolism may have a bias on evaluating the clinical course and prognosis of pulmonary embolism.

Therefore, we designed a study to observe the clinical manifestations, diagnostic methods, treatment modality, and to investigate the prognostic factors of patients with acute pulmonary embolism who present with overt or impending right heart failure using the diagnostic criteria suggested by MAPPET study.

**Methods** : Among 103 patients diagnosed as pulmonary embolism from 1990 to 1997, 63 patients(male/female : 21/42, mean age : 56±15) were enrolled as acute major pulmonary embolism by MAPPET's diagnostic criteria. Patients were included in the study if they showed clinical, echocardiographic and cardiac catheterization findings signifying acute right heart failure or pulmonary hypertension due to pulmonary embolism, together with: 1) a diagnostic pulmonary angiogram, or 2) a lung scan indicating high probability of pulmonary embolism, or 3) at least 3 of the followings: syncope; tachycardia (heart rate > 100 beats /min); dyspnea or tachypnea (> 24 breaths/min or need for mechanical ventilation); arterial hypoxemia (partial arterial pressure of oxygen < 70mmHg while breathing room air) in the absence of pulmonary infiltrates on chest x-ray; ECG signs of right heart strain.

**Results** : Among the 63 patients, 15 patients(23.8%) did not have an underlying disease. Eleven

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patients(17.5%) had malignancy, 8 patients had an operation in the recent 20 days, 6 patients had chronic pulmonary disease, 5 patients had a history of congestive heart failure and cerebrovascular accident respectively, 4 patients had a previous history of pulmonary embolism, 3 patients had vasculitis such as Behcets' disease and systemic lupus erythematosus and a history of venous thrombosis, respectively.

The main clinical manifestation on the time of diagnosis was dypnea in 55 patients(87.3%), which was the most frequent, and chest pain in 18 patients(28.6%), syncope in 10 patients(15.9%), and tachycardia in 2 patients(3.2%).

The diagnostic methods were echocardiography(43 patients, 68.3%), lung perfusion scan(39 patients, 61.9%), chest computed tomography(16 patients, 26.4%), pulmonary angiography(4 patients, 6.3%) and right heart catheterization(2 patients, 3.2%). In order to examine deep vein thrombosis, lower extremity Duplex ultrasonography and venography were performed in 11 patients(17.5%) and 7 patients(11.1%) respectively.

The overall in-hospital mortality was 38.1%(24 patients). The factors influencing in-hospital mortality were associated malignancy( $p<0.01$ ) and unstable vital sign(systolic blood pressure of less than 90mmHg)( $p<0.05$ ).

**Conclusion** : Acute pulmonary embolism with overt or impending right heart failure is a significant lethal disease with a high in-hospital mortality. The predictors of mortality were associated malignancy and unstable vital sign.(Korean J Med 58:293-300, 2000)

**Key Words** : Acute pulmonary embolism, In-hospital mortality

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MAPPET(Management Strategy and Prognosis of  
Pulmonary Embolism Registry)  
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MAPPET  
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1990 1997 103  
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40 mmHg 가 15  
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 30 ml ,  
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 ( , paradoxical septal wall motion, tricuspid regurgitation jet velocity > 2.8m/s)  
 , 5) (mean pulmonary artery pressure) 20 mmHg  
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 1) , 2)  
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 37가 : a) ,  
 b) 100 / , c)  
 24 / , d)  
 ( pO2 < 70mmHg), e)  
 ( 가 :  
 , I lead S III lead  
 Q T [S1Q3T3 pattern], V1  
 V3 precordial lead T ).

**Table 1. Age and sex distribution**

Age	Male	Female	Total
20- 29	1	2	3
30- 39	1	5	6
40- 49	7	7	14
50- 59	5	6	11
60- 69	2	11	13
70- 79	4	11	15
80-	1	0	1
Total	21	42	63

1:2 . 23 81 70 가 15  
 가 56±15 (Table 1).

2.

55 (87.3%)  
 가 18 (28.6%), 10 (15.9%),  
 2 (3.2%) (Table 2).  
 가 15 (23.8%) 가 11  
 (17.5%), 20 가 8 (12.7%),  
 가 6 (9.5%),  
 가 5 (7.9%) ,  
 가 4 (6.3%),

**Table 2. Initial symptoms at the time of diagnosis**

Symptom	No. of pts(%)
Dyspnea	55(87.3)
Chest discomfort	18(28.6)
Syncope	10(15.9)
Palpitation	2(3.2)

1.

63 가 21 , 가 42 :

**Table 3. Underlying diseases**

Underlying disease	No. of pts(%)
No underlying disease	15(23.8)
Malignancy	11(17.5)
Recent major operation(within 20days)	8(12.7)
Chronic pulmonary disease	6(9.5)
History of congestive heart failure	5(7.9)
Stroke	5(7.9)
History of pulmonary embolism	4(6.3)
Vasculitis(ex. Behcet, Systemic lupus erythematosus)	3(4.8)
History of venous thrombosis	3(4.8)

가 3  
 (4.8%) (Table 3).  
 3.  
 가 43 (68.3%)  
 , 가 39 (61.9%), 16 (25.4%), 4  
 (6.3%), 2 (3.2%)  
 11 (17.5%), 7 (11.1%) (Table 4).

**Table 4. Diagnostic workup**

Diagnostic method	No. of pts(%)
Echocardiography	43(68.3)
Lung perfusion scan	39(61.9)
Chest computed tomography	16(25.4)
Duplex ultrasonography	11(17.5)
Venography	7(11.1)
Pulmonary angiography	4(6.3)
Right heart catheterization	2(3.2)

4.  
 49 (77.8%)  
 13 (20.6%)  
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**Table 6. Duration between symptom onset and death**

Duration (day)	No. of death (n=24)	Percent (cumulative)
1	6	25
2-3	11	71
4-7	4	88
> 7	3	100

1  
 (Table 5).  
 24 (38.1%)  
 24  
 가 6 (25%), 3 가 17 (71%), 7  
 가 21 (88%) (Table 6).  
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 ( 90 mmHg 15  
 )가  
 (Table 7).

**Table 5. Treatment of pulmonary embolism**

Treatment	Stable vital sign(n=43)	Unstable vital sign*(n=20)	Total(n=63)
Anticoagulation	38(88.4%)	11(55.0%)	49(77.8%)
Thrombolysis	8(18.6%)	5(25.0%)	13(20.6%)
Embolectomy	1(2.3%)	0	1(1.6%)

\*Systolic blood pressure < 90mmHg for a time period > 15 min.

**Table 7. Multivariate logistic regression analysis for predictors of in-hospital mortality**

Factor	Mortality(%)	p	OR(95% CI)
Malignancy(n=11)	9(81.8)	<0.01	13.2(2.3- 74.2)
Unstable vital sign*(n=20)	12(60.0)	<0.05	4.6(1.3- 16.0)

\*Systolic blood pressure < 90mmHg for a time period > 15 min.

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 (Urokinase in Pulmonary Embolism Trial) PIOPED PIOPED trial  
 (Prospective Investigation of Pulmonary Embolism Diagnosis) trial . 87.3% 가  
 , , 28.6%, 15.9%, 3.2%  
 8% 1.9.  
 9.5% 3. 가  
 가 23.8% 가  
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 , 71% 가 3 , 88% (18.1, 22.6%, 29%) 가 3.4 9.  
 가 7 가  
 MAPPET 75%  
 13.2 , 28.6%  
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 90mmHg ) 4.6 가 가 .  
 PIOPED trial 3.8 95% 가 10.11)  
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가

12) 가 (25.0% vs 18.6%, Table 5).

가 68.3%  
가 61.9%

가 가

가

가 (15.4% vs 44.0%,  $p=0.07$ )

가

가

가 (20.0% vs 73.3%,  $p=0.06$ ).

가

13)

가

14)

가

가

15).

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16).

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MAPPET

20

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4

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가

20.6% (Table 5).

PIOPED

trial 6%

PIOPED

trial

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5).

MAPPET

48%

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MAPPET 가

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(28% vs 31.7%)

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가

(74% vs 68.3%)

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4) MAPPET

1997 MAPPET

REFERENCES

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 103 MAPPET  
 63 ( / : 21 /42 , : 56  
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 가 15 (23.8%)  
 가 11 (17.5%), 20 가 8  
 (12.7%), 가 6 (9.5%),  
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 (6.3%), ,  
 가 3 (4.8%) .  
 55 (87.3%)  
 가 18 (28.6%), 10 (15.9%),  
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 가 43 (68.3%)  
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 (17.5%), 7 (11.1%) .  
 24 (38.1%)  
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