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Clinical Profile, Management and Outcome of Patients Presenting with Acute Pulmonary Embolism at Tertiary Level Cardiac Centre in Nepal

Chandra M Poudel, Smriti Shakya, Rajaram Khanal, Ratna M Gajurel, Hemant Shrestha, Surya Devkota, Sanjeev Thapa, Bhawani Manandhar, Surya R Pathak

Author(s) affiliation

Department of Cardiology, Maharajgunj Medical Campus, Manamohan Cardiothoracic Vascular and Transplant Centre, Institute of Medicine, Maharajgunj, Kathmandu, Nepal

Corresponding author

Chandra M Poudel, MD, DM
chandra_poudel@yahoo.com

ABSTRACT

Introduction

Pulmonary embolism (PE) is a common, under diagnosed and potentially lethal clinical condition. The aim of our study was to find out the clinical profile, management and outcome of patients with acute PE.

Methods

It was a retrospective study. The participants included patients admitted and diagnosed to have acute PE from January 2014 to December 2019. Patients with high clinical probability and positive D-dimer in low and intermediate clinical probability were diagnosed as acute PE clinically. Data were obtained from the records section of the hospital.

Results

The most common risk factor was found to be smoking. Only two patients were found to have protein C and protein S deficiency (4.4%) and one patient had hyperhomocysteinemia (2.2%). The most common symptom was found to be shortness of breath (97.8%). The most common sign was sinus tachycardia. Right ventricular dysfunction was found in 35.5% of the patients on echocardiogram. Computerized tomography pulmonary angiogram (CTPA) was done in 60% of the patients. The most common CT finding was presence of thrombus in main pulmonary artery in 13.3% of patients. Troponin I was positive in 26.7% of patients and D-dimer was positive in 66.7%. Only 42.2% had evidence of deep vein thrombosis. Only 13.3% were thrombolysed. All the patients received low molecular weight heparin or unfractionated heparin followed by warfarin or dabigatran. The in-hospital mortality rate was 15.6% where the rest of the patients were discharged.

Conclusion

The most common symptom and sign was found to be shortness of breath and sinus tachycardia. Single investigation was not conclusive so multiple investigations were done to reach the diagnosis. Though all the patients received anticoagulation, only few of them were thrombolysed. The in-hospital mortality was found to be 15.6%.

Keywords
High clinical probability, pulmonary embolism, thrombolysis

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INTRODUCTION

The clinical presentation of acute pulmonary embolism (PE) ranges from asymptomatic to mild dyspnea and cardiogenic shock. It is sometime lethal.[1] Death due to PE usually occurs within the first few hours of the event. Ten percent of PE are fatal in the first hour.[2] Depending on the clinical presentation, the case fatality rate for acute pulmonary embolism ranges from less than 1% to 60%.[1] It is unrecognized and under diagnosed clinically despite its high mortality. It has an average annual incidence of about one case per 1000 population in the western world.[3, 4] This is because the clinical symptoms, signs, and investigations required for the support of its diagnosis are relatively nonspecific. Due to the lack in specificity of the clinical presentation and investigations like D-dimer, ECG, Chest X-ray and Echo, a high index of suspicion is necessary to consider the diagnosis.[5]

Major trauma, surgery, lower-limb fractures and joint replacements, and spinal cord injury are strong provoking factors for Venous thromboembolism (VTE) and PE.[6] Other predisposing conditions include Oestrogen-containing oral contraceptive agents, post-menopausal women who receive hormone replacement therapy, infection and central venous lines. The common risk factors for both VTE and atherosclerosis such as cigarette smoking, obesity, hypercholesterolaemia, hypertension, and diabetesmellitus.[7] The mainstay of treatment of acute PE is anticoagulation and in some cases thrombolysis, catheter based thrombolysis and surgical embolectomy.[6,7]

Acute pulmonary embolism in Nepal has not been extensively studied, so we tried to study the clinical profile, management and outcome of patients in Manmohan Cardiothoracic Vascular and Transplant Centre (MCVTC).

METHODS

It was a retrospective study done at a tertiary care cardiac centre – MCVTC in Nepal. It included all patients who were admitted and diagnosed with acute PE clinically and by investigations during January 2014 to December 2019. The hospital records of all patients diagnosed with acute PE and admitted in MCVTC in the specified period were assessed via the hospital record-section. There were no exclusion criteria. The data taken from the patient files included age, sex, predisposing conditions, symptoms, signs, chest roentogram, transthoracic echocardiographic (Echo) findings, CT scan, lab reports, treatment obtained, and outcome. The diagnosis of acute PE at MCVTC is done as per ESC guideline (2008/2014/2019)[7] on clinical ground. D-dimer test was done in patients with Low and intermediate probability of PE. Patient with positive D-dimer and high probability PE patients were anticoagulated if not contraindicated and patients with negative D-dimer were investigated for other disease. Patients with Positive D-dimer and high probability of PE were diagnosed as acute PE clinically and subjected to CT pulmonary angiography (CTPA) as per hospital protocol. CTPA were done according to its availability and absence of contraindications. Patient with thrombus in CTPA were diagnosed as definite PE and treatment done accordingly. Clinical probability was done by Wells rule. Patients who were in cardiogenic shock and or had RV dysfunction, who did not have contraindications and who gave consent to thrombolysis were thrombolysed. Blood investigations for thrombophilic disorders were sent in patients who did not have predisposing conditions. Ethical approval for the study was obtained from Institutional Review Committee (IRC), Institute of Medicine (IOM). All the data obtained were entered in IBM SPSS Statistics 19 and statistical analysis was done.

RESULTS

A total of 45 patients were diagnosed to have acute pulmonary embolism. Among them, 33 (73.3%) were female and 12(26.7%) male. The mean age of the patient was 45.46 (±17.42) years. The most common risk factor was found to be smoking (35.6%). Among them, 11patients (24.4%) were sent for thrombophilia screening. Only two patients were found to have protein C and protein S deficiency and one had hyperhomocysteinemia. The risk factors or predisposing conditions are given in Table 1.

Table 1. Risk factors or predisposing conditions for pulmonary embolism

Predisposing conditions	Frequency (%)
History of immobilization	12 (26.7%)
Prior h/o of major surgery	10 (22.2%)
History of drug use(risk of PE)	3 (6.7%)
History of smoking	16 (35.6%)
Prior history of DVT/PE	12 (26.7%)
Heart failure	9 (20%)
Protein C and S deficiency	2 (4.4%)
Hyperhomocysteinemia	1 (2.2%)

The most common symptom was found to be shortness of breath (97.8%). The least common symptoms were syncope and hemoptysis. The symptoms involved are tabulated in Table 2. The most common sign was sinus tachycardia and all 92.6% the patients included in the study had sinus tachycardia. Among the 45 patients 33.3% were in cardiogenic shock. Investigations done in these patients are given in Table 2.

Table 2. Clinical features and investigations of patients with pulmonary embolism

Features	Frequency (%)
Symptoms	
Shortness of breath	44 (97.8%)
Chest pain	30 (66.7%)
Haemoptysis	9 (20%)
Syncope	9 (20%)
Cardiogenic shock	9 (20%)
ECG changes	
Sinus tachycardia	41 (91.1%)
S1Q3T3	20 (44.4%)
RBBB	23 (51.1%)
ST-T changes	29 (64.4%)
Echocardiography findings	
Dilated RA, RV and RV dysfunction	16 (35.5%)
Dilated RA and RV	24 (53.3%)
CT findings	
Not done	18 (40%)
Thrombus in MPA	6 (13.3%)
Thrombus in MPA, LPA, RPA and segmental arteries	2 (4.4%)
Thrombus in MPA and LPA	1 (2.2%)
Thrombus in MPA and RPA	1 (2.2%)
Thrombus in MPA, RPA and LPA	6 (13.3%)
Thrombus in RPA	2 (4.4%)
Thrombus in LPA	2 (4.4%)
Thrombus in RPA and LPA	7 (15.5%)
Chest X ray findings	
Normal	20 (44.4%)
Hampton`s hump	3 (6.7%)
Oligemia	7 (15.5%)
Pleural effusion	7 (15.5%)
Pulmonary artery hypertension	5 (11.1%)
Consolidation	3 (6.7%)
Doppler USG with DVT	12 (26.7%)
D-dimer	30 (66. 7%)
Trop I	12 (26.7%)

The most common ECG finding was sinus tachycardia which was found in 91.1% of patients. Other findings were RBBB (51.1%), S1Q3T3 (44.4%) pattern and ST-T changes (64.4%).

RV dysfunction was found in 35.5% of the patients whereas dilated RA ad RV was found in all the patients except 4 (8.8%) patients who had normal echocardiography. Echo findings are listed in Table 2. Chest X-ray was normal in 44.4% of the patients. Other findings in chest x-ray are tabulated in Table 2. CT scan was done in 60% of the patients. The most common CT finding was presence of thrombus in MPA only and MPA extending to RPA and LPA. Only 12 patients had evidence of DVT on Doppler Ultrasonogram (USG). Other findings are tabulated in Table 2.

Troponin I was positive in 26.7% of patients. It was not done in 5 patients(11%). (The cutoff value for Troponin I is >0.12 nanogram/ml to be positive). D-dimer was positive in 66.7% patients. D-dimer was not done in 9 patients (20%) as they were in cardiogenic shock. (The cutoff value for D-dimer is > 0.5 microgram/ml to be positive.) Among the 45 patients, about 19 (42.2%) had evidence of DVT.

Among the 45 patients, twenty percent (9 patients) were in shock and 6 patients 13.3% were thrombolysed. All were thrombolysed with streptokinase. The mean duration of thrombolysis was 24 hrs. One patient (2.2%) of the total patients with PE developed intracranial hematoma, and one patient (2.2%) developed rectus sheath hematoma that resolved spontaneously with medical management. All patients received anticoagulation. Forty two percent (42.2%) of the patients received unfractionated heparin whereas 57.8% received low molecular heparin. Eighty nine percent (88.9%) patients received Warfarin and 11.1% received Dabigatran (150mg twice a day). The mean dose of warfarin was 3.37± 2.29mg.

Among the 45 patients, 7 patients died (15.6%) and 38 (84.4%) patients were discharged. The death recorded was in hospital death only. All those patients who died were in cardiogenic shock at presentation. The duration of hospital stay was 10.1 ± 3.63 days.

DISCUSSION

The mean age of the patient was 45.46 years. Majority of the studies showed that acute PE is more common among those aged above 60 years. Goldhaber et al found that majority of patients with PE were in the age group of 70–79 year. However, in a study done in India, mean age was similar to our study (39±12.1 years).[1] The pattern of predisposing conditions was similar to the other studies. The most common risk factor was found to be smoking (35.6%). In a study done by Klok et al,[8] 61% of the patients were smokers. This could be due to the fact that smoking increases the risk of thrombosis and DVT.

Similar to other studies,[1,8] dyspnea was a predominant symptom (97.8%) in the study. It was the most common symptom. This confirms an important fact that the finding of only dyspnea in a patient provides a strong suspicion for PE. Similarly sinus tachycardia was found to be the most predominant sign which is similar to other studies.[9,10] In this study 20% were in cardiogenic shock which is similar to study done by Nagamalesh et al.[11] While cardiogenic shock occurs in less than 5% of patients with PE, the mortality of patients

with cardiogenic shock ranges from 25-40%.[12]

The ECG findings of PE are nonspecific, in this study the most common was sinus tachycardia which is similar to other studies.[7] The most specific finding S1Q3T3 was found only in 44.4% of the patients. It can help us to make a suspicion when the clinical findings are suggestive of PE. A total of 44.4% of the patients had a normal chest X-ray. There were numerous chest X-ray findings that could indicate pulmonary embolism, however, these findings were neither sensitive nor specific. In other studies, it has been found that the incidence of a normal X-ray in patients with a confirmed PE ranges from 24% to up to 80%.[13] On Echocardiography, RV dysfunction was found in 35.5% of the patients whereas dilated RA ad RV was found in most of the patients. At least 25% of patients with acute PE have signs of RV dysfunction on echocardiography in a study done by Gerges et al.[14] Similar findings were found in a study done by Agarwal et al,[3] where 83% of the patients with a confirmed diagnosis of acute PE had an abnormal ECHO. In this study CT scan was done in 60% of the patients and the diagnosis was based on clinical findings, ECG, Chest X-ray and Echo.

Eleveted cardiac troponins in PE is associated with the increased severity and poor prognosis rather than diagnosis.[15] Troponin I was positive in 26.7% of patients in this study which is similar to other studies.[15] Thrombolytic therapy were used in patients who presented in cardiogenic shock except in the presence of major contraindications due to bleeding risks. Anticoagulants either LMWH or UFH were used in all patients. Most of the patients were taking warfarin and a few of them were taking dabigatran, a novel oral anticoagulant.

The in-hospital mortality in our study was 15.6%. Other studies showed that the mortality due to PE occurs in approximately 2 to 6% of patients with hemodynamically stable and in 30% or more of patients with PE presenting with hemodynamic instability or shock.[11,16] The limitations of our study are that it was a retrospective study and CT was not done in 40% of the patients. No long term follow up was done and is a single centre study.

CONCLUSION

In conclusion, PE can have variable presentation clinically. Smoking was the most common risk factor. Dyspnoea was the most common symptom. Sinus tachycardia was the most common sign. Single investigation was not conclusive, so multiple investigations were done to reach the diagnosis. Though all the patients received anticoagulation, only few of them were thrombolysed (13.3%). The in hospital mortality was found to be 15.6%.

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CONFLICT OF INTEREST

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