Pak Heart J

PULMONARY EMBOLISM RISK FACTORS, PRESENTATION AND MANAGEMENT: A CROSS SECTIONAL STUDY

Muhammad Irfan[1], Shah Zeb[2], Kaleem Ullah Bacha[3]

[1-3]Department of Cardiology Lady Reading Hospital, Medical Teaching Institute, Peshawar, Pakistan.

Address for Correspondence:

Shah Zeb

Department of Cardiology Lady Reading Hospital, Medical Teaching Institute, Peshawar, Pakistan

Emails: drshahzeb.mohmad@yahoo.com

Date Received: January 06, 2019

Date Revised: February 19, 2019

Date Accepted: March 08, 2019

Contribution

MI conceived the idea and designed study. KUB did data collection and manuscript writing. SZ did review. All authors contributed equally to the submitted manuscript.

All authors declare no conflict of interest.

This article may be cited as: Irfan M, Zeb S, Bacha KU. Pulmonary embolism risk factors, presentation and management: A cross sectional study. Pak Heart J 2019; 52 (02):176-9

ABSTRACT

Objective: To analyse the presenting symptoms, risk factors, management and outcome of patients admitted with pulmonary embolism

Methodology: Patients admitted to Cardiology department, Lady Reading Hospital, Peshawar as pulmonary embolism in the last 18 months, from 1st January 2018 to 10th June 2019, were enrolled utilizing convenient sampling. Patients were analyzed for presenting symptoms, risk factors, hemodynamic parameters, Well's score, ECG, Echo, CTPA parameters, treatments received and mortality. Frequency, mean and standard deviation were determined. Sensitivity and specificity was calculated for ECG signs, RV dilatation and pulmonary hypertension against CTPA.

Results: Out of 5917 admissions 31 (0.5%) patients were diagnosed as pulmonary embolism. Mean age 46 + 16 years, male 45.2 %. The presenting symptoms were dyspnea 96.8%, chest pain 61.3% and dizziness 32.3%. Risk factors were immobilization 80.6%, hypertension 41.9% and diabetes 25.8%. D-dimmers were high in 96.3%. Right ventricular dilatation was documented in 77.4% having sensitivity 87.5% and specificity 20%. Pulmonary hypertension was determined in 74.2% with sensitivity 81% and specificity 40%. CTPA was performed in 19 out of 31(61.3%) patients and of them14/19 (73.6%) had evidence of pulmonary embolism. Anticoagulants were given in 90.3% while thrombolytic in 9.7%. Mortality was 5/5917 (0.1%) of the total admissions and 5/31 (16.1%) of the patients admitted as pulmonary embolism. The hospital mortality was zero in those having no pulmonary clot on CTPA.

Conclusion: Dyspnea is the most common presenting symptom in pulmonary embolism. Immobilization is the most common risk factor for pulmonary embolism. The in hospital mortality of Pulmonary embolism is 16% in our study population.

Key Words: Pulmonary embolism, Pulmonary CT angiography.

INTRODUCTION

Pulmonary embolism is the third most common cause of mortality after ischemic heart disease and stroke.[1] Being a great mimicker of other diseases it remained elusive for long due to non availability of non invasive gold standard diagnostic tools.

With judicious use of the clinical scoring system and computerized tomographic pulmonary angiography (CTPA), pulmonary embolism has become an in vivo than autopsy diagnosis.[2]

Ventilation perfusion scan had sensitivity 98% specificity 10% and could not be interpreted without clinical probability.[3] D-dimers are good to rule out pulmonary embolism having a sensitivity of more than 95 % but specificity of 41%. The specificity goes further down with advancing age.[5]

Proximal lower limb compression ultrasound (CUS) is a good confirmatory test for pulmonary embolism having a sensitivity 41% (95% confidence interval [CI], 36–46%) and specificity 96% (95% CI, 94–98%). For whole leg CUS the sensitivity and specificity was 79% and 84 % respectively.[6]

CTPA with its high resolution is now at par with or even better than the conventional pulmonary angiography. With a sensitivity of 83-100% and specificity of 89-96% it is nowadays the gold standard for the diagnosis of pulmonary embolism.[7] Easy administration, almost no thrombocytopenia and no need for monitoring the coagulation status, low molecular heparin (LMWH) and novel oral anticoagulants (NOAC) have mostly replaced heparin and warfarin regimen.[8] The availability of the bedside echocardiography and CT pulmonary angiography at our centre seems to be a big boost in the diagnosis of pulmonary embolism.

This study was conducted to analyze diagnostic workup, management and outcome of pulmonary embolism.

METHODOLOGY

This was single centre cross sectional study conducted at Cardiology department, Lady Reading Hospital, Peshawar Pakistan from 1st January 2018 to 10th June 2019. After approval from the ethical committee, all the records of the patients admitted with first diagnosis as pulmonary embolism were analyzed for risk factors, presenting symptoms, hemodynamic parameters, Well's score, ECG, Echo and CT pulmonary angiographic parameters. Frequency, mean and standard deviation were determined. Sensitivity and specificity of S1Q3T3 on ECG, RV dilatation and pulmonary hypertension was calculated against CTPA. Proportions of different treatments received, was calculated. Mortality was calculated for the total admissions and those admitted with pulmonary embolism. SPSS 19 was used for data analysis.

RESULTS

Out of 5917 admissions 31 (0.5%) patients were having pulmonary embolism as first diagnosis. Their mean age was 46$\pm$16 years. About 45.2 % were male. The presenting symptoms in the descending order were dyspnea 96.8%, chest pain 61.3%, dizziness 32.3%, syncope 25.8% and hemoptysis 12.9%. Physical signs in the form of tachycardia and cyanosis were present in 83.9% and 19.4% respectively. The frequency of risk factors for pulmonary embolism in the study subjects is tabulated in a descending order below (Table 1).

The S1Q3T3 pattern on the presenting ECG was found in 7 out of 31 (22.6%) cases with sensitivity 25% and specificity 80% against the gold standard of pulmonary artery clots on CTPA (Table 2)

Table 1: Frequency of Risk Factors for Pulmonary Embolism

Risk Factors for Pulmonary Embolism	Frequency (%)
Immobilization	80.6
Hypertension	41.9
Diabetes	25.8
Pregnancy	12.9
Smoking	12.9
Travel	3.2
Malignancy	0.0

Table 2: S1Q3T3 in Pulmonary Embolus Patients

		Pulmonary Embolus Present		
		Yes	No	Total
S1Q3T3	Yes	4	3	7
	No	12	2	14
Total		16	5	21

D dimers levels were checked in 27 out of 31(87.1%) patients. In three post surgical and one post trauma patient the D dimers were not checked. Twenty six (96.3%) out of 27 patients had high D-dimers while one (3.7 %) out of 27 patients had normal D dimers. Echocardiography was performed in all patients either at bedside or echo lab. Twenty four out of 31 patients (77.4%) had RV dilatation while 23 (74.2 %) patients had pulmonary hypertention. One patient had RV free wall akinesia and apical hyperkinesias (McConnell sign). Right ventricular dilatation was found in 24 out of 31 (77-4%) cases of pulmonary embolism with sensitivity 87.5% and specificity of 20% against the gold standard of pulmonary artery clot on CTPA (Table 3).

Pulmonary hypertension was present in 23 out of 31 (74.2%) cases of pulmonary embolism with sensitivity 81% and specificity of 40% against the gold standard of pulmonary artery clot on CTPA (Table 4).

Table 3: ECHO findings of study population

		Pulmonary Embolus present		Total
		Yes	No	
Right Ventricular Enlargement	Yes	14	4	18
	No	2	1	3
Total		16	5	21

Table 4: CTPA findings of study population

		Pulmonary Embolus present		Total
		Yes	No	
Right Ventricular Enlargement	Yes	13	3	16
	No	3	2	5
Total		16	5	21

Lower limb Doppler study was performed in 14/31 (45.2%) of the patints with pulmonary embolism. Deep vein thrombosis was documented in 13/31 (41.9%) of patients with pulmonary embolism and 13/14 (92.9 %) of the 14 subjects who had undergone Doppler study of the lower limb.

The CTPA was performed in 19 out of 31(61.3%) patients, 14/19 (73.6%) had pulmonary embolism. The reasons for not doing the CTPA were critical condition in 5 patients, documented pulmonary embolism on echo in 2, done but not retrievable 2, LAMA one patient and impaired renal function in one patient.

The average delay from the date of admission to CTPA was 3.15$\pm$1.99 days which was 3.66 days in cases with S1Q3T3 and no clot on CTPA.

The treatment given was LMWH-NOAC 24/31 (77.4%), thrombolytic-heparin- warfarin 3/31(9.7%), heparin-warfarin 2/31 (6.5%), heparin-NOAC 1/31 (3.2%), NOAC-warfarin 1/31 (3.2%).

The mortality from pulmonary embolism was 5/5917 (0.1%) of the total admissions and 5/31 (16.1%) of the patients admitted as pulmonary embolism. The hospital mortality was zero in those having no pulmonary clot on CTPA.

DISCUSSION

The frequency of PE in our study was 0.5 % while the incidence in general population is reported to be 0.5-1.0%[9].

The presenting symptoms in the descending order were dyspnea 96.8%, chest pain 61.3%, dizziness 32.3% as compared to dyspnoea34%, chest pain 20% and cough 9% by Manuel et al.[10] (Table 5). The risk factors for pulmonary embolism were compared with the same study in a tabulated form.

The S1Q3T3 pattern on ECG was found in 22.6% patients with acute pulmonary embolism vs. 3.7% by Thomson et al.[11]

We had 27/31 (87%) cases who had d dimer test done and 26/27 (96.3%) had positive d dimmers while 20/22 (91%) had positive D-dimer in a study by Yousaf et al.[12]

We measured the right ventricular size and tricuspid velocity for all the patients. Right ventricular dilatation was found in 24 out of 31 (77-4%) cases while pulmonary hypertension was found in 23/31 (74.2%). We did not objectively measure the right ventricular function which has a strong association with in hospital mortality. With severe RV dysfunction in these patients, the in-hospital mortality can be as high as 15–30%.[13]

We had clinical evidence of DVT in 14/31 (45%) patients compared to less than 25% in the literature.[14]

For suspected pulmonary embolism CTPA was done in 19/31 (61.3%) compared to 37/41(90.2%) by Tambe et al while pulmonary embolism was documented in 14/17 (82.4%) in our study vs. 12/37 (32.4%) by Tambe et al.[15]

The negative CTPA results in some of the very highly suspected cases of pulmonary embolism e.g. having S1Q3T3 pattern, could be due to delay in the CTPA and a very early resolution of clot.[16]

Mortality In our study the mortality was 16.1% against 8-10 % in treated and up to 30% in untreated cases of pulmonary embolism by Goldhaber et al. Two third deaths occur in the first two hours.[17]

Table 5: Comparison of Risk Factors for Pulmonary Embolism

Risk Factors for Pulmonary Embolism	Frequency (%) In our study	Frequency (%) Study by Mauel et al
Immobilization	80.6	48
Hypertension	41.9	36
Diabetes	25.8	12
Pregnancy	12.9	2
Smoking	12.9	8
Travel	3.2	Not checked
Malignancy	0.0	10
Surgery/trama	19	16
Obesity	Not checked	12
Previous known coagulations disorders	0	Previous known coagulations disorders
Hospitalization	Not checked	28

CONCLUSION

Dyspnea is the most common presenting symptom in pulmonary embolism. Immobilization is the most common risk factor for pulmonary embolism. Thrombolytic were given in 10% of patients while the rest were treated with low molecular weight heparin only. The in hospital mortality of Pulmonary embolism was 16% in our study population.

REFERENCES

1. Giuntini C, Di Ricco G, Marini C, Melillo E, Palla A. Pulmonary embolism:epidemiology. Chest 1995;107(Suppl 1):3S-9S.
2. Kopcke D, Harryman O, Benbow EW, Hay C, Chalmers N. Mortality from pulmonary embolism is decreasing in hospital patients. J R Soc Med 2011;104(8):327-31.
3. PIOPED. Investigators. Value of the ventilation/perfusion scan in acute pulmonary embolism: results of the prospective Investigation of Pulmonary Embolism Diagnostic (PIOPED). JAMA 1990;263(20):2753-9.
4. Pulivarthi S, Gurram MK. Effectiveness of d-dimer as a screening test for venous thromboembolism: an update. N Am J Med Sci 2014;6(10):491-9.
5. Righini M, Van Es J, Den Exter PL, Roy PM, Verschuren F, Ghuysen A,et al. Age-adjusted D-dimer cutoff levels to rule out pulmonary embolism: the ADJUST-PE study. JAMA 2014;311(11):1117-24.
6. Da Costa Rodrigues J, Alzuphar S, Combescure C, Le Gal G, Perrier A. Diagnostic characteristics of lower limb venous compression ultrasonography in suspected pulmonary embolism: a meta-analysis. J Thromb Haemost 2016;14:1765-72.
7. Doğan H, de Roos A, Geleijins J, Huisman MV, Kroft LJ. The role of computed tomography in the diagnosis of acute and chronic pulmonary embolism. Diagn Interv Radiol 2015;21(4):307-16.
8. Ryan J. Pulmonary embolism: new treatments for an old problem. Open Access Emerg Med 2016;8:87-95.
9. Torbicki A, Perrier A, Konstantidines S, Agnelli G, Galiè N, Pruszczyk P, et al. Guidelines on the diagnosis and management of acute pulmonary embolism. Eur Heart J 2008;29:2276-315.
10. Manuel A, Aufico A, Africano R, Peralta T, Salas A,Silva A, et al. Clinical profile, management and outcomes of patients with pulmonary embolism: a retrospective tertiary centre study in Angola. Cardiovasc J Afr 2017;28(6):356-61.
11. Thomson D, Kourounis G, Trenear R, Messow CM, Hrobar P, Mackay A, et al.ECG in suspected pulmonary embolism.PostgradMedJ 2019;95(1119):12-7.
12. Youssf ARI,Ismail MFM, ElGhamry R, Reyad MR. Diagnostic accuracy of D-dimer assay in suspected pulmonary embolism patients.EgyptJ Chest Dis Tuberc 2014;63(2):411-7.
13. Jaff MR, McMurtry MS, Archer SL, Cushman M, Goldenberg N, Goldhaber SZ, et al.Management of massive and submassive pulmonary embolism, iliofemoral deep vein thrombosis, and chronic thromboembolic pulmonaryhypertension: a scientific statement from the American Heart Association.Circulation 2011;123(16):1788-830.
14. Kearon C, Julian JA, Newman TE, Ginsberg JS. Noninvasive diagnosis of deep vein thrombosis. McMaster Diagnostic Imaging Practice Guidelines Initiative. Ann Intern Med 1998;128(8):663-77.
15. Tambe J, Moifo B, Fongang E, Guegang E, Juimo AG. Acute pulmonary embolism in the era of multidetector CT: a reality in sub-Saharan Africa. BMC Med Imaging 2012;12:31-31.
16. Aghayev A, Furlan A, Patil A, Gumus S, Jeon KN, Park B, et al. The rate of resolution of clot burden measured by pulmonary CT angiography in patients with acute pulmonary embolism. AJR Am J Roentgenol 2013;200(4):791-7.
17. Goldhaber SZ, Visani L, De Rosa M. Acute pulmonary embolism: Clinical outcomes in theInternational Cooperative Pulmonary Embolism Registry (ICOPER). Lancet 1999;353:1386-9.