Research Paper

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Role of Multi - Detector Computed Tomographic Pulmonary Angiography in the Prognostic Evaluation of Pulmonary Thromboembolism

Medical Science

KEYWORDS : CT PULMONARY ANGIOGRAPHY, PULMONARY EMBOLISM

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ABSTRACT

MDCT Pulmonary angiography and CT venography in combination can be considered as first line diagnostic tool for the evaluation of patients with PTE because of direct visualisation of thrombus, non invasiveness, less time consuming, wide availability, rules out other chest pathologies , comfortable for immobile patients.

35 patients with clinical suspicion of PTE ,were imaged using specific time protocol for CTPA and CTV. Most common risk factor for pulmonary embolism was immobilisation followed by recent history of surgery. Most patients presented with shortness of breath. Most common ancillary findings were pulmonary effusion followed by pulmonary infarct. CT venographies were positive in 25 patients (72%). MPA diameter, PE Index, cardiovascular parameters were important parameters in prognostic outcome of the patients.

INTRODUCTION

Pulmonary embolism was first described in the early 1800s[1]. Acute pulmonary thrombo-embolism is the third most common cause of death in hospitalized patients, after myocardial infarction and stroke. Important risk factors are deep venous thrombosis and immobilization following a major surgery. Early and accurate diagnosis is extremely important as a wide range of effective therapeutic options are available thereby reducing morbidity and mortality. The gold standard investigation for its diagnosis is conventional pulmonary angiogram. Unfortunately, this test is invasive, costly, time consuming .In view of the clinical limitations, there is need for an accurate, low risk, highly sensitive and specific, non-invasive, easily and rapidly performed, cost effective and widely available screening test.

For 30 years, ventilation-perfusion (V/Q) lung scanning had been the non invasive imaging procedure of choice .However, in most patients for whom pulmonary embolism is suspected, V/Q scans are either of low or intermediate probability, and the actual incidence of pulmonary embolism in these individuals ranges from 10% and 40%. The diagnostic uncertainty in these situations is a major limitation of V/Q scanning.

MATERIAL AND METHOD

This prospective study was done in the Department of Radio diagnosis, Vishesh Hospital, Indore, Madhya Pradesh. A total of 35 patients who were referred to our department with clinical suspicion of Pulmonary thrombo embolism, underwent CT Pulmonary Angiography (CTPA) & Indirect lower limb CT Venography (CTV) using 32 Multi slice Spiral CT scanner, from May 2011 to May 2013.

Exclusion criteria

1. Patients with known hypersensitivity to iodinated intravenous contrast media
2. Patients with severe renal impairment
3. Pregnant females

EQUIPMENTS & TECHNIQUES

CT examination was performed on Siemens Somatom 32 Multi slice CT scanner. This is a fourth generation rotate only scanner with slip-ring technology. It has multi detector 32 slice configuration with gantry rotation time of 0.33 seconds. It is capable of obtaining 0.6,1,2,5,8 and 10 mm sections with maximum range of table tilt of 0 to ± 30 degrees. Automatic Medrad Vistron CT pressure injector system was employed for intravenous contrast material administration.

Images were viewed at mediastinal window width 450 HU; window level 35 HU), lung (window width 1500 HU; window level -700 HU) and pulmonary embolism specific window (window width 700 HU; window level 100 HU) on a workstation. Images of CTV viewed from lower IVC down to the popliteal vein at specific window (window width 350; window level 40).

OBSERVATIONS AND RESULTS

This study was carried out in department of Radio diagnosis Vishesh Hospital and Diagnostic Solutions, Indore. A total of 35 patients were included in this study who underwent MDCT Pulmonary angiography and lower limb CT Venography . The patients were followed up to 3 months on the basis of departmental hospital records. Statistical analysis was done with the help of Winpepi Statistical Analysis Software.

Among 35 patients in this study , most common clinical presenting age group was found between 30-40 years which constituted 10 (28.58%)cases. Mean age of presentation was 40. Out of 35 Patients, 27 (77.14%) were males and 8 (22.8%) were females. Mean age of presentation for Male Patients was 41 years and Female Patients was 36 years.

Shortness of Breath was seen in 27 (77.2%) patients and was the most common presenting symptom followed by cough in 23 (65.7%) patients. Many patients had more than one presenting symptom. Most common risk factor was history of immobilisation noted in 11 (31.4%) patients followed by history of recent Surgery noted in 9 (25.7%) patients.

D-dimer report was abnormal in 30 (85.7%) patients and Normal in 5 (14.3%) patients. ECG report was abnormal in 26 (74.3%) patients and normal in 9 (25.7%) patients. Lower Limb Deep Vein Thrombosis was reported in 25 (71.4%) patients and 10 (28.6%) patients were found negative for DVT.

17 (48.5%) patients out of 35 patients were positive for PTE.

PI index > 60 % was seen in 9 (53 %) patients and < 60 % was seen in 8 (47%) patients.

Pulmonary artery diameter (PA_D) was abnormal >33.2mm in 13 (77%) patients and was normal <33.2 mm in 4 (23 %).

The ratio of right ventricle diameter to left ventricle diameter, RVD/LVD was > 1 in 11 (65 %) patients and was < 1 in 6 (35 %) patients.

Inter ventricular septum (IVS) bowing was seen in 9 (53%) patients and not seen in 8 (47 %) patients.

Contrast reflux in IVC was seen in 10 (59%) patients and

not seen in 7 (41%) patients. Pulmonary Artery Diameter was considered abnormal if it was >33.2mm and was seen in 13 out of 17 patients (76.4%) with CT evidence of pulmonary embolism and in 3 out of 18 patients (16.6%) with no CT evidence of pulmonary embolism in 16 out of 35 (45.7%) patients with abnormal pulmonary artery diameter(with p value <0.001.)

Most common CT chest finding in Plain scan was Pleural Effusion, seen in 22 (63.0%) patients, followed by Pulmonary Infarct, seen in 8 (22.0 %) patients

CT Venography: 25 out of 35 total patients were positive for DVT (72%).

14 out 17 patients of PTE were positive for DVT (83%).

SUMMARY AND CONCLUSION

35 patients with clinical suspicion of PTE, were imaged using specific time protocol for CTPA and CTV. From the observations we concluded that majority of the patients who presented with pulmonary embolism belonged to third and fourth decade that is 10 (28.58%) patients in 30-40 year age group. The mean age for presentation in males was 41 years and mean age for females was 36 years. The number of male patients 27(77%) outnumbered the female patients 8 (22.8%). Majority of patients presented with shortness of breath noted in 27 (77%) patients .The most common risk factor was immobilisation noted in 11 (31%) patients.

Pleural effusion was the most common (63%) ancillary finding followed by pulmonary infarct. Most of patient with PTE had abnormal ECG and abnormal D-dimer levels.

CT venography was positive in 25 (72%) patients and it is a major determinant factor in the study. Deep vein thrombosis was diagnosed in 11 patients without PTE and changed the treatment plan.

MPA diameter is a significant predictor in the diagnosis of PTE but does not significantly contribute in the prognostic outcome of patients. On the basis of MPA diameter, 3 patients were diagnosed with Primary PAH and 13 patients with PTE.

PE index and cardiovascular severity parameters are significant (p value <0.05) predictors of patients out come.

Thus MDCT Pulmonary Angiography and CT lower limb venography can be considered as the first line radiological investigation for the diagnosis and assessment of prognostic outcome of patients presenting with clinical suspicion of Pulmonary Thromboembolism.

RECOMMENDATIONS

It is recommended to use the highest generation CT scanner for increasing the accuracy and rate of detection of pulmonary thrombus in higher order of pulmonary arteries due to better spatial and temporal resolution, which remains occult with lower generation scanners.

The scan technique should be planned in the caudo-cranial direction to avoid the artefacts from contrast filled SVC.

It is recommended to perform CTV of lower limbs in the same setting as the CTPA to facilitate the detection of DVT early as Color Doppler of lower limbs in the separate setting is time consuming and is difficult and inconvenient in ICU settings.

In severely dyspnec patients and in patients with high clinical suspicion of pulmonary embolism it is advisable to directly perform CTPA as the preliminary examination for thrombus detection before performing chest radiography, echocardiography and D Dimer levels which saves crucial time and reduces morbidity and mortality.

If the results of CTPA are equivocal , the entire lung fields should be assessed for indirect signs of pulmonary embolism like pleural effusion, pulmonary infarcts, focal areas of consolidation, to aid in the deciding the proper line of treatment at its earliest.

PHOTOSHEETS

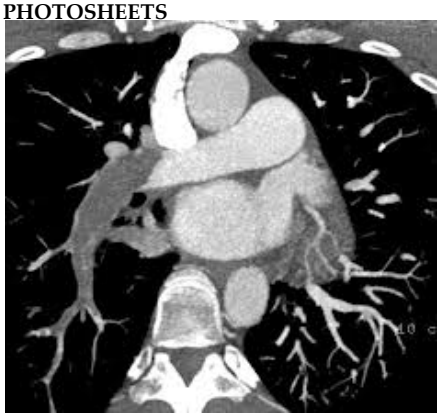

FIG 1. CTPA CORONAL SECTION SHOWING HYPOECHOIC FILLING DEFECT IN RIGHT MAIN PULMONARY ARTERY SUGGESTING THROMBUS.

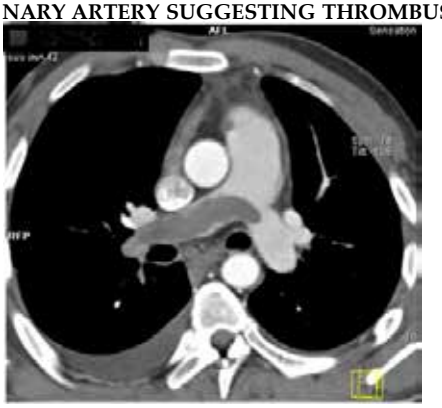

FIG 2. CTPA AXIAL SECTION SHOWING HYPOECHOIC FILLING DEFECT IN MAIN PULMONARY ARTERY EXTENDING ON RIGHT SIDE WITH RIGHT PLEURAL EFFUSION.

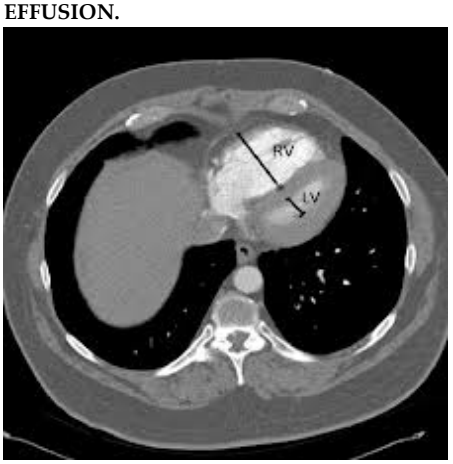

FIG 3: CTPA SHOWINHG ENLARGED RIGHT HEART

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CHAMBERS IN A PATIENT WITH SIGNIFICANT PULMONARY EMBOLISM.

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