

Adquacy of CT Pulmonary Angiogram for Diagnosis of Pulmonary Embolism

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ABSTRACT

Aim: Assessment of contrast enhancement adequacy in CT pulmonary angiograms (CTPA) to ensure sufficient diagnosis.

Methodology: This study was conducted in Radiology Department, Rehman Medical Institute, Peshawar. Sample size was 100 cases were selected with suspicion of pulmonary embolism that underwent CTPA. Study duration was 01-03-2019 to 30-06-2019.

Results: First audit: 60% cases were females and 40% were males. 38 cases were of age 41-60 years. In 12% cases, the enhancement of pulmonary trunk was below 211 HU thus unsatisfactory scans. This showed 5% deviation from the standard. In 15 cases, there is acute pulmonary embolism.

Second audit: 58% cases were females and 42% were males. In 3% cases, the enhancement of pulmonary trunk was below 211 HU thus unsatisfactory scans. For set standard, the target was achieved. In 22% cases, there is acute pulmonary embolism.

Conclusion: Audit on CTPA adequacy showed that there is improvement of inadequate scans from 12% to 3% and our scans fulfilled the criteria as recommended.

Keywords: CTPA, Pulmonary embolism, Pulmonary angiogram

INTRODUCTION

Third acute cardiovascular disease is pulmonary embolism (PE) ¹. First priority investigation is CTPA for suspected pulmonary embolism ². For PE, the diagnostic accuracy of CTPA is high, sensitivity 90%–100% and specificity of 89–94% keeping pulmonary angiography as gold standard³. For detection of thrombus, proper opacification of the main pulmonary artery is necessary. The density of acute and chronic thrombus is 33 and 87HU respectively. For detection of acute thrombi, minimum attenuation of blood should be 93 HU and for chronic thrombi, it should be 210 HU⁴

METHODOLOGY

This study was conducted in Radiology Department, RMI, Peshawar for a period of four months i.e., from 01-03-2019 to 30-06-2019. Patients having CTPA done on 128 slice CT scan were included in the study while patient having age <15 year and CTPA done on 16 slice CT scan were excluded from the study. Sample size was hundred cases were included.

Imaging analysis: Machine used for CTPA was Toshiba Aquilion CT scanner. Iodine based contrast used. Contrast was injected through a double chamber power injector followed by a saline chaser. Bolus tracking method was used placing ROI on the main pulmonary artery. The images were seen by using different settings e.g., Lung

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window (W:1500 HU, C:-600HU), Mediastinal window (W:350HU, C:40HU), Pulmonary artery specific window (w: 700HU, c:100HU). The minimum enhancement of main pulmonary trunk should be 211HU and > 211 will be satisfactory while < 211HU is unsatisfactory.

Target: The target was defined as no more than 11% of CTPA having HU <211 in main pulmonary trunk (MPOT).

RESULTS

Acute pulmonary embolism was diagnosed in only 15 cases.

Table 1: Density * PE * Comment Cross tabulation (Second Audit)

| Adequacy CTPA | | | PE | | Total |
|---------------|---------|---------|-----|-----|-------|
| | | | -ve | +ve | |
| Adequate | Density | 200-250 | 3 | 0 | 3 |
| | | 250-300 | 7 | 2 | 9 |
| | | 300-350 | 14 | 4 | 18 |
| | | 350-400 | 17 | 5 | 22 |
| | | >400 | 34 | 11 | 45 |
| | Total | | 75 | 22 | 97 |
| Inadequate | Density | 100-150 | 1 | | 1 |
| | | 150-200 | 2 | | 2 |
| | Total | | 3 | | 3 |
| Total | Density | 100-150 | 1 | 0 | 1 |
| | | 150-200 | 2 | 0 | 2 |
| | | 200-250 | 3 | 0 | 3 |
| | | 250-300 | 7 | 2 | 9 |
| | | 300-350 | 14 | 4 | 18 |
| | | 350-400 | 17 | 5 | 22 |
| | >400 | 34 | 11 | 45 | |
| Total | | 78 | 22 | 100 | |

First audit: In 12% of cases the enhancement of pulmonary trunk was below 211 HU, showing unsatisfactory scans.

Second audit: In 3% of cases the enhancement of pulmonary trunk was below 211 HU, showing unsatisfactory scans. This achieved the target for set standard. Acute pulmonary embolism was diagnosed in 22% cases.

Fig 1: Mean density value in main pulmonary trunk (second cycle).

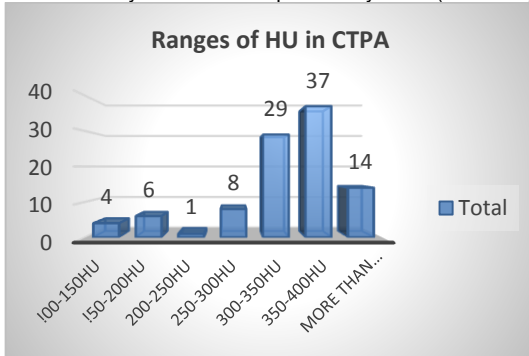


Fig 2: Pulmonary embolism and adequacy of CTPA.

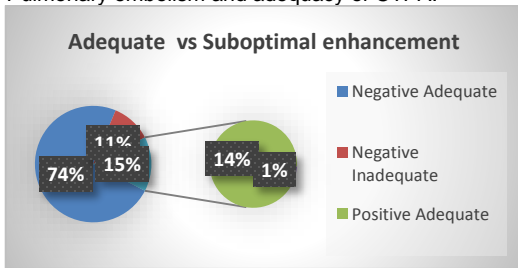


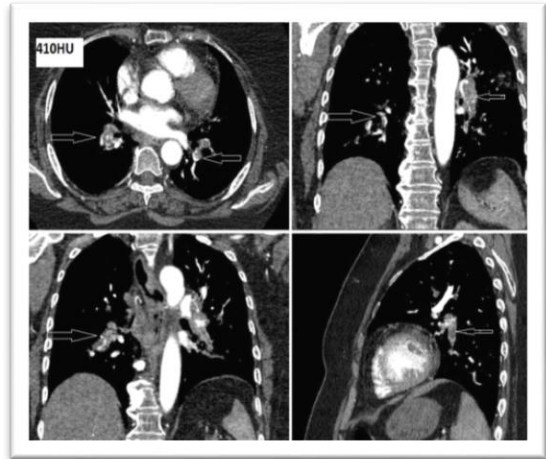
Fig 3: The density of MPOT is more than 211 HU



Fig 4: Axial CTPA image showing mean density of <211 HU of MPOT, an inadequate scan.



Fig 5: A 58 year old female presented with shortness of breath. CTPA images here confirm extensive pulmonary embolism.



DISCUSSION

In our study, 12% of the scans had MPOT opacification <211HU showing unsatisfactory scans. In one study, there are 11% of the CTPA to be inadequate⁶. The results of this study are consistent with our results. After re-audit, total of 15-22% of our cases had diagnosed pulmonary embolism on CTPA. This may be due to changing window setting from mediastinal to vascular window thus increased the visualization of vessel lumen for any thrombus.

In one study done in Royal college of Radiology, which set a target of 210 HU as minimum enhancement of main pulmonary artery lumen and no more that 10.8% of CTPAs should have < 211 HU⁵.

CONCLUSION

Audit on CTPA adequacy showed that there is improvement of inadequate scans from 12% to 3% and our scans fulfilled the criteria as recommended.

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