

CT Venography in Diagnosing Deep Vein Thrombosis Having Suspicion of patients with Pulmonary Embolism

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ABSTRACT

Aim: CT venography in diagnosing DVT in cases with suspicion of pulmonary embolism taking doppler USG as gold standard

Methodology: A cross sectional study was conducted in Radiology Department of a tertiary care Hospital. Forty cases with suspicion of pulmonary embolism were selected. CT venography from iliac to calf veins was done with CT pulmonary angiogram. Doppler USG was taken as gold standard.

Results: The overall sensitivity, specificity, positive & negative predictive values for CT venography were 100%, 94.1%, 75%, and 100% respectively.

Conclusions: Sensitivity, specificity and negative predictive value of CT venography was significant in diagnosing DVT with strong suspicion of patients with pulmonary embolism.

Keywords: DVT, pulmonary embolism, CT pulmonary angiography, CT venography

INTRODUCTION

Deep venous thrombosis (DVT) is an important cause of morbidity and mortality¹. Pulmonary embolism (PE) and DVT are two ends of the same spectrum, i.e. venous thromboembolism (VTE)².

Risk factors of DVT are surgery around hip, older age, obesity, hypertension, diabetes, pregnancy, immobilization and history of thromboembolism³.

Accurate and cost-effective method for diagnosing the DVT in the lower extremities is venous USG⁴.

The objective of the study was to find out CT Venography in diagnosing deep vein thrombosis having suspicion of patients with Pulmonary Embolism

METHODOLOGY

This study was done in Radiology Department of a tertiary care Hospital, Islamabad for a period of nine months after getting permission from Ethical Review Board. The patients with strong clinical suspicion of pulmonary embolism with age >18yrs with either gender were included. Patients with already diagnosed DVT, H/o allergy to contrast, serum creatinine level >1.7mg/dl, pregnancy and inadequate peripheral venous access were excluded.

Initially CT pulmonary angiography with CT venography was performed on a 64-slice CT scanner. Pulmonary angiogram was performed starting from lung apices to bases, once a contrast density of 180 Hounsfield units was achieved in the pulmonary trunk. After a delay of 150 sec, CT venogram was performed starting from the iliac crests till the mid calf region. This was followed with color doppler sonography of both lower limbs from inguinal to mid calf region using compression and augmentation maneuvers as well as assessment of color flow in the deep veins. Iliac veins were also scanned in addition. Presence or absence of thrombus, partial or complete venous occlusion and involvement of iliac, femoral, popliteal and calf veins was determined. These results were then compared with doppler sonography of lower limb and pelvic veins using gray scale, color doppler, spectral analysis, compression and augmentation maneuvers. Data was analyzed on SPSS version 14.

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RESULTS

A total of forty cases were selected. Mean \pm SD of the age was 48.6 \pm 17.2 years. Out of 40 cases, 26 were female (65%) whereas 14 were male (35%). Six patients (15%) were diagnosed as having DVT on CT venography and these findings were confirmed to be true by doppler sonography. Two patients were false positive and found to be normal on doppler sonography. The remaining 32 cases were not having DVT by CT venography since doppler sonography approved these CT venography findings. Overall sensitivity, specificity, positive and negative predictive values were 100%, 94.1%, 75% and 100% respectively.

Table 1:

Presence of DVT on CT	Presence of DVT on USG		Total
	Yes	No	
Yes	6	2	8
No	0	32	32
Total	6	34	40

Sensitivity: 100%, Specificity: 94.1%,

Positive Predictive Value: 75%,

Negative Predictive Value: 100%

DISCUSSION

This study showed the sensitivity to be comparable to the study done by Baldt et al⁵. Its specificity is also close to the results of the same study which compares CT venography with conventional venography. The negative predictive value is equal to this study while positive predictive value (75%) is significantly lower than the study performed by the same authors.

The sensitivity and specificity for iliac vein DVT in our study were 100% and 97.3% respectively. The positive and negative predictive values were 75% and 100% respectively. For femoral and popliteal veins the sensitivity was 100%. Specificity for femoral and popliteal vein DVT was 97.1% and 97.3% respectively. Two patients were false positive for DVT. Both these patients had flow related artifacts in their lower limb external iliac and femoral vein in one patient and popliteal vein in the other one. When these cases were studied again retrospectively it was found that the reason was flow related artefacts in the aforementioned veins. These are a result of inhomogeneous mixing of contrast enhanced and non enhanced blood. Although mostly they are readily identified, sometimes they may cause problems in diagnosis due to

misinterpretation as a thrombus. In our institution we use a 150 seconds delay before triggering the indirect CT venogram following a CT pulmonary angiogram. Perhaps a longer delay time should be employed in these patients to avoid this pitfall. The other patient was 47 years old with no known co morbid conditions. However her doppler ultrasound was performed 2 days before her CT venogram which showed small filling defects within the lumen of external iliac and common femoral veins. Such a discrepancy can be avoided by performing these two investigations as close in time to each other as possible.

There was also complete agreement between CT venography and doppler sonography regarding degree of venous occlusion. Out of the 6 true positive cases, only 1 had complete occlusion as shown by CT venography. This was found to be true when doppler ultrasound was undertaken. Similarly, there was complete agreement between these two modalities for the rest of the 5 patients all of whom had partial venous occlusion.

CONCLUSION

Sensitivity, specificity and negative predictive value of CT venography was significant in diagnosing DVT with strong suspicion of patients with pulmonary embolism.

Conflict of interest: Nil

REFERENCES

1. Bilal N, Niazi R. Deep vein thrombosis of the lower limbs - predilection for left leg and importance of isolated right leg DVT. *J Pak Inst Med Sci* 2001;8:595-8.
2. Emmerich J. Looking for deep vein thrombosis in suspected pulmonary embolism. *SeminVasc. Med* 2001;1:181-8.
3. Yuan XZ, Wu XM, Chen M et al. Incidence of deep venous thrombosis in patients undergoing thoracotomy and changes of hemostasis. *Beijing Da XueXue Bao* 2004;36:529-32.
4. Jacques C, Steven DP, Joseph FP. Deep venous thrombosis: Complete lower extremity venous US evaluation in patients without known risk factors—Outcome study. *Radiology* 1999;211:637-41.
5. Baldt MM, Zontsich T, Stümpflen A et al. Deep venous thrombosis of the lower extremity: efficacy of spiral CT venography compared with conventional venography in diagnosis. *Radiology* 1996;200:423-8.