

Combined Radionuclide Phlebography and V/Q scan in the assessment of iliac vein thrombosis and pulmonary embolism – A case report establishing a cause and effect relationship

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ABSTRACT

Deep vein thrombosis (DVT) is an important life threatening condition that is difficult to diagnose, particularly in the early stages. Looking for DVT in lower limb can be considered ancillary in suspected cases of pulmonary embolism (PE) indirectly highlighting a cause and effect relationship of a single disease (i.e cause being DVT and effect is the assault on the lung vasculature). Prompt and early identification of one or both of these pathologies calls for urgent intervention in the form of instituting anticoagulation therapy. Synthetic Tc-99m labeled peptides like apcitide, a glycoprotein (GP IIb/IIIa) receptor antagonist is increasingly used as a specific tracer in the detection of acute DVT. But due to its non availability in certain countries, one needs to resort to indirect evidence in the form of Tc-99m MAA to help in the identification of DVT. Radionuclide phlebography (RPh) combined with lung perfusion scintigraphy (LP) is a one stop shop for the rapid and non-invasive diagnostic assessment of PE due to DVT. The aim of this case report is to highlight the underutilization of nuclear techniques in the evaluation of DVT in routine clinical practice. We report a case of a young Indian male who presented with sudden onset dyspnoea. On scintigraphic evaluation by a simultaneous RPh and LP, the cause and effect of DVT could be easily established.

Key words: Radionuclide phlebography; Deep vein thrombosis; Pulmonary embolism; Lung perfusion scintigraphy; Lung ventilation scintigraphy; Tc-99m MAA

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INTRODUCTION

About 10% of patients have pulmonary emboli as a dynamic complication of DVT and 90% of them originate from the lower limbs. More than 60% of patients are prone to recurrent episodes of DVT. RPh is a simple, non invasive imaging technique that uses non specific tracers which are simultaneously injected into dorsal veins of feet. Positive scans

reveal abnormal vascular filling patterns with or without collaterals in leg veins. It is especially useful in patients with high clinical suspicion of DVT and in those with associated predisposing factors like recent surgery to hip, knee, or abdomen; any recent trauma; malignancy; or stasis secondary to congestive heart failure, varicose veins; obesity and certain hypercoagulable states especially due to oral contraceptive pills, pregnancy and polycythemia [1].

Noninvasive imaging is ideal in patients with minimal signs or symptoms especially in a postoperative setting.

Radionuclides used for RPh are Tc-99m MAA (macro aggregated albumin), Tc-99m sulphur colloid, xenon, and krypton [2, 3]. Of all the above tracers, Tc-99m MAA has inherent advantages. It is an easy, non invasive and cost effective whole body screening technique that can be performed with a single injection of MAA and has excellent patient compliance. It is widely available in India and using the same cold kit, simultaneous assessment of venous system and lungs are possible. Previously ¹³¹I labeled fibrinogen using in vivo probes were tried but due to inherent deficiencies in interpretation, long hours of imaging and drawbacks of ¹³¹I it did not gain much popularity [4].

Although ascending contrast venography is the present standard for the diagnosis of DVT, duplex ultrasonography in combination with color doppler flow imaging, is accepted as a useful imaging alternative [5]. MR venography is also indicated when proximal thrombus is likely or suspected as in pelvic trauma, postsurgical cases, or cryptogenic stroke [6] and also when ultrasonography is negative. But none of these tests can provide simultaneous assessment of lungs and venous system non invasively like Tc-99m MAA imaging.

DVT can affect both upper and lower limb veins. Literature review shows that DVT in young patients was encountered following Harrington's procedure for scoliosis correction where the symptomatology is diffuse but carries a risk for fatal pulmonary embolism [7].

There are no other reports of DVT in young adults on literature search. Similarly it is also stated that iliac vein thrombosis is rarely encountered and our case is one of them.

CASE REPORT

21- year old Indian male presented with sudden onset dyspnoea with no other positive signs or symptoms suggesting an underlying cardiac or respiratory disease. Clinically on examination patient was conscious, well oriented with no cardiac or respiratory abnormalities. Basic blood investigations, D dimer test and chest X Ray were negative. Based on these factors, patient was referred to nuclear medicine department to rule out PE. 74 MBq (megabecquerel) of Tc MAA was injected simultaneously in bilateral lower limb veins. Dynamic images (anterior, posterior projections) were acquired (15 sec / frame) from feet end first, followed by conventional static imaging of lungs on a dual head variable angle Gamma camera.

RPh images revealed intermittent obstruction in pelvic veins with significant collaterals in left iliac vessels (Figure 1).

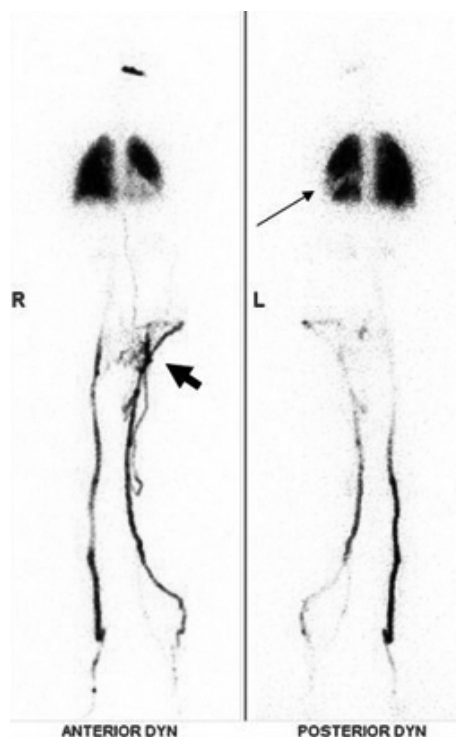


Fig 1. Radionuclide phlebography images shows normal progression of MAA through right lower limb vessels while significant collaterals in left iliac vessels are noted (bold arrow). Lungs are also simultaneously visualized. There is associated subsegmental perfusion defect in left lateral basal lung segment (thin arrow).

LP imaging showed a mismatching sub segmental perfusion defect in left lung lateral basal segment (Figure 2A). Subsequently a Tc-99m DTPA aerosol ventilation imaging was carried out the following day which was normal (Figure 2B). Thus a mismatching V/Q (ventilation – perfusion) defect with intermittent obstruction in pelvic veins and significant collaterals in left iliac vessels confirms the diagnosis of PE in left lung due to pelvic vein obstruction. Although a single sub segmental mismatching V/Q defect is generally categorized as a low probability for PE by PLOPED criteria (prospective investigation of pulmonary embolism diagnosis), it was reported positive in our patient based on the clinching evidence of DVT from a simultaneous RPh scan. Thus PE was confirmed to be the underlying cause of dyspnoea. This finding was further supported by doppler study of lower limb that showed an acute thrombus filling entire lumen of Left common iliac, external iliac, superficial and deep femoral vein with no recanalisation (Figure 3).

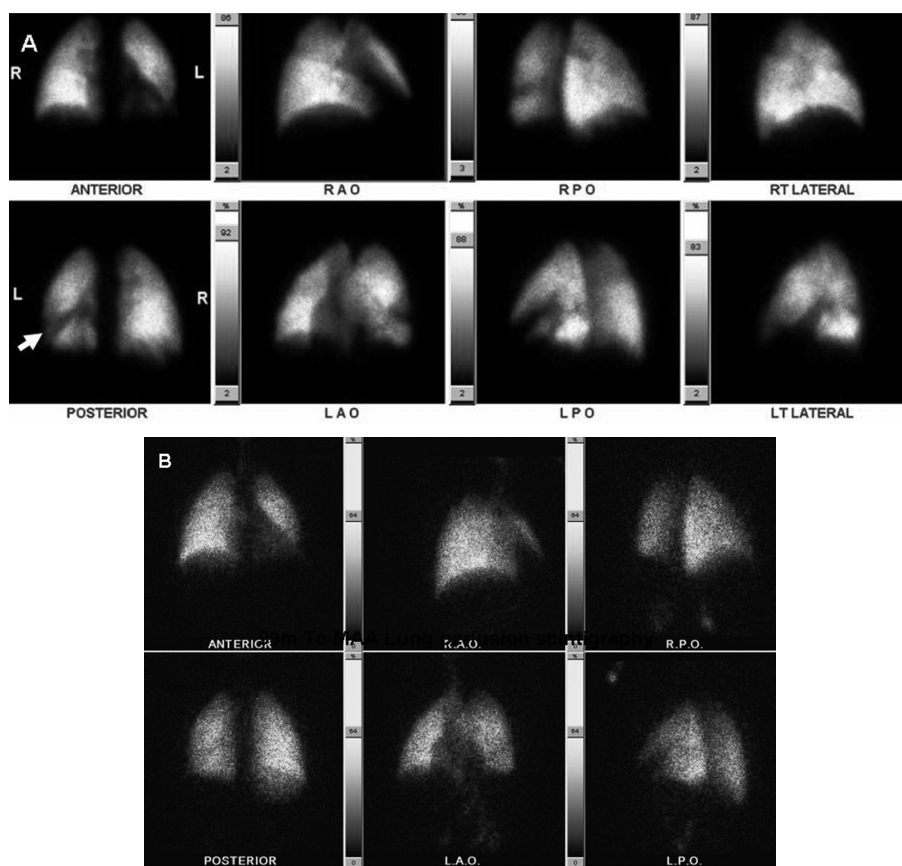


Fig 2. A: ^{99m}Tc -MAA lung perfusion scintigraphy performed on a dual head variable angle gamma camera in anterior, posterior, lateral and oblique projections shows a sub segmental perfusion defect in left lateral basal lung segment. **B:** ^{99m}Tc -DTPA lung ventilation imaging shows normal aerosol distribution in left lateral basal segment as well as in rest of bilateral lungs (mismatching V/Q ventilation /perfusion defect).

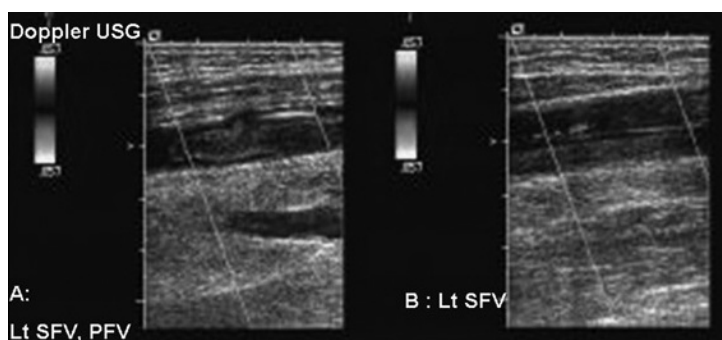


Fig 3. A: Doppler ultrasound test shows the thrombus tip in the SFA, superficial femoral vein, with a small amount of flow around it. The color flow deep into the superficial femoral vein is from the profunda femoris vein, PFV. **B:** shows the thrombus filling the SFA, superficial femoral vein; the noncompressibility further confirms the diagnosis.

DISCUSSION

DVT is a common disease that demands accurate imaging for diagnosis [8-11].

A high index of clinical suspicion is necessary to initiate appropriate imaging. In the absence of predisposing factors, the relative frequency of

isolated pelvic DVT is considered uncommon (< 2%) [12, 13]. Non specific tracers that have been used for this sort of imaging are ^{99m}Tc -MAA, ^{99m}Tc -labeled RBC (red blood cell), and ^{99m}Tc -HSA (human serum albumin). They provide an indirect evidence of DVT as they cannot ascertain the cause of venous obstruction nor differentiate acute from chronic DVT.

The scintigraphic criteria that are usually considered in a positive case of RPh based on flow pattern include one or more of the following (1) nonfilling or nonvisualization of a deep vein, (2) interruption of the flow, (3) irregular or asymmetric filling of a deep vein, and (4) presence of abnormal collateral vessels. Magnetic resonance venography for the detection of DVT has been compared with contrast venography and duplex Doppler ultrasonography [14, 15].

Kosuda et al [16] performed RPh with ^{99m}Tc-MAA in 31 patients suspected of DVT and 58.1% patients had abnormal findings. Sensitivity, specificity and accuracy of RPh for DVT were found to be 100%, 76%, 87%, respectively. In their series, lung scans were abnormal in 33.3% patients with DVT.

Mangkharak et al [17] compared RPh and contrast venography in 72 limbs of 59 patients with suspected DVT of lower extremities. MR venography in the pelvis was shown to be 100% sensitive and 95% specific, whereas ascending venography was 78% sensitive and 100% specific. There are relatively few studies using ^{99m}Tc-MAA or HSA in the evaluation of DVT. It is relatively safe in all age groups and there is no associated risk of contrast allergies.

CONCLUSION

We conclude that radionuclide phlebography can be recommended as a single or combined imaging modality along with lung perfusion scintigraphy in the routine evaluation of high risk DVT's. Advantages include the physiological basis, non invasiveness of the procedure, relative ease of performance, good patient acceptance and low radiation dose compared with conventional phlebography.

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