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CASE REPORT

Utilizing radionuclide venography for evaluating superior vena cava syndrome secondary to retrosternal goiter: A case report

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ABSTRACT

Superior Vena Cava Syndrome (SVC syndrome) due to a retrosternal goiter is exceptionally rare, with only a handful of documented cases in medical literature. The utilization of radionuclide venography is a valuable, noninvasive procedure that plays a crucial role in the comprehensive assessment of these rare occurrences. We present here a case of 55-year-old male patient referred to nuclear medicine department for evaluation of neck swelling. He had neck swelling for a past 06 years accompanied by dyspnea on lying down and had visibly dilated veins in the neck and anterior chest wall. Based on sign and symptoms of the patient, superior vena cava syndrome was provisional diagnosis and radionuclide venography with thyroid scan (and SPECT/CT) were performed. Scintigraphic findings favored SVC syndrome secondary to retrosternal goiter. Patient was referred to surgical department where subtotal thyroidectomy was performed. Histopathology showed benign thyroid nodular disease. The patient is now clinically stable, on thyroxine and his symptoms have resolved. Radionuclide venography stands out as a non-invasive and safe diagnostic tool that not only aids in the initial identification of SVC syndrome but also provides essential insights into collateral circulation dynamics.

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INTRODUCTION

Superior Vena Cava (SVC) syndrome, characterized by a set of symptoms and signs resulting from superior vena cava (SVC) obstruction, can be caused by various factors, whether intrinsic or extrinsic. This obstruction leads to swelling in the head and neck, facial redness, and the expansion of subcutaneous veins due to increased venous pressure. In recent years, common causes of SVC syndrome have included lung cancer, germ cell tumors, thymomas, and more. However, SVC syndrome due to a retrosternal goiter is exceptionally rare, with only a handful of documented cases in medical literature.

In such cases, the SVC obstruction can remain asymptomatic or develop slowly over time due to the gradual growth of the goiter, allowing collateral venous circulation to develop [1].

The utilization of radionuclide venography is a valuable, noninvasive procedure that plays a crucial role in the comprehensive assessment of these rare occurrences [2].

CASE PRESENTATION

We present here a case of 55-year-old male patient referred to nuclear medicine department for evaluation of neck swelling. He had neck swelling for a past few years accompanied by dyspnea on lying down and had visibly dilated veins in the neck and anterior chest wall (Figure 1).

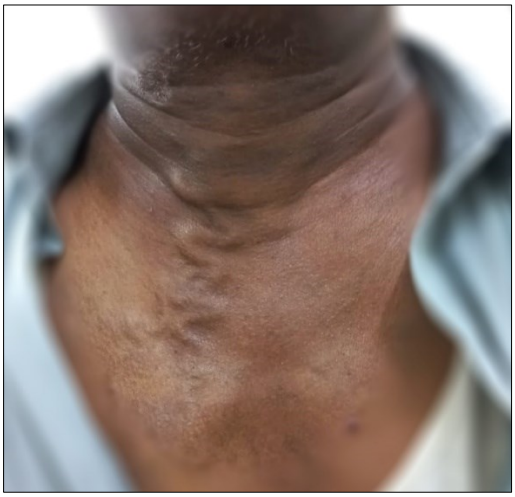

Figure 1. Clinical examination showing dilated veins in neck and anterior chest

Upon examination, the neck swelling was observed to move with deglutition and was hard and nodular in consistency, with the lower limit not palpable on either side. Pemberton's sign was positive. Biochemical thyroid profile was within normal limits. Rest of the surgical and medical history was unremarkable.

Based on sign and symptoms of the patient, Superior vena cava syndrome was provisional diagnosis and radionuclide venography with thyroid scan was planned. Radionuclide venography followed by thyroid scan with Single-photon emission computed tomography/computed tomography (SPECT/CT) was performed in this patient using [^{99m}Tc]Tc-pertechnetate. A bolus of 2.5mCi of [^{99m}Tc]Tc-pertechnetate, in a volume of less than 0.5 ml, was injected simultaneously into each median cubital vein while the patient was lying in the supine position with the arms by the sides and the neck in the neutral position with back and occiput touching the examination table. The gamma camera was positioned anteriorly over the neck and upper chest. Data was acquired in frame mode at 2 frames per second for 2 minutes, using a 64 x 64 matrix. This was followed by a thyroid scan 30 minutes post-injection, and then a SPECT/CT of the neck and chest was performed.

Radionuclide venography revealed normal flow up to subclavian vein on left side and axillary vein on right side. Reduced to absent flow was seen in bilateral brachiocephalic vein and proximal part of superior vena cava. Lateral thoracic, internal thoracic and anterior chest walls collateral formation was seen (Figure 2). Thyroid scan showed non homogenous uptake in thyroid gland with dominant photo-deficient areas seen in lateral part of left lobe and lower half of right lobe (Figure 3). Correlative SPECT/CT showed enlarged thyroid with heterogeneous density extending in anterior mediastinum up to the arch of aorta causing compressive effects on large vessels. Right lobe showed specks of calcification in lower pole (Figures 4 and 5). Thyroid gland was causing compression effects on bilateral brachiocephalic veins causing collateral formation seen on venography. These findings favored SVC syndrome secondary to retrosternal goiter.

Patient was referred to surgical department where subtotal thyroidectomy was performed. Histopathology showed benign thyroid nodular disease. The patient is now clinically stable, on thyroxine and his symptoms have resolved.

DISCUSSION

Superior vena cava (SVC) syndrome encompasses a set of clinical signs and symptoms arising from partial or complete obstruction of blood flow within the SVC. The primary cause of SVC syndrome includes malignancies such as lung cancer and lymphomas, other causes include benign tumors

like thymomas, infections such as tuberculosis and histoplasmosis, fibrosing mediastinitis, thrombosis from central venous catheters or hypercoagulable states, iatrogenic causes from radiation therapy or surgery, aortic aneurysms, and conditions like goiter and sarcoidosis [3]. Interestingly, retrosternal goiters have been identified as a contributor to SVC syndrome in approximately 3.2% of cases [1].

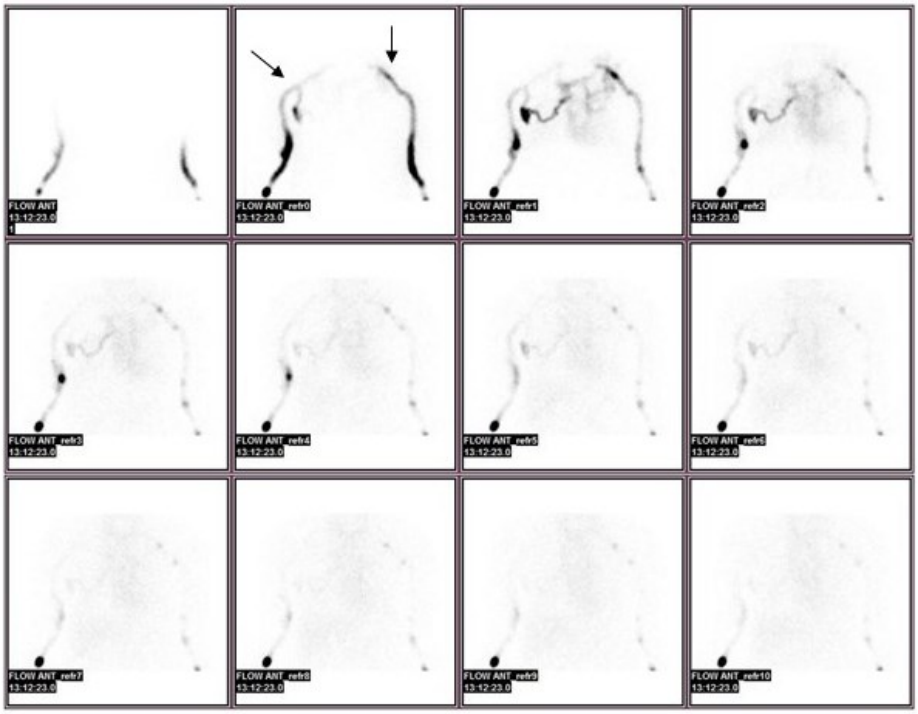

Figure 2. Upper extremity radionuclide venography showing normal perfusion up to subclavian vein on left side and axillary vein on right side (arrows). Reduced to absent blood flow in bilateral brachiocephalic veins and proximal superior vena cava

The classic manifestations of SVC syndrome include facial and neck swelling, distended neck veins, cough, dyspnea, orthopnea, upper extremity edema, dilated chest vein collaterals, and conjunctival suffusion. Less frequently observed symptoms encompass stridor, hoarseness, dysphagia, pleural effusion, head plethora, headache, nausea, lightheadedness, syncope, alterations in vision, changes in mental status, upper body edema, cyanosis, papilledema, stupor, and even coma [3].

The vascular anatomy of the upper body includes the brachiocephalic veins, superior vena cava, and azygos-hemiazygos system, forms an intricate network. When obstruction, tumor invasion, or compression affects the superior vena cava, blood flow is redirected through a network of collateral channels. The azygos and hemiazygos systems play a vital role in diverting blood from the superior vena cava to the inferior vena cava, often becoming dilated and tortuous in the process.

The extent and location of these collateral networks can vary widely but typically involve veins in the chest, abdomen, and even the pelvis. Many patients develop multiple collateral pathways, which are believed to serve as protective mechanisms against the development of severe symptoms [4].

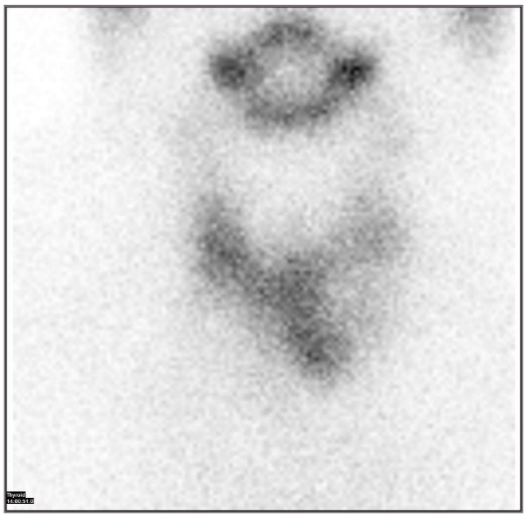

Figure 3. Thyroid scan showing non-homogeneous tracer uptake in both lobes of thyroid gland with dominant photon deficient areas seen in lateral part of left lobe and lower half of right lobe

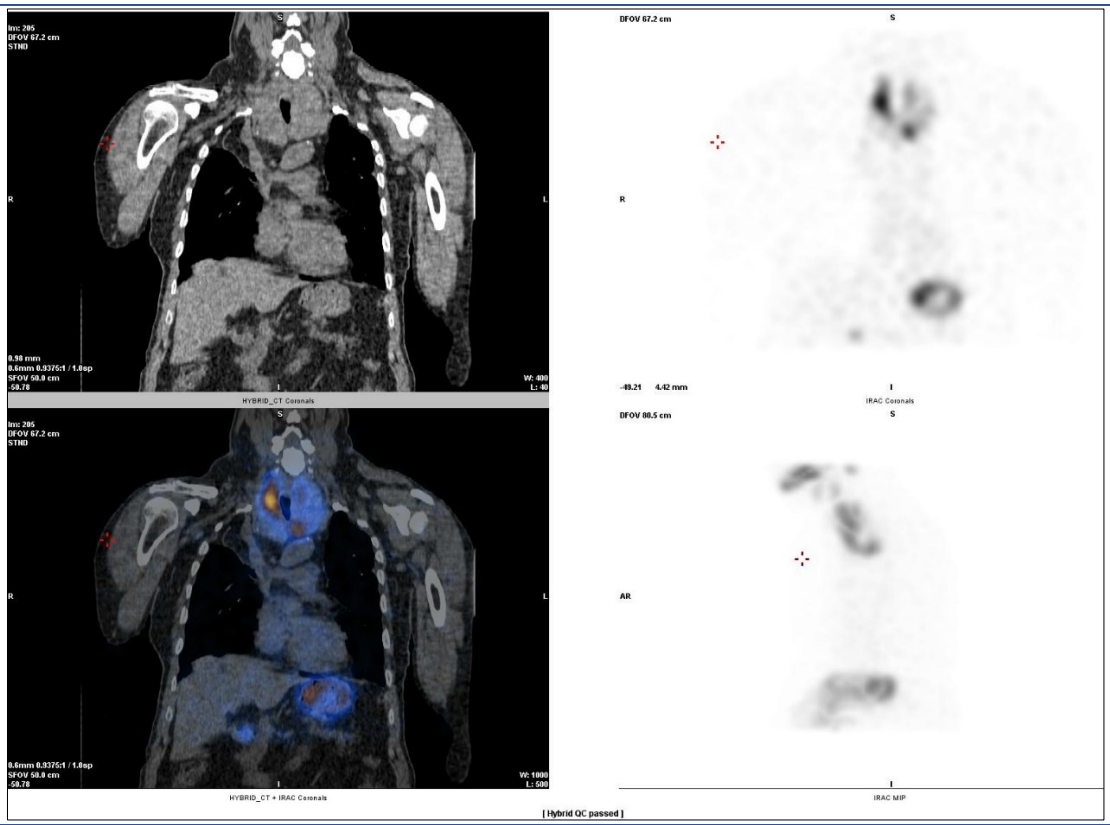

Figure 4. SPECT-CT (Coronal view) showing enlarged thyroid with heterogeneous density extending in anterior mediastinum up to the arch of aorta. Specks of calcification in lower pole of right lobe

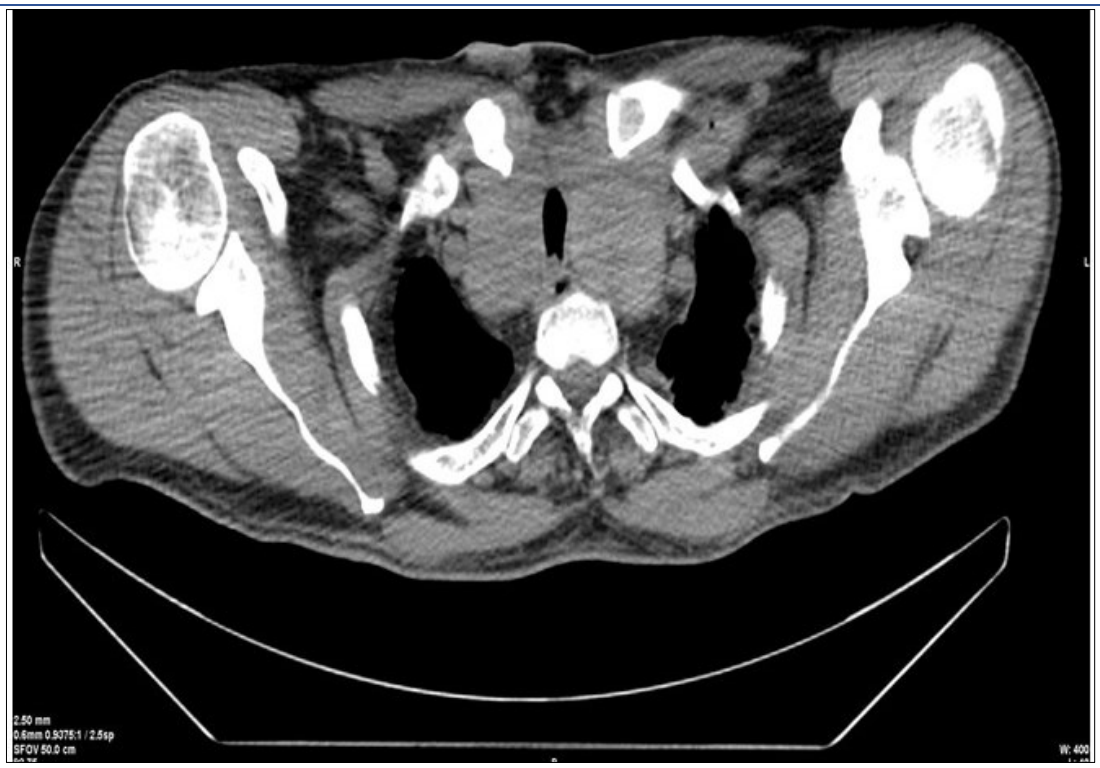

Figure 5. Low dose CT image: Axial view showing enlarged thyroid gland displacing major vessels

For patients with a strong clinical suspicion of SVC syndrome, imaging of the upper body and vasculature is crucial. Ultrasound examinations of the jugular, subclavian and innominate veins are valuable in identifying thrombi within vessel lumens. Radiographic imaging and magnetic resonant imaging (MRI) provide additional insights into the location, severity, and underlying cause of SVC obstruction. Contrast-enhanced CT scans of the chest is most common diagnostic tool for evaluating SVC syndrome [5, 6]. However, in cases where SVC syndrome is secondary to retrosternal goiters, radionuclide venography is a valuable, noninvasive procedure for both initial diagnosis and post-therapeutic evaluation. It can be used alongside thyroid scans to assess collateral formation due to an enlarged retrosternal goiter.

In the above reported case, radionuclide venography along with thyroid scan was performed and the patient was referred for surgery. Radionuclide venography is a simple, alternative and cost-effective imaging technique for assessing superior vena cava (SVC) syndrome. It provides detailed visualization of the venous system to identify obstructions or compressions in the SVC, and evaluates blood flow for functional assessment. This method is safer for patients, especially those with contraindications to invasive procedures or iodinated contrast agents. When combined with other imaging modalities, radionuclide venography offers a comprehensive evaluation, particularly in cases where SVC syndrome is secondary to conditions like retrosternal goiters.

CONCLUSION

The case presented here underscores the value of radionuclide venography in the diagnosis and management of superior vena cava (SVC) syndrome, particularly when associated with rare causes such as retrosternal goiters. Radionuclide venography stands out as a noninvasive and safe diagnostic tool that not only aids in the initial identification of SVC syndrome but also provides essential insights into collateral circulation dynamics.

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REFERENCES

1. Idrees S, Mayilvaganan S. The imminent sign of SVC syndrome secondary to retrosternal goiter. J Endocr Surg. 2021 Dec;21(4):118-22.
2. Mahmud AM, Isawa T, Teshima T, Hirano T, Anazawa Y, Miki M, Nukiwa T. Radionuclide venography and its functional analysis in superior vena cava syndrome. J Nucl Med. 1996 Sep;37(9):1460-4.
3. Torres-Pérez ME, Vargas-Ledo JF, Huerta-Torres KG. Thrombosis of the superior vena cava surrounding central venous catheter in a patient with superior vena cava syndrome. Med Case Rep J. 2018;1(2):110.
4. Sheth S, Ebert MD, Fishman EK. Superior vena cava obstruction evaluation with MDCT. AJR Am J Roentgenol. 2010 Apr;194(4):W336-46.
5. Khosa F, Otero HJ, Prevedello LM, Rybicki FJ, Di Salvo DN. Imaging presentation of venous thrombosis in patients with cancer. AJR Am J Roentgenol. 2010 Apr;194(4):1099-108.
6. Khan UA, Shanholtz CB, McCurdy MT. Oncologic mechanical emergencies. Hematol Oncol Clin North Am. 2017 Dec;31(6):927-40.