Case Report

Lymphoscintigraphy – Beyond Lymphedema

Abstract

Lymphoscintigraphy is an established modality for imaging the lymphatic system using radiocolloids and is routinely indicated to find the cause of limb lymphedema. However, in this case series, we are highlighting other less-known indications of lymphoscintigraphy like chylothorax and chyluria which present as lymphatic leaks in the thorax and abdomen, respectively. Once the site of the lymphatic leak is established by lymphoscintigraphy, definitive management like thoracic duct ligation or sclerotherapy can be done. The other indication discussed is postrenal transplant perinephric fluid collection which can be challenging to confirm whether it is urinoma, lymphocele, or any other collection. And finally, sentinel lymph node localization is another, now, well-established indication of lymphoscintigraphy.

Keywords: *Chyloptysis, chylothorax, chyluria, lymphocele, lymphoscintigraphy, sentinel node localization radiocolloid*

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Introduction

Lymphoscintigraphy is a well-established nuclear medicine technique to evaluate the lymphatic system. The main function of the lymphatic system is to transport the large molecules to the vascular compartment. The lymphatic system can be imaged by various techniques which include lymphography, lymphangiography, magnetic resonance lymphography (MRL), contrast-enhanced ultrasonography (CEUS), near-infrared fluorescence imaging (NIRF), and lymphoscintigraphy.[1] Of these, lymphography, lymphangiography, and MRL are invasive and very challenging to perform as they require cannulation of lymphatic vessels, while CEUS and NIRF are still in the nascent stage. However, lymphoscintigraphy is an easy, well-established, noninvasive method for imaging the lymphatic system which has been used for many decades now. It requires injection of a colloid like sulfur colloid (SC), nanocolloid, human serum albumin, or dextran which is tagged to Technetium-99m (Tc-99m), hence called radiocolloid, which is injected in the web spaces of the hands or feet and it travels through the lymphatics following the physiological pathway.[2-4] The usual indication for lymphoscintigraphy is suspected lymphedema of the limbs which includes primary lymphatic dysplasia, congenital lymphedema, and primary and secondary lymphedema and to differentiate them from other causes of limb or truncal edema like cardiac cause and deep-vein thrombosis.[3] The other important indications for which patients can undergo lymphoscintigraphy are chylous leakage, mainly chyluria, chylothorax, and chylous ascites.[4] In this case series, we are presenting interesting cases of indications beyond lymphedema where lymphoscintigraphy imaging played an important role in diagnosis and management decisions.

Case Reports

Case 1

A 64-year-old male, a known case of chronic kidney disease for 5 years, underwent a deceased donor renal transplant 4 months back after antithymocyte globulin induction. The graft showed delayed graft function, and the patient had a gradual reduction in serum creatinine levels. The ultrasonography (USG) of the transplant kidney on postoperative day (POD)-3 showed a normal functioning transplant kidney with no abnormality. He was discharged on POD-12 in healthy condition. The patient was on regular follow-up in the nephrology outpatient department (OPD)

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where he was evaluated with serum creatinine levels and other blood parameters. The Color Doppler USG study of the transplant kidney on POD-55 showed peri-transplant fluid collection around the lower pole of the transplant kidney in the right iliac fossa, opined as urinoma or lymphocele. He underwent USG-guided aspiration of right iliac fossa collection around the transplant kidney. The fluid was straw-colored with a glucose level of 171 mg/dl, protein level of 2.1 g/dl, albumin of 1.2 g/dl, adenosine deaminase (ADA) of 5.8 U/L, lactate dehydrogenase (LDH) of 106 U/L, creatinine of 1.3 mg/dl, and triglyceride level of 20 mg/dl. The tuberculosis (TB) fluorescence staining was negative for acid-fast bacilli. The Tc-99m DTPA renogram [Figure 1.0] on POD-60 showed preserved perfusion of renal allograft with reduced function and loculated fluid collection in the peritoneum. Since it did not show any DTPA accumulation, it was thought to be likely lymphocele and less likely to be urinoma. The noncontrast computed tomography kidney, ureter, and bladder (KUB) was repeated after 2 weeks, which showed perinephric fat stranding around the transplant kidney and well-defined hypodense collection posteromedial to it – likely lymphocele/urinoma. The patient was advised lymphoscintigraphy to confirm lymphocele. The lymphoscintigraphy was performed after the injection of 1 millicurie (mCi) of Tc-99m SC in the web space of both feet, and immediate whole-body sweep images [Figure 1.1a] were acquired. Subsequently, static images of the abdomen and pelvis were acquired till 4 h [Figure 1.1b] which showed abnormal focal Tc-99m SC concentration in the right iliac fossa adjacent to the transplant kidney which was persistent till 4 h delated image [Figure 1.1]. The single-photon emission computed tomography (SPECT)–computed tomography (CT) of the same region localized abnormal Tc-99m SC uptake in a large 10.4 cm × 5.8 cm × 5.4 cm hypodense fluid collection on the medial aspect of the transplant kidney with multiple surgical staples along the lateral border of collection [Figure 1.1c]. The findings were in favor of lymphocele along the medial border of the transplant kidney, possibly due to disruption of lymphatic channels by surgical staples near the renal hilum.

Case 2

A 44-year-old female presented with a complaint of multiple episodes of urinary tract infection past 1 year with the passage of milky-colored urine and weight loss (~5 kg) over 4 months. Her serum lipid profile showed raised total cholesterol = 228 mg/dl (normal range 130–200), raised very-low-density lipoprotein = 51 mg/dl (normal range ≤30), raised triglycerides = 256 mg/dl (normal range ≤150), and raised ratio of total cholesterol/high-density lipoprotein = 4 (normal range ≤3.5). The total serum proteins were mildly reduced = 5.8 g/dl (normal range 6.0–8.0), and so was serum albumin = 3.4 g/dl (normal range 3.5–5.2). All other blood investigations were within normal limits. Macroscopically, urine appeared milky white in color with high triglycerides level of 280 mg/dl (normal range 1–10 mg/dl). Her 24-h urinary protein was significantly elevated measuring 7700 mg/day (normal range ≤100), and her urine protein/creatinine ratio was also significantly elevated measuring 6.69 (normal range ≤0.2) with urine proteins of 149.51 mg/dl and urine creatinine of 22.35 mg/dl. The peripheral blood smear for microfilaria was negative. The ultrasound scan and contrast-enhanced computer tomography (CECT) of the abdomen failed to detect any abnormality. The patient was kept on conservative treatment for 1 month with no improvement.

The patient was sent to the nuclear medicine department for lymphoscintigraphy to localize the site of the chyle leak. The lymphoscintigraphy [Figure 2] was performed after the injection of 1 mCi of Tc-99m SC in the web space of both feet, and immediate whole-body sweep images were acquired [Figure 2a]. Subsequently, static images of

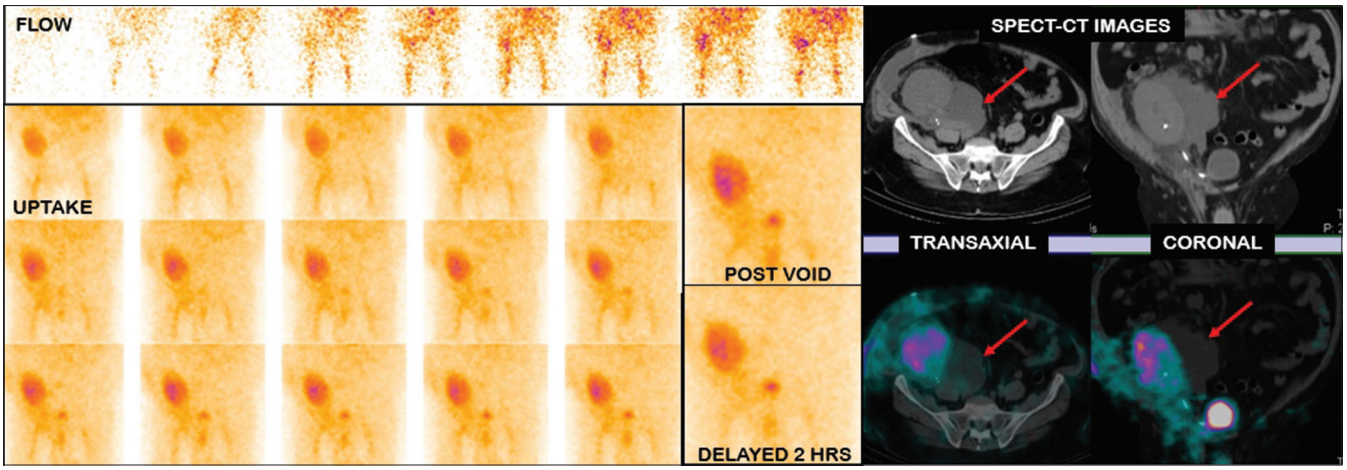

Figure 1.0: The Technetium-99m DTPA scan for transplant kidney evaluation on postoperative day 60 showed prompt, though, reduced perfusion in flow images showing mild reduced tracer uptake with cortical tracer retention and slow drainage as seen in 2hours delayed image. No abnormal DTPA collection was noted in the vicinity of the transplant kidney. Single-photon emission computed tomography–computed tomography transaxial and coronal images showed fluid collection medial to the transplant kidney (red arrows) near the surgical staples with no DTPA accumulation ruling out urinoma

the abdomen and pelvis were acquired till 3 h [Figure 2b]. The scan showed tracer accumulation in the bladder by 30 min. The SPECT-CT of the abdomen and pelvis showed thickened lymphatic channels in the retroperitoneum in close proximity to the right ureter with mild fat stranding at the upper border of the L4 vertebral level [Figure 2c].

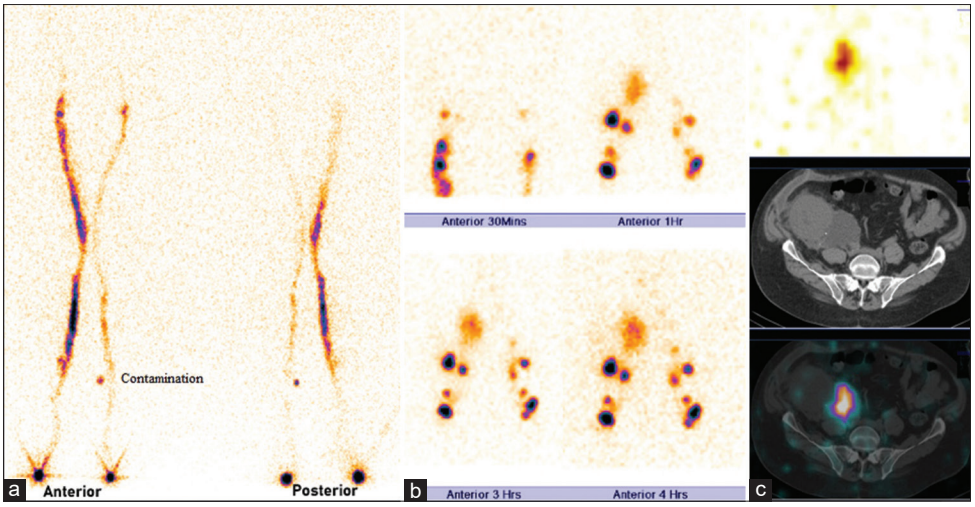

Figure 1.1: The Technetium-99m (Tc-99m) sulfur colloid (SC) was injected in the first web space of both lower limbs of the patient, and a whole-body sweep image followed by static images was acquired. (a) Radiocolloid traversing through the lymphatic channels in both lower limbs into the inguinal nodes. Focal contamination of radiocolloid noted in the calf region of the left leg, (b) Multiple static images till 4 h. Apart from the bilateral inguinal and iliac group of nodes, there is focal Tc-99m SC concentration on the right side of the pelvis which is not seen in the 30-min image but is visualized at 1 h and shows increasing concentration till 4 h. For localization of Tc-99m SC, single-photon emission computed tomography–computed tomography was performed, (c) Transaxial image shows radiocolloid uptake in the perinephric fluid collection along the medial aspect of transplant kidney in the pelvis with multiple surgical staples *in situ*. Based on the history and lymphoscintigraphy finding, it was opined to be lymphocele

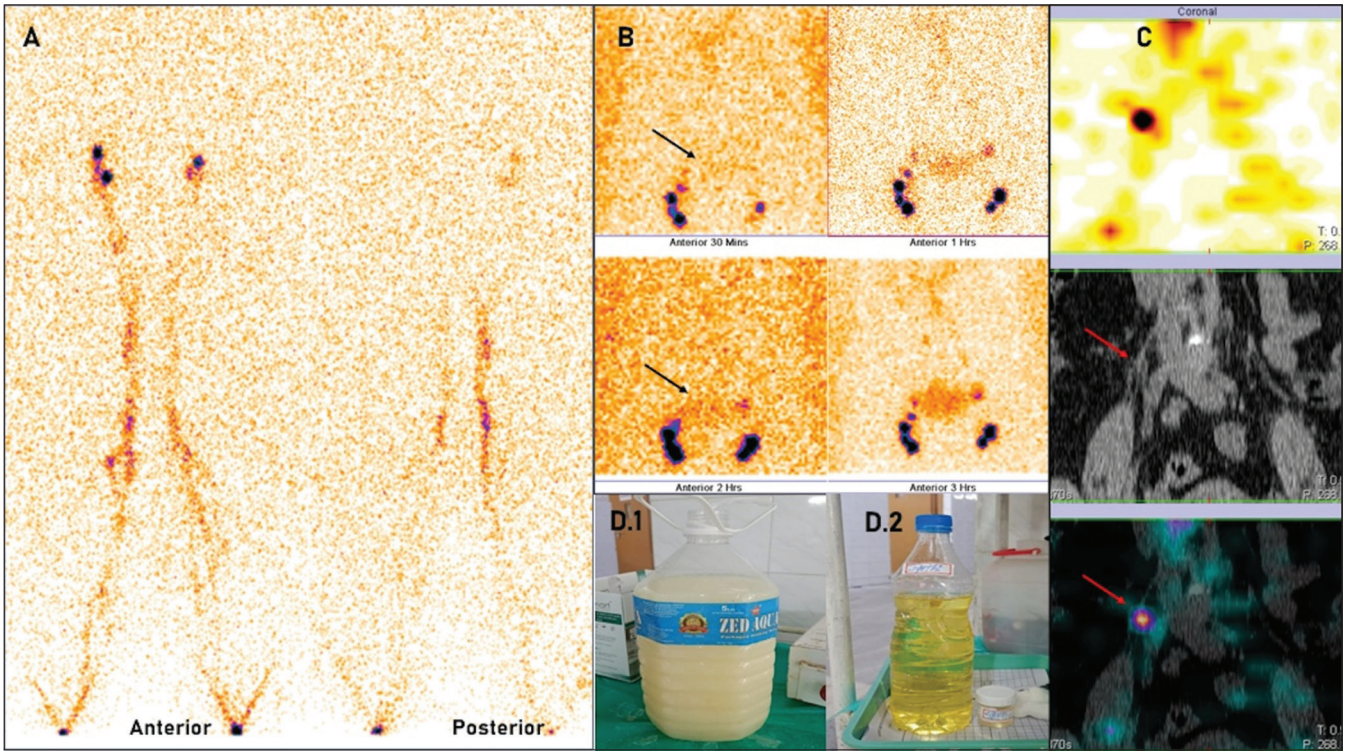

Figure 2: The patient was injected with 1 mCi of Technetium-99m (Tc-99m) sulfur colloid (SC) in the first web space of both lower limbs, and a whole-body sweep image followed by static images was acquired. (a) Normal transit of radiocolloid through lower limb lymphatics with visualization of inguinal lymph nodes. The static images (b) showed inguinal and iliac nodes with the tracer in the urinary bladder region (black arrows). There was faint tracer uptake in the right lumbar region at 1 h and single-photon emission computed tomography-computed tomography (SPECT-CT) was performed immediately. The coronal image (c) of SPECT-CT showed focal Tc-99m SC collection in the path of the ureter with lymphatic channel overlap (red arrows), mild fat standing, and no lymph node in the vicinity on computed tomography image of SPECT-CT suggestive of possible ureterolymphatic connection near the L4 vertebral level. Image (D.1) shows milky-white urine and (D.2) image shows normal-colored urine after the sclerotherapy

Thereafter, the patient underwent cystoscopy with ureteric catheterization and sclerotherapy using 0.2% povidone–iodine for 3 days. The patient expressed relief of symptoms, and urine turned normal by the 2nd day of intervention. Her urine protein/creatinine ratio also returned to normal measuring 0.19 (normal range ≤0.2) with urine proteins of 6.13 mg/dl and urine creatinine of 30.71 mg/dl. She was asked to maintain a modified diet with high protein, vitamin supplementation, a leafy vegetable-based diet, and restricting fat to <25 g/day. After a follow-up of 6 months, the patient is doing well and showed no relapse of symptoms.

Case 3

A 48-year-old female, with comorbidities of type II diabetes mellitus and hypertension, presented with recurrent urinary tract infection for 1 year which was treated with appropriate antibiotics. Subsequently, she presented with a passage of frothy milky white urine for 2 months, which was associated with abdominal pain and swelling in her lower limbs. The physical examination of the patient was unremarkable. The laboratory findings were hemoglobin – 12.3 g/dl (normal: 12–15), packed cell volume – 38.3 vol% (normal: 36–46 vol%), red blood cells – 5.05 × 10^6/μL (normal: 4.5–5.5 × 10^6), mean corpuscular volume – 75.8 Fl (normal 83–101), mean corpuscular hemoglobin – 24.3 pg (normal: 27–32), red cell distribution width (RDW) (standard deviation) – 37.6 Fl (normal: 39–46), RDW (coefficient of variation) – 14.1% (normal: −11.6%–14%), total leukocyte count was 6.8 × 10^3/μL (normal: 4–10 × 10^3/μL), and platelet count – 360 × 10^3/μL (normal: 150–400 × 10^3/μL). The urine chemistry and microscopic examination were normal. The urine protein/creatinine ratio (Spot test) was raised measuring 10.54 (<0.2) with urine protein – 666.22 mg/dl and urine creatinine 63.20 mg/dl. The patient's HbA1c was 7.1 (normal: 4%–5.6%), serum albumin was 4.9 (normal: 3.5–5.2), and serum creatinine was 0.48 mg/dl (0.6–1.1). She underwent USG abdomen which showed normal-sized kidneys with no obvious abnormality. The patient's urine was positive for chylomicrons and triglycerides. The voiding urosonography, uroflowmetry, and cystometry were largely normal and showed no abnormalities. With this history, the patient was sent for lymphoscintigraphy to localize the site of the lymph leak. The lymphoscintigraphy [Figure 3] was performed after injecting 1 mCi of Tc-99m SC in the web space of both feet, and immediate whole-body sweep images [Figure 3a] were acquired. Subsequently, the static images of the abdomen and pelvis were acquired till 4 h [Figure 3b]. The whole-body sweep images and serial static images showed normal visualization of lower limb lymphatic channels and the inguinal and iliac groups of nodes. The urinary bladder showed Tc-99m SC accumulation in 30 min confirming chyluria. However, the site of the lymphatic leak could not be identified, but the scan confirmed chyluria. The patient was kept on strict dietary restrictions with fat <25 g/day, a high-protein diet, vitamin and mineral supplementation, and a healthy leafy-vegetable diet. The patient's symptoms showed significant remission and is on regular follow-up. The lymphoscintigraphy could not localize the site of the leak; hence, cystoscopy was deferred for the later period, if patient symptoms recurred.

Case 4

A 24-year-old female, a known case of polycystic kidneys and chronic right-sided deep-vein thrombosis for the past 10 years, presented with severe abdominal pain, reduced appetite, and easy fatiguability 3 years back. Her USG KUB showed bilaterally enlarged kidneys with multiple cysts. The CECT scan of the abdomen showed enlarged both kidneys with thinned-out cortices, large hypodense collection in the bilateral perinephric spaces showing thin internal septations extending into the bilateral renal pelvicalyceal systems causing stretching of calyces with caliectasis suggestive of bilateral renal lymphangiectasia along with gross ascites. The bone marrow aspiration showed normal marrow with depleted iron stores. The ascitic fluid was tapped, and its analysis showed a total leukocyte count of 960 cells/mm^3, of which polymorphs were 60% and lymphocytes were 40%. The ascitic fluid glucose was 109 mg/dl, protein was 1.6 g/dl, albumin was 1.1 g/dl (low serum-ascites albumin gradient), total cholesterol 13 mg/dl, triglycerides were 24 mg/dl, and ADA was 3.2 U/L. The TB fluorescence staining was negative for acid-fast bacilli, and the calcofluor white mount showed no fungal elements. The aerobic culture of ascitic fluid showed no growth after incubation for 48 h. The Tc-99m DTPA renogram showed mildly reduced bilateral kidney function and nonobstructed drainage. The patient was readmitted 1 month back with similar complaints. The ascitic fluid was aspirated. It was straw colored and its analysis showed a total leukocyte count of 70 cells/mm^3, of which polymorphs were 10% and lymphocytes were 90%. The ascites fluid cholesterol and triglycerides are not elevated. In view of splenomegaly and ascites, splenoportal artery Doppler was performed which was normal. The upper gastrointestinal endoscopy was normal. The patient underwent genetic analysis which showed NPHP4 – heterozygous, exon – 26, c3611C>T, and nephronophthisis 4, suggestive of autosomal recessive Senior-Loken syndrome. USG abdomen showed gross ascites, organized perinephric collection with septations around the bilateral kidney suggestive of old perinephric hematoma, bilateral polycystic enlarged kidneys with Grade III renal parenchymal changes, and umbilical hernia. Her urine was frothy white in color, but the spot test for chyle was negative.

The patient was sent to the nuclear medicine department for renal lymphoscintigraphy with suspicion of chyluria. The patient underwent lymphoscintigraphy [Figure 4] after injecting 1 mCi of Tc-99m SC in the web space of both feet, and immediate whole-body sweep images [Figure 4a] were

acquired. Subsequently, the static images of the abdomen and pelvis were acquired till 3 h [Figure 4b]. The whole-body sweep images and serial static images showed a visualization of lower limb lymphatic channels and inguinal and iliac groups of nodes.

Static images of the pelvis and abdomen show early visualization of the urinary bladder by 30 min with faint tracer uptake in the left renal region and normal visualization of the bilateral inguinal and pelvic nodes. SPECT-CT showed abnormal tracer accumulation in the left renal pelvis – likely to be the cause of chyluria with hypodense collection in the bilateral perinephric spaces filling the entire abdominal cavity and pushing the bowel loops in the lower abdomen and pelvis. The patient underwent cystoscopy with sclerotherapy using 0.2% povidone–iodine for 3 consecutive days. The patient expressed relief of symptoms and urine turned normal. The patient is on regular follow-up in nephrology OPD.

Case 5

A 42-year-old male is a known case of chronic calcific pancreatitis for 5 years and underwent pancreatic duct

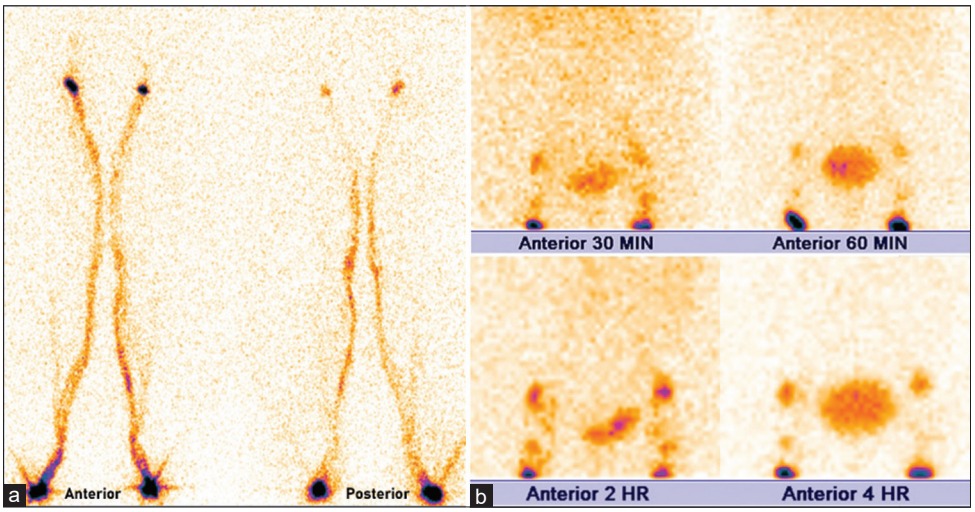

Figure 3: The patient was injected with 1 mCi of Technetium-99m sulfur colloid in the first web space of both lower limbs, and a whole-body sweep image followed by static images was acquired. (a) Radiocolloid traversing through the lymphatic channels in both lower limbs into the inguinal nodes. The static images (b) till 4 h showed inguinal and iliac nodes with radiocolloid accumulation in the urinary bladder by 30 min. No other abnormal radiocolloid concentration was noted in the visualized abdomen and pelvis. The scan confirmed chyluria, but the site of the leak was not identified

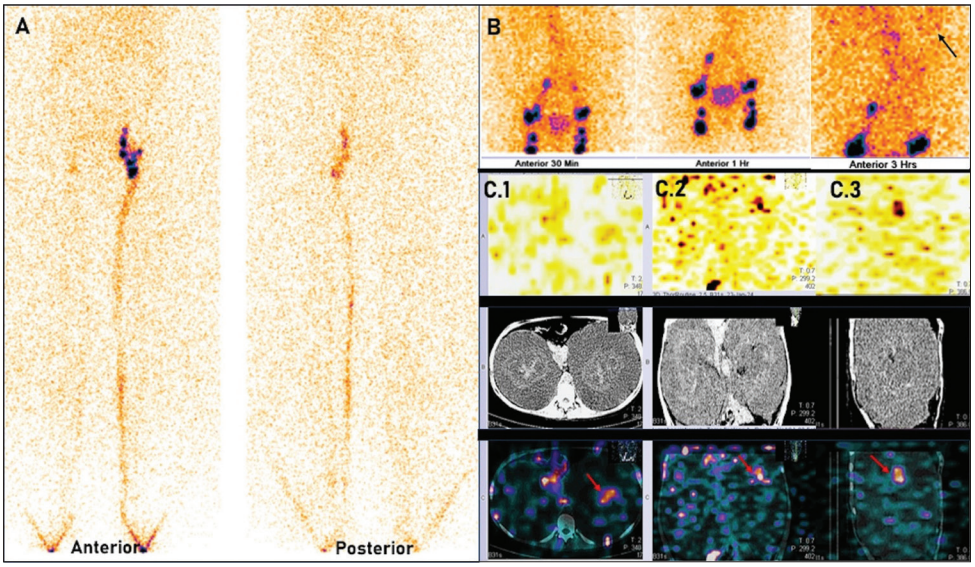

Figure 4: The Technetium-99m sulfur colloid was injected in the first web space of both lower limbs of the patient, and a whole-body sweep image followed by static images was acquired. (a) Normal transit of radiocolloid in the left lower limb into the inguinal nodes and faintly visualized lymphatics and inguinal nodes in the right lower limb – could be secondary to chronic deep venous thrombosis. The static images (b) till 3 h show normal visualization of inguinal and iliac nodes with visualization of the urinary bladder by 30 min and faint radiocolloid uptake in the left renal fossa in the 3-h image (black arrow). Single-photon emission computed tomography–computed tomography of the abdomen (axial – c.1, coronal – C.2, and sagittal – C.3) showed faint radiocolloid accumulation in the left renal pelvis. In addition, there was bilateral hypodense perinephric collection consistent with a history of renal lymphangiectasia with cystic changes in the kidney

stenting 3 years back. He presented to the emergency medical department (EMD) with a cough, shortness of breath, and fever. The patient had noted progressive shortness of breath for the past 1 month with occasional expectoration of milky-white sputum for 4 days, possibly chyloptysis. In the EMD, he denied any other associated symptoms such as weight loss, fatigue, lymphadenopathy, nausea, or vomiting. He was found to be hypotensive. The cardiovascular and abdominal examinations were unremarkable. The respiratory system examination showed absent breath sounds on the right side. The patient underwent a CT chest, which showed gross pleural effusion and hydropneumothorax. The pleural fluid was tapped and it appeared milky-white in color. Pleural fluid analysis showed a glucose level of 10 mg/dl, protein level of 1.6 g/dl, albumin of 0.3 g/dl, ADA of 374.6 U/L (normal <30), LDH of 75 U/L, amylase of 5.0 U/L, and triglyceride level of 117 mg/dl. The TB fluorescence staining was negative for acid-fast bacilli, and the calcofluor white mount showed no fungal elements. The procalcitonin was negative measuring 0.158 ng/ml (up to 0.5).

The patient was sent to the nuclear medicine department to look for the site of the lymphatic leak. The patient underwent lymphoscintigraphy [Figure 5] after injecting 1 mCi of Tc-99m SC in the web space of both feet, and immediate whole-body sweep images [Figure 5a] were acquired. Subsequently, the static images of the abdomen and pelvis were acquired till 3 h [Figure 5b]. The whole-body sweep images and serial static images showed normal visualization of lower limb lymphatic channels and inguinal and iliac groups of nodes. Serial static images till 3 h showed faint abnormal tracer uptake in the midline on the right side superior to hepatic tracer activity, likely chylothorax. SPECT-CT showed a collapsed right lung with hydropneumothorax and intercostal drainage tube *in situ*. There was subtle hypodensity in the prevertebral lesion of the T6 vertebrae with focal increased Tc-99m SC concentration [Figure 5c]– likely a site of leak from the thoracic duct. There was another focal uptake noted superior to the right lateral border of the D6 vertebra in the basal segment of the right lower lobe [Figure 5d]– a possible site of pleura bronchial communication leading to chyloptysis. The patient was planned for exploration with the surgical intent of thoracic duct ligation in view of clinical deterioration. Meanwhile, the pleural fluid fungal cultures came positive for *Candida glabrata*, and the patient was started on antifungal therapy before undergoing the surgical procedure. Despite being on antifungals and best efforts, the patient succumbed to illness during the hospital stay.

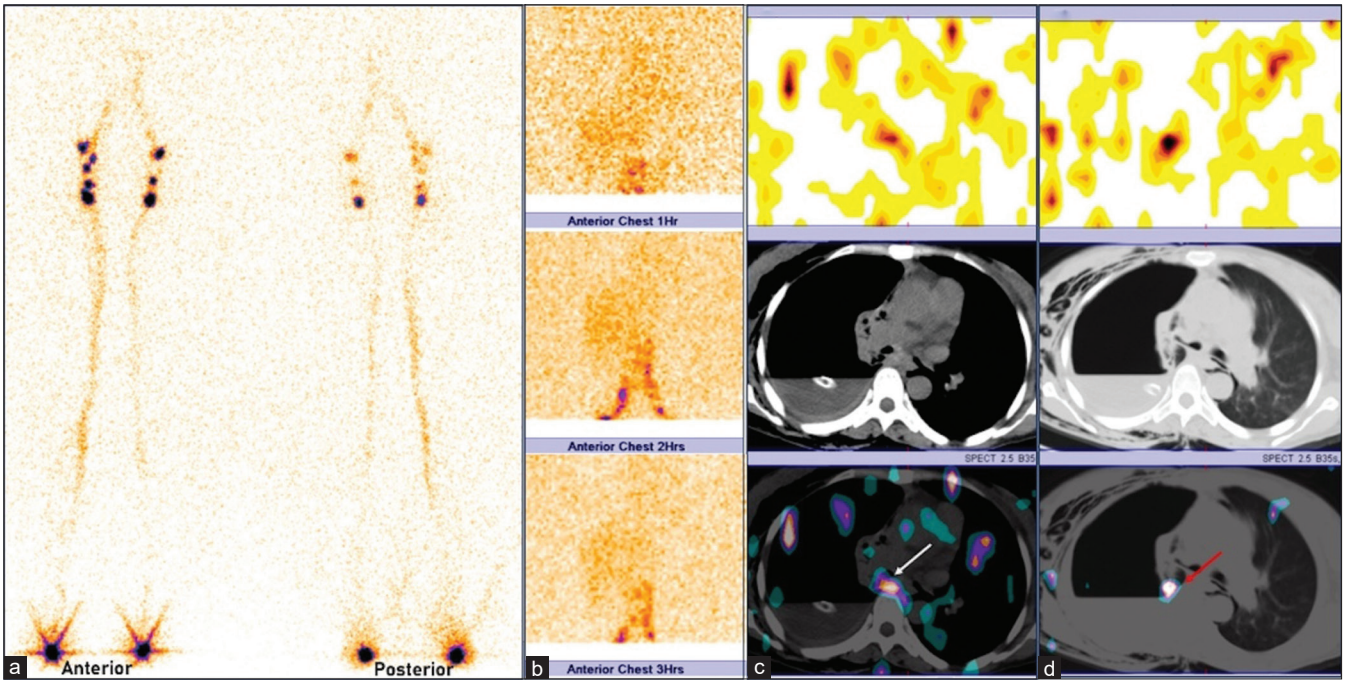

Figure 5: The patient was injected with 1 mCi of Technetium-99m (Tc-99m) sulfur colloid (SC) in the first web space of both lower limbs, and a whole-body sweep image followed by static images was acquired. (a) Normal transit of radiocolloid through lower limb lymphatics with visualization of inguinal and iliac groups of lymph nodes. The static images (b) of the chest till 3 h showed retroperitoneal nodes and hepatic uptake with faint tracer uptake in the suprahepatic region, more in the midline. The single-photon emission computed tomography–computed tomography (SPECT-CT) mages at 1 h in axial view (c) showed right hydropneumothorax with intercostal drainage *in situ*. There is faint hypodensity in the prevertebral region of the D6 vertebrae at the site where the thoracic duct should be present with Tc-99m SC concentration (white arrow) not conforming to any lymph node – possibly the site of lymphatic leak from the thoracic duct. (d) Axial SPECT-CT image of the chest in the lung window with focal radiocolloid concentration near the right lower lobe bronchus (red arrow) which was suggested as the possible site of pleuro-bronchial connection leading to chyloptysis

Case 6

A 45-year-old female presented with a lump in her right breast which was approximately 2 cm in size, mobile, nontender, and firm in consistency. There were no palpable axillary lymph nodes. The mammography showed a BI-RADS IV lesion in the lower inner quadrant of the right breast. The patient underwent a Tru-Cut biopsy of the lesion and was diagnosed with invasive ductal carcinoma, no special type (IDC-NST). The clinical staging was – cT1N0 with ER positive, PR negative, and HER2neu negative. The metastatic workup was negative. The patient was referred to the nuclear medicine department for localization of the sentinel node before the surgery [Figure 6]. The patient was injected 1 mCi of Tc-99m SC in the periareolar region, and static images were obtained [Figure 6A.1]. As the radiotracer activity at the injection site interferes with the proper localization of the sentinel node in the axilla, the injection site was masked with a piece of lead metal, and the axillary node was localized [Figure 6A.2] which was marked on the skin [Figure 6C.1 – red arrow]. SPECT-CT of the chest region was performed and the skin depth of the sentinel node was noted and informed to the operating surgeon [Figure 6B]. During the operation, the surgeon injected blue dye into the periareolar region and based on the skin marking, made a small skin incision. The depth of the node as seen on SPECT-CT guides the surgeon on how deep to go. The surgeon, with the help of blue dye, localized the sentinel node, which was removed and sent for frozen section [Figure 6C: 1-3]. Meanwhile, the surgeon continued with the prior surgical plan as discussed by the patient. The frozen section was negative for any metastatic disease; hence, axillary clearance was deferred. The patient underwent postoperative chemotherapy and radiation therapy to the postoperative site. She has been on regular follow-ups with medical oncologists for the past 1 year with no complications.

Discussion

Whenever lymphoscintigraphy is mentioned, one tends to remember lymphedema of the limbs. However, lymphoscintigraphy has a much wider role beyond diagnosing causes of lymphedema as shown by the above cases. The first case had undergone a renal transplant, and perinephric collection is a known complication. Although the appearance of the perinephric collection after the transplant surgery gives a clue to what it can be,[5] many times, it is challenging to distinguish it from other fluid collections like urinoma and seroma, and our case nicely demonstrates the noninvasive way of confirming lymphocele.

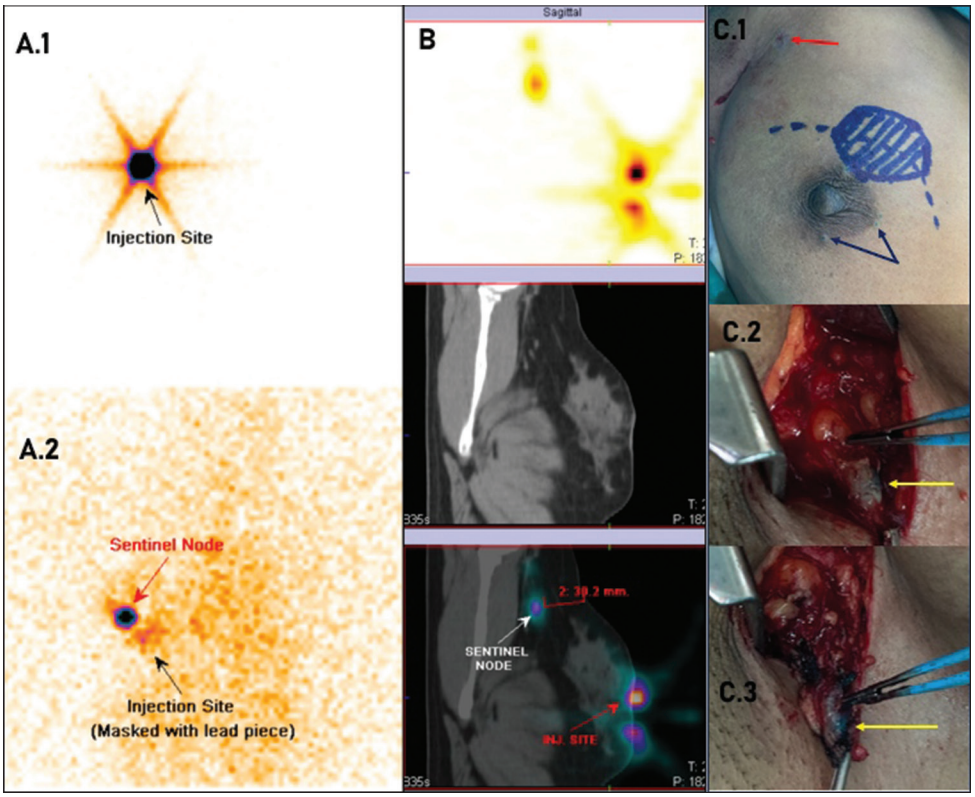

Figure 6: In sentinel node localization, the patient was injected with 0.8 mCi of Technetium-99m sulfur colloid in the periareolar region of the right breast (A.1) and a static image was acquired. The image (A.2) shows the masking of the injection site with a lead piece with visualization of the sentinel node. The sagittal image of single-photon emission computed tomography–computed tomography (SPECT-CT) (B) Radiocolloid localization in the right axillary node which is present at the depth of 30.2 mm from the skin. (C.1) Skin marking of sentinel node localized on SPECT-CT (red arrow) and schema of the surgery. During surgery, blue dye was injected into the periareolar region (blue arrows). The blue sentinel node was localized based on SPECT-CT findings and blue dye localization (yellow arrow in C.2) and it was removed (C.3)

Chyluria can be a manifestation of filariasis, repeated retroperitoneal infection like Koch's, trauma, genitourinary/gastrointestinal tumors, malignancy of the thoracic duct, rarely of ureteric stone, hydrocele, or inguinal hernia.[6] Abnormal lymphatico-urinary communication at the level of the kidney, ureter, or bladder is nicely depicted on lymphoscintigraphy, and SPECT-CT is very useful.[7] The next three cases demonstrate the usefulness of lymphoscintigraphy in chyluria. Although it cannot demonstrate the cause of chyluria, it can diagnose chyluria and possibly the site of the leak. If the site of the leak is identified, cystoscopy with sclerotherapy is indicated as in case number 2 and 4, and the agents used for sclerotherapy are 0.5% silver nitrate solution, 0.2%–5% povidone–iodine, 50% dextrose, 3% hypertonic saline, and 10%–25% potassium iodide.[8] If the site of the leak is not identified as in case number 3, but lymphoscintigraphy confirmed chyluria, the patient can be given a trial of medical management with diet restriction, which works well in up to 60% of patients. If they recur, then invasive options can be explored, and even lymphoscintigraphy can be repeated to localize the site of the leak.

One of the less common indications for lymphoscintigraphy is chylothorax and chyloptysis as our case number 5. For reporting lymphoscintigraphy for chylothorax, it is very important to know the anatomy and course of the thoracic duct to localize the site of the leak. The common causes for chylothorax are thoracic surgical procedures and malignancy related.[9] However, in India, where TB is endemic, tuberculous lymphadenitis is an important cause, as appears to be in our case. The lymphoscintigraphy cannot determine the cause of chylothorax, but it can pick up the site of the leak and the patient can undergo definite treatment. In both chylothorax and chyluria, any focal radiocolloid accumulation in the absence of any lymph node at that site needs a closer look, and SPECT-CT of that region should be performed to localize the site of the leak.

Another very common indication of lymphoscintigraphy is sentinel node localization. The sentinel node is described as the first draining node and its involvement determines the surgical approach. Sentinel node localization is done in many cancers, most commonly in breast cancer, melanomas, and penile cancers, and is now increasingly being used in head-and-neck cancers, and gynecological malignancies like vulvar cancers.[10] In our case number 6, sentinel node localization was performed for breast malignancy, and since the frozen section was negative for malignancy, the axillary lymph nodal dissection was deferred, thereby preventing the morbidity associated with it like lymphedema of the ipsilateral upper limb.

The drawbacks of lymphoscintigraphy are inferior spatial resolution leading to poor gamma camera resolution and physiological uptake of the radiocolloid in the liver, spleen, and kidneys. Their shortcomings can be solved by the use of SPECT-CT in these cases. The other common problem is the presence of free Tc-99m pertechnetate due to poor labeling of Tc-99m to SC, and this results in normal retention of free Tc-99m pertechnetate in the kidneys and bladder, which can be difficult to distinguish from lymph reflux.[11] For this reason, if the stomach is visualized during the study, which concentrates the free Tc-99m pertechnetate, it is advisable to repeat the scan on another day with a properly labeled radiocolloid.

Conclusion

Our series of six cases shows the importance of lymphoscintigraphy in indications other than lymphedema like chylothorax, chyluria, difficult cases of postrenal transplant perinephric fluid collection, and sentinel node localization in various malignancies. Any focal radiocolloid accumulation, not conforming to lymph node, should be given importance and needs a closer look. SPECT-CT is very helpful in the exact localization of the lymphatic leak.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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