Lymphocele: The Spectrum of Scintigraphic Findings in Lymphoceles Associated with Renal Transplant

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Lymphocele is a well recognized complication of renal transplant surgery. We performed a retrospective review of 305 renal transplant patients with over 2,500 scintigraphic exams to describe the pattern of activity on technetium-99m-DTPA blood flow and dynamic imaging, and iodine-131-OIH studies. Diagnostic criteria for a lymphocele were ultrasonic evidence of a perirenal fluid collection and analysis of that fluid that demonstrated BUN, creatinine, and electrolytes similar to the patient's plasma. Scintigraphic findings were attributed to a lymphocele if abnormalities were in the same area as the ultrasound fluid collection. Scintigraphic findings attributable to lymphocele resolved in all patients following surgical drainage or peritoneal window placement. Six of the 11 documented lymphoceles demonstrated a cold defect on initial dynamic images that "filled in" to equal background activity and another exceeded background. Three cases showed a rim of increased activity surrounding the lymphocele ("rim sign").

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In many institutions, renal transplant patients are routinely followed with serial renal scintigraphy including technetium-99m diethylenetriaminepentacetic acid (^{99m}Tc-DTPA) blood flow and dynamic imaging, and iodine-131-orthoiodohippurate (^{131}I-OIH) studies (*1–3*). It is important for the imager to be aware of the appearance of lymphocele on renal scintigraphy so that its early recognition might avoid complications such as urinary obstruction, infection, or iliac thrombosis and pulmonary embolus (*4–13*). The scintigraphic findings of lymphoceles have been described in only a few case reports (*7,13–17*). In order to better describe the spectrum of findings on flow, ^{99m}Tc-DTPA dynamic imaging, and ^{131}I-OIH studies, we undertook a retrospective review of documented lymphoceles.

MATERIALS AND METHODS

The patient records of all renal transplants performed at the Walter Reed Army Medical Center from January 1980 through June 1988 were reviewed. The patient was considered to have a lymphocele if (a) a fluid collection was noted on ultrasound *and* (b) subsequent fluid analysis revealed electrolytes, BUN, and creatinine similar to the patient's plasma. All but one patient was further confirmed with surgical drainage or peritoneal window that resulted in the resolution of the fluid collection.

All patients had serial studies from the day following transplantation until well after surgical repair of the lymphocele, and a large number of each patient's studies demonstrated a defect attributable to a lymphocele. The lymphoceles were discovered between 2 wk and 2 mo after transplantation, and depending upon symptoms were followed up to 3 mo before intervention. Each patient had a study demonstrating this same defect within 72 hr of ultrasound detection and subsequent fluid analysis confirmation.

The technique for renal scintigraphy is briefly reviewed (*15*). The patients were instructed to drink three eight ounce glasses of water 30 min prior to the study unless they were on fluid restriction. After urinary bladder emptying, the patient was imaged supine so that the renal transplant, ureter, and bladder were all in the field of view. Iodine-131-OIH, 150 μCi (5.5 MBq) was administered intravenously with sequential two-minute analog images acquired for 24 min followed by pre- and post-void images. A flow study was then obtained with ^{99m}Tc-DTPA 15 mCi (555 MBq) administered intravenously with a bolus injector. Analog images were acquired at three seconds per frame for 48 sec. Two-minute ^{99m}Tc-DTPA dynamic images were then acquired for 24 min followed by pre- and post-void images of the bladder. Additional images were requested by the nuclear medicine physician as necessary.

In one patient, in an attempt to document a urinoma, the fluid collection was percutaneously drained and immediately afterward ^{99m}Tc-DTPA was injected intravenously followed by furosemide, 40 mg i.v., in order to enhance rapid filling of a potential urinoma.

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RESULTS

Of 305 transplants with over 2,500 scans, 11 patients had lymphoceles as defined by the above criteria, and the scintigraphic findings on flow, ^{99m}Tc-DTPA dynamic imaging, and ^{131}I-OIH studies are shown in Table 1.

Only one of the ten patients whose flow studies were available demonstrated an area of photopenia due to a lymphocele. However, this finding was only appreciated retrospectively after the detection of a prominent photopenic region on the ^{99m}Tc-DTPA dynamic images.

In the ^{99m}Tc-DTPA dynamic imaging studies, an abnormality due to a lymphocele was seen in 8 of 11 patients. The abnormalities noted in these patients' scans could be divided into two distinct patterns: one being a photopenic defect that did not change during imaging (Fig. 1), the second being a photopenic defect that increased in activity to equal (Fig. 2) or exceed plasma activity (Fig. 3). In the one patient who had percutaneous lymphocele drainage followed immediately with ^{99m}Tc-DTPA and furosemide intravenously, a previously noted photopenic defect that was not observed on initial images following drainage, was noted to have activity that increased to exceed background by 3 hr (Fig. 3). Three lymphoceles were outlined by a "rim" of increased activity (Fig. 4), and the contour of the bladder was distorted in six patients (Figs. 1–4).

On review of the ^{131}I-OIH studies the only abnormality attributable to a lymphocele was a deformed bladder seen in four cases (Fig. 1).

All visualized lymphoceles were noted to be periureteral. Two extended superiorly to surround the kidney and six extended inferiorly to deform the bladder. Two lymphoceles, detected ultrasonically and described as being suprarenal and perihilar, were not identified with scintigraphy.

Scintigraphic findings attributable to lymphocele resolved in all patients following surgical drainage or peritoneal window placement.

DISCUSSION

Lymphocele, with a reported incidence of between 1% and 18% (*6,10,16*), is a well known complication of renal transplant surgery. Lymphoceles typically occur from 1–14 mo (average <5 mo) following surgery (*6–10*). Although the patient may be asymptomatic, the typical symptomatology includes discomfort at the transplant site, unilateral leg edema, oliguria, and fever (*6,7,9,10,13*).

Lymphocele may cause renal obstruction resulting in

TABLE 1
Scintigraphic Findings Flow, ^{99m}Tc-DTPA, and ^{131}I-OIH Studies

		^{99m}Tc-DTPA			
Case	Flow	Pattern	Other	Location	^{131}I-OIH
±1	NEL[*]	Cold defect unchanged over time	Deformed bladder "Rim" sign	Periureteral/vesicle	Deformed bladder
	NEL	Cold defect that becomes almost equal to Bkg[†]	Deformed bladder "Rim" sign	Periureteral/vesicle	Deformed bladder
2	N/A[‡]	Cold defect that becomes equal to Bkg	"Rim" sign	Periureteral	N/A
3	NEL	Cold defect that becomes equal to Bkg	Deformed bladder "Rim" sign	Periureteral/vesicle/renal	N/A
4	NEL	Cold defect that becomes almost equal to Bkg	Deformed bladder	Periureteral/vesicle/renal	Deformed bladder
5	NEL	Cold defect unchanged over time	—	Periureteral	NEL
6	NEL	Cold defect unchanged over time	Deformed bladder	Periureteral/vesicle	Deformed bladder
7	Cold Defect	Cold defect that becomes equal to Bkg	Deformed bladder	Periureteral/vesicle	NEL
8[§]	NEL	Cold defect that becomes greater than Bkg	Deformed bladder	Periureteral/vesicle	Deformed bladder
	NEL	Cold defect that becomes equal to Bkg	Deformed bladder	Periureteral/vesicle	Deformed bladder
9	NEL	NEL	—	N/A	NEL
10	N/A	NEL	—	Perihilar	N/A
11	NEL	NEL	—	Suprarenal	NEL

[*] NEL = no evidence of lymphocele.
[†] Bkg = Background.
[‡] N/A = not available.
[§] All patients had serial scans, however, Patients 1 and 8 demonstrated sequential scan patterns that differed. All other patients' scan patterns were serially the same.

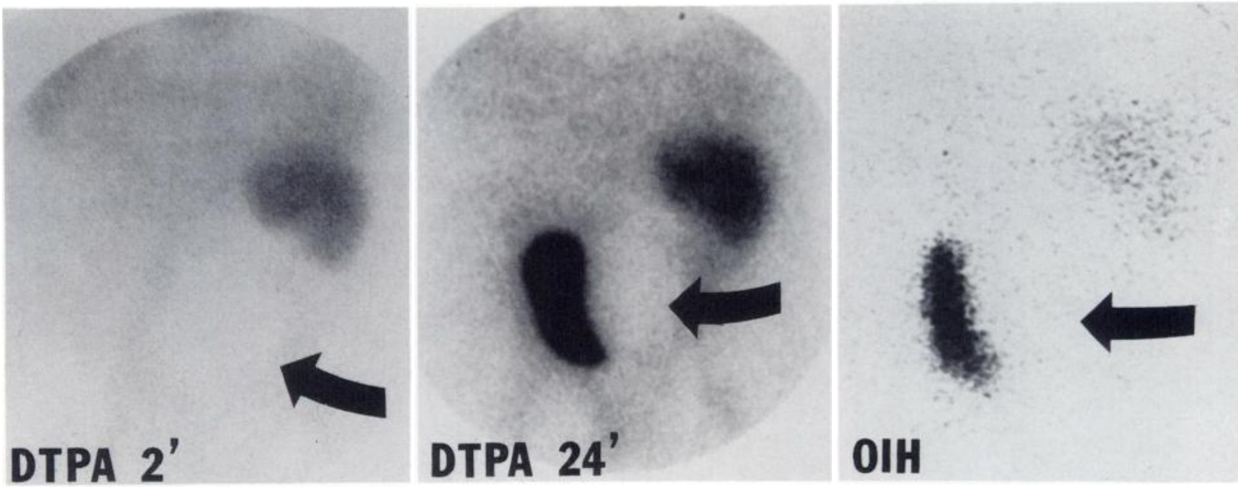

FIGURE 1
Cold-to-cold lymphocele. An example of a lymphocele (arrows) that presents at 2 min as a cold defect and does not increase in intensity by the 24-min image (or subsequently). This is also a good example of bladder contour distortion due to a lymphocele. The hippurate image in this case and all others studied demonstrates bladder deformity as the only evidence of an uncomplicated lymphocele. Tracers are ^{99m}Tc-DTPA (DTPA) and ^{131}I-OIH. Images are anterior.

permanent damage to the graft and an infected lymphocele places the immunocompromised renal transplant patient at high risk for sepsis (*2,3,6,11*). Pulmonary embolism following iliac thrombosis is a further complication (*13*).

Lymphocele has been repeatedly described as a photon deficient lesion that remains "cold" with time in contradistinction to a urinoma which becomes "hot" with time (*1,3,17*). Our results militate against this distinction. In severe renal failure or in a large urinoma with a very slow fluid exchange rate there might never be enough accumulated incremental urine for the urinoma to appear "hot." Lymphoceles, on the other hand, have now been demonstrated to be photon deficient (cold), neutral, or photon intense (hot) with time.

We propose that in our case of the hot lymphocele, the space left after lymphocele drainage rapidly filled with relatively "hot" lymph (i.e., from the initial 20 to 30 min of plasma activity). The good function of the transplanted kidney resulted in a rapid decrease of plasma and renal cortical activity (*18*), the activity of the lymph trapped in the lymphocele remained relatively unchanged, and the "cold to hot" pattern of activity resulted.

The importance of this observation is that it supports our proposal that the pattern of lymphocele activity is a spectrum. Lymphoceles are thought to develop as a result of leakage of lymph from severed host pelvic lymphatics or renal hilar lymphatics (*9,12*). Lymph drains into the peritoneal cavity and when this becomes loculated and encapsulated a lymphocele has developed. It is maintained by direct (host or kidney) lymphatic perfusion. Using a compartmental DTPA clearance model, a lymphocele can be considered a separate

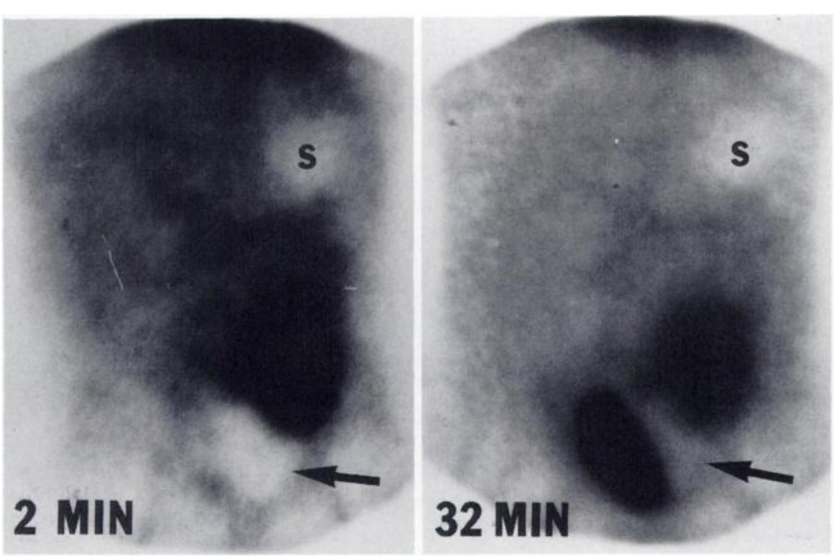

FIGURE 2
Cold-to-background lymphocele. An example of a lymphocele (arrows) that presents as a cold defect at 2 min and reaches background activity by 32 min. Air in the stomach (S) is used for comparison. Tracer is ^{99m}Tc-DTPA. Images are anterior.

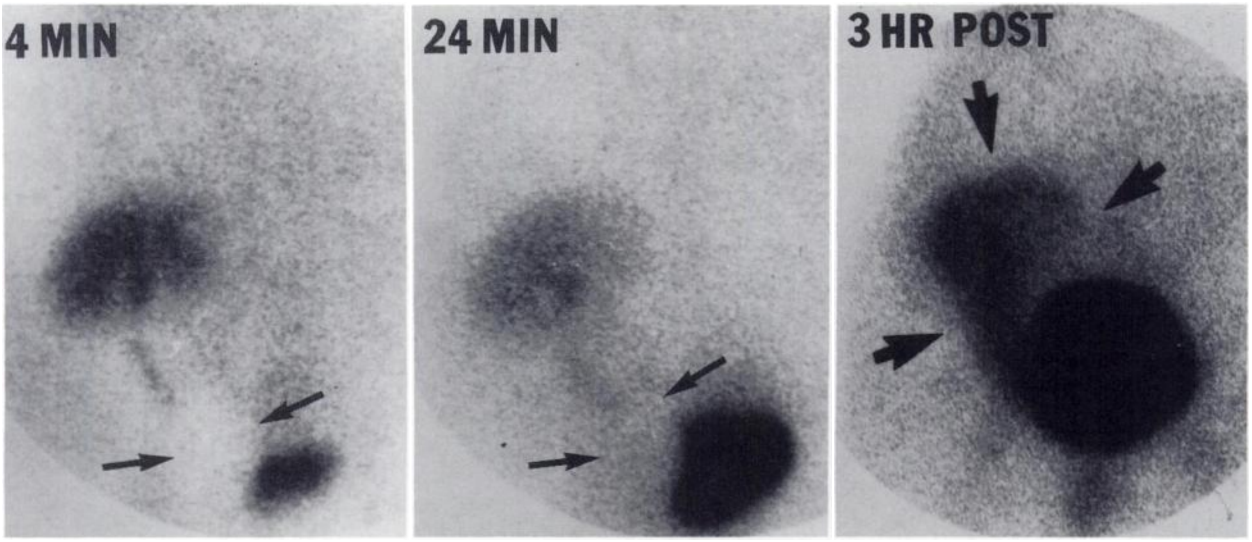

FIGURE 3
Cold-to-hot lymphocele. An example of a lymphocele (arrows) that presents as a cold defect at 4 min and reaches background activity by 24 min. Three hours following percutaneous drainage a second tracer study demonstrates a perirenal periureteral lymphocele with activity significantly exceeding background (i.e., "hot" lymphocele). The 3-hr image demonstrates a lymphocele larger than previously appreciated. Tracer is ^{99m}Tc-DTPA. Images are anterior.

compartment with its concentration of radioactivity a function of the fluid exchange rate between compartments and the volume of the lymphocele in which the radioactivity must be diluted (*1*). The equilibrium constants into and out of the lymphocele as well as the size of the lymphocele will determine the pattern seen. While plasma tracer activity is greater than lymphocele activity, tracer will move into the lymphocele. As the DTPA blood level decreases and since there is a significantly lower clearance rate (slower equilibrium constant) from the lymphocele to plasma than from plasma to urine (i.e. GFR), the intensity of activity in the lymphocele compared to background will ultimately approach, equal, or even exceed the background activity. In short, we feel that all lymphoceles will initially appear as cold defects; however, the pattern over time is dependent upon time of imaging and lymphocele fluid dynamics, and the previous scintigraphic description of lymphoceles as a photopenic defect needs to be expanded.

Three cases demonstrated a rim of increased activity surrounding the lymphocele. This "rim sign" was originally reported by Manier (*15*) and may represent an interface of fluid exchange in the lymphocele. Since the radioactivity most likely enters a lymphocele through disrupted lymphatic vessels, the tracer should exit the lymphocele via transudation through the wall. As fluid of lesser radioactivity continues to enter the lymphocele a gradient would exist between the center and the wall of the lymphocele resulting in the rim we describe.

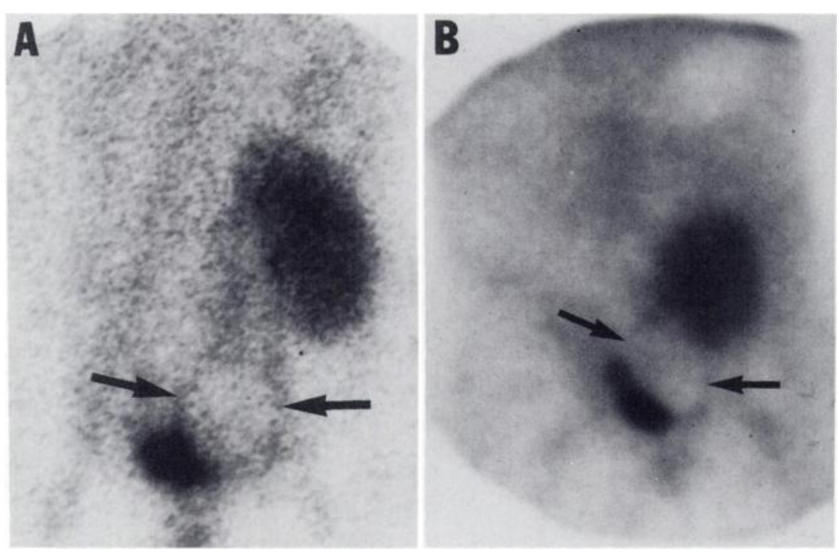

FIGURE 4
Lymphoceles with rim sign. Two examples of lymphoceles are presented that demonstrate a rim of activity (arrows) greater than background surrounding the less photointense lymphocele. In both cases the 26-min image is presented. Tracer is ^{99m}Tc-DTPA. Images are anterior.

Although an inflammatory process might have this appearance, these lymphoceles were not infected.

Our evaluation of the ^{131}I hippuran studies and the DTPA flow examination added no additional information to the DTPA functional images in the ability to detect a lymphocele.

Based upon this study, there is no definitive way beyond fluid aspiration to absolutely distinguish lymphocele from urinoma. However, a very hot early appearing DTPA collection suggests urinoma and a persistently cold collection suggests lymphocele (also hematoma or abscess). Additionally since the rim sign has not been seen in urinoma, the finding may further support the diagnosis of lymphocele.

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