Imaging findings in secondary renal lymphomas

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Learning objectives

1. To describe both typical and atypical radiologic patterns seen in secondary renal lymphomas.

2. To check the pathologic conditions that may mimic renal lymphomas.

Background

Renal lymphoma (RL) occurs almost exclusively by secondary involvement from systemic disease.

RL is usually a part of a systemic disease and is associated with adenopathy or involvement of other organs such as the liver and gastrointestinal tract.

Extranodal spread of lymphoma often affects the genitourinary system, with the kidneys being the most commonly involved organs.

Renal involvement in secondary RL occurs much more commonly in non-Hodgkin´s lymphomas than in Hodgkin´s lymphomas.

Contrast material-enhanced computed tomography (CT) remains the modality of choice for the evaluation of patients with suspected RL.

Imaging findings OR Procedure details

Secondary RL has a variety of imaging appearances depending on the pattern of tumor proliferation at histologic analysis.

Spectrum of imaging manifestations:

1) multiple renal masses
2) solitary renal mass

3) invasion from contiguous retroperitoneal disease

4) diffuse infiltration/renal enlargement

5) perirenal disease

6) uncommon findings: cystic lesions and tumors predominantly affecting the renal sinus and collecting system.

1) MULTIPLE RENAL MASSES:

Is the commonest disease pattern. The masses are commonly isodense or hyperdense prior to intravenous injection of contrast medium and hypodense afterwards (Fig. 1 on page 6). Nephrographic phase contrast-enhanced CT is essential because many lesions are small and affect the medullary portion of the kidneys, with relatively little cortical deformity.

The lesions are most often bilateral but may also affect only one kidney.

Large lesions tend to be more heterogeneous.

The presence of retroperitoneal adenopathy is an additional clue to the diagnosis.

Differential diagnosis:

- metastatic disease to the kidneys (Fig. 2 on page 7)
- acute pyelonephritis
- septic emboli to kidneys
- renal infarcts
- abscesses (Fig. 3 on page 8)
- multiple synchronous renal cell carcinomas: are differentiated on the basis of their hypervascular enhancement pattern.

Thickening of perirenal fascial planes and infiltration of perinephric fat can be present in both inflammatory processes and lymphoma.
2) SOLITARY RENAL MASS:

A solitary renal mass is seen in only 5-15% of kidneys and can be indistinguishable from renal cell carcinoma.

The mass characteristically demonstrates little enhancement following intravenous contrast material administration (Fig. 4 on page 9).

Small lesions are generally homogeneous. In large lesions, there may be necrosis and heterogeneity.

Differential diagnosis:

- atypical renal cell carcinoma: Renal cell carcinoma usually enhances in the arterial phase, however papillar and chromophobe variants do not exhibit this classic enhancement. The presence of associated thrombus in the renal vein or inferior vena cava is highly unusual in lymphoma.

- solitary metastasis.

3) INVASION FROM CONTIGUOUS RETROPERITONEAL DISEASE:

Is the second most common pattern (25-30% of cases).

Many are immunocompromised. This patients typically present with a large, bulky retroperitoneal mass that envelops the renal vasculature and invades the renal hilium (Fig. 5 on page 10).

Hydronephrosis caused by entrapment of the ureters is common (Fig. 6 on page 11).

In most patients, the renal arteries and veins remain patent despite tumor encasement, a finding that is characteristic for lymphoma.

4) DIFFUSE INFILTRATION/RENAL ENLARGEMENT:

Diffuse infiltration of the kidneys with microscopic nodulation can result in global enlargement of the kidneys (Fig. 7 on page 12). Contrast-enhanced CT shows heterogeneous enhancement of the kidneys, loss of the normal differential enhancement between the cortex and the medula in the corticomedullary phase, and infiltration of the renal sinus fat. In some cases, the infiltrative process is unilateral or asymmetric.

This appearance is more common in Burkitt lymphoma.
**Differential diagnosis:**
- Transitional cell carcinoma
- collecting duct or medullary carcinoma of the kidneys
- severe pyelonephritis

**5) PERIRENAL DISEASE:**

Although perirenal spread from retroperitoneal or RL is common, isolated perinephric lymphoma is unusual (10% of cases) (*Fig. 8 on page 12*).

Contrast-enhanced CT shows a perinephric rind of soft tissue without a focal parenchymal lesion. The soft tissue has a low attenuation, and commonly directly invades the renal parenchyma.

In less dramatic cases, findings are limited to thickening of the Gerota fascia or plaques and nodules in the perirenal space.

**Differential diagnosis:**
- Sarcoma arising from the renal capsule
- metastases to the perinephric space
- perinephric hematoma (*Fig. 9 on page 13*)
- retroperitoneal fibrosis
- amyloidosis
- extramedullary hematopoiesis

**6) UNCOMMON FINDINGS:**

The vast majority of patients with renal lymphoma present with characteristic imaging findings. Rarely the CT findings are quite unusual.

Atypical findings include:

a) **tumors predominantly affecting the renal sinus**

Is an uncommon occurrence. At CT the normal renal sinus is replaced by a homogeneous soft-tissue mass (*Fig. 10 on page 14*). Vascular encasement is
common. The resulting hydronephrosis is often mild.

*Differential diagnosis:*

- heterogeneous renal sinus fat
- transitional cell carcinoma.

b) **cystic lesions**

c) **lymphoma of the ureter:**

Is extremely rare. There are no particular imagin characteristics *(Fig. on page 15 11 on page 15)*

d) **spontaneous hemorrhage**

e) **necrosis**

f) **heterogeneous attenuation**

  g) **calcification**

Some of these findings are often the result of prior treatment.

**Images for this section:**
Renal lymphoma in a 40-year-old HIV-positive man. Contrast-enhanced CT scan of the midabdomen shows bilateral soft-tissue renal masses (arrows). Note that these masses do not deform the contour of the kidneys. There is a paraaortic retroperitoneal adenopathy (arrowhead).

Fig. 1
Fig. 2: Lung cancer metastatic disease to the kidneys.
Fig. 3: Renal abscess
Renal lymphoma in a 71 year old woman. Solitary hypovascular mass in the right kidney which is slightly hyperdense relative to renal parenchyma on nonenhancement image (left), demonstrating minimal enhancement following intravenous administration of contrast material (right). Note the retrocaval adenopathy (arrow).

Fig. 4
Invasion from contiguous retroperitoneal disease

68 year-old woman. Contrast-enhanced CT scan shows a large soft-tissue mass infiltrating the retroperitoneum, encasing the right renal vessels, and extending into the perinephric space.

Fig. 5

Invasion from contiguous retroperitoneal disease

Diffuse large B-cell lymphoma in a 55-year-old man. Enhanced CT scan shows retroperitoneal disease that has invaded right kidney. There is right renal enlargement. Note hydrenephrosis (arrow) in right kidney.

Fig. 6
Renal lymphoma in a 45-year-old woman with Systemic lupus erythematosus. Unenhanced CT scan shows bilateral renal enlargement and retroperitoneal adenopathy. The diagnosis of diffuse large B-cell lymphoma was established with renal biopsy.
Perinephric disease in a 70-year-old man. Contrast-enhanced CT shows a large hypovascular mass located in the perinephric spaces.

Fig. 8
Fig. 9: Perinephric hematoma
Renal Sinus Involvement:

Large B-cell lymphoma in a 82 year-old man. Contrast-enhanced CT scan shows a homogeneous soft-tissue mass (arrows) in the left renal sinus. Note the lack of significant hydronephrosis.

Fig. 10
Follicular primary lymphoma of the ureter in a 36 year-old woman. Intravenous urography shows slightly irregular stricture (arrow) of the middle third of the right ureter and resultant dilatation of the proximal collecting system. Enhanced CT shows thickening of the wall of the right ureter with a soft tissue mass (arrow).
Conclusion

- CT is the modality of choice for the detection, diagnosis, staging and monitoring of renal lymphoma.

- Multiple bilateral masses are the most common appearance of secondary RL

- Although the CT appearances of renal disease due to lymphoma are nonspecific, the association with retroperitoneal lymph node enlargement and involvement of other sites often suggests the proper diagnosis.

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