RADIOGRAPHIC QUIZ

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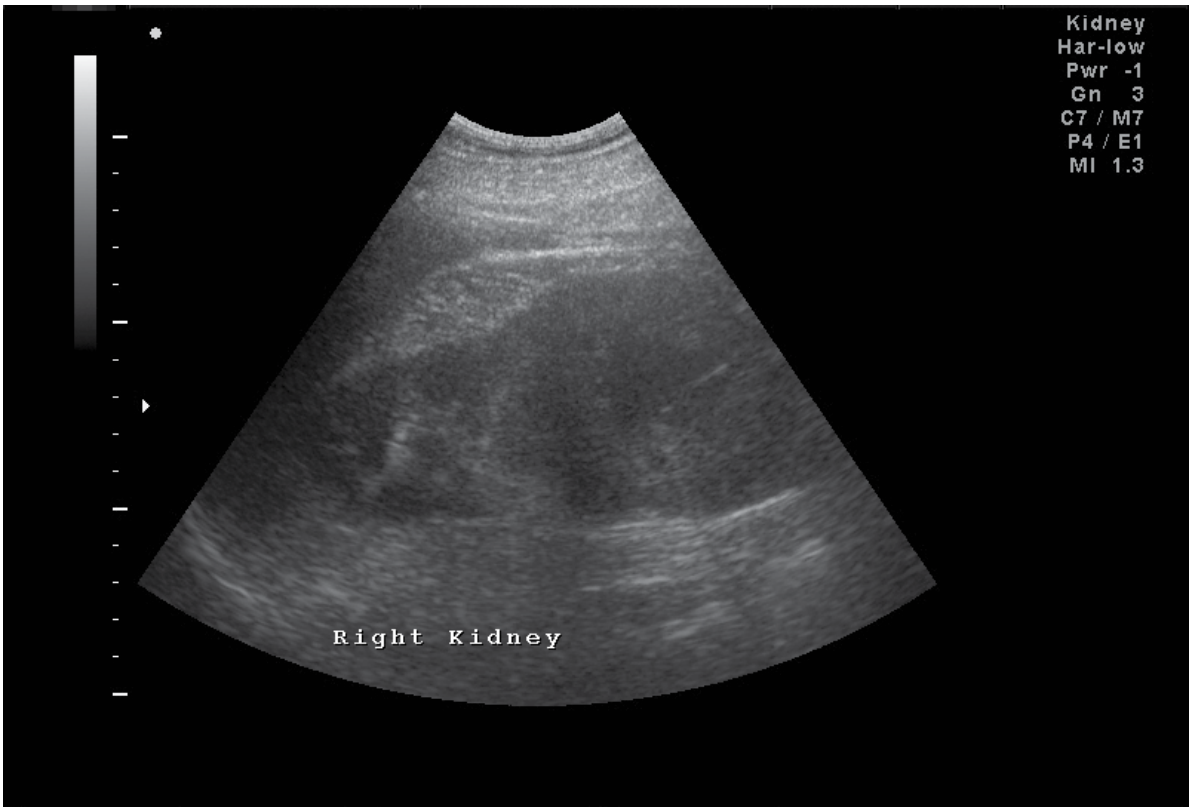
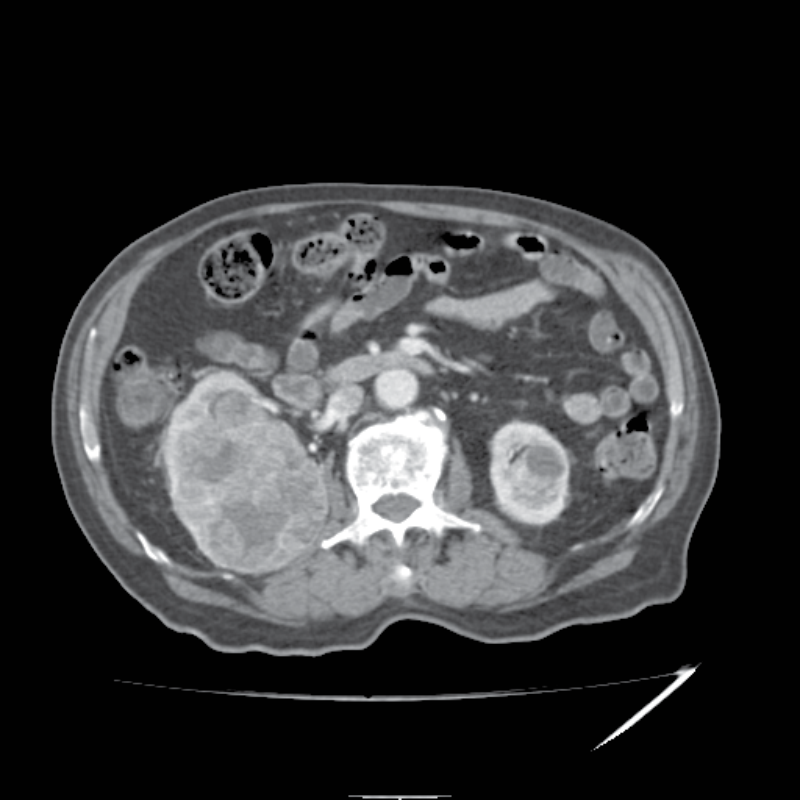
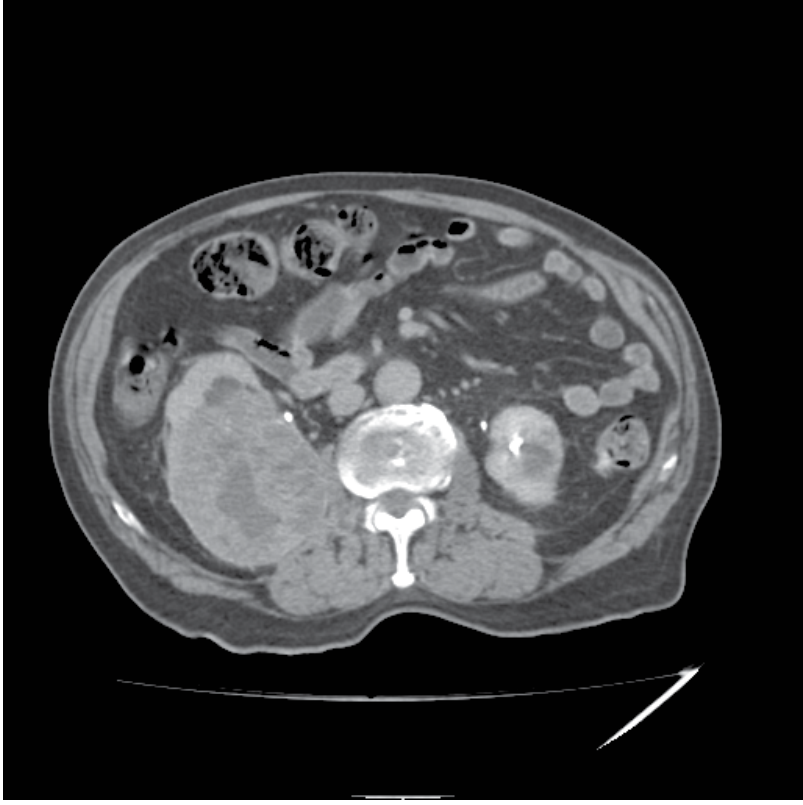
80 year-old man with abdominal discomfort

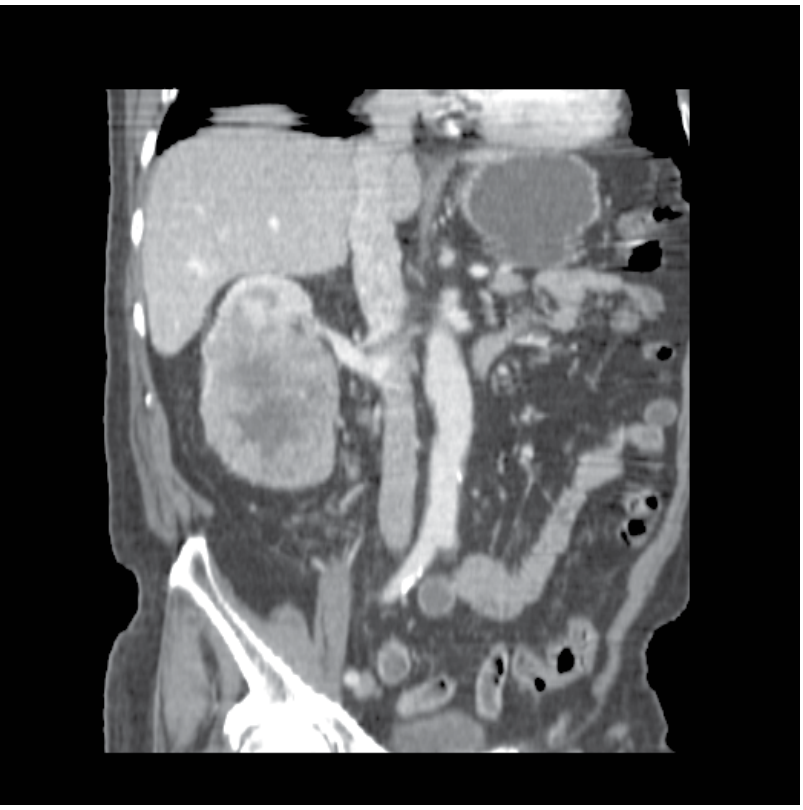


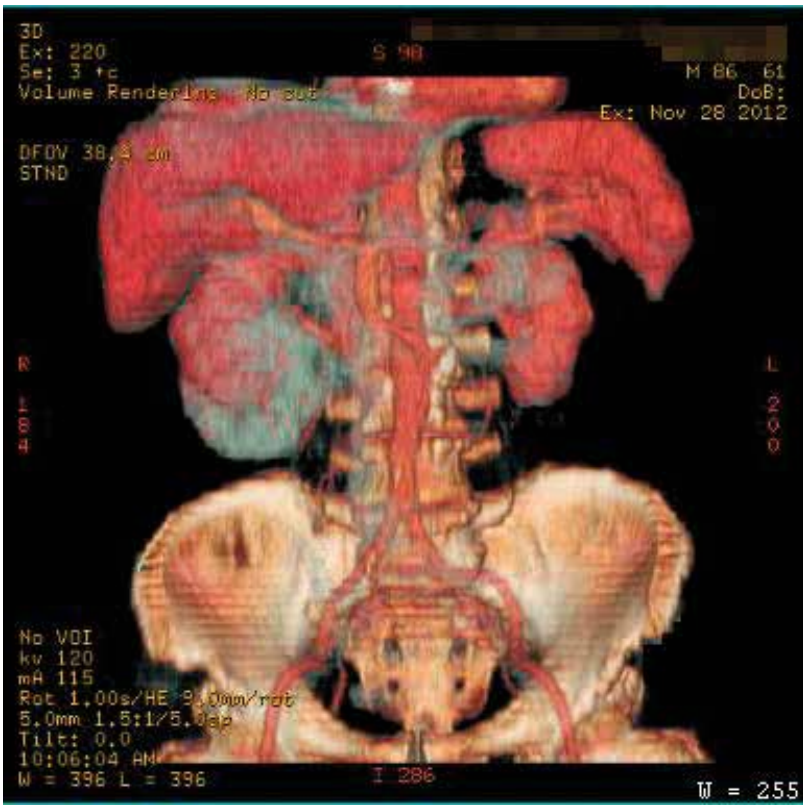
Which choice best characterizes the salient finding?

__Hydronephrosis
__Exophytic renal cyst
__Solid renal mass
__Perinephric fluid collection
__Mostly fatty renal mass









Please review the previous CT images. Which choice is most likely?

___ Hydronephrosis
___ Renal mass
___ Adrenal mass
___ Renal abscess
___ Duplication

Please respond to the following with TRUE or FALSE

____ There is IVC tumor invasion.
____ There are lytic spine metastases.
____ There is contralateral malignant adenopathy.
____ The most likely diagnosis is renal cell carcinoma.

■ ULTRASOUND IMAGE DESCRIPTION

9.17 x 6.39 cm solid mass with heterogeneous echogenicity and mildly lobulated margins occupying the mid and lower pole of the right kidney
CT description
10 x 8.2 cm diameter heterogeneous enhancement mass occupying the mid-lower aspect of the right kidney. The heterogeneity is related with areas of hemorrhage or necrosis. No evidence of perinephric spread of tumor. Normal adrenal gland. No venous spread tumor. No regional enlarged lymph nodes.

■ DIAGNOSIS:

Renal cell carcinoma (surgically proven)

■ OVERVIEW OF THE PATHOLOGY

Renal cell carcinoma (RCC) also referred to as hypernephroma or adenocarcinoma accounts for approximately 3% of adult malignancies and 90-95% of neoplasms arising from the kidney. In the past these tumors were believed to derive from the adrenal gland; therefore, the term hypernephroma often was used. Risk factors for renal cell carcinoma are cigarette smoking and obesity. Other associated risk factors are hypertension; unopposed estrogen therapy; occupational exposure to petroleum products, heavy metals, solvents, coke-oven emissions, or asbestos; abuse of phenacetin-containing analgesics; acquired cystic kidney disease; renal transplantation; and von Hippel-Lindau syndrome.
At least 4 hereditary syndromes associated with renal cell carcinoma are recognized: (1) von Hippel-Lindau (VHL) syndrome, (2) hereditary papillary renal carcinoma (HPRC), (3) familial renal oncocytoma (FRO) associated with Birt-Hogg-Dube syndrome (BHDS), and (4) hereditary renal carcinoma (HRC).
The lesions occur most often after age 50 and have a 2:1 male:female ratio. There is a 10 % to 25 % incidence of bilateral or multifocal RCC in patients with von Hippel-Lindau syndrome and in patients with Autosomal Dominant Polycystic Kidney Disease (ADPKD) undergoing dialysis; and there is slightly increased incidence in ADPKD, tuberous sclerosis, and other diseases and syndromes associated with multiple renal cysts.
Renal cell carcinoma may remain clinically occult for most of its course. The classic triad of flank pain, hematuria, and flank mass is uncommon (10%) and is indicative of advanced disease. Twenty-five to thirty percent of patients are asymptomatic, and their renal cell carcinomas are found on incidental radiologic study; 60% present with hematuria; 40%, with flank pain. Mass is palpable in roughly 40%. A left-sided varicocele or symptoms suggestive of paraneoplastic syndromes may warrant investigation of a renal mass.
Approximately 30% of patients with renal carcinoma present with metastatic disease at diagnosis; spread by local invasion, particularly into the renal vein and IVC. It also invades adrenal glands, liver, spleen, colon, and local lymph nodes. Physical examination should include thorough evaluation for metastatic disease. Organs involved include: lung (75%), soft tissues (36%), bone (20%), liver (18%), and cutaneous sites (8%).

■ RADIOLOGIC WORKUP:

Excretory urography- low sensitivity and specificity. A small- to medium-sized tumor may be missed by excretory urography.
CT scan with contrast- enhancement is the imaging procedure of choice for diagnosis and staging of renal cell cancer and has virtually replaced excretory urography and renal ultrasound. In most cases, CT imaging can differentiate cystic masses from solid masses and supplies information about lymph node, renal vein, and inferior vena cava involvement. On CT, renal cell carcinoma (RCC) is typically hyper vascular with enhancement >20 HU. The enhancement pattern may be heterogeneous due to the presence of hemorrhage and/or necrosis.
Detection of small hyper vascular RCC masses has been shown to be most optimal in the nephrographic phase (80-180 seconds after initiation of intravenous contrast medium injection).
RCC generally shows a lobular margin with adjacent normal tissue but can sometimes infiltrate calyces or the renal pelvis.
It may have internal calcifications (10%), which helps to differentiate it from angiomyolipoma.
Ultrasonography- Ultrasound examination provides useful diagnostic information, especially for evaluating questionable cystic renal lesions if CT imaging is inconclusive. Also, primary tumors of the kidneys (usually renal cell carcinoma) are often first detected on ultrasound and then worked up further with CT. Ultrasound is not as useful/facile as CT for staging.
MRI - Generally is reserved as a problem-solving tool, as usually CT and ultrasound (often CT alone) are adequate to diagnose and stage the disease. MRI is particularly useful when inferior vena cava involvement is suspected. Knowledge of inferior vena cava involvement is important in planning the vascular aspect of the operative procedure.
Nuclear Medicine:
Scintigraphy with Technetium DMSA used to differentiate a pseudomass (which will have normal uptake) from RCC (decreased)
Bone scanning with technetium diphosphonate is used pri-

marily to look for bone metastases; however, RCC is associated with a higher false negative rate.
Differential diagnosis for the renal mass:
- Renal cell carcinoma
- Oncocytoma
- Angiomyolipoma (usually fat containing)
- Lymphoma
- Metastasis

Differential diagnosis for complex renal mass:
- Renal cell carcinoma
- Renal oncocytoma
- Angiomyolipoma
- Renal metastatic disease or lymphoma
- Focal pyelonephritis
- Renal abscess
- Hemorrhagic renal cyst

Staging:
- o Stage 1: RCC <7cm and confined to kidney
- o Stage 2: RCC ≥7cm, confined to kidney
- o Stage 3: tumor extension into the renal vein or vena cava, ipsilateral adrenal or perinephric fat, or local lymph nodes
- o Stage 4: Tumor extension beyond the Gerota fascia, more than one local node, distant metastases.

Medical Care:
The medical treatment options for renal cell cancer are chemotherapy, hormonal therapy, immunotherapy, or combinations of these. Other experimental approaches for treatment include vaccines and non-myeloablative allogeneic peripheral blood stem-cell transplantation.

Surgical Care:
Surgical resection remains the only known effective treatment for localized renal cell carcinoma, and it is also used for palliation in metastatic disease. Nephrectomy may be performed as an open or laparoscopic procedure.

Radiation Therapy:
Radiation therapy may be considered as the primary therapy for palliation in patients whose clinical condition precludes surgery, either because of extensive disease or poor overall condition.
Follow up:
Radiologic Outpatient Care:
• Abdominal CT scan is recommended once at 4-6 months and then as indicated.
• For stage III renal cell carcinoma, chest x-ray is recommended every 4 months for 2 years, every 6 months for 3 years, and then annually for 5 years. Abdominal CT scan should be performed at 4-6 months, then annually or as indicated.
• Careful surveillance of patients with end-stage renal disease by ultrasonography and CT scan is recommended.

■ REFERENCES:
1. Linehan MW, Berton Z, Bates S: Cancer of Kidney and Ureter in: DeVita VT Jr et al eds. Principles and Practice of Oncology. 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2001: 1362-1396.

2. Diane M. Kawamura. Kidneys. Diagnostic Medical Sonography. A Guide to Clinical Practice. Second Edition. 1997: 362-372.

3. eMedicine: http://www.emedicine.com/med/topic2002.htm

4. Craig, W. Approach to Renal Masses. Genitourinary Radiology.

5. Atkins, Michael B, MD. "Clinical manifestations, evaluation, and staging of renal cell carcinoma. Up-To-Date. May 8, 2006

6. Auntminnie.com

7. Sheila Sheth, MD, Jonh C. Scatarige, MD, Karen M. Horton, MD, Frank M. Corl, MD and Eliot K. Fishman, MD. Current Concepts in the Diagnosis and Management of Renal Cell Carcinoma: Role of Multidetector CT and Three-dimensional CT. October 2001 Radiographics 21, S237 –S254.

Linehan MW, Berton Z, Bates S. Cancer of Kidney and Ureter. In: Devita VT Jr, et al eds. Principles and Practice of Oncology. 6th ed. Philadelphia, Pa: Lippincott

■ ANSWERS TO RADIOGRAPHIC QUIZ

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