Radiology-Pathology Conference

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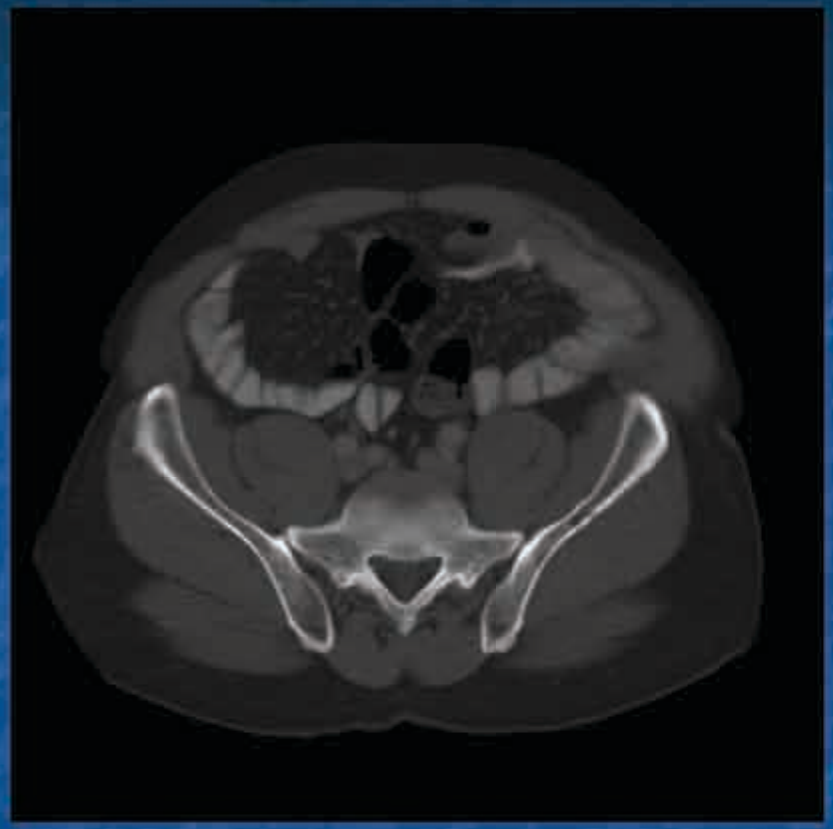
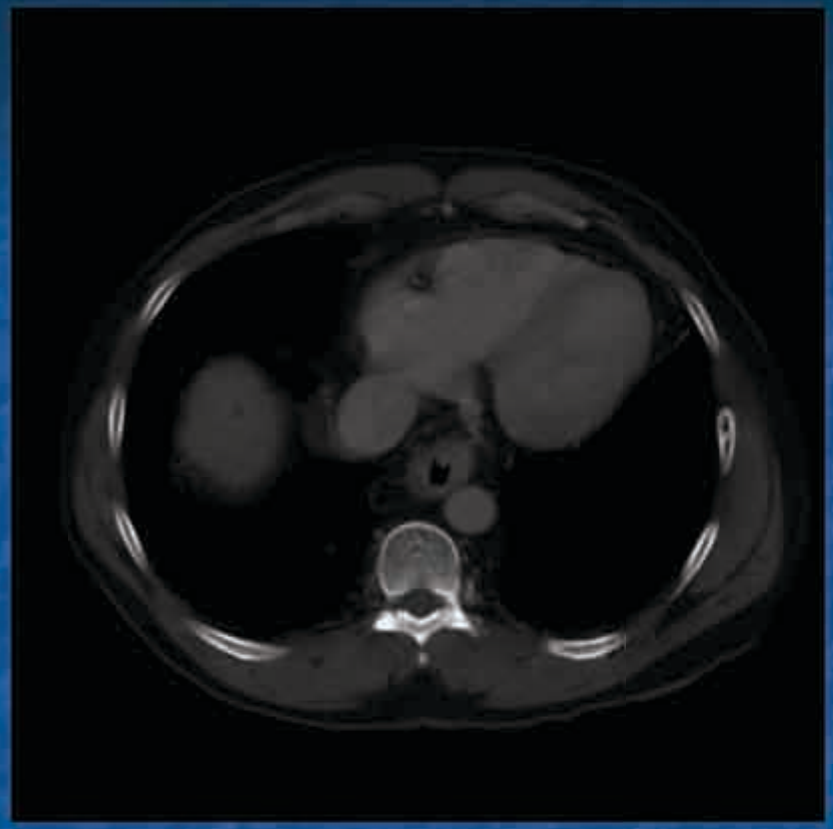
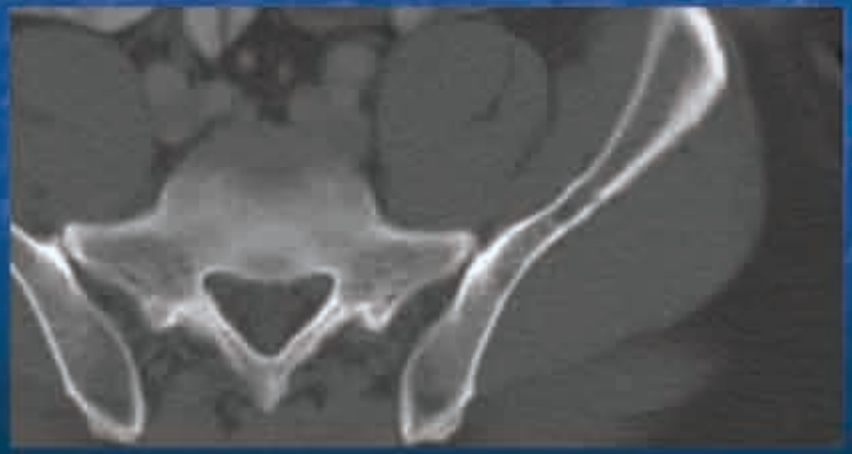
4/30/2010

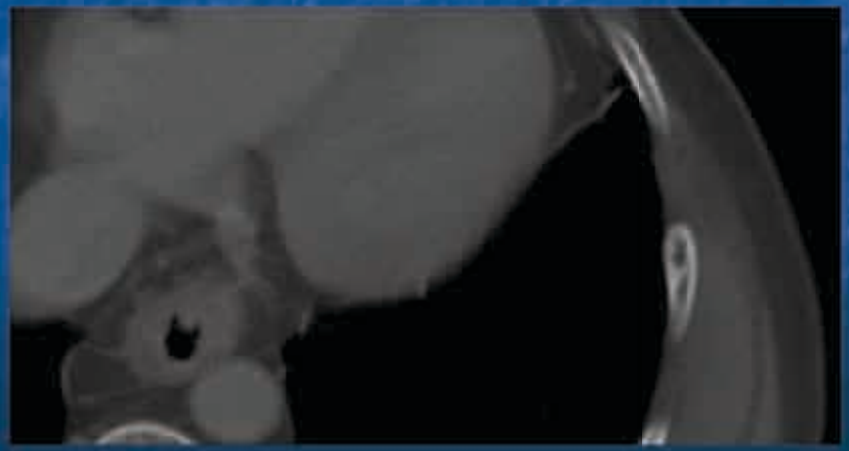
Case 1

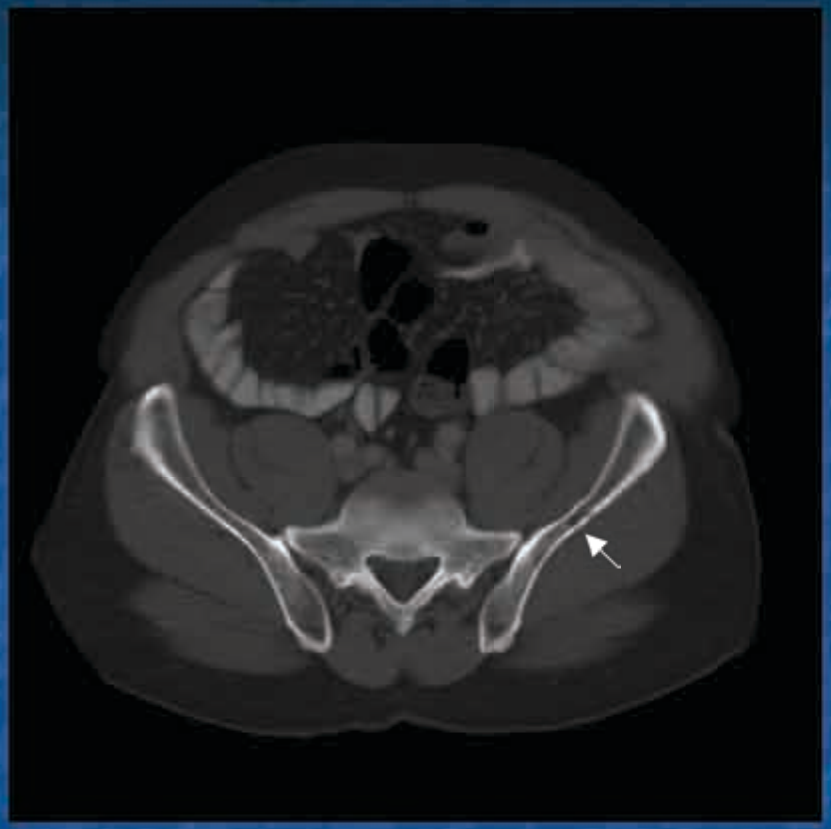
- 67 year old male with history of IgA monoclonal gammopathy
- CT abdomen and pelvis obtained for evaluation of abdominal pain

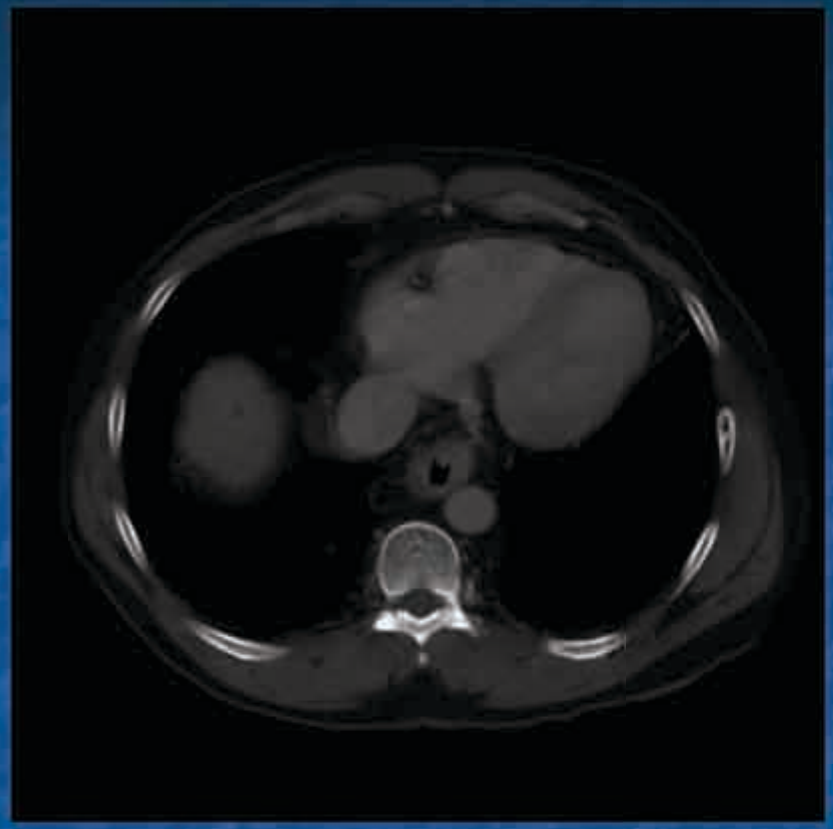


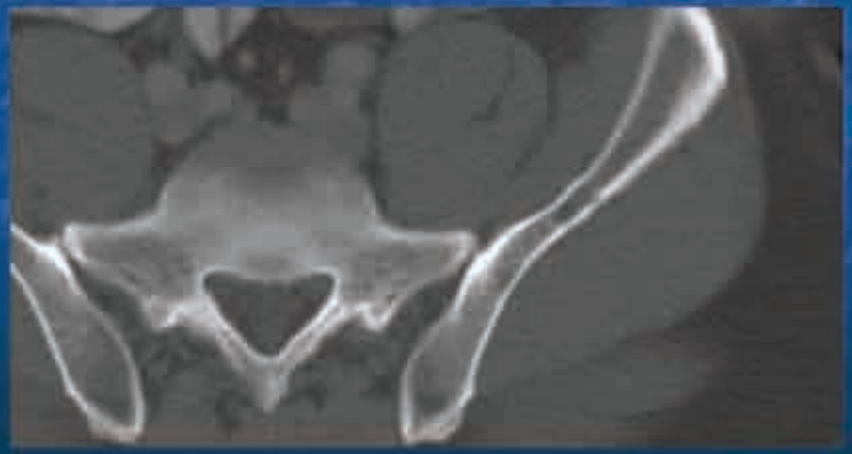


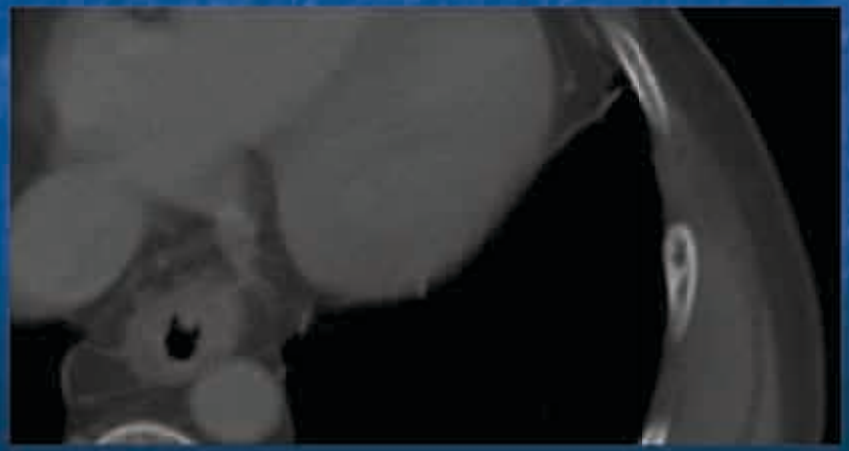


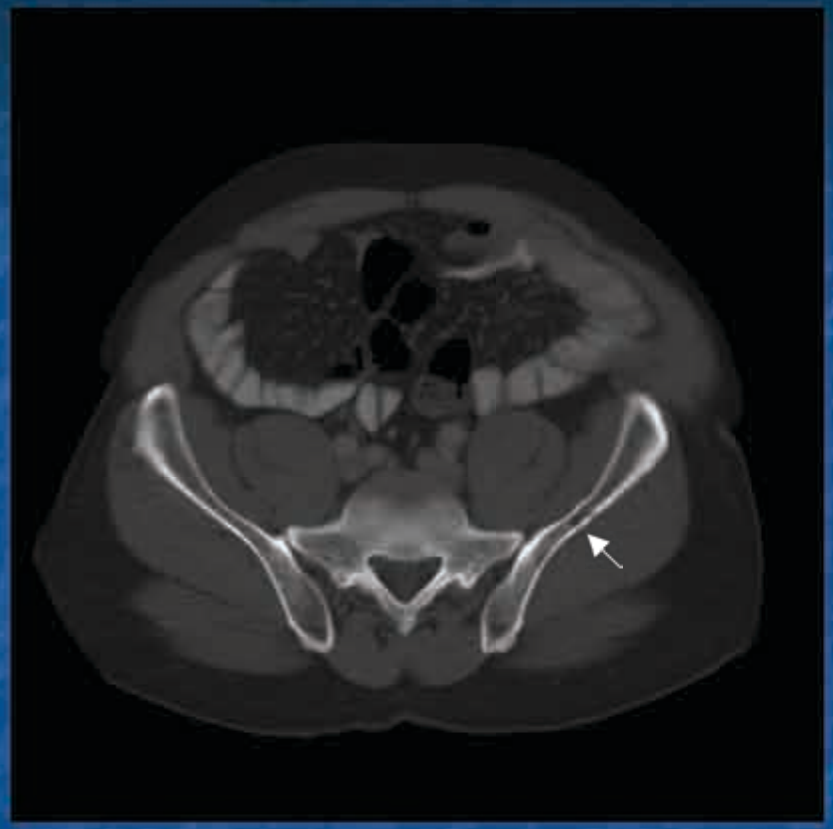


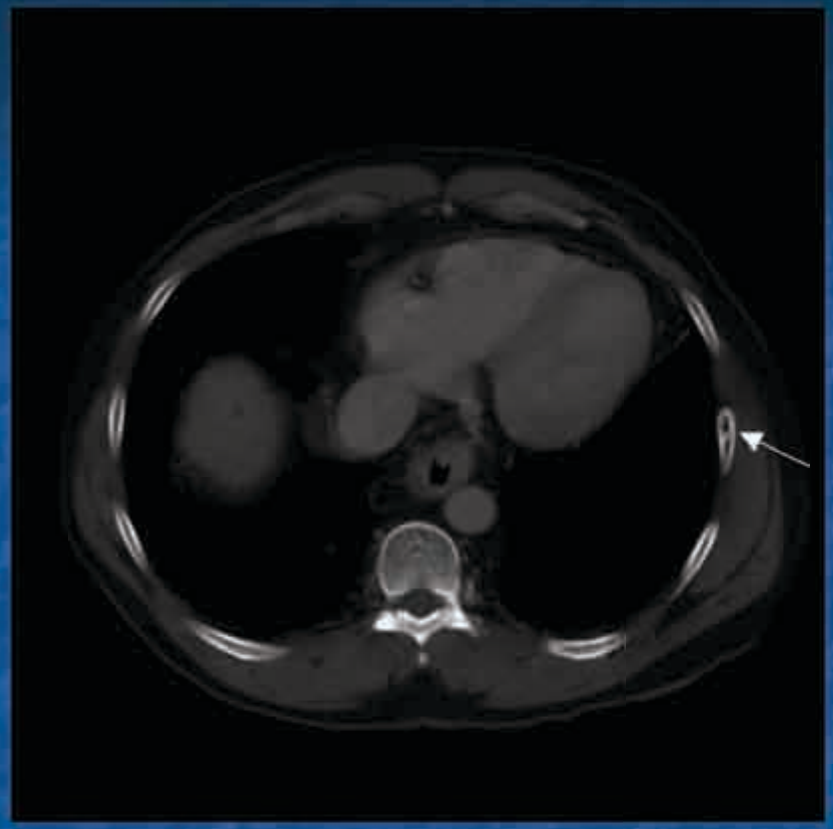


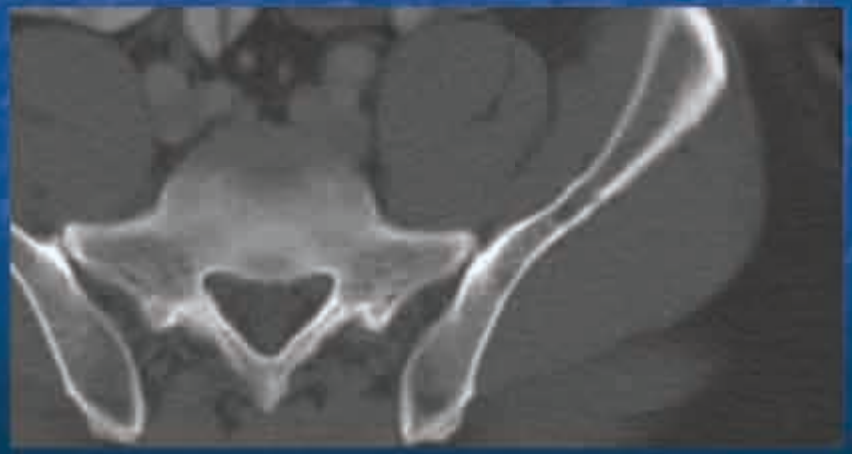


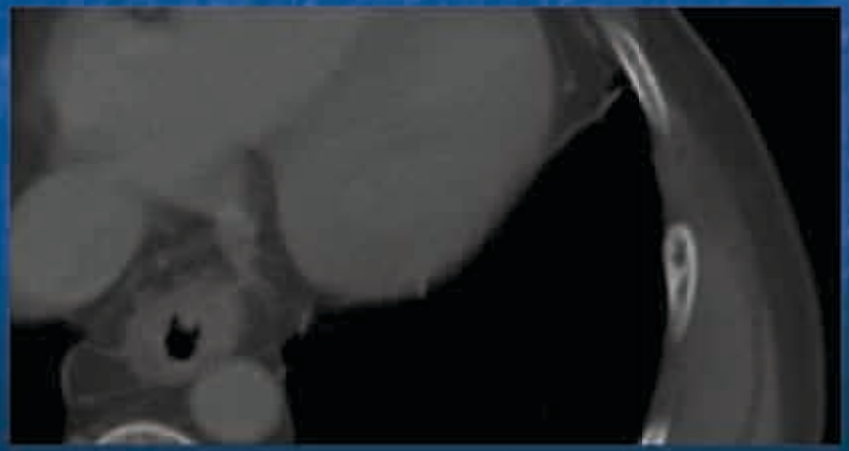


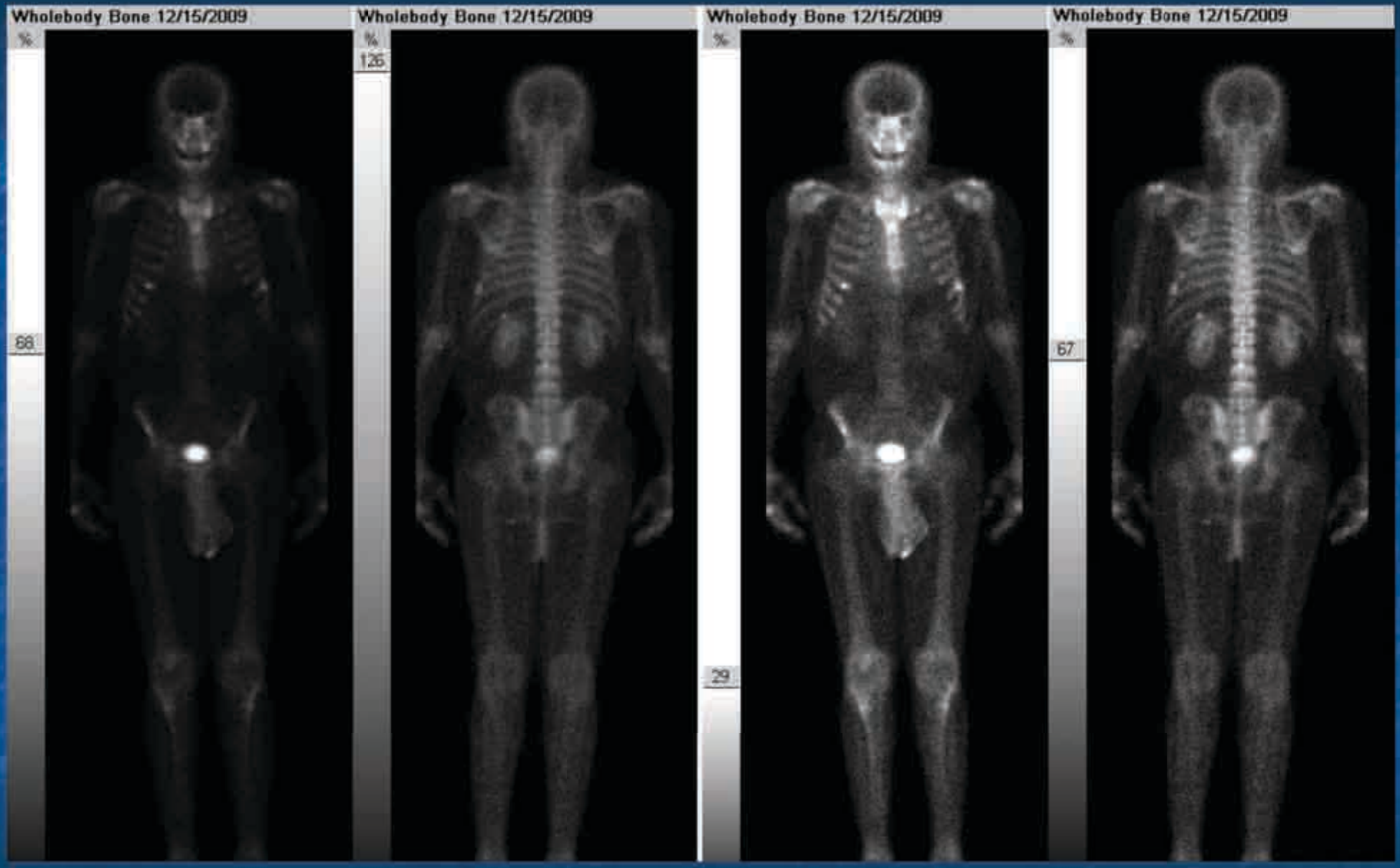








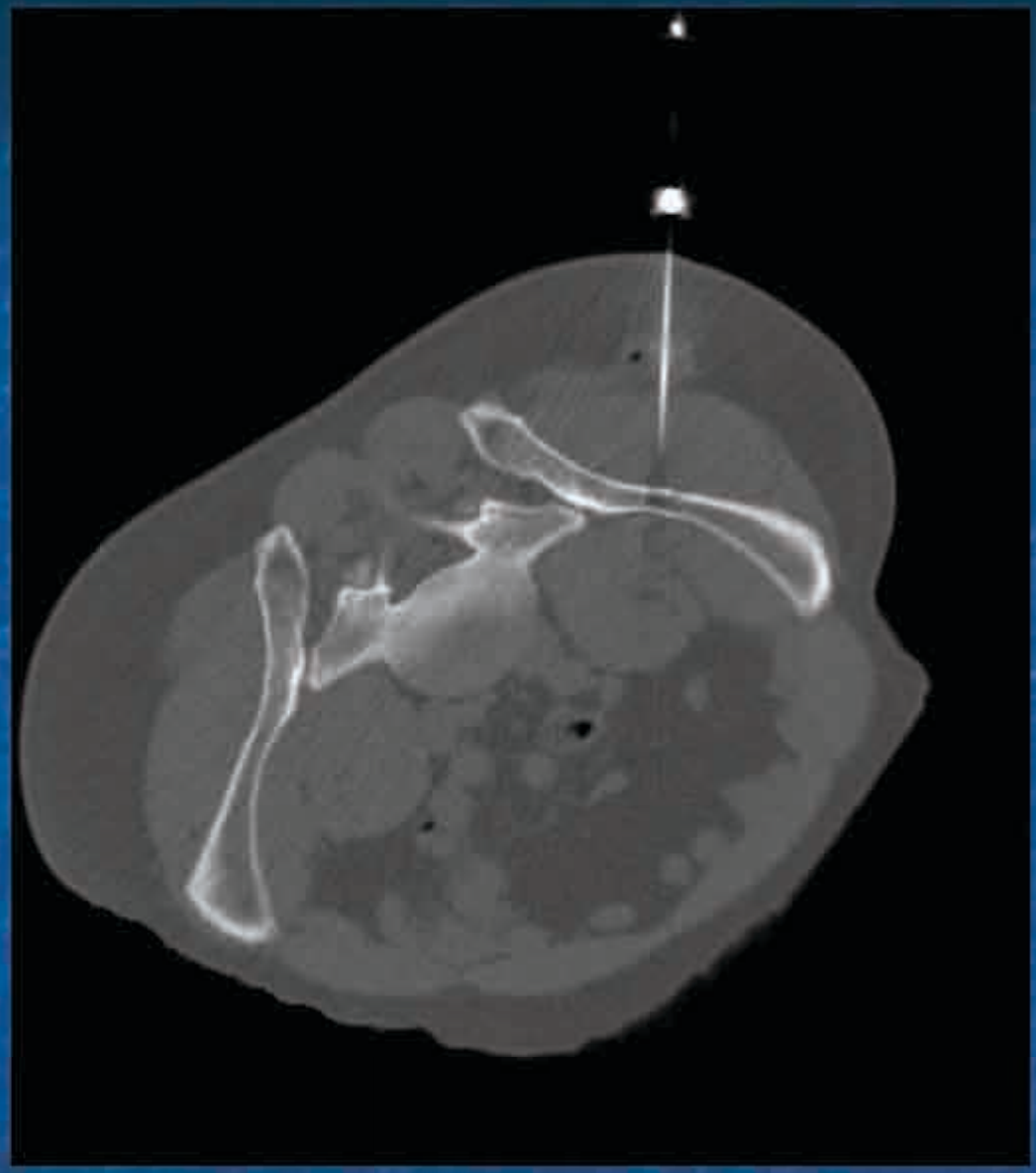




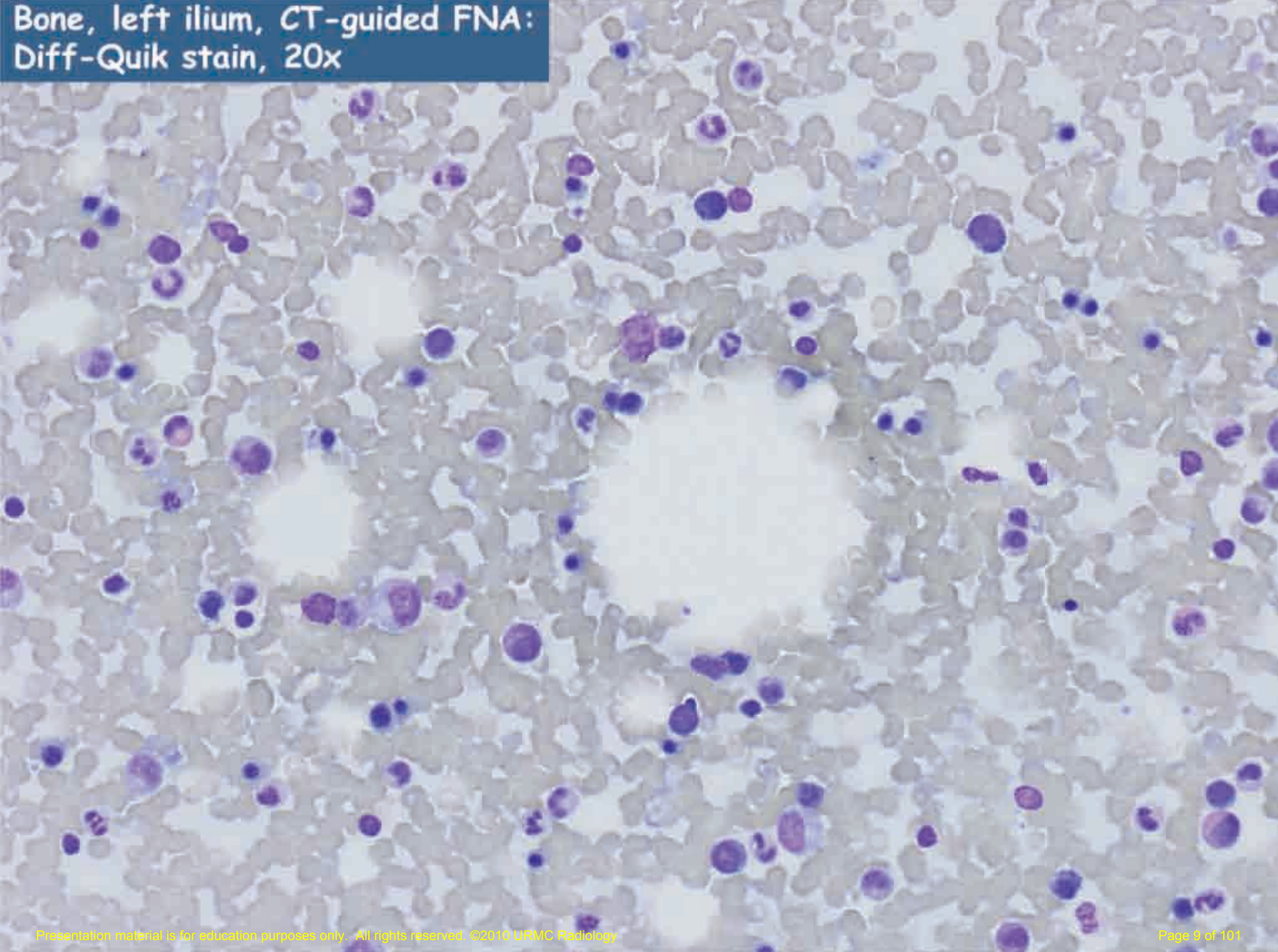
Whole Body Bone Scan 12/15/2009

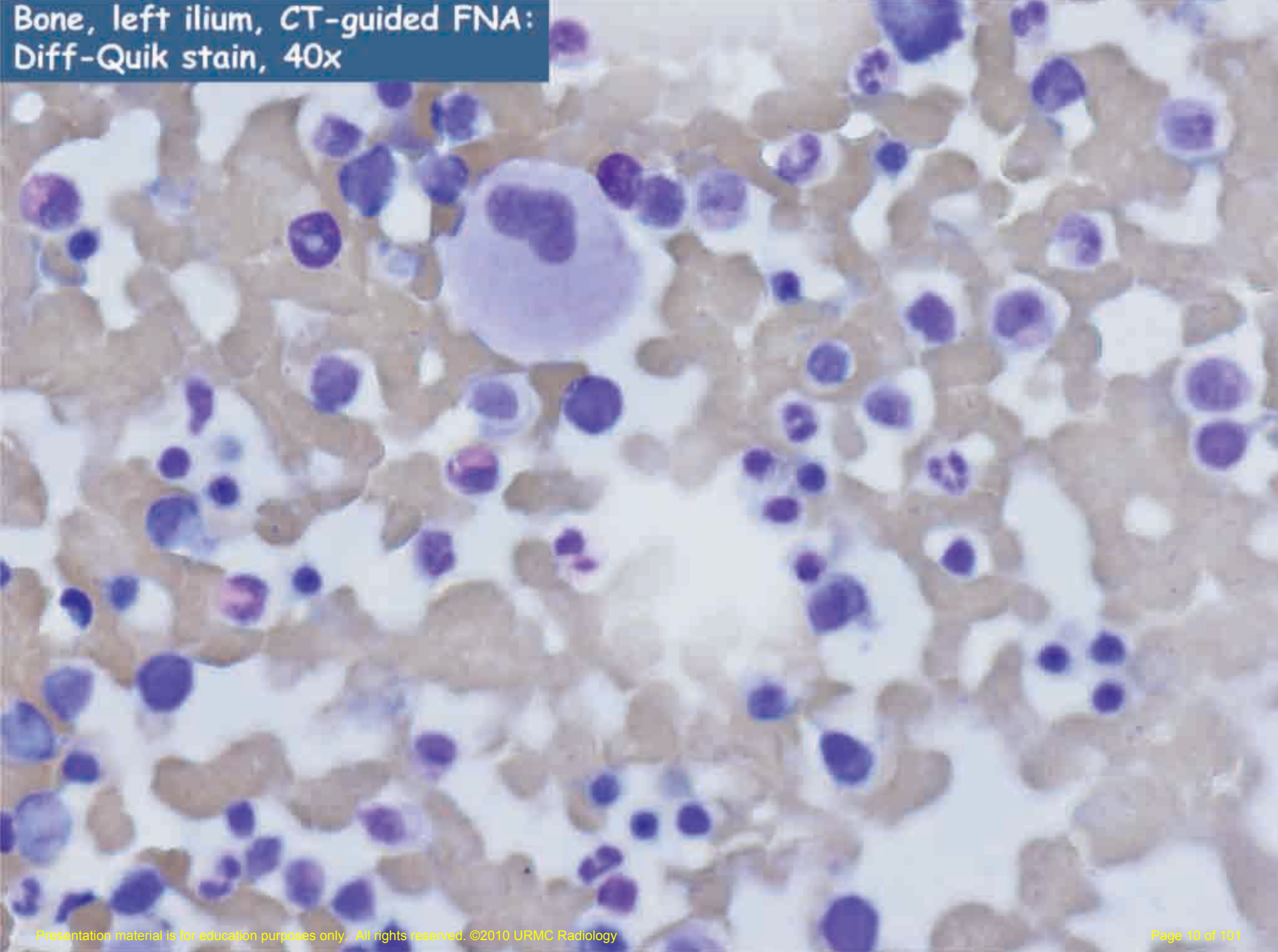
Differential Diagnosis of Multiple Lucent Bone Lesions

- Metastasis
- Multiple Myeloma
- Lymphoma
- Fibrous Dysplasia
- Eosinophilic granuloma/Enchondroma

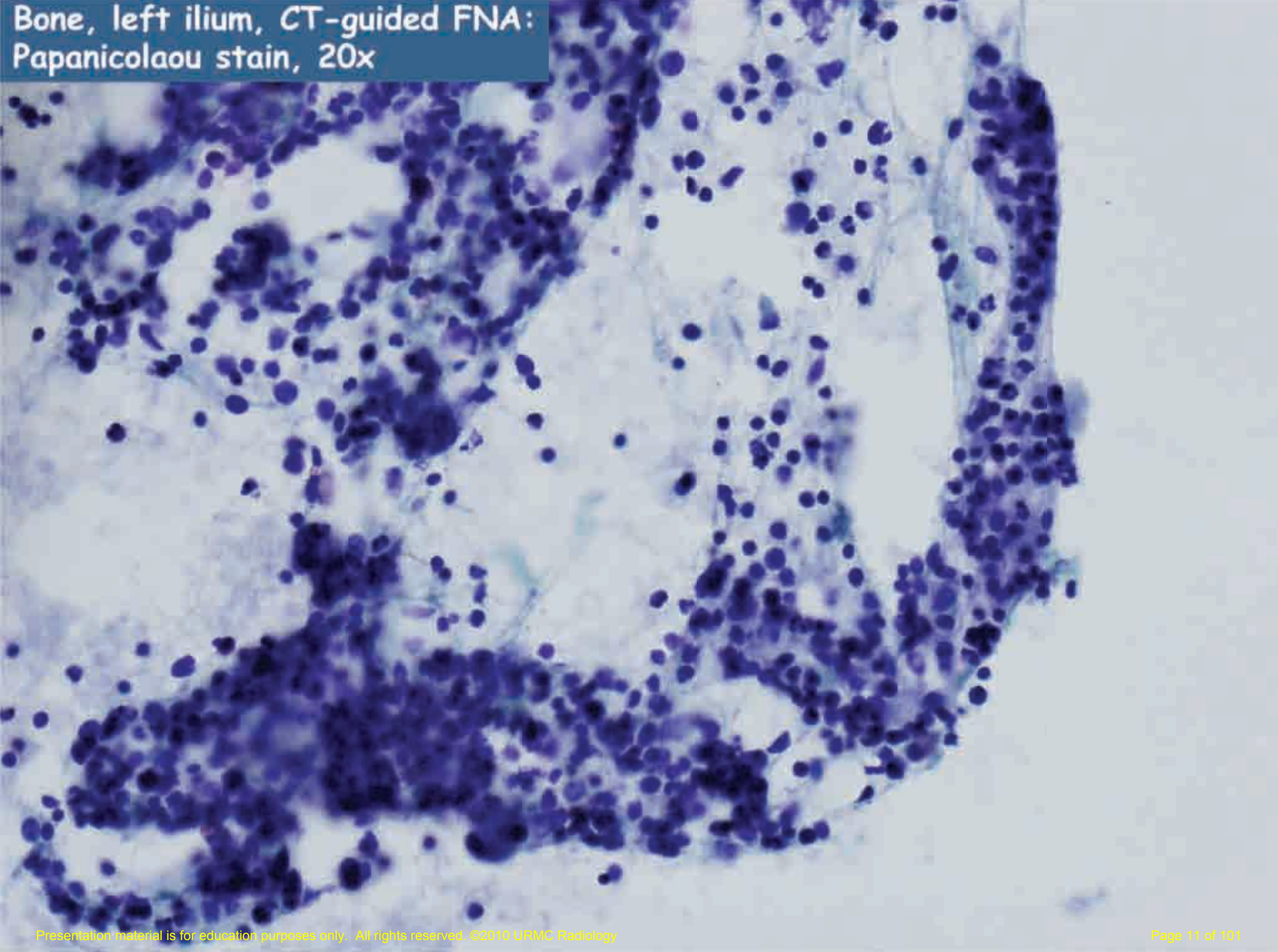


CT guided biopsy of left iliac lytic lesion

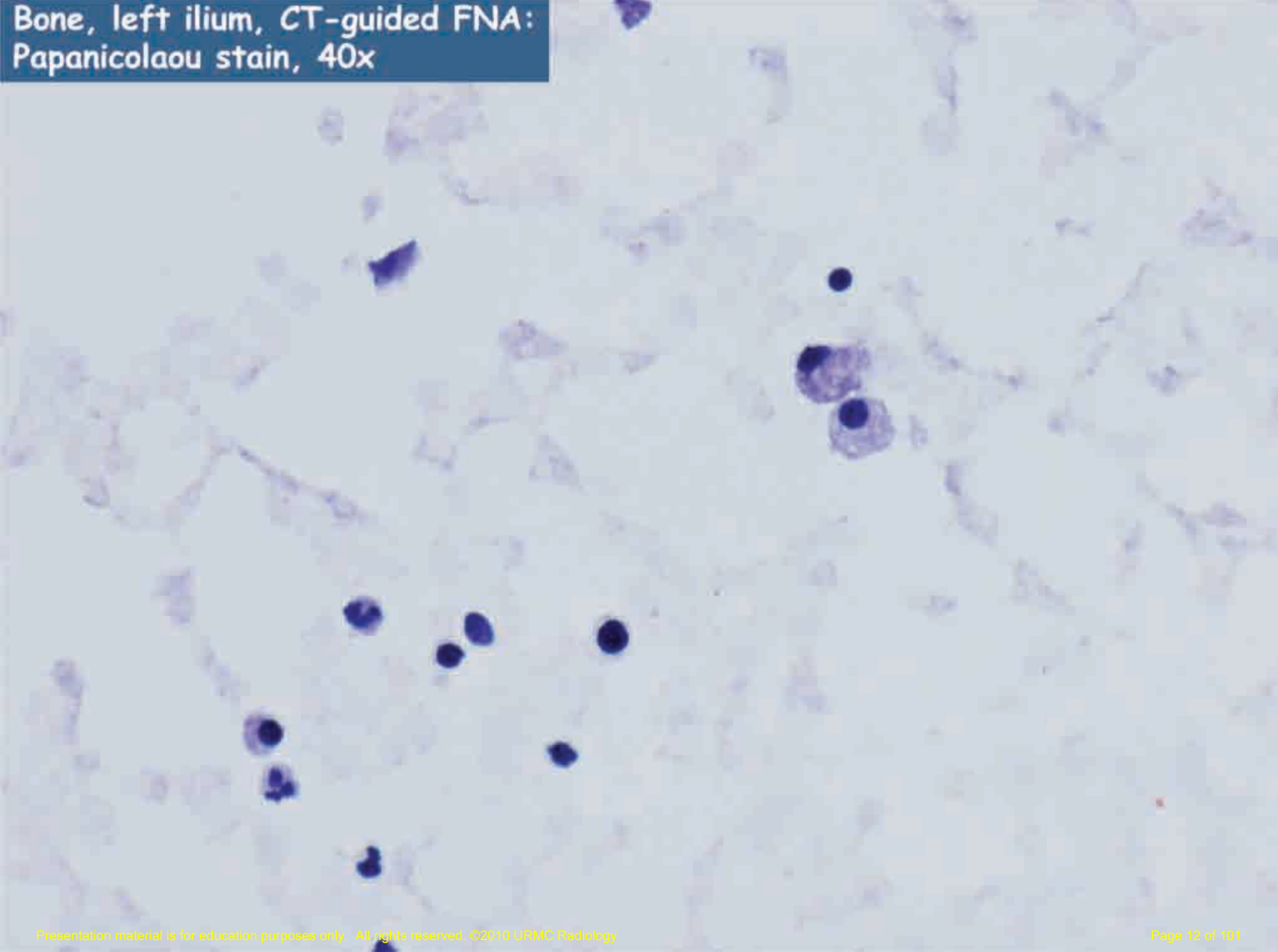




Bone, left ilium, CT-guided FNA:
Papanicolaou stain, 20x



Bone, left ilium, CT-guided FNA:
Papanicolaou stain, 40x

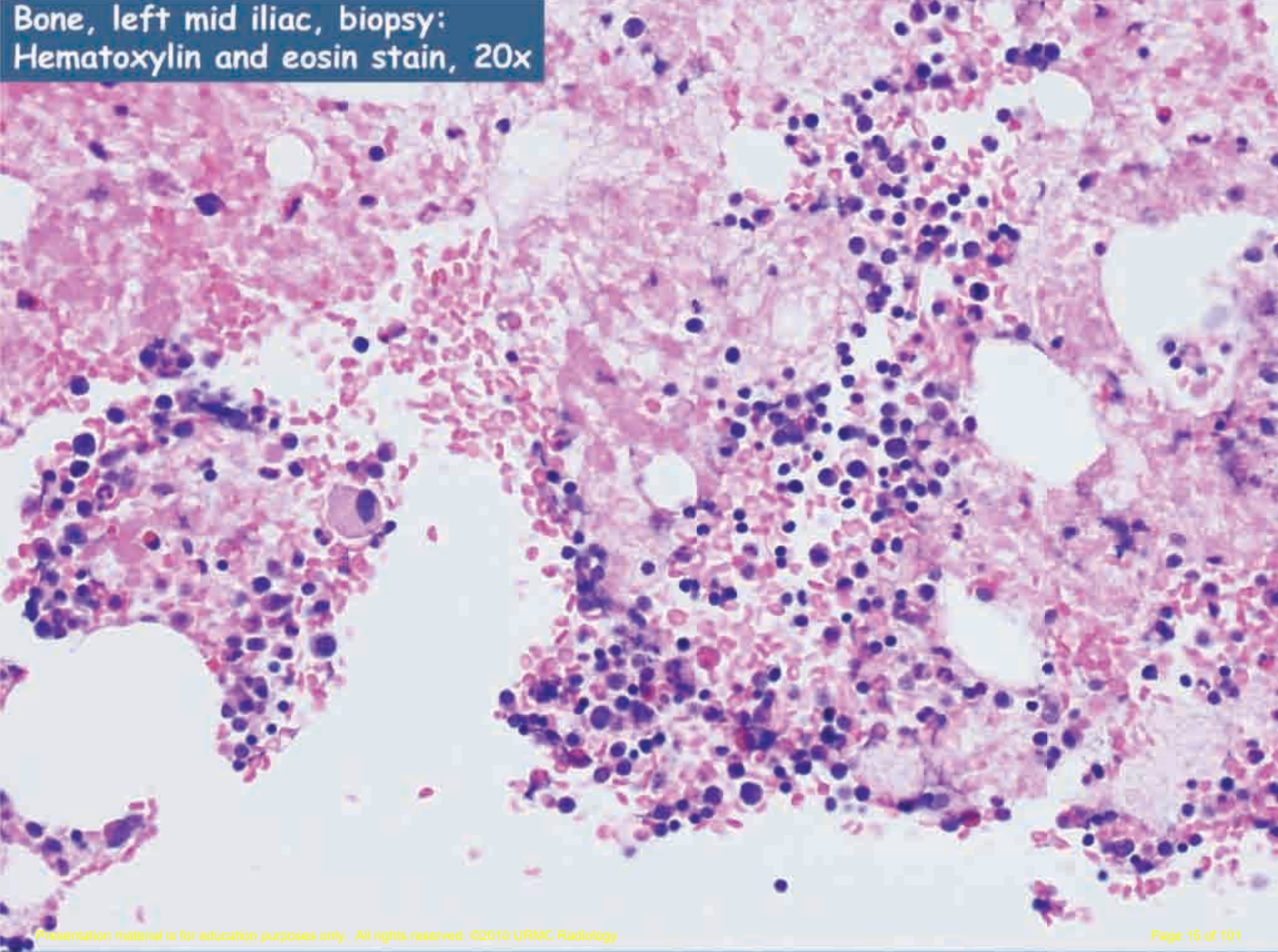


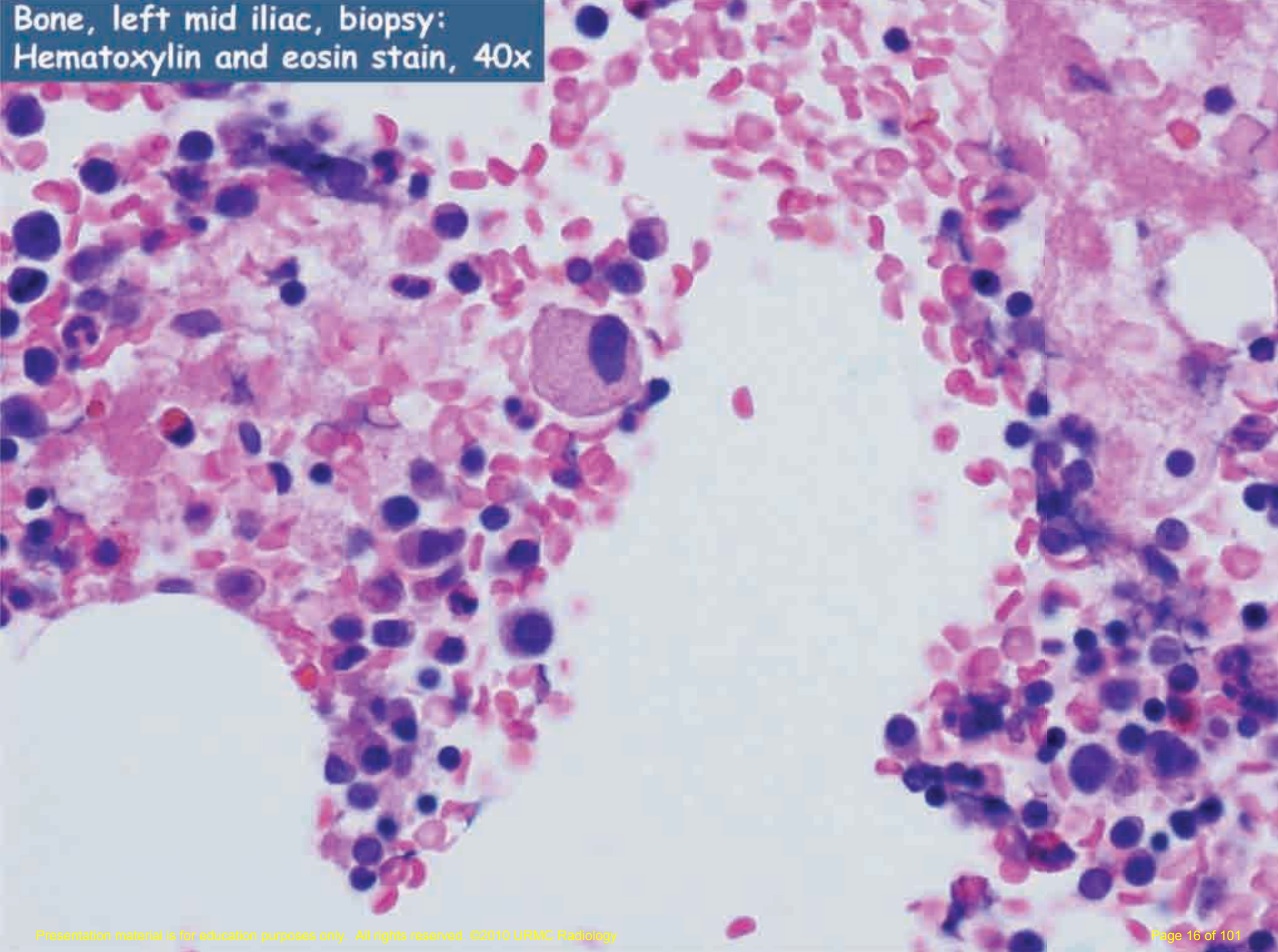
Bone, left ilium, CT-guided fine needle aspiration:

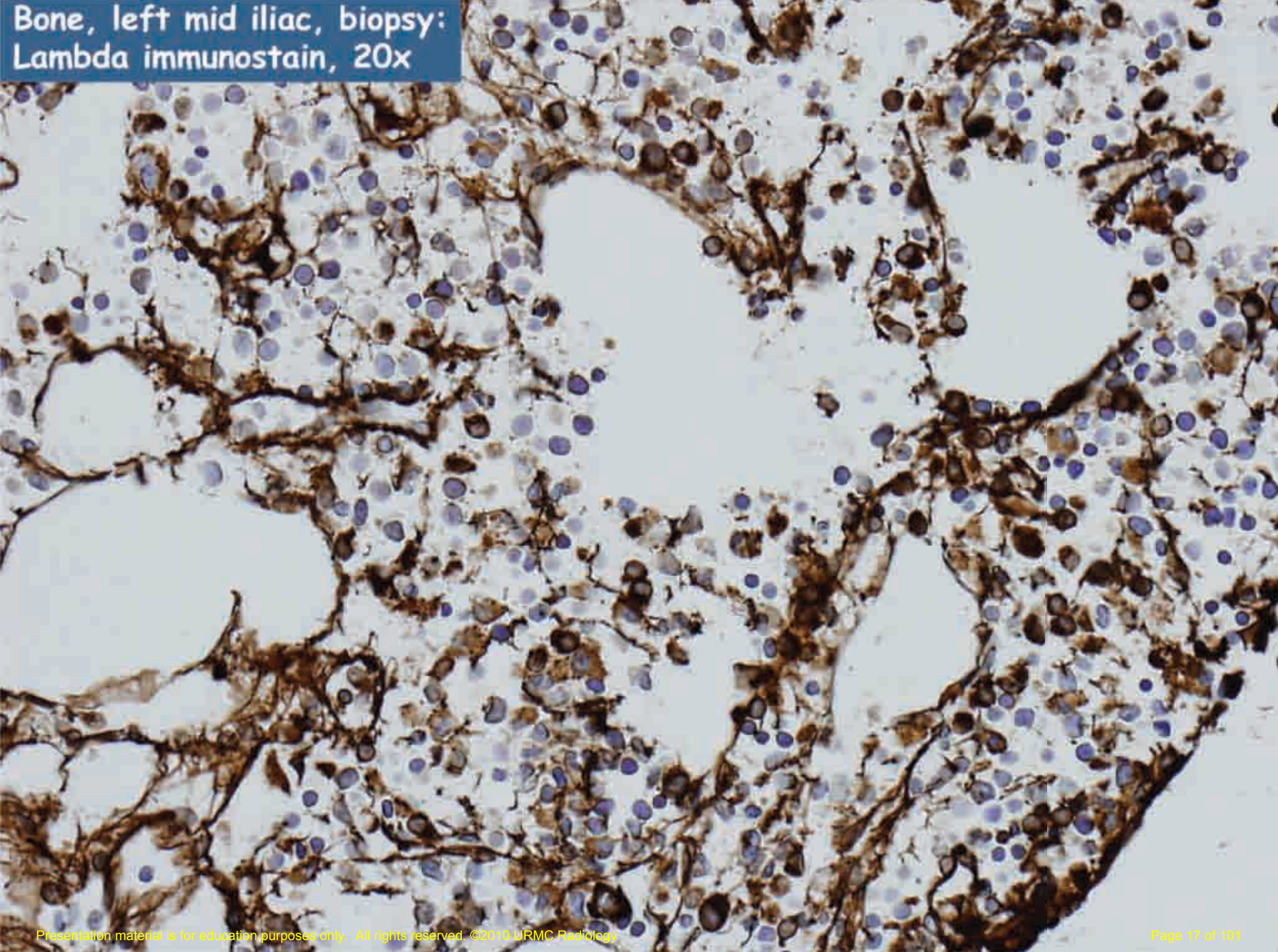
Cellular evidence of bone marrow elements. No evidence of metastatic carcinoma.

Bone, left mid iliac, biopsy:

- Two spicules with substantive marrow present
- Single plasma cells comprise approximately 10% of cellularity
- Concurrent flow cytometry with Lambda plasma cell clonality, in the context of a lytic bone lesion should be considered consistent with symptomatic plasma cell myeloma







Plasma Cell Neoplasm

- Monoclonal proliferation of plasma cells, commonly produce osteolytic lesions
- Common in 6th and 7th decades
- Common sites: vertebra, ribs, skull, pelvis, femur, clavicle and scapula

Differential diagnosis:

-reactive conditions with increase plasma cells

-lymphoma

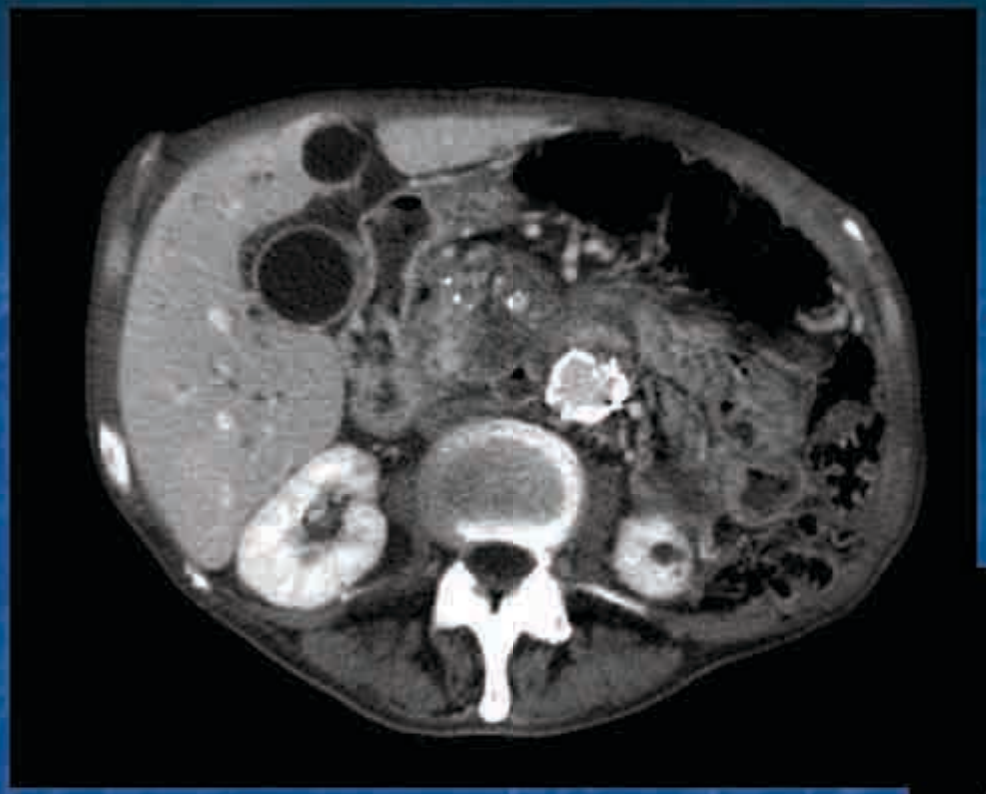
-melanoma

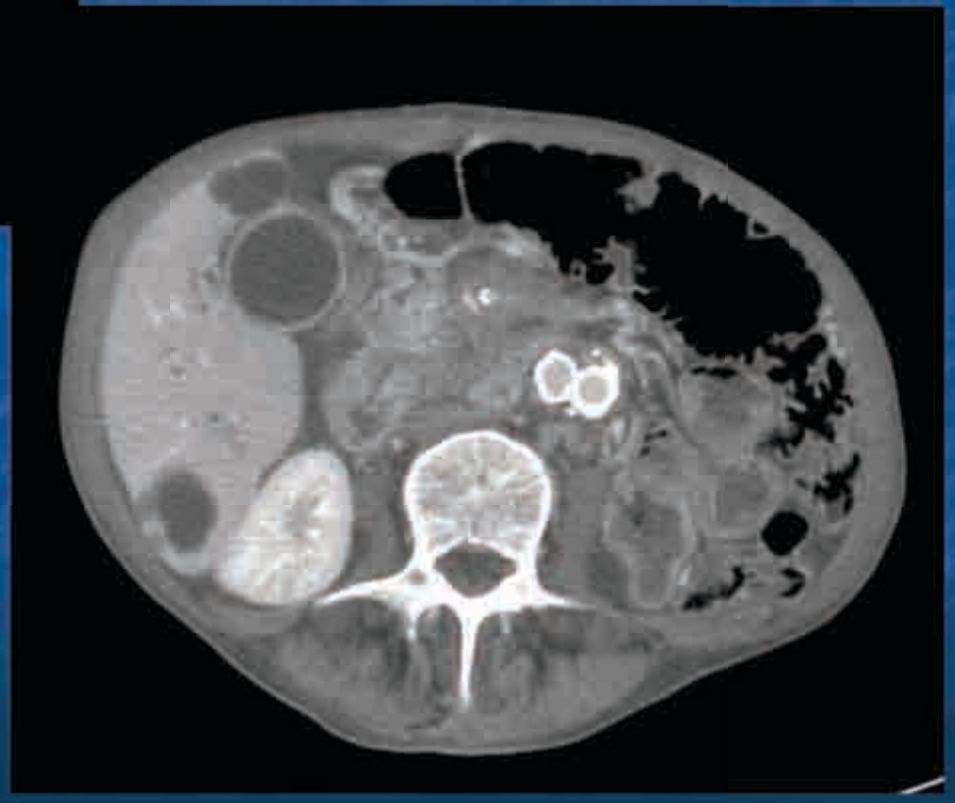
Plasma Cell Myeloma (Multiple Myeloma)

- Multiple myeloma is the most common bone malignancy
- Lytic bone lesions are present in approximately 80% of patients
- Role of imaging
  - Conventional radiographs→ Bone Survey
    - Initial work up
    - False negative rate 30-70%
  - MRI
    - Ideal for detection of EARLY bone destruction and marrow changes
    - Better at estimating instability of areas with bone lesions and fracture risk
  - Other modalities: low dose CT, nuclear medicine studies

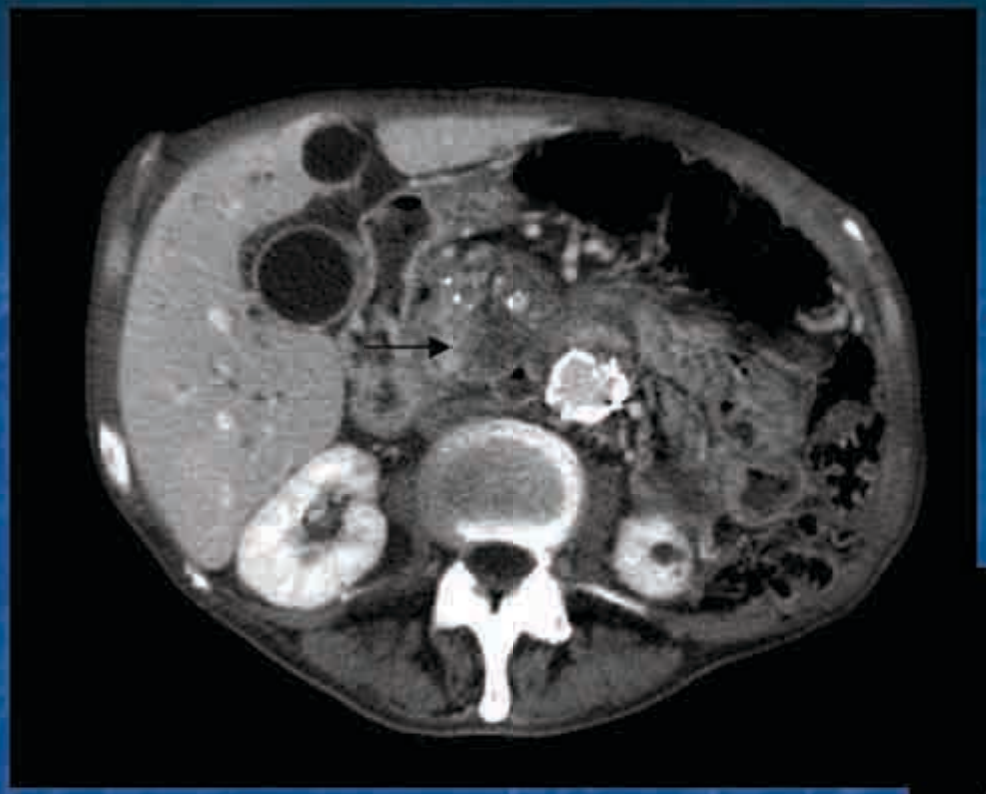
Case 2

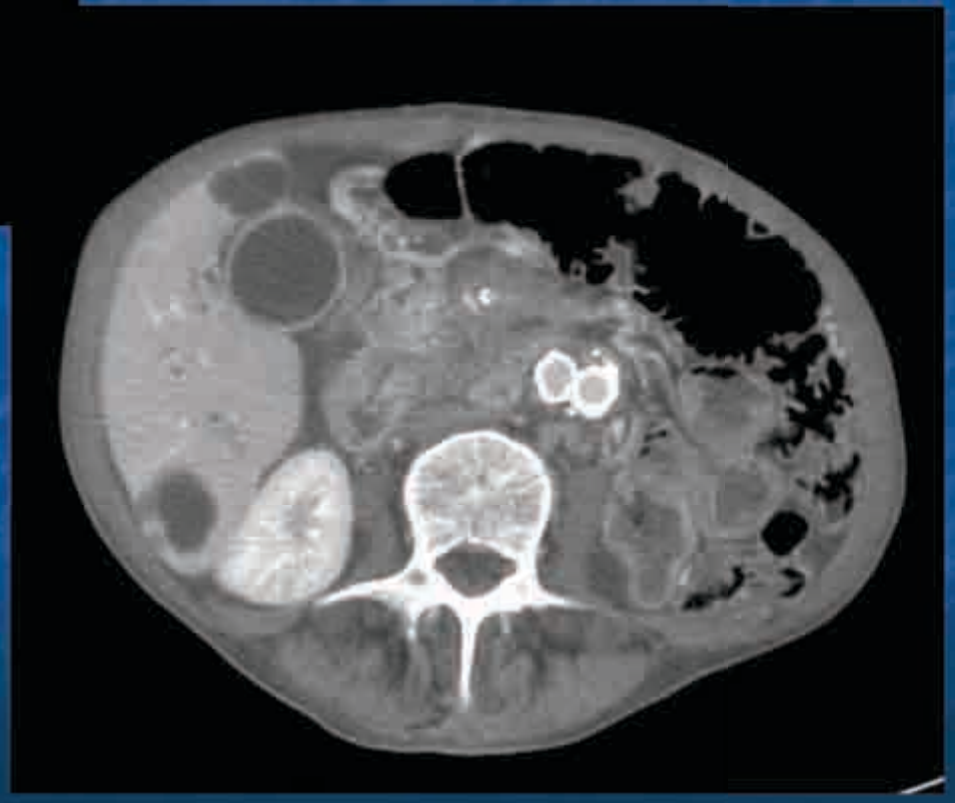
- 77 year old male with history of chronic pancreatitis
- Presenting with significant weight loss and abdominal pain



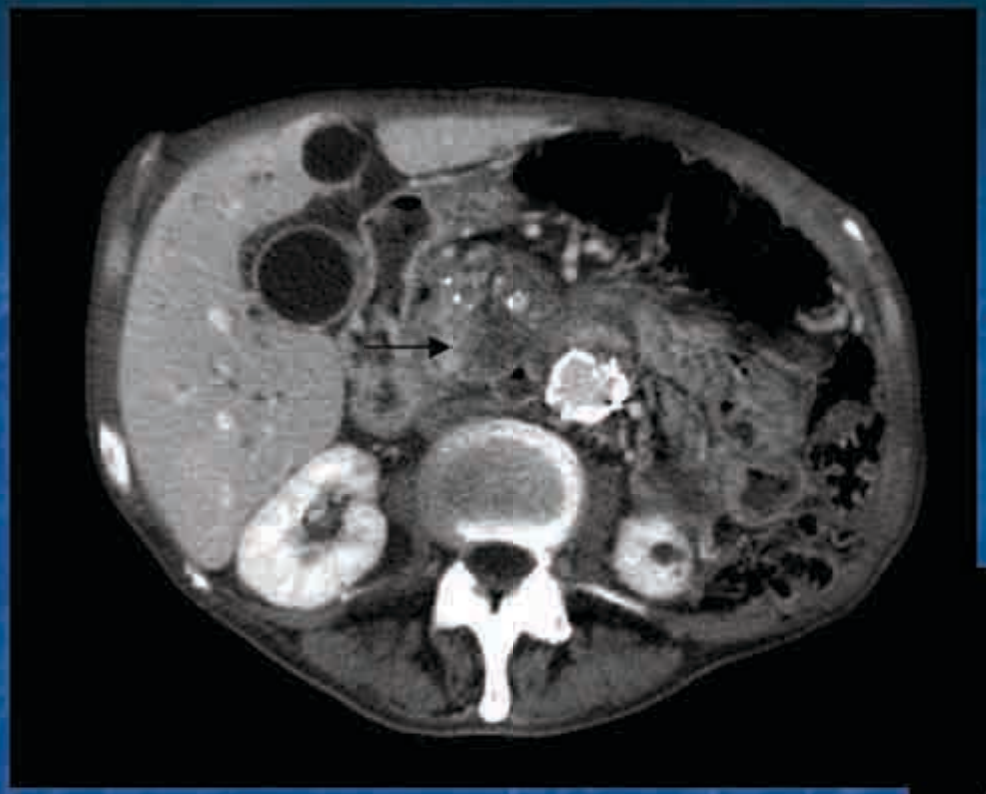


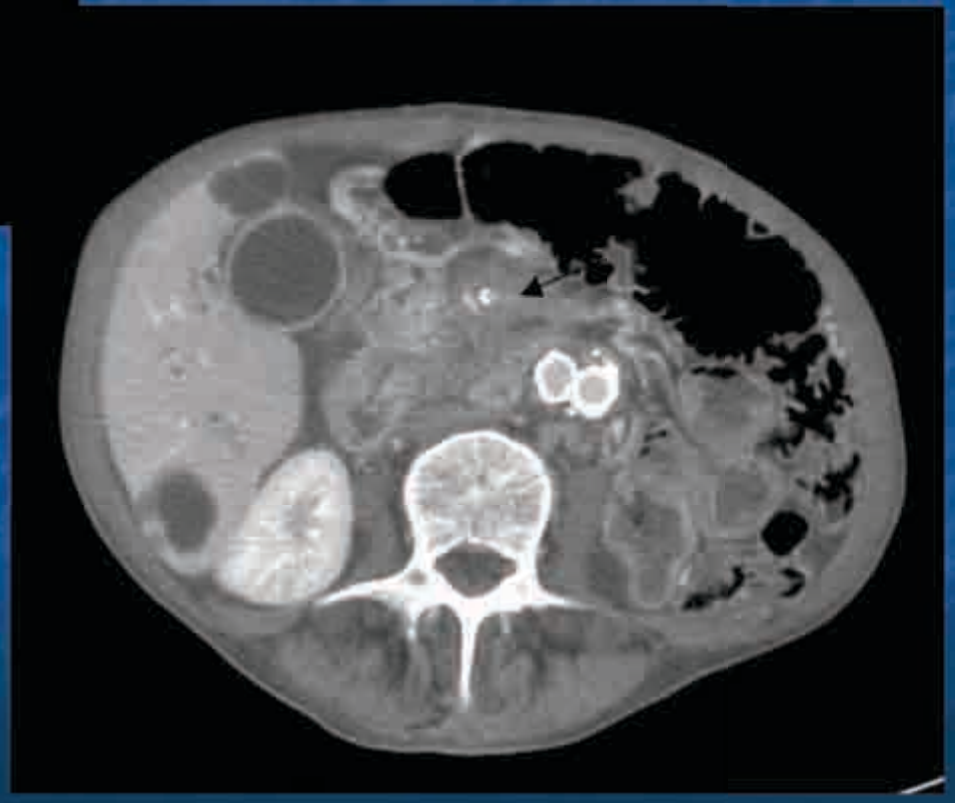
CT abdomen 3/2010



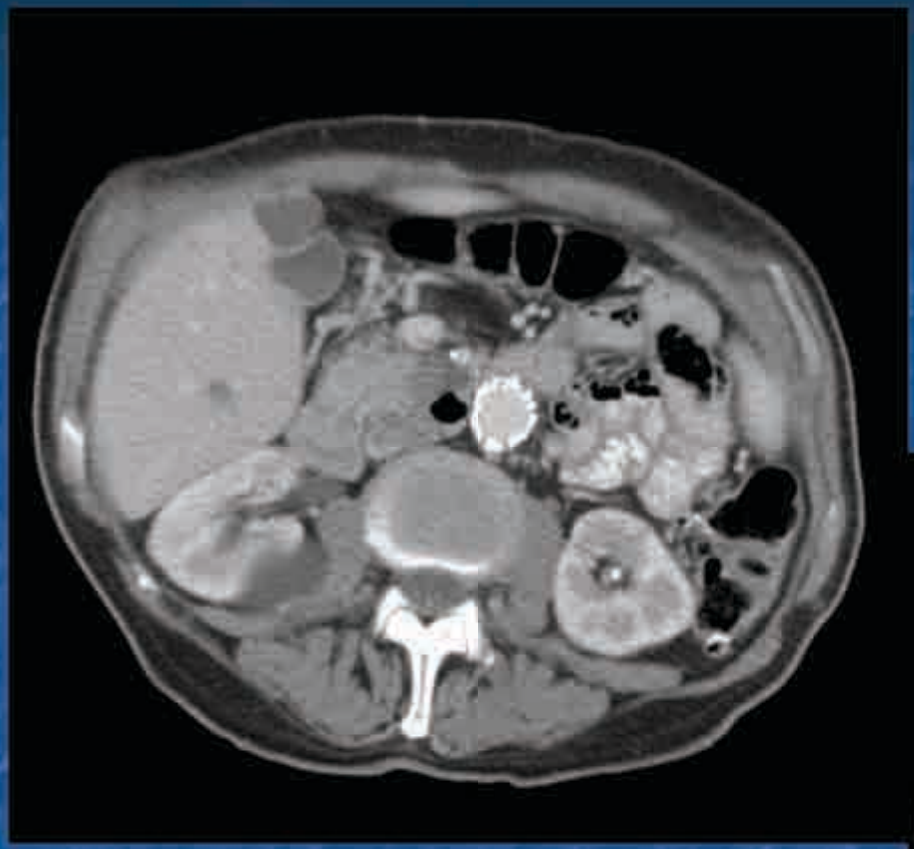


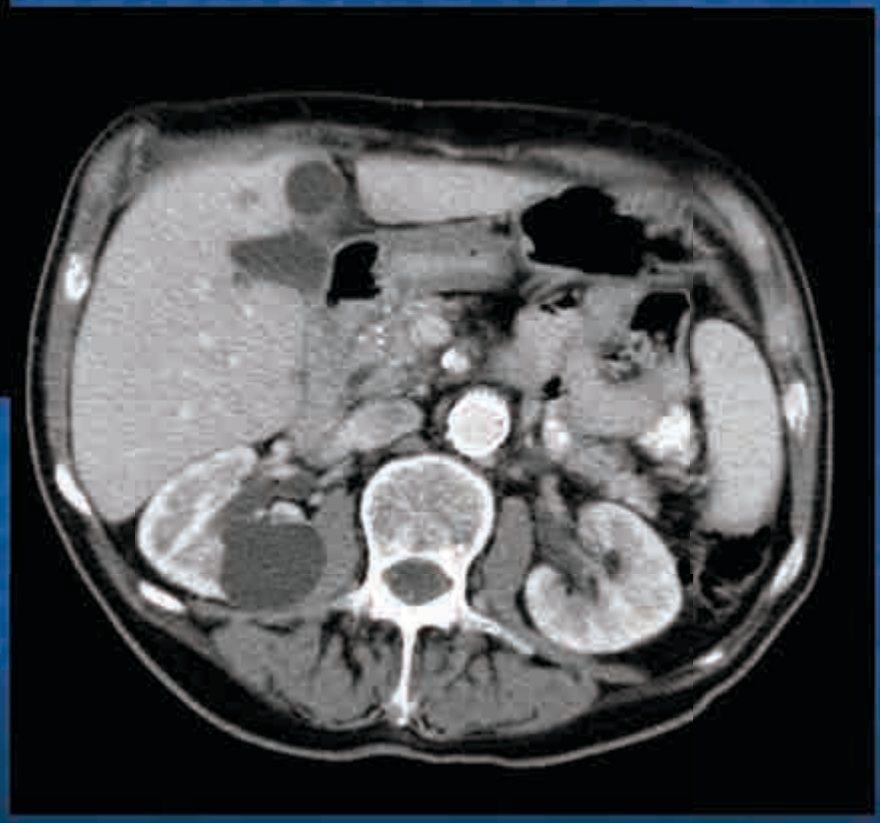
CT abdomen 3/2010





CT abdomen 3/2010

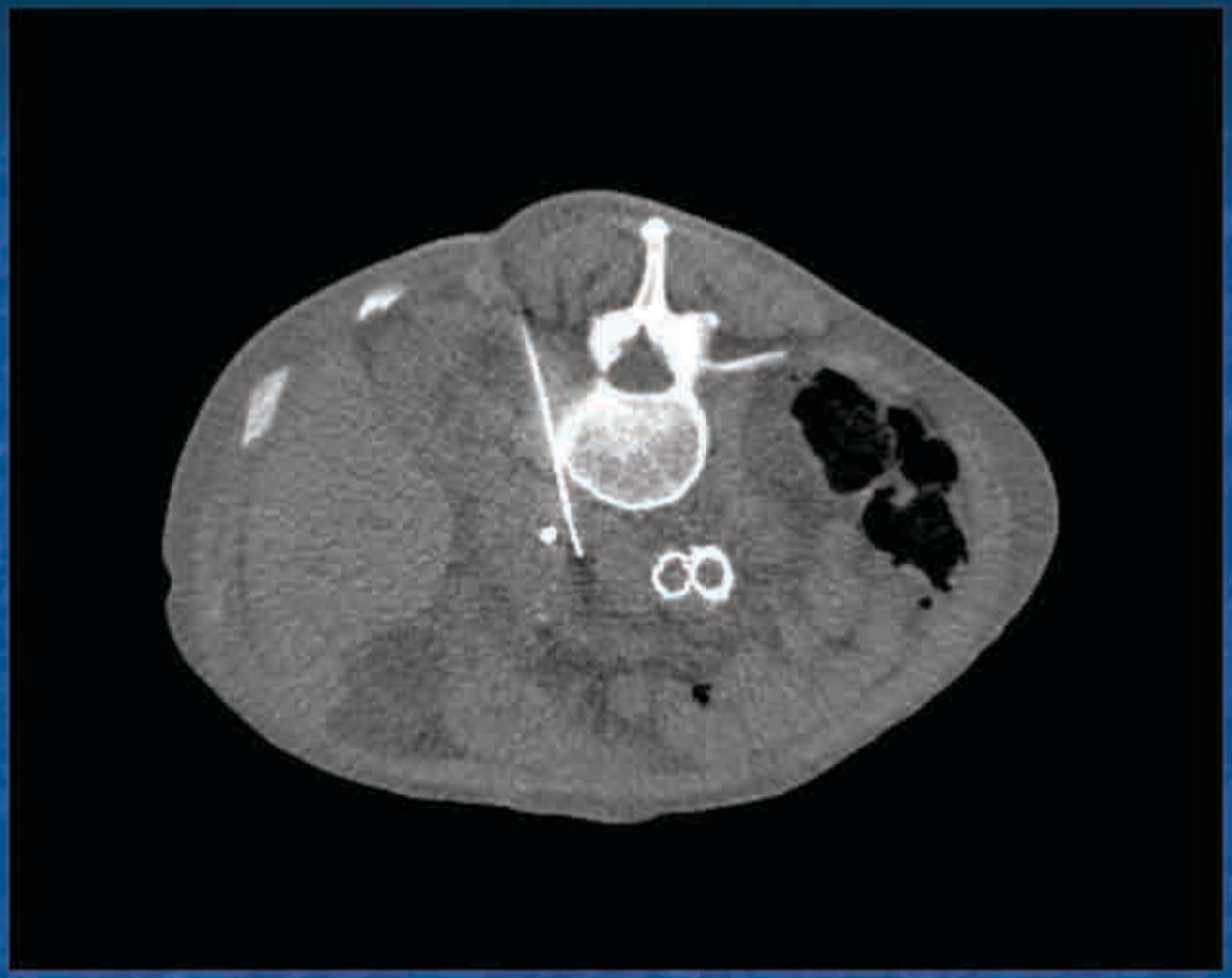




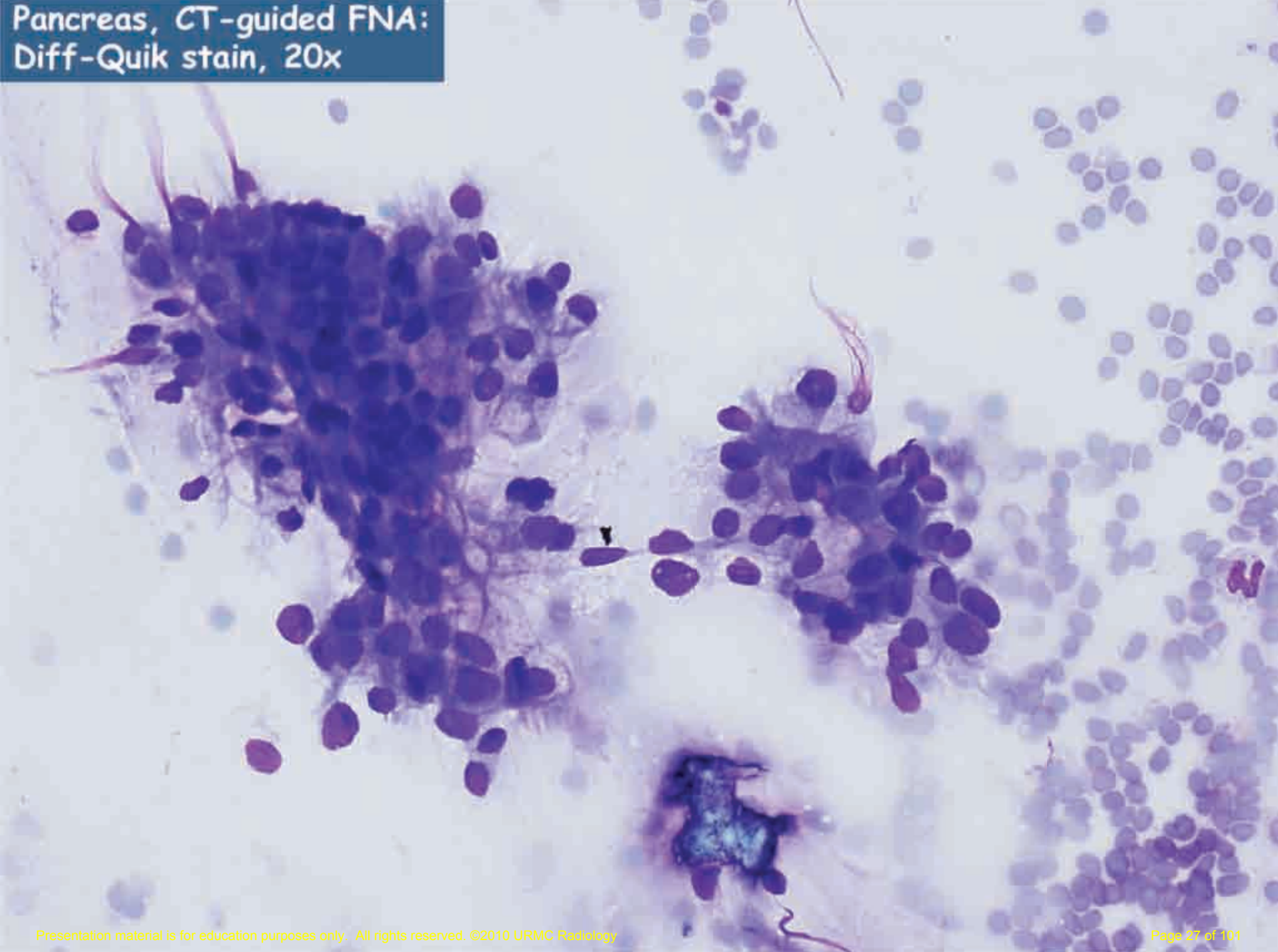
CT abdomen 9/2009

Differential Diagnosis of a Solid Pancreatic Mass

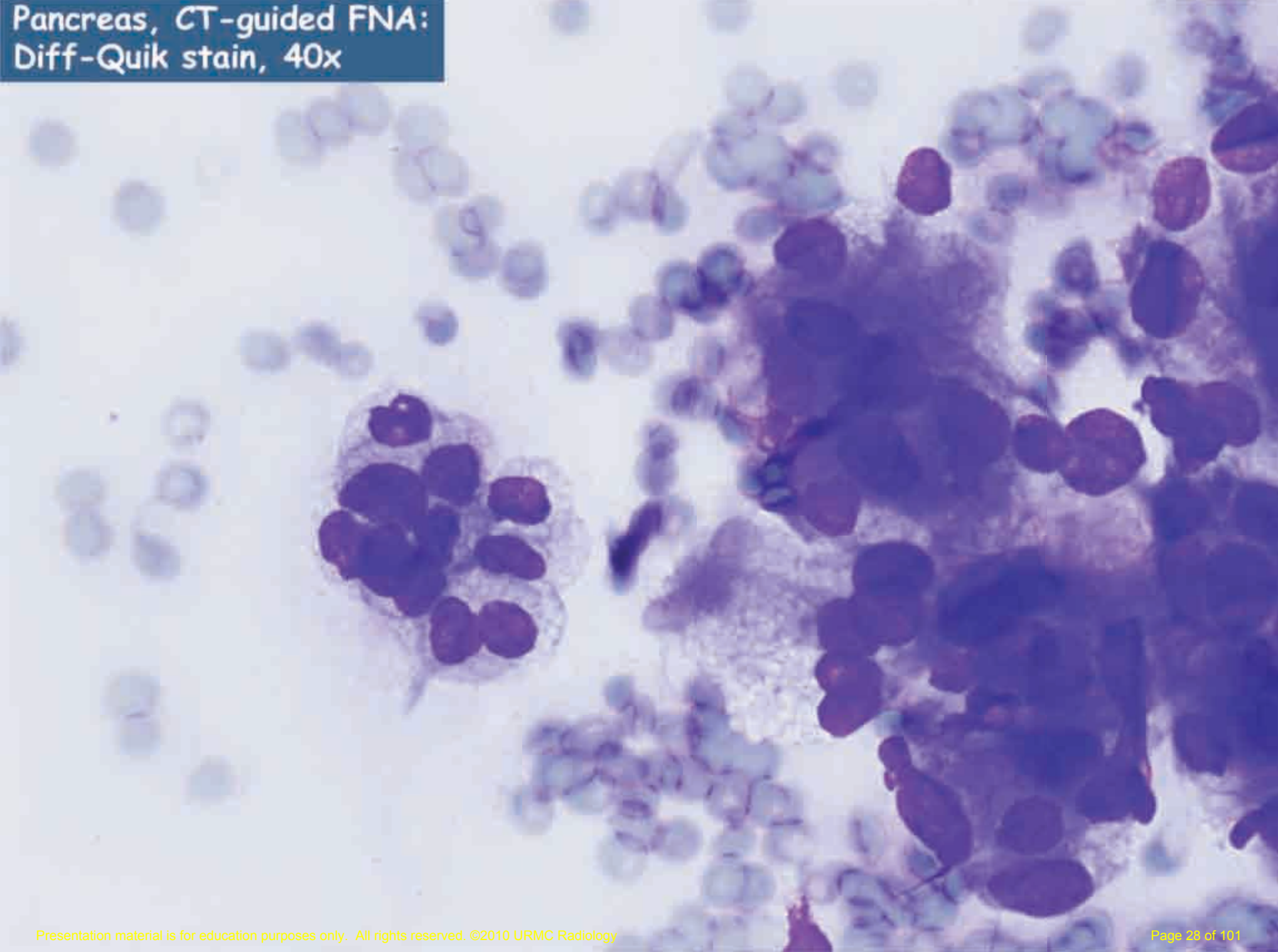
- Adenocarcinoma
  - **Most common** solid pancreatic mass
  - Typically presents with advanced disease
- Chronic pancreatitis
- Neuroendocrine tumors
  - Uncommon→ representing 2-4% of all pancreatic neoplasms
  - Functional and nonfunctional types
- Others: solid pseudopapillary tumor, metastasis



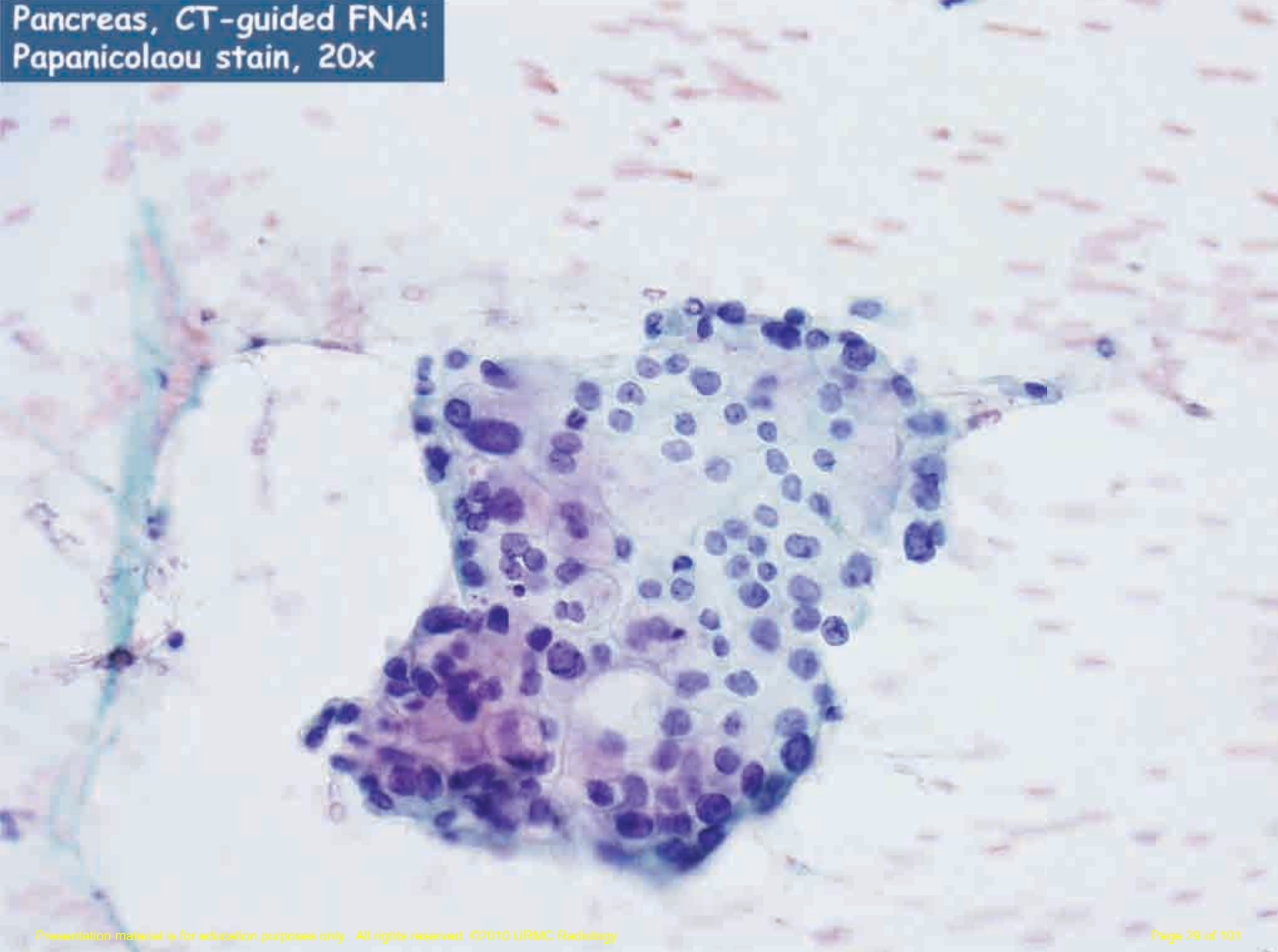
CT guided biopsy of pancreatic head mass 4/1/2010



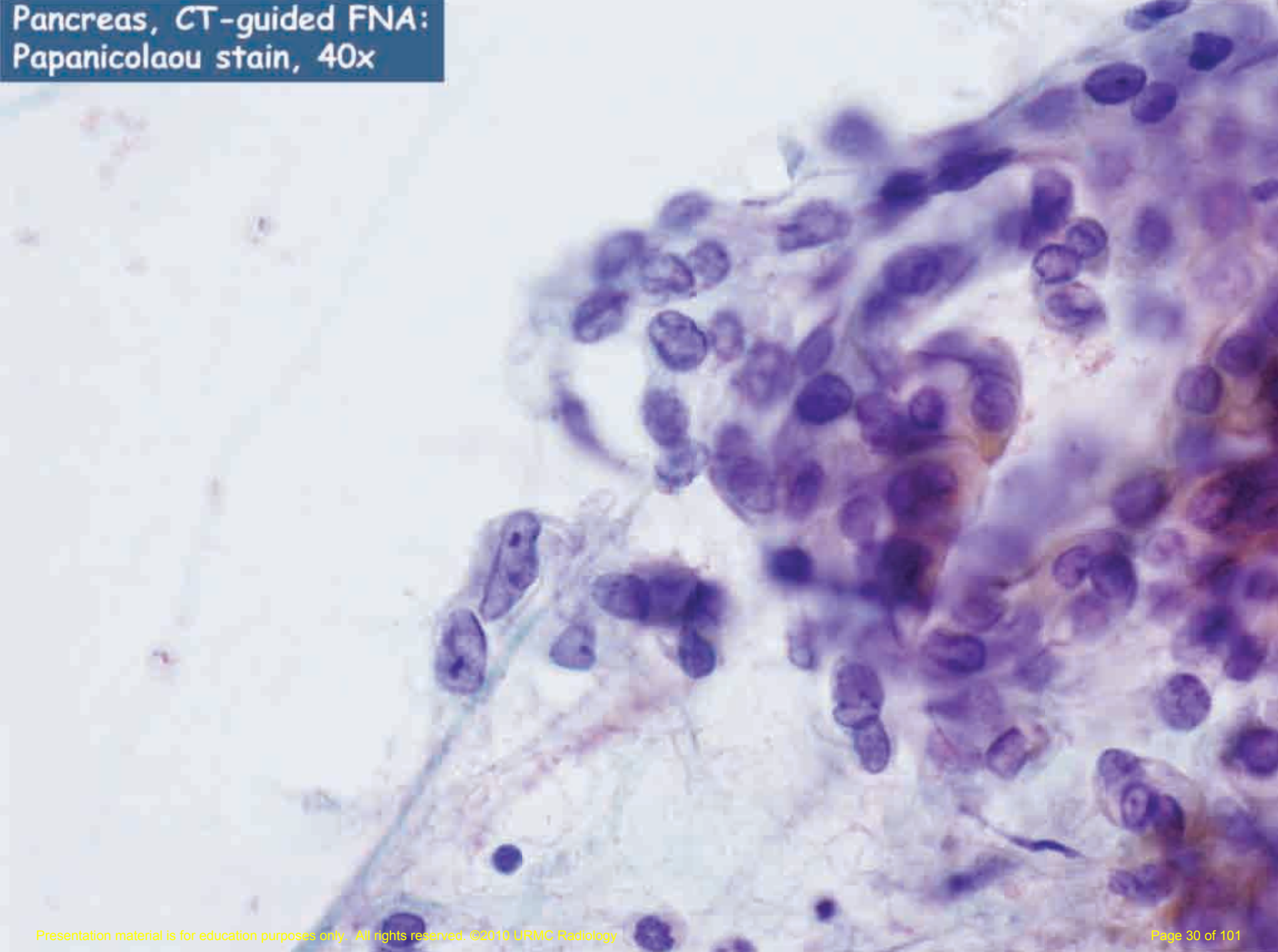
Pancreas, CT-guided FNA:
Diff-Quik stain, 40x

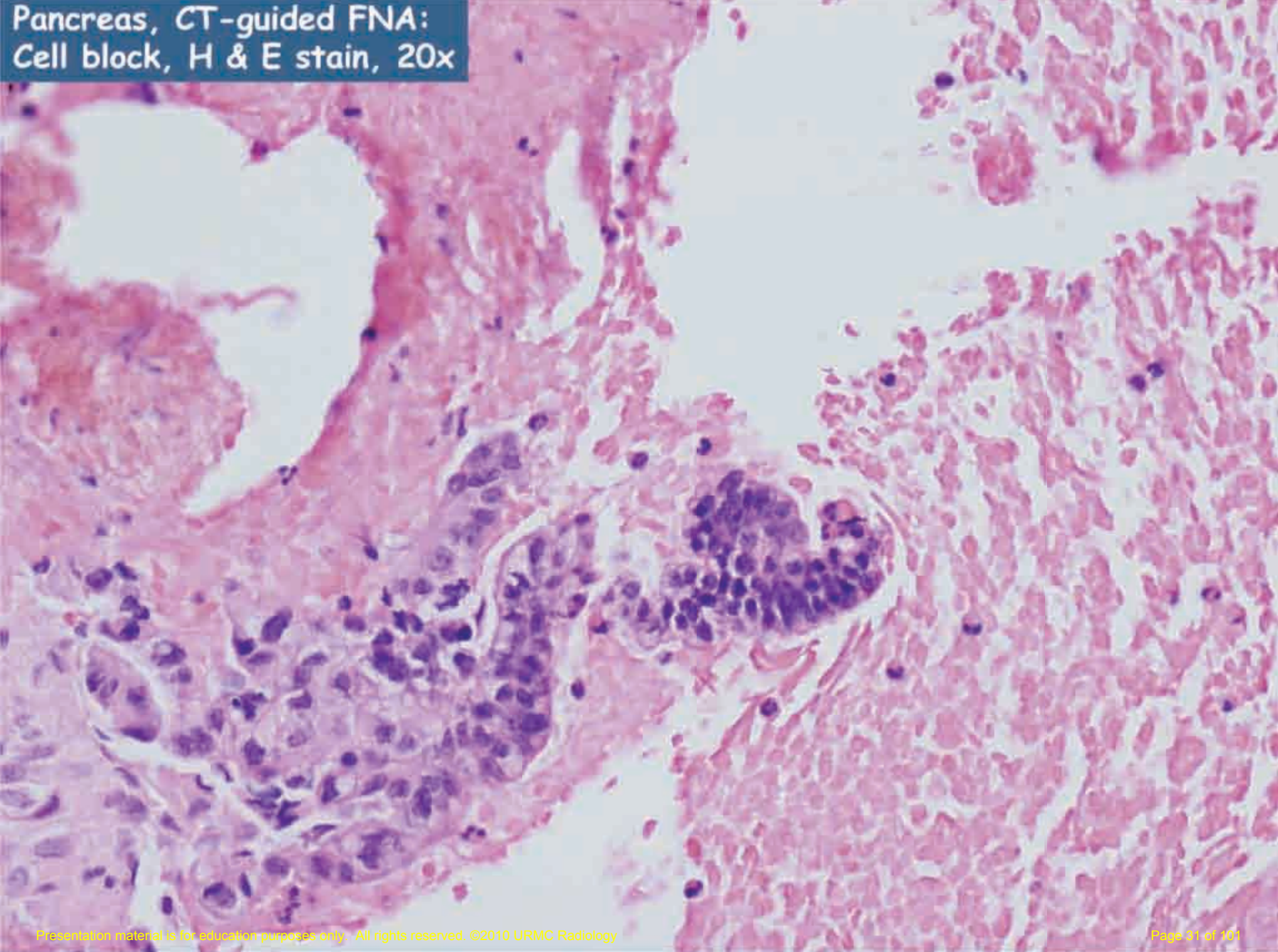


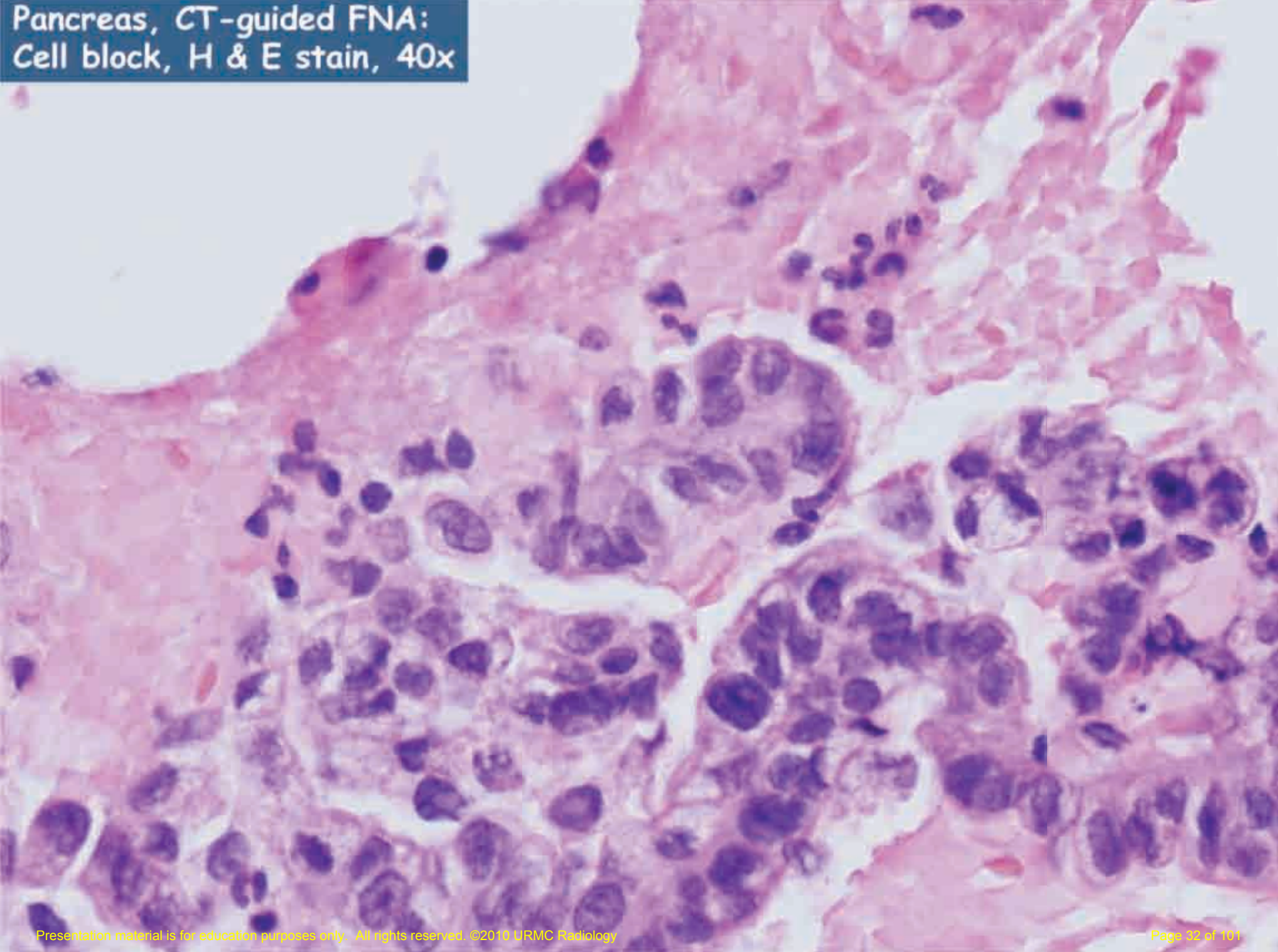
Pancreas, CT-guided FNA:
Papanicolaou stain, 20x



Pancreas, CT-guided FNA:
Papanicolaou stain, 40x







Pancreas, CT-guided fine needle aspiration:

Malignant tumor cells present derived from adenocarcinoma.

Cell block and cytologic preparations examined.

Pancreatic Adenocarcinoma

- Pancreatic carcinoma ranks 4th in frequency of cancer deaths in North America, increasing in numbers
- Adenocarcinomas comprise 80-90% of malignant neoplasms of pancreas
- Common in 5th and 6th decades
- 5-year survival rate <15%
- Majority of tumors occur in head of pancreas (2/3) and 1/3 occur in the tail or body

Imaging of Pancreatic Neoplasms

- CT: **premier imaging** modality of choice for diagnosis and staging of **solid** pancreatic tumors
  - Detect lesions > 1cm with sensitivity and specificity >90%
  - Provide information about vascular involvement, local invasion, and metastatic disease
  - Limitation→ inability to detect small peritoneal and liver metastasis

Imaging of Pancreatic Neoplasms

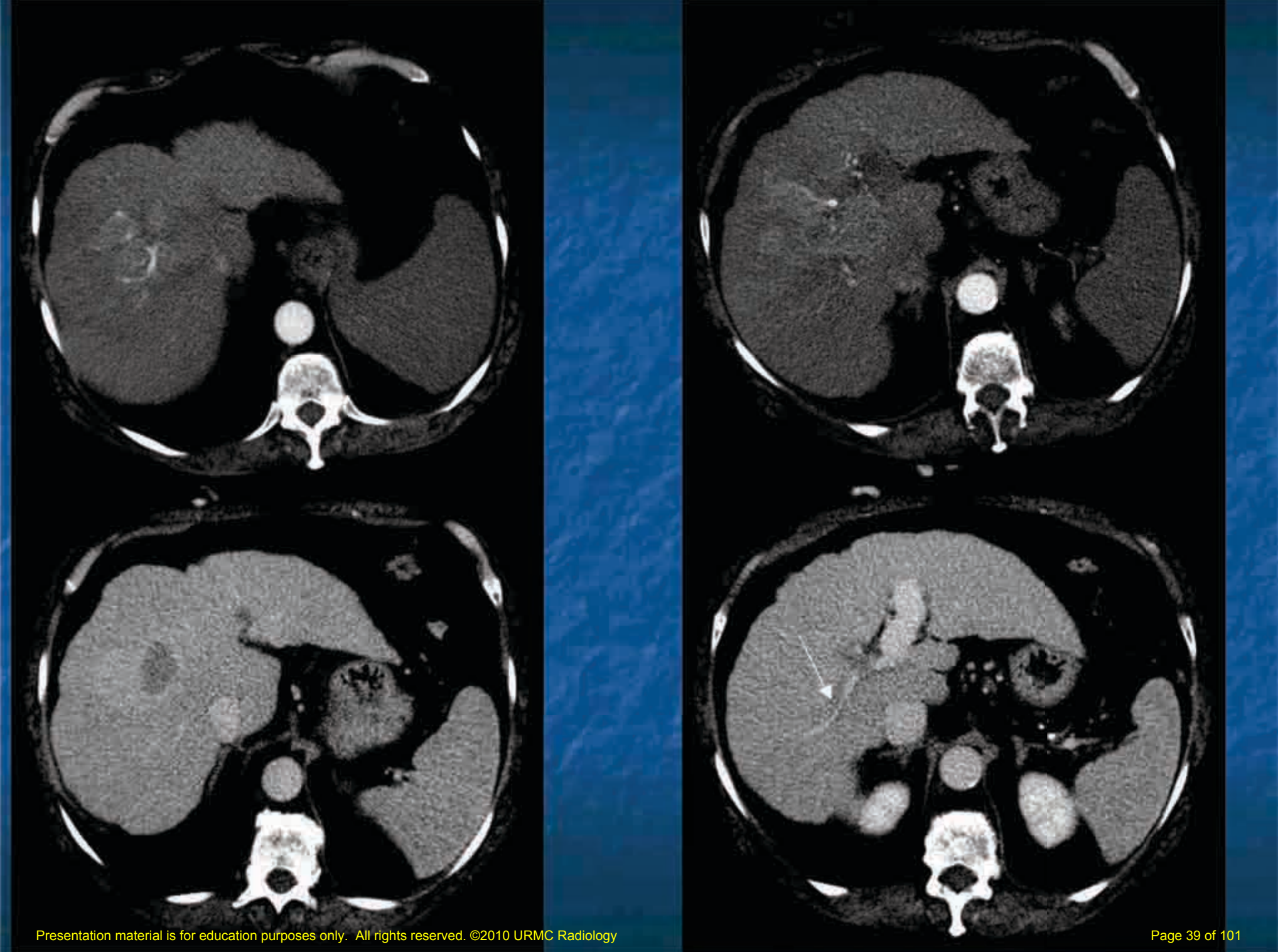
- MRI
  - Sensitivity and specificity ~ 80% for detecting a tumor
  - Advantage over CT in detecting small liver metastasis
- Endoscopic Ultrasound
  - Localization of **small tumors** (<1 cm)→ 95-100% sensitivity
  - Better for tumors in the **body and tail** of the pancreas

Differentiation of Pancreatic Tumor vs. Pancreatitis

- Pancreatic cancer develops in ~ 4% of patients with chronic pancreatitis
- Overlap between CT findings of chronic pancreatitis and pancreatic adenocarcinoma
- Imaging clues for neoplasm
  - Obliteration of fat with tissue surrounding vasculature (ie SMA, celiac trunk)
  - Smooth dilatation of the pancreatic duct vs. irregular distortion as seen with scarring in chronic pancreatitis

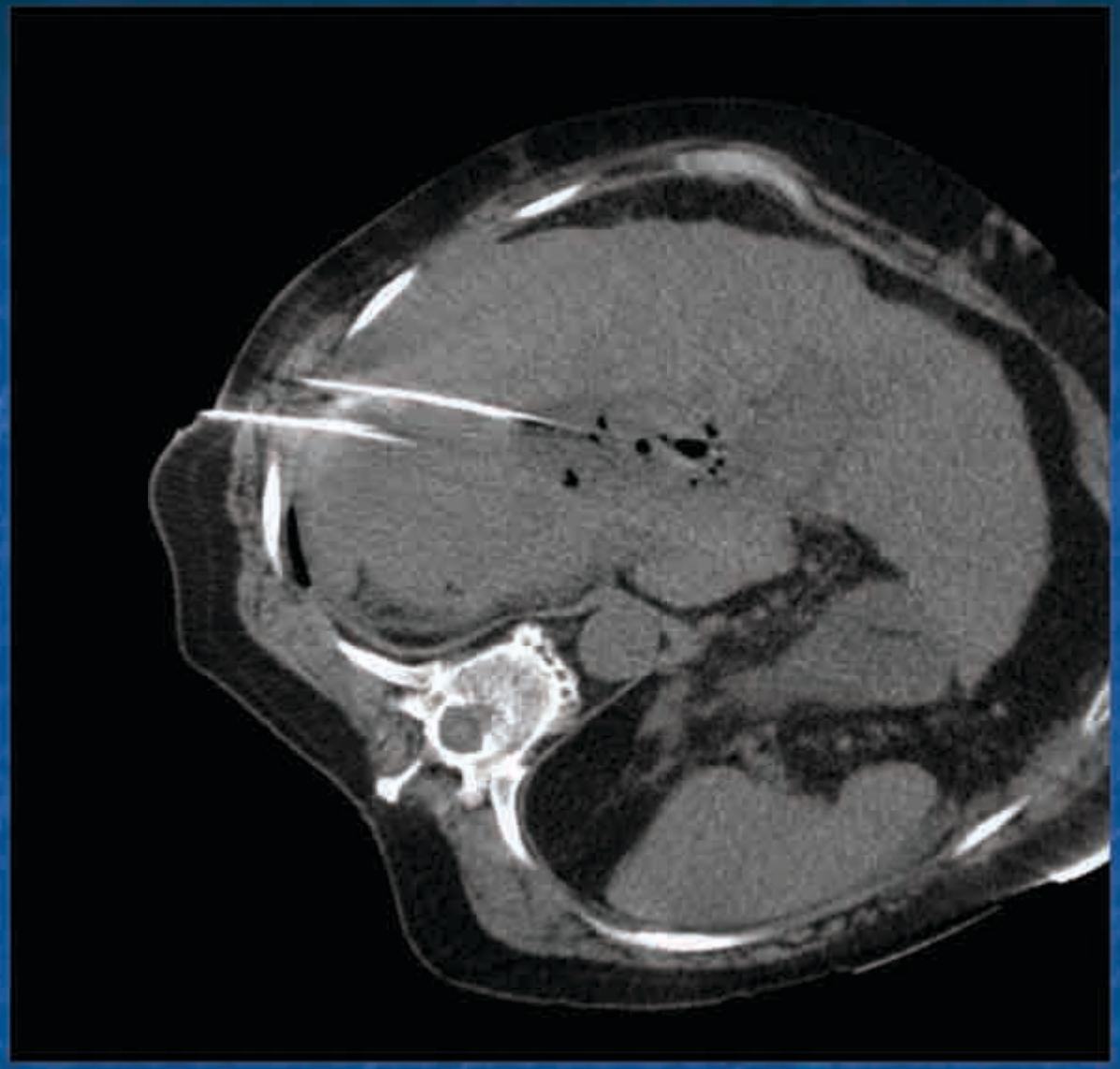
Case 3

- 63 year old female with history of cirrhosis
- Patient presenting for routine surveillance imaging to rule out hepatic tumors

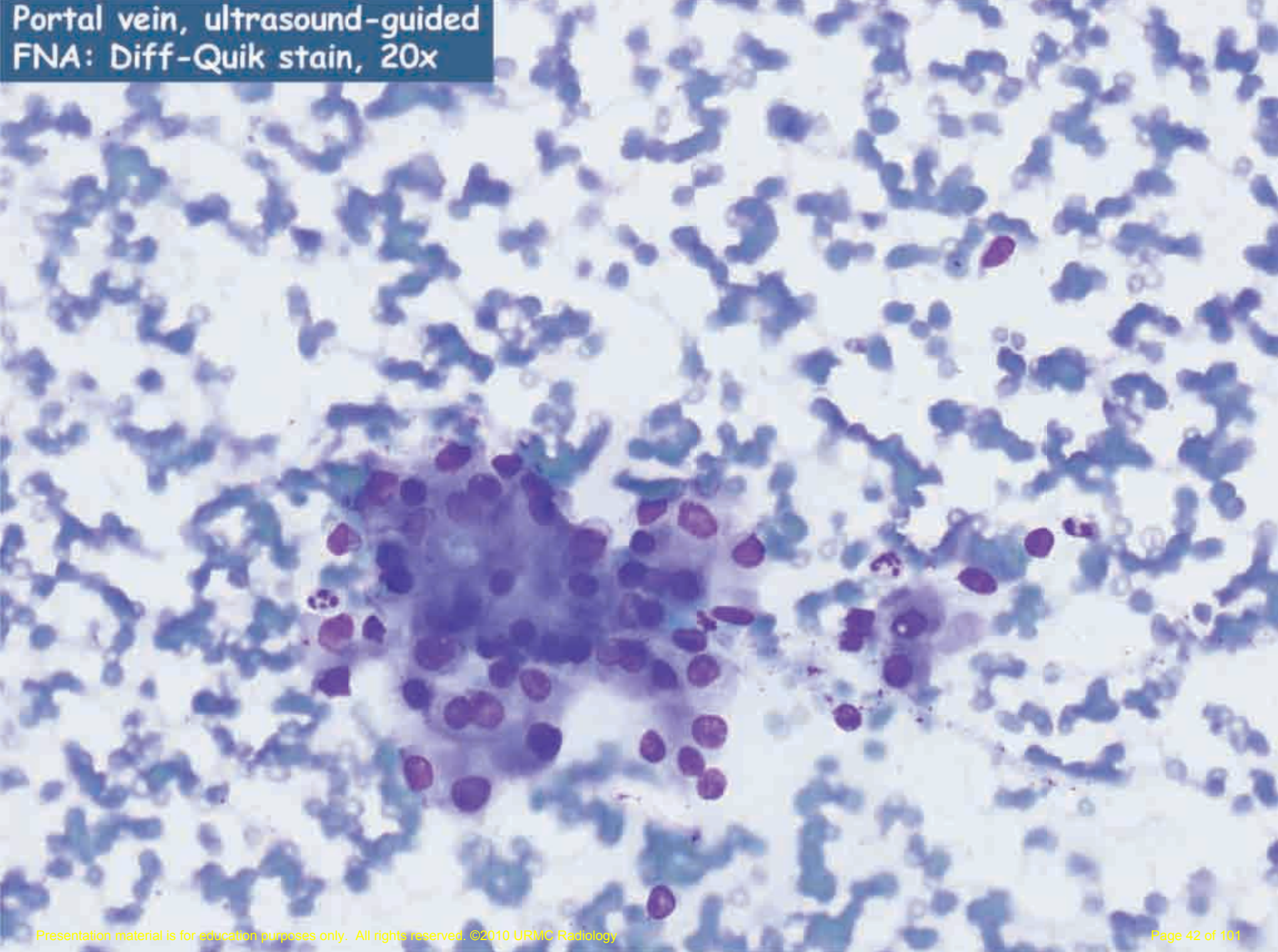


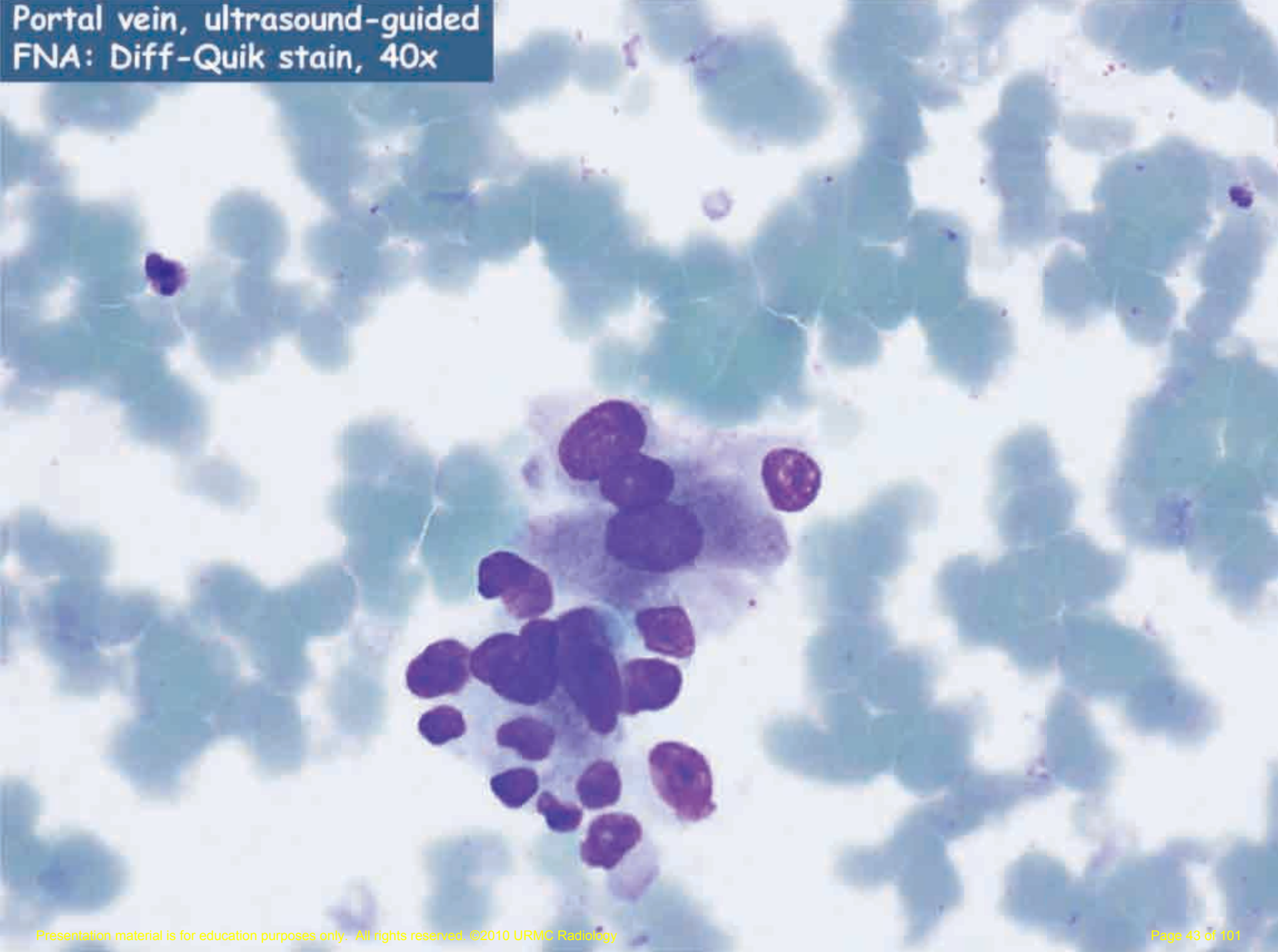
Hypervascular Liver Lesions: Differential Diagnosis

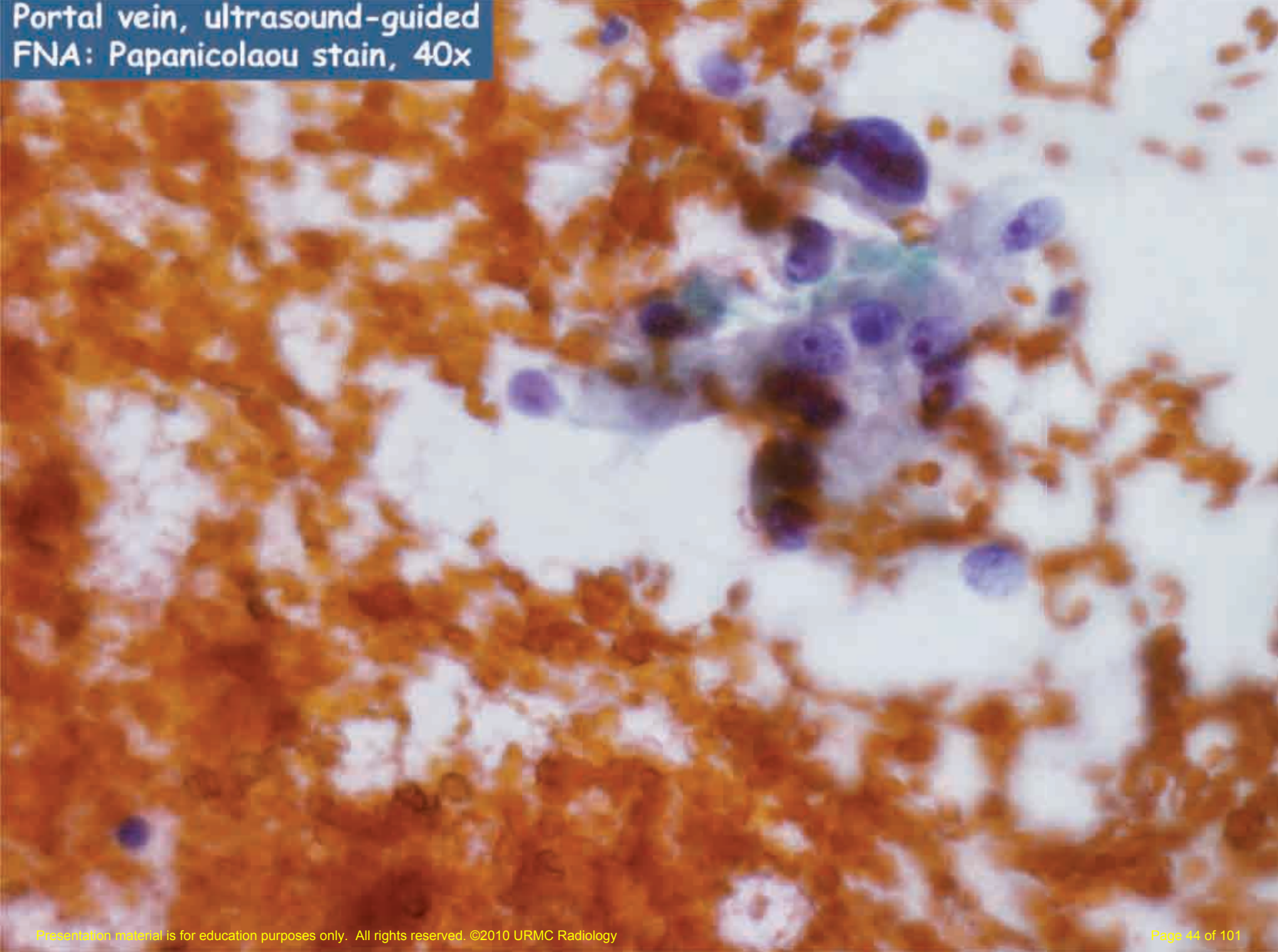
- Hepatocellular Carcinoma
- Hepatic metastasis
- Cavernous Hemangioma
- Focal Nodular Hyperplasia
- Hepatic Adenoma



CT guided portal vein biopsy







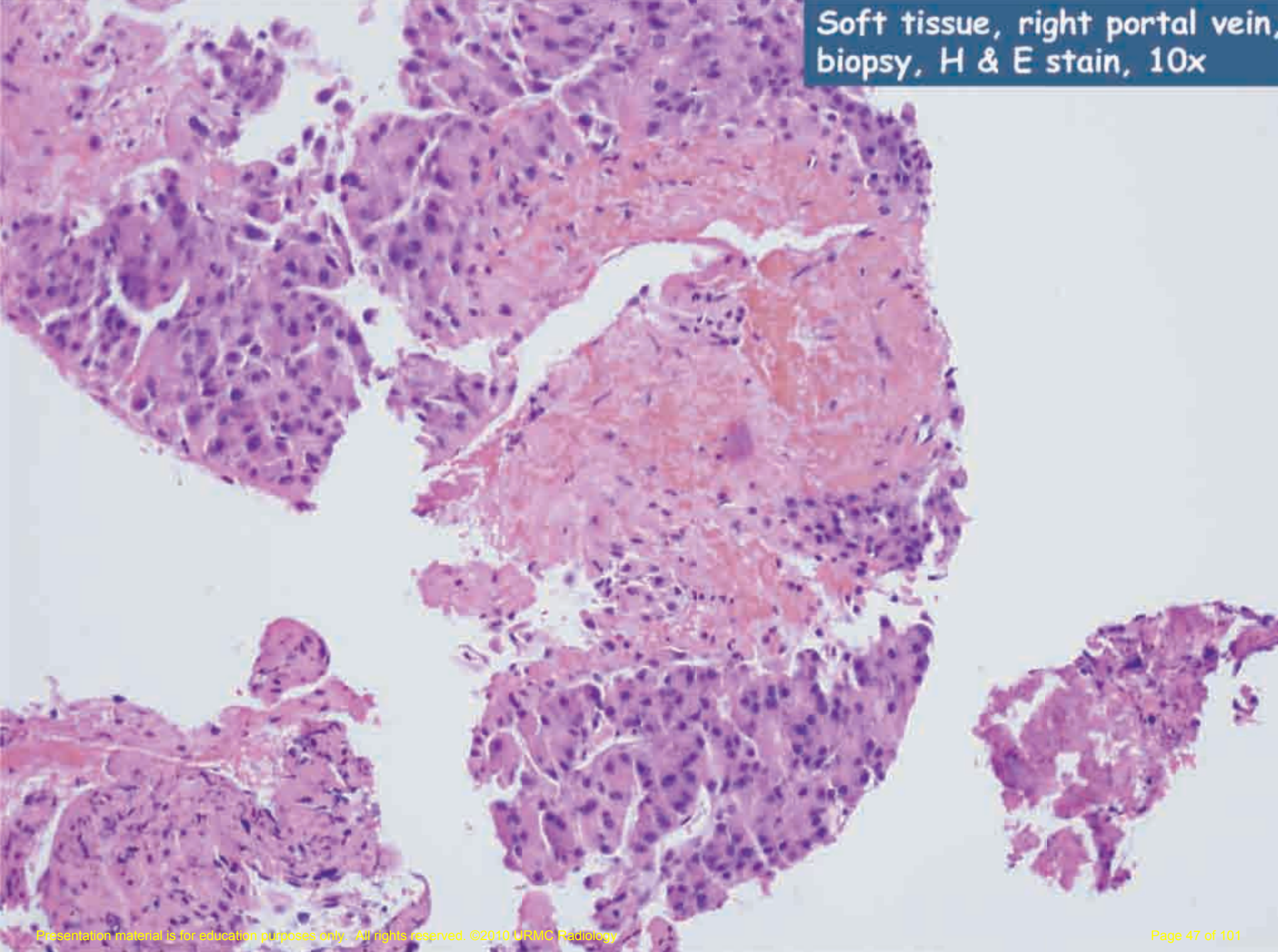
Portal vein, ultrasound-guided fine needle aspiration:

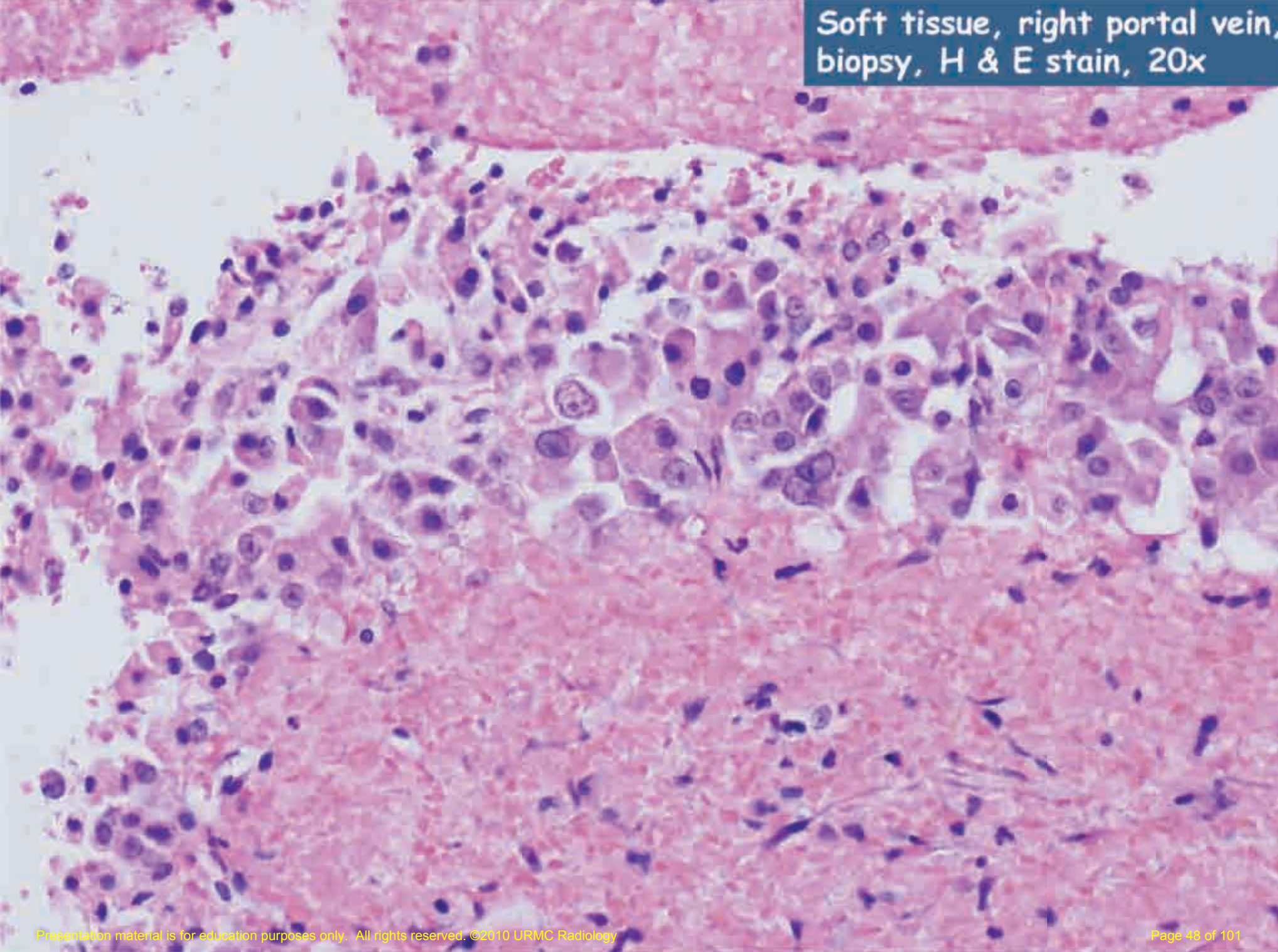
Atypical hepatocytes. See comment.

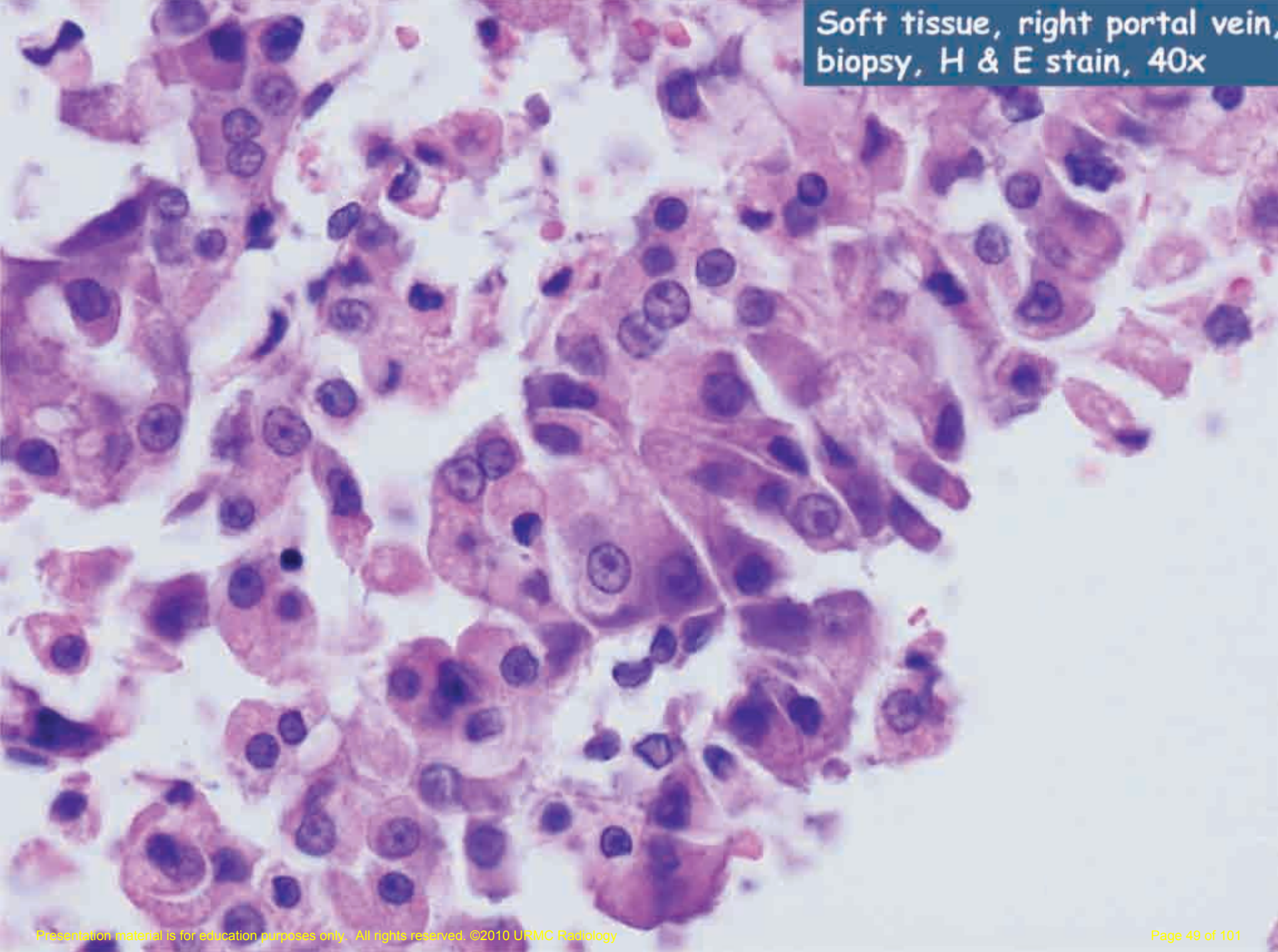
Comment: The cells within the portal vein would be consistent with the patient's clinical diagnosis of hepatocellular carcinoma.

Soft tissue, right portal vein, biopsy:

Hepatocellular carcinoma.







Hepatocellular Carcinoma

- Accounts for 20-40% of cancer cases in high-incidence regions such as Africa, China, and Japan and 0.5-2% in low- incidence regions including western Europe and North America
- Rising in the U.S. due to chronic hepatitis C virus
- Metastases to regional lymph nodes and distant sites may occur but usually tend to remain localized in the liver

Portal Vein Tumor Thrombus in Association with Hepatocellular Carcinoma (HCC)

- HCC tends to invade the intrahepatic vasculature, especially the portal vein
  - Very poor prognosis
  - Mean survival with portal vein tumor thrombus is < 3 months
  - Main predictor of death in patients with HCC

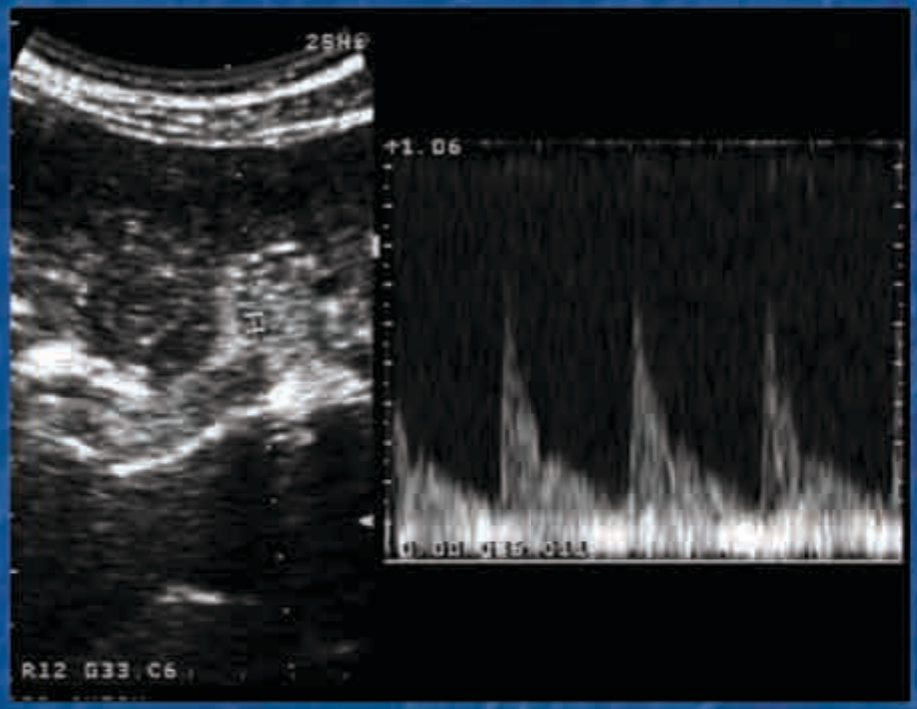
Portal Vein: Bland versus Tumor Thrombus

- Neoplastic thrombus of the portal vein is found in 6.5-44% of patients with HCC
  - Considered Stage IV disease
  - Renders patient unsuitable for surgical resection or liver transplantation due to high incidence of tumor recurrence
- Bland thrombus occurs in 4.5-26% of patients with chronic liver disease and in 42% of patients with HCC

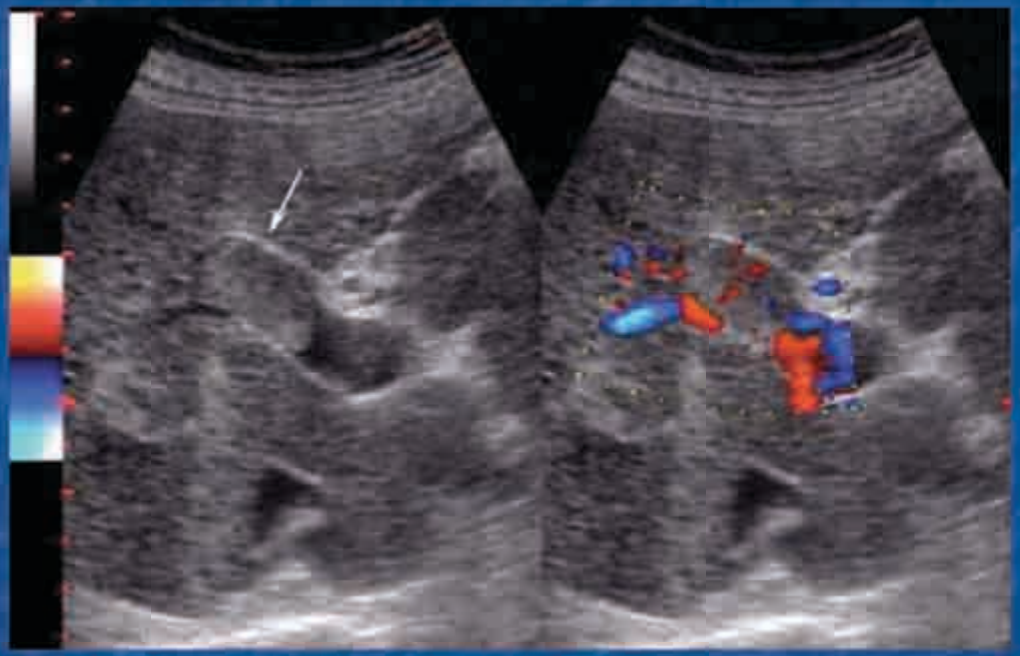
Portal Vein: Bland versus Tumor Thrombus

- Imaging findings
  - Spectral Doppler US: demonstration of **arterial flow** within the thrombus is **100% specific for tumor thrombus**
  - Contrast enhanced CT: sensitivity of 86% and specificity of 100%→ can see expansion of the vessel with enhancement of the thrombus itself

Imaging Portal Vein Tumor Thrombus



Doppler spectral examination of pulsating signal within thrombus reveals arterial waveform.



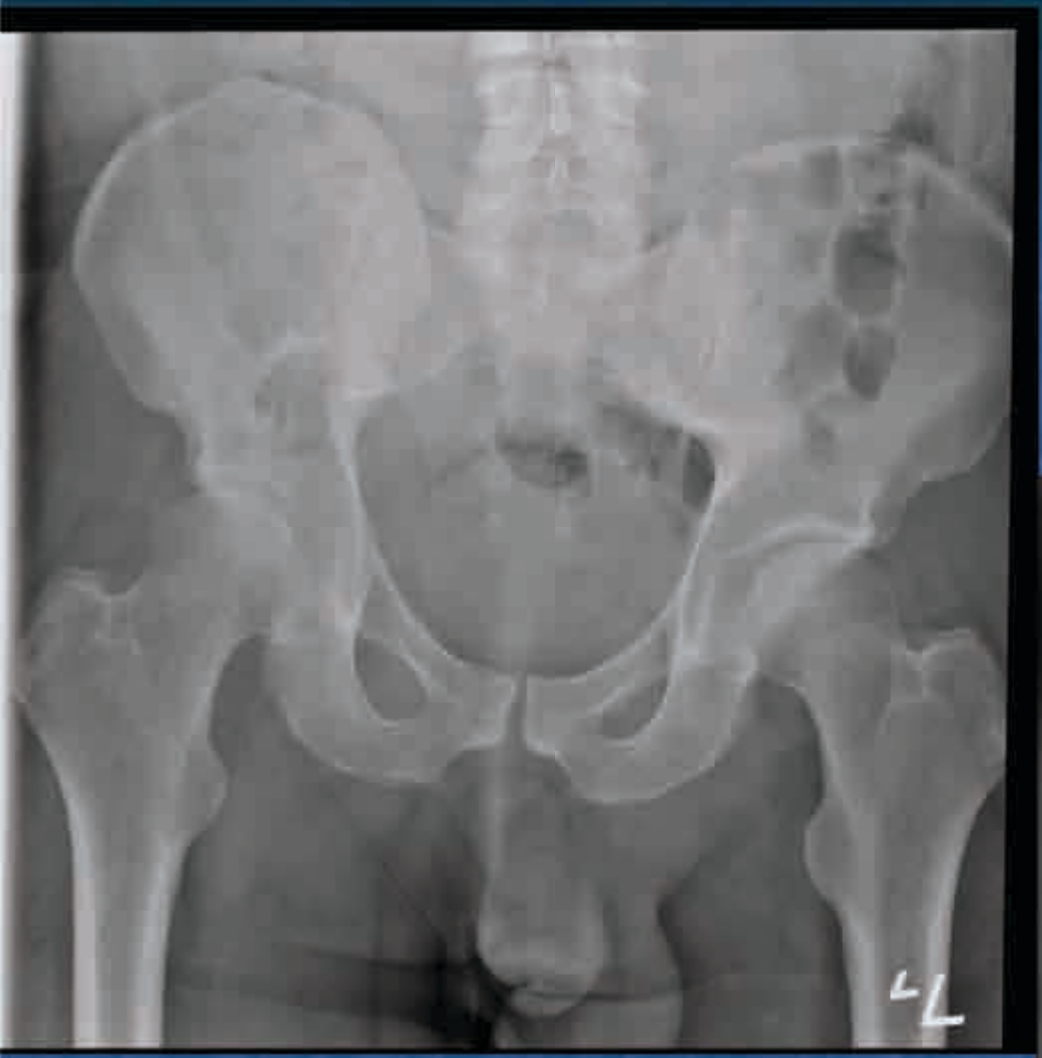
Rossi et al. Contrast enhanced versus conventional and color doppler of thrombosis of the portal and hepatic venous systems. *AJR* 2006; 186: 763-773

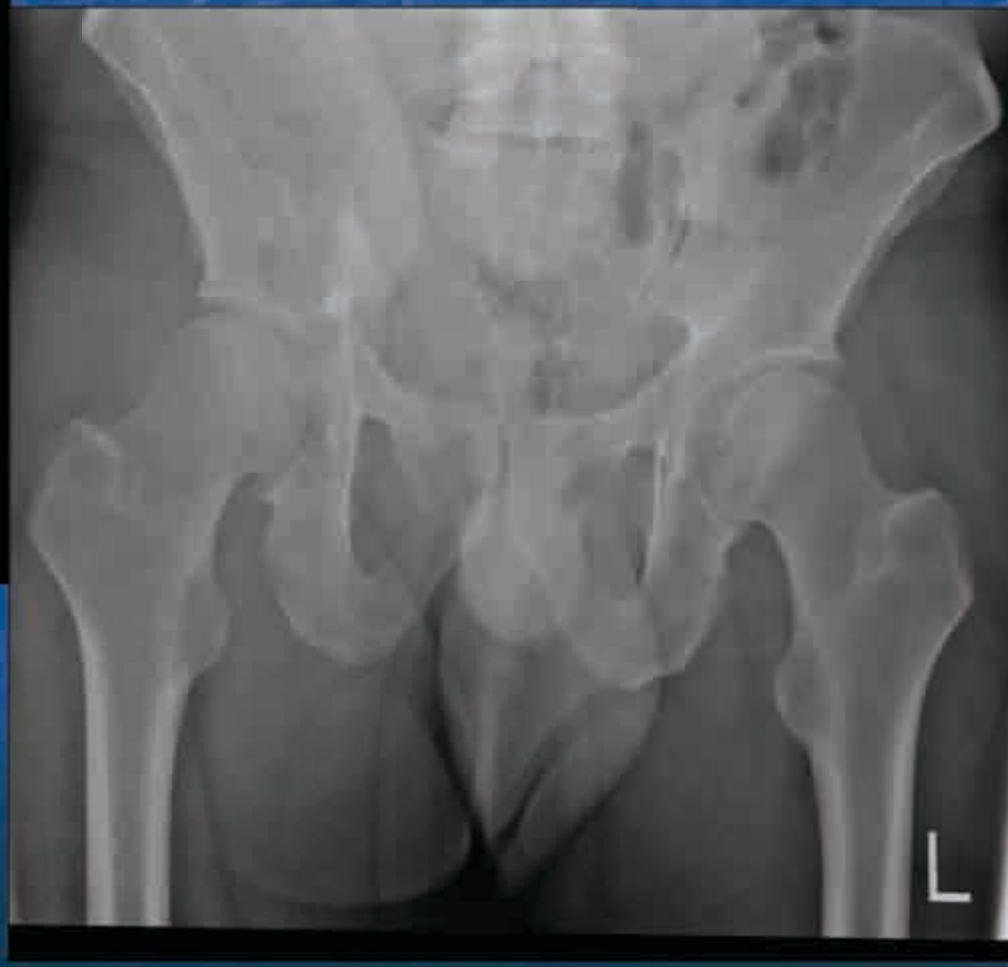
Management of HCC

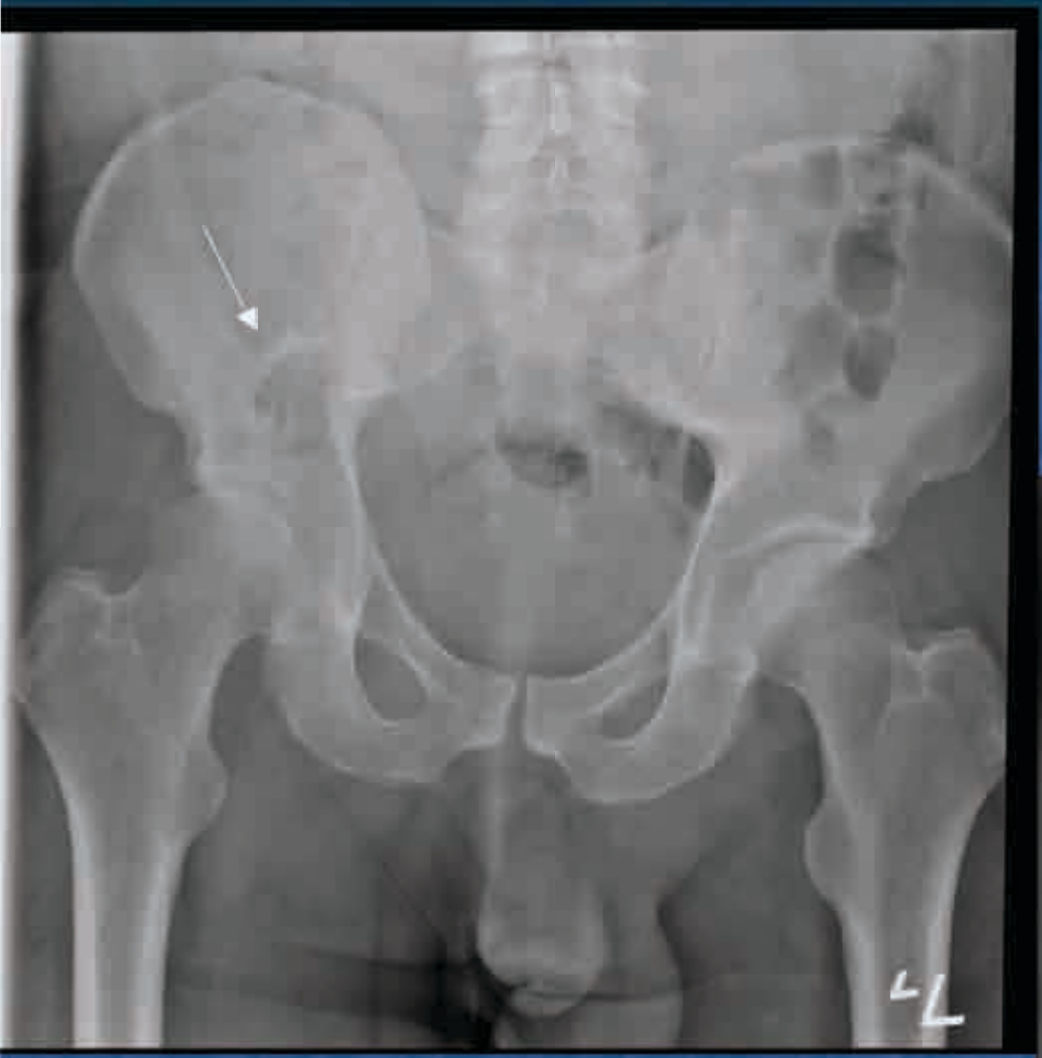
- Incidence of HCC in patients with cirrhosis after 5 years of follow up may exceed 20%
- OLT offers excellent results in patients with:
  - solitary HCC
  - those with up to 3 lesions, each less than 3 cm in size
  - < 25% of patients with HCC meet criteria
- Nonsurgical treatment of HCC
  - Percutaneous ablation
  - TACE
  - Hormonal therapy
  - Chemotherapy

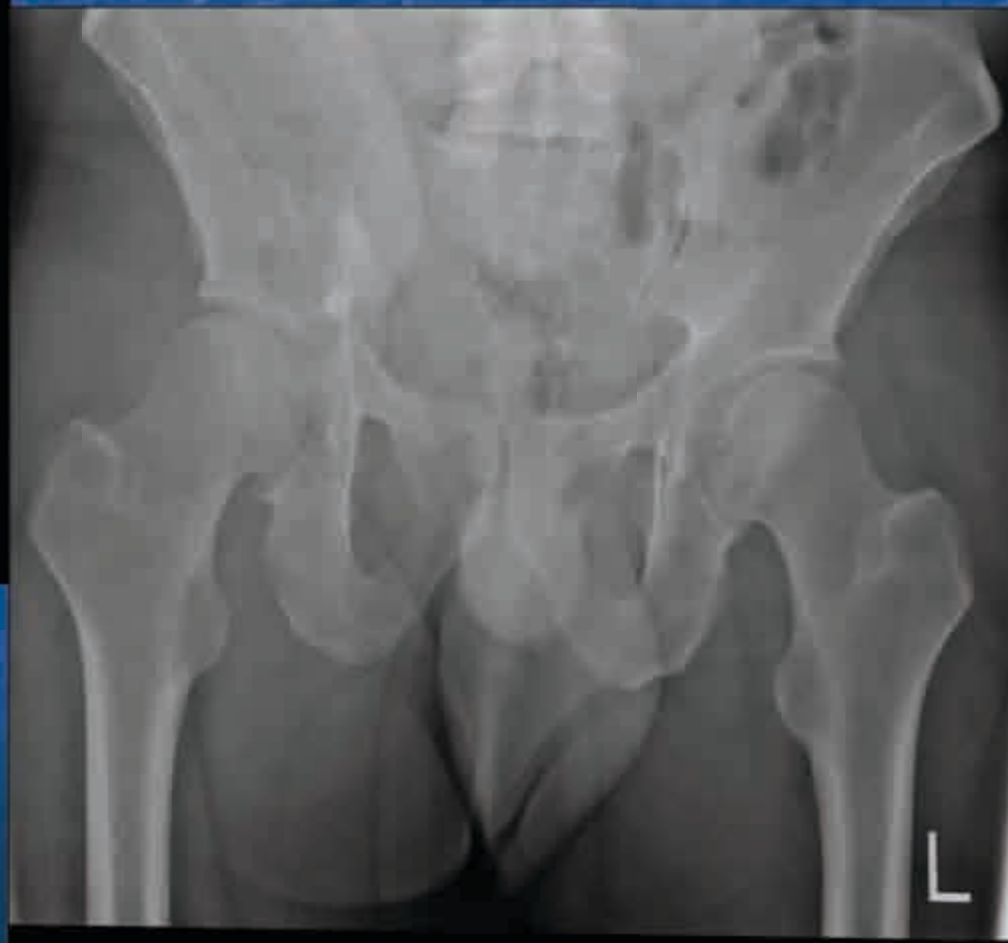
Case 4

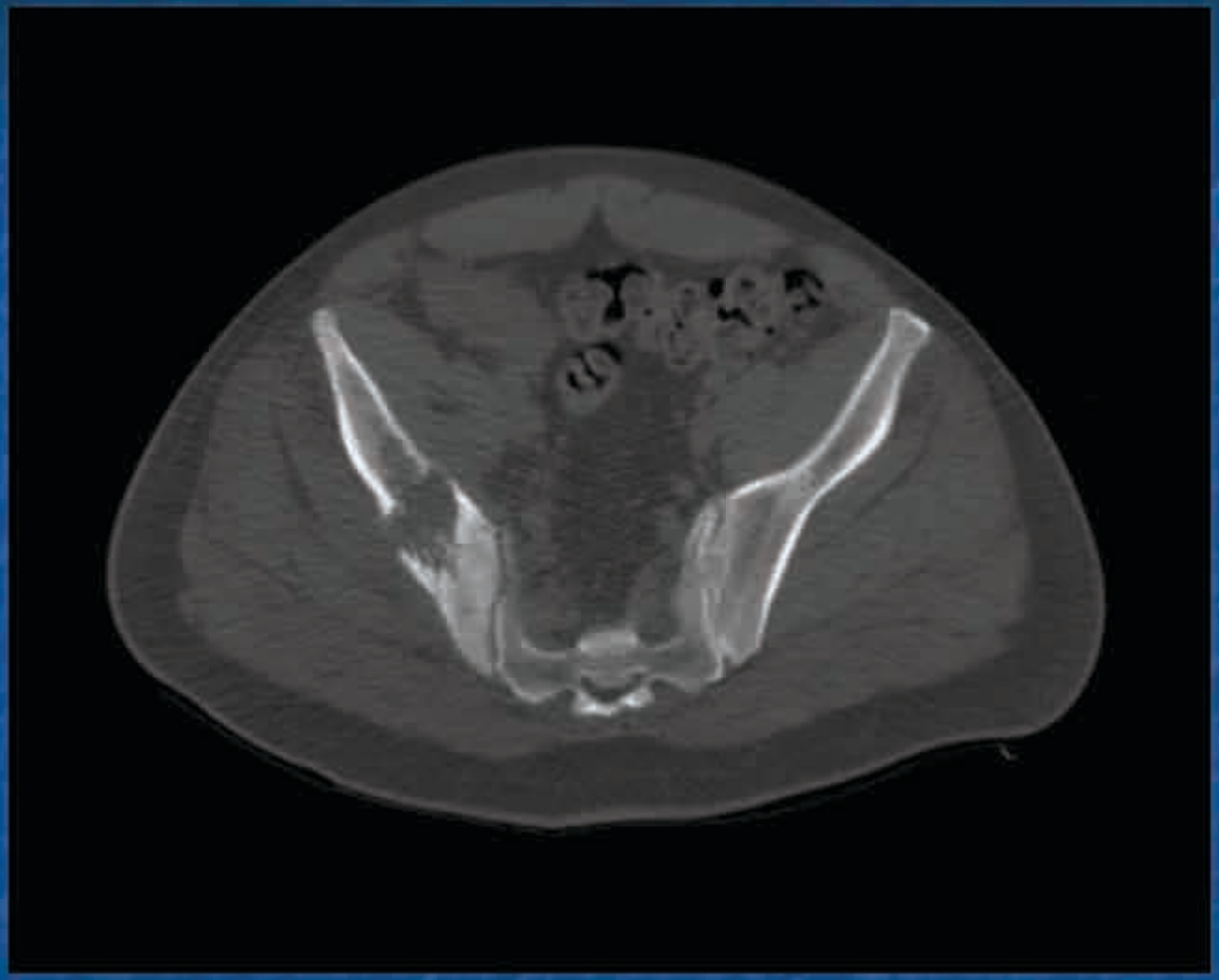
- 41 year old male with history of malignant peripheral nerve sheath tumor of the mandible status post resection in 2005
- Presenting with weight loss, right hip pain, and difficulty ambulating

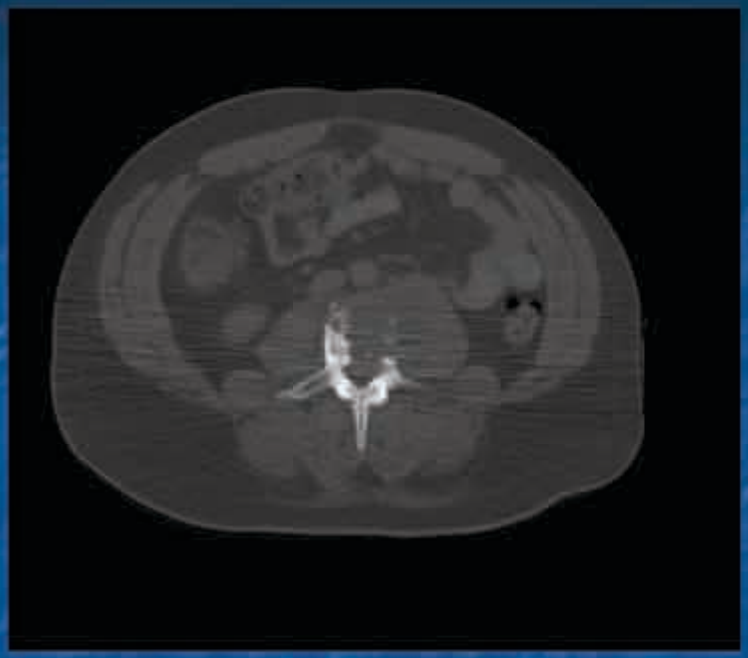


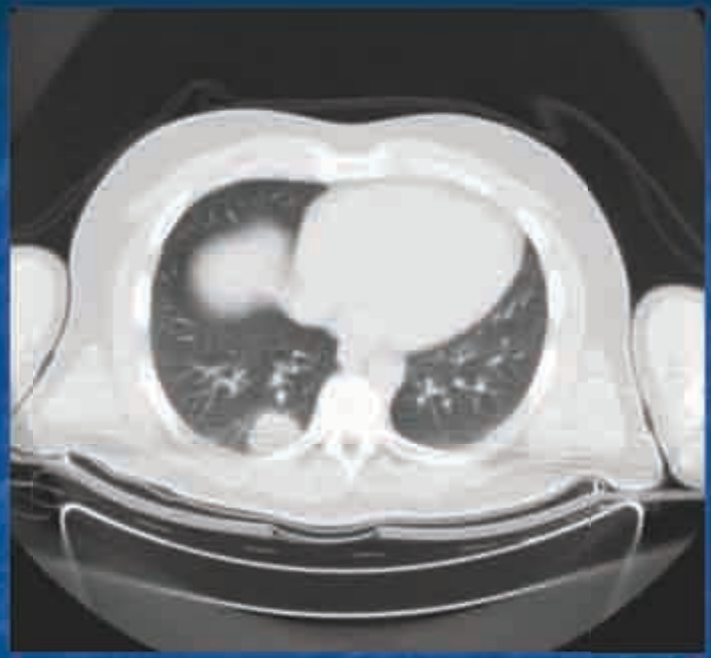


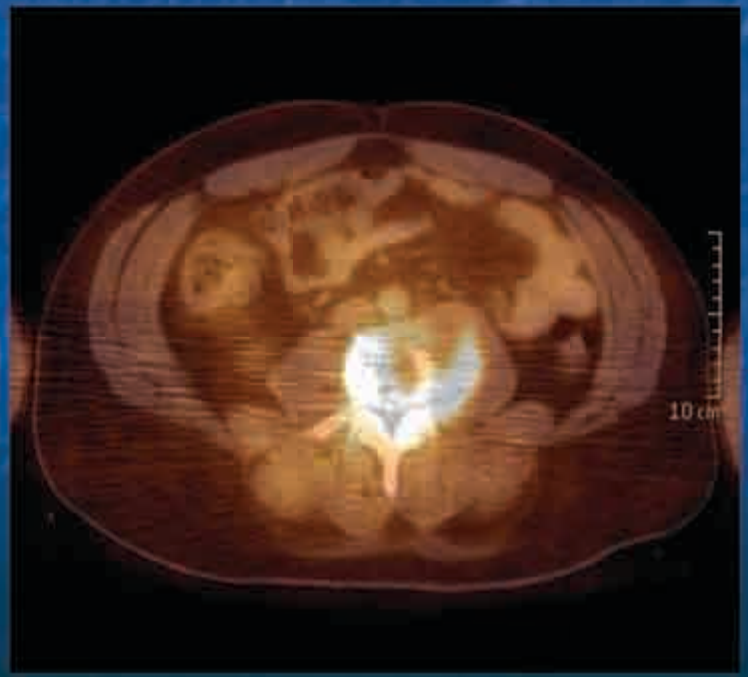


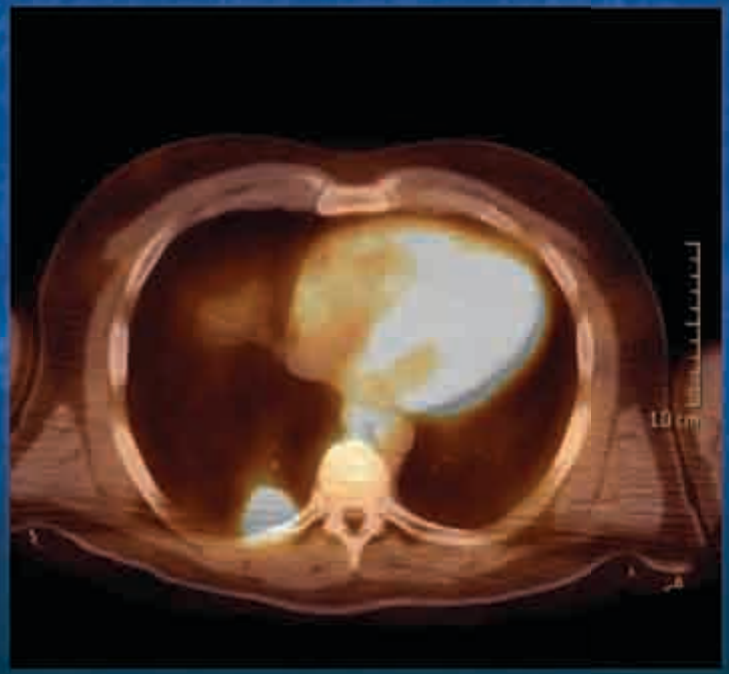


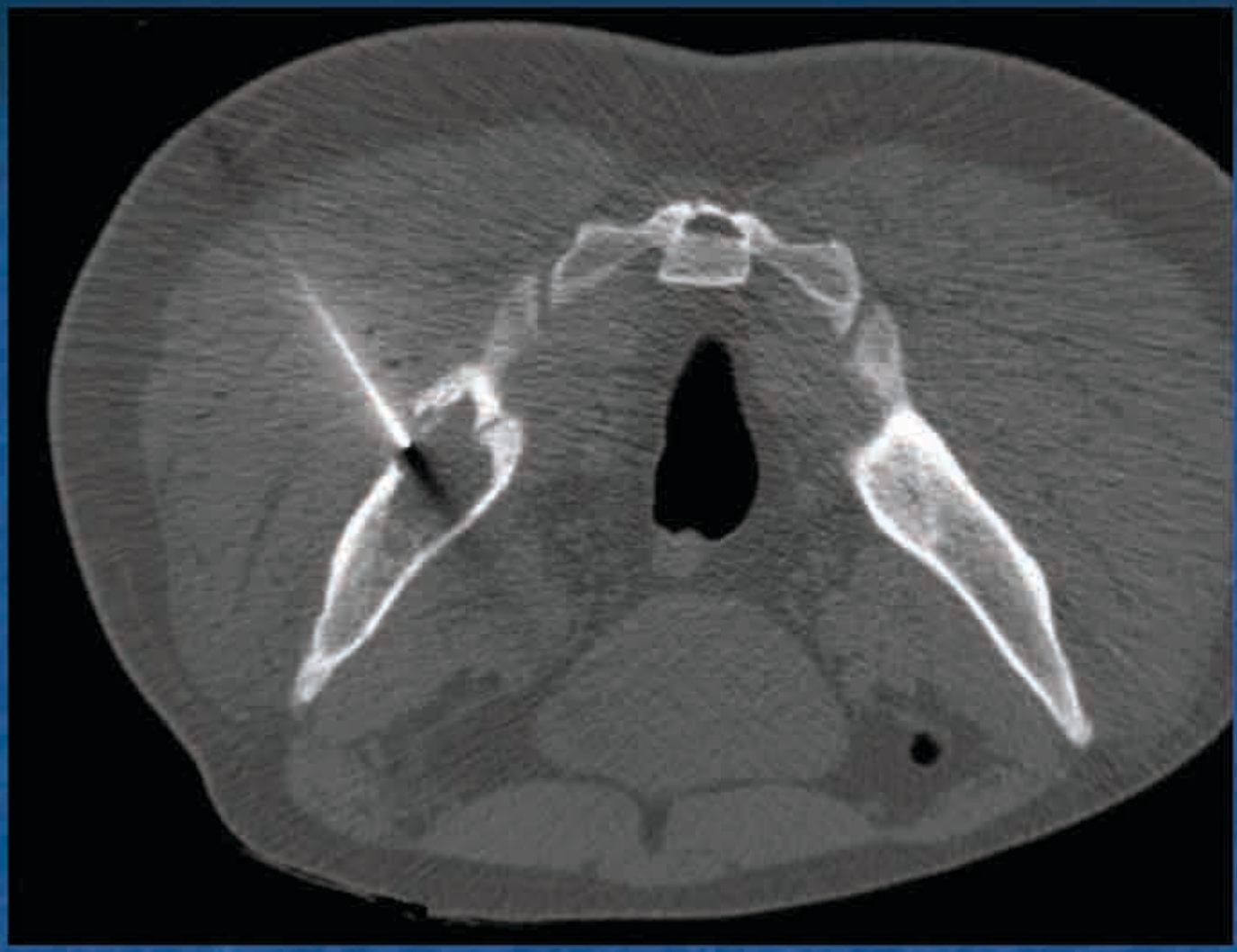




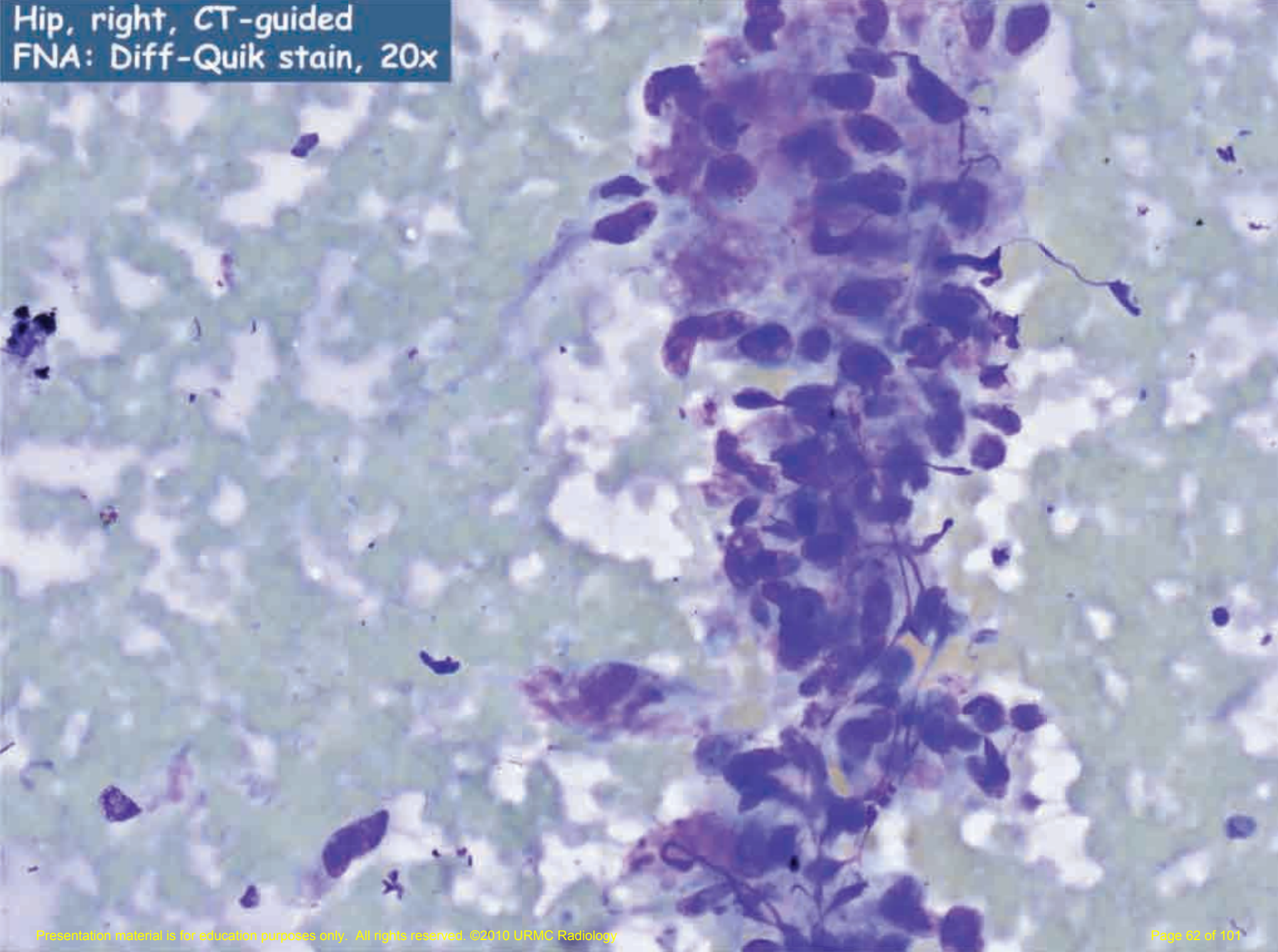


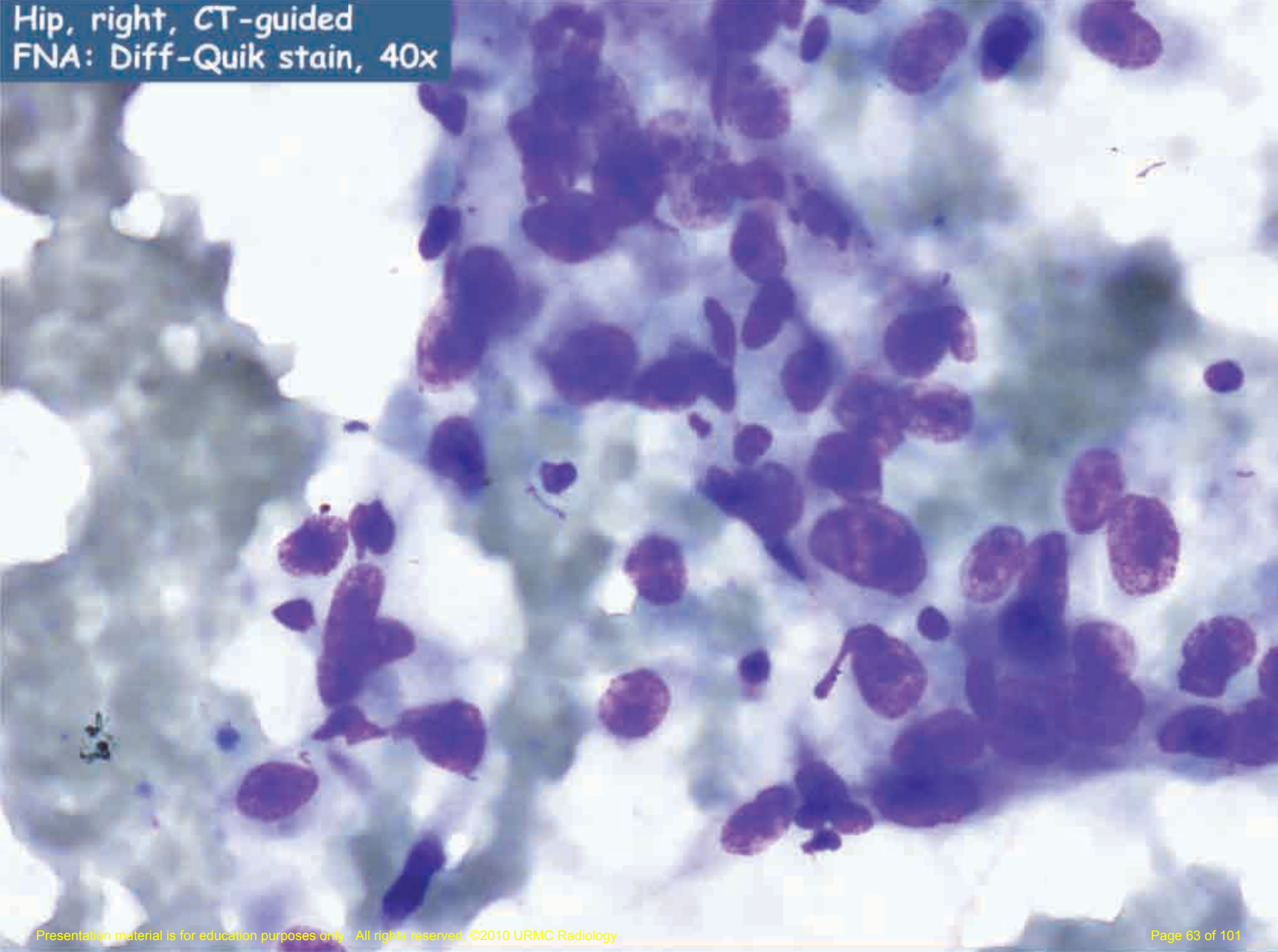




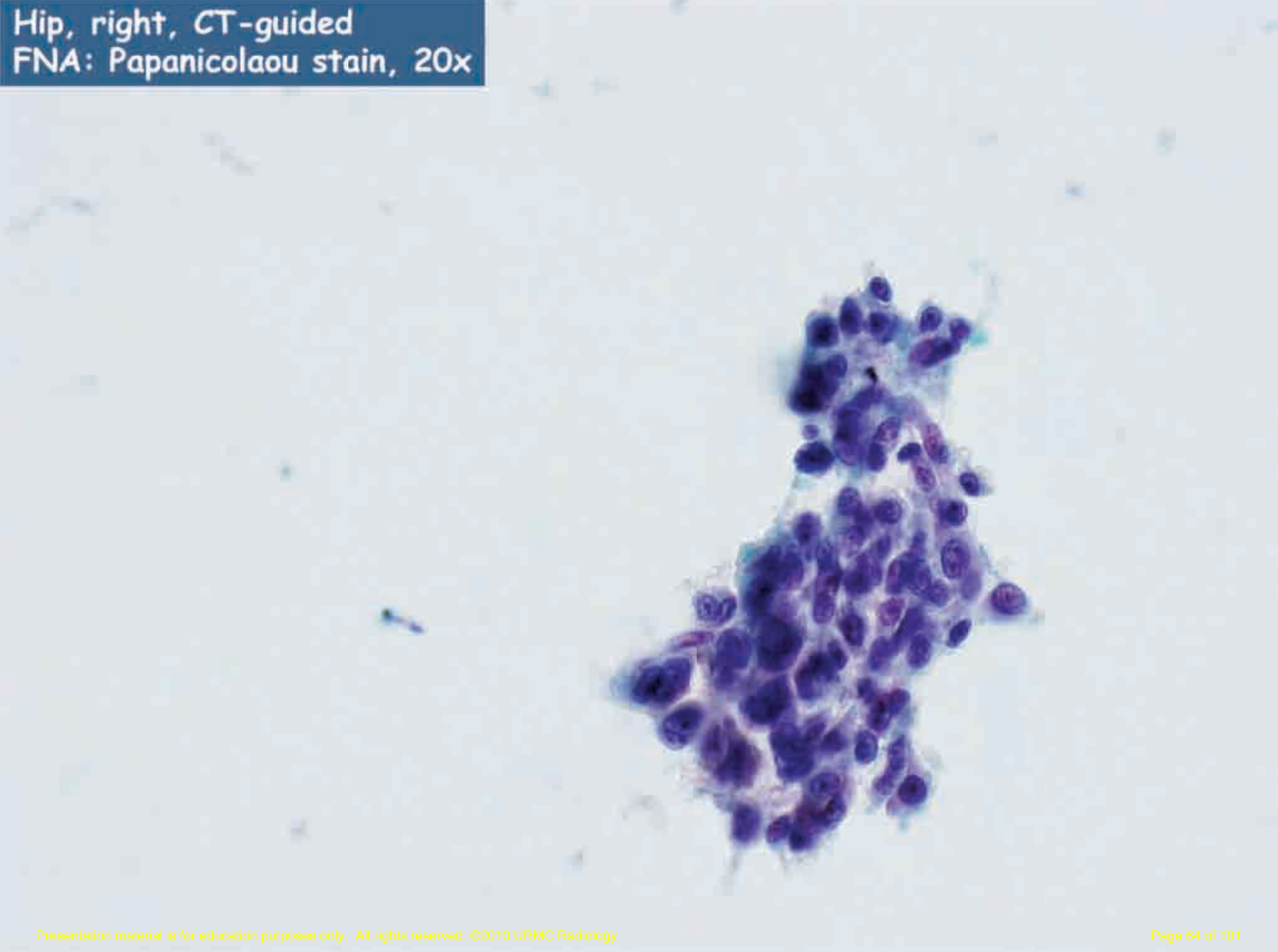


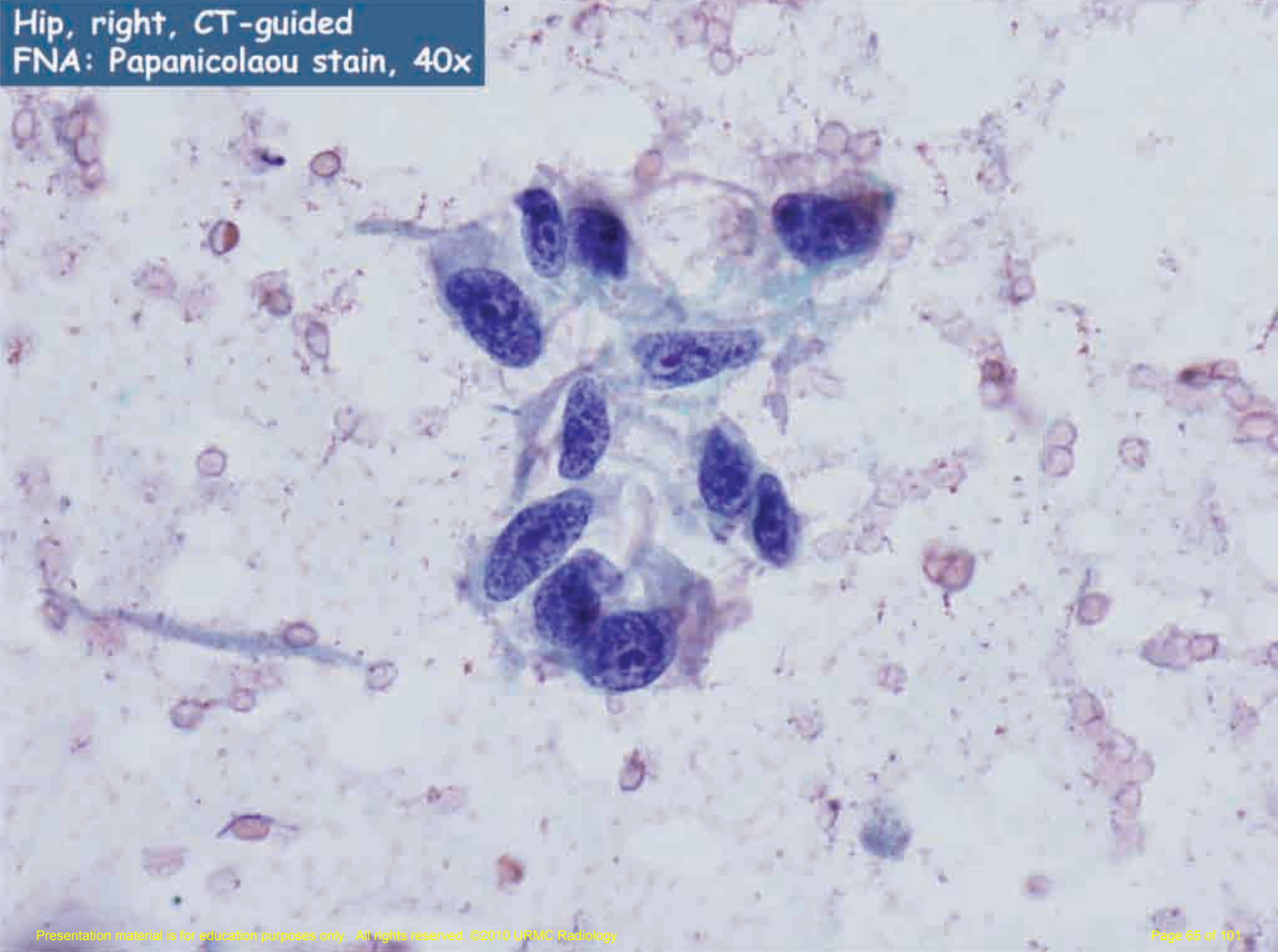
CT guided biopsy 3/2010



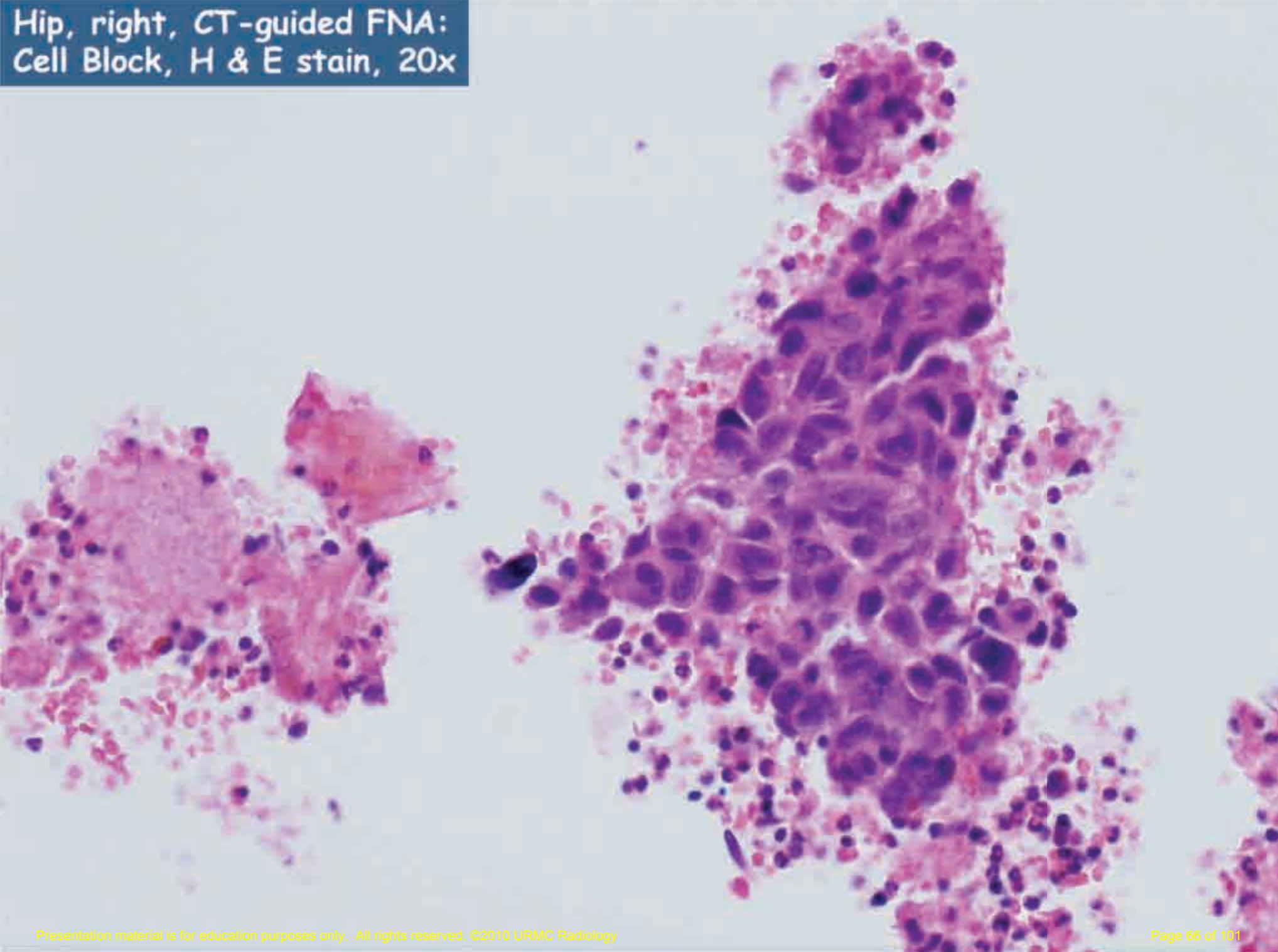


Hip, right, CT-guided
FNA: Papanicolaou stain, 20x

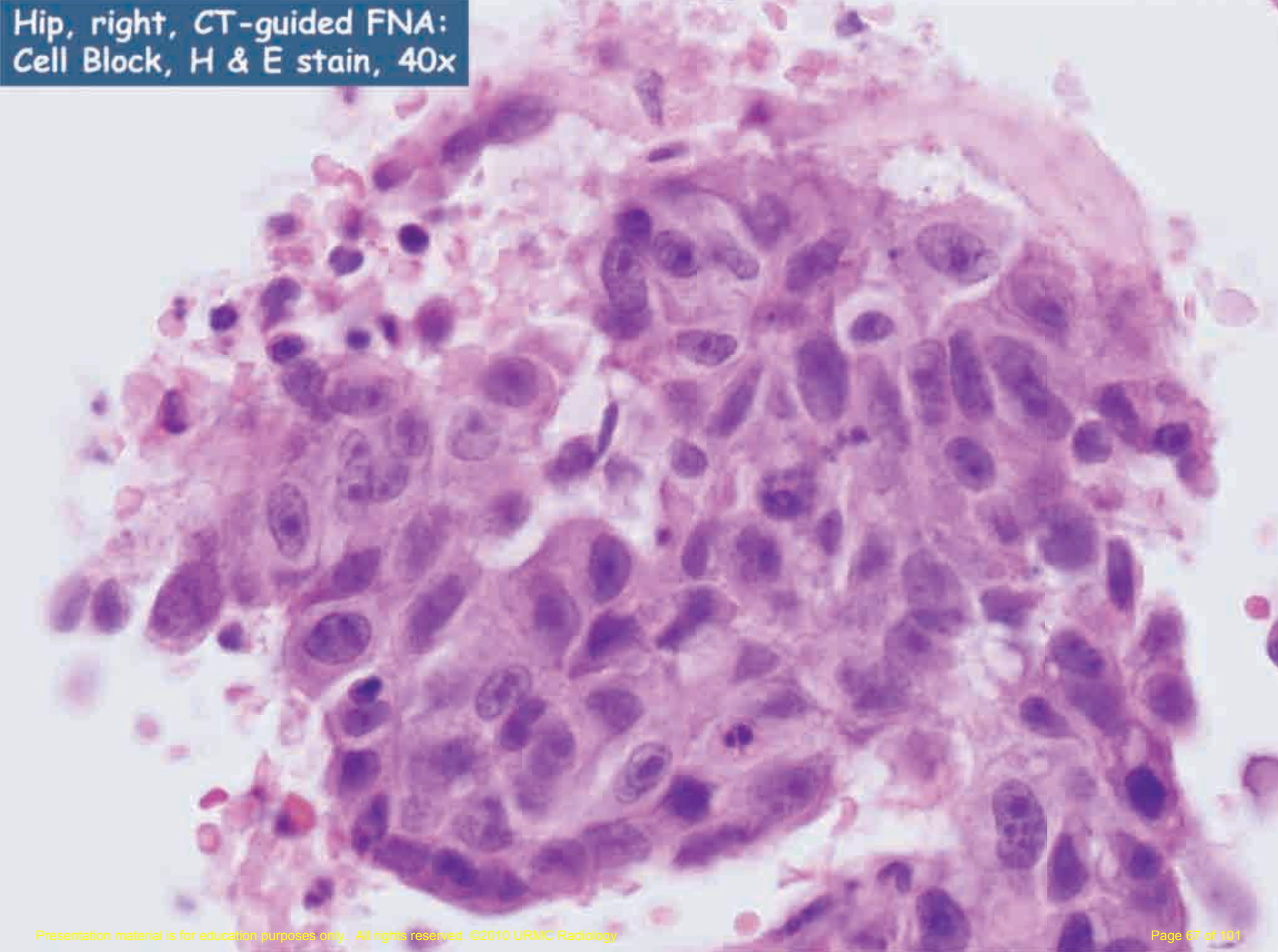


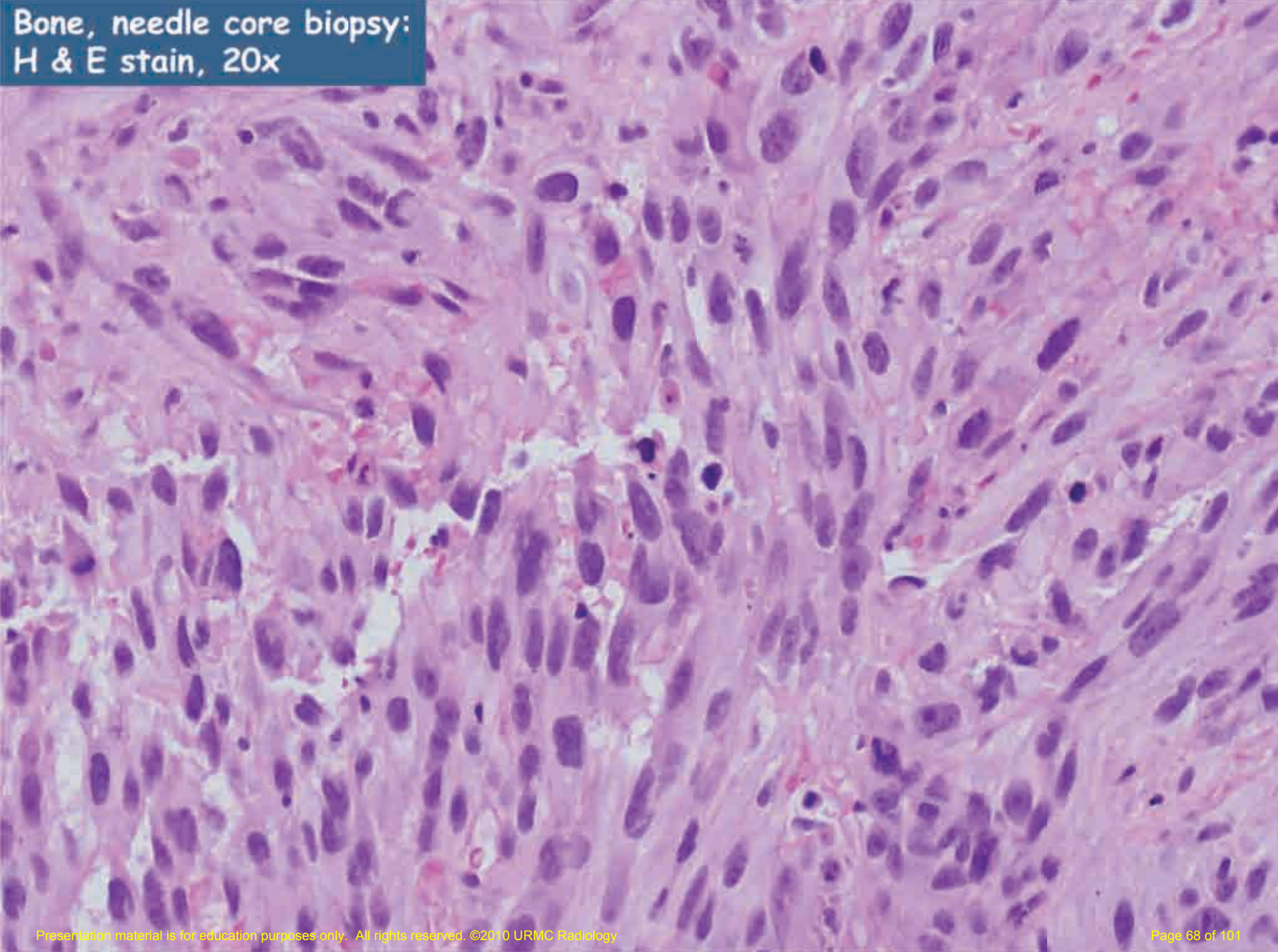


Hip, right, CT-guided FNA:
Cell Block, H & E stain, 20x



Hip, right, CT-guided FNA:
Cell Block, H & E stain, 40x





Hip, right, CT-guided fine needle aspiration:

Malignant tumor cells present consistent with metastatic malignant peripheral nerve sheath tumor.

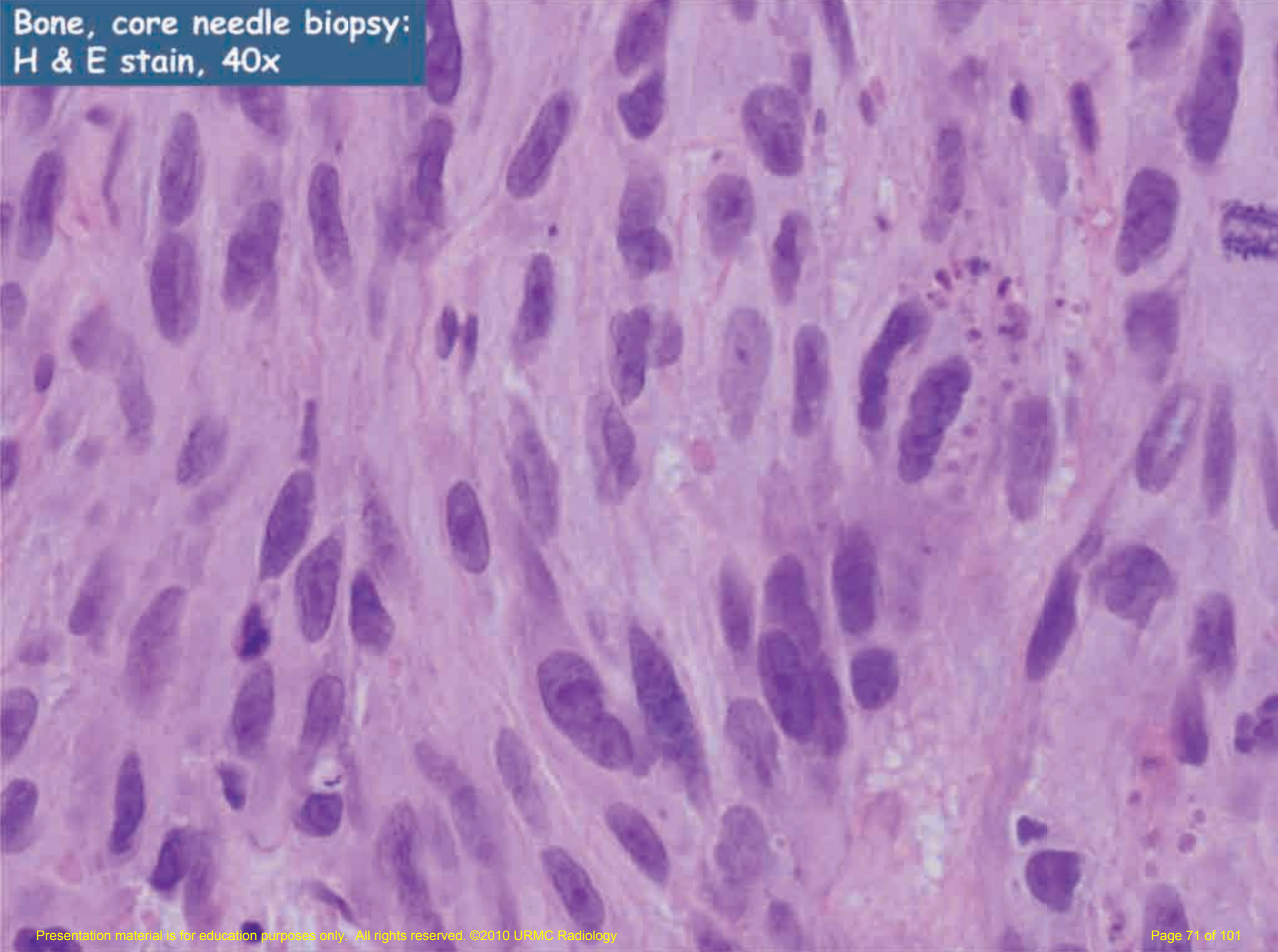
Cell block and cytologic preparations examined.

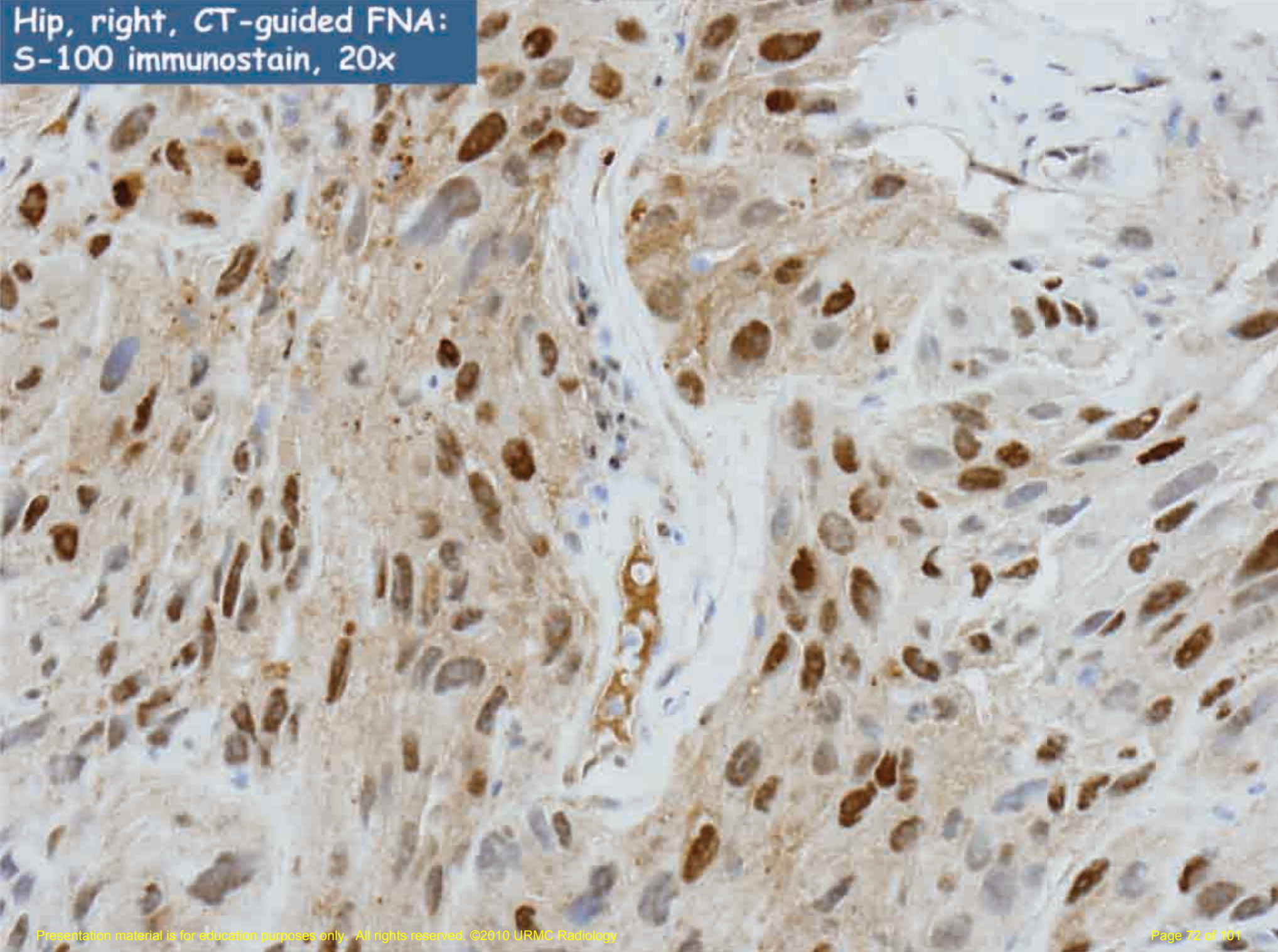
Bone, needle core biopsy:

Malignant epithelioid spindle neoplasm consistent with metastatic peripheral nerve sheath tumor.

Comment: Tumor cells are positive for S-100 and negative for epithelial markers: pancytokeratin, CK 5/6 and p63. The tumor in the bone is morphologically similar to the malignant spindle cell neoplasm in the lip.

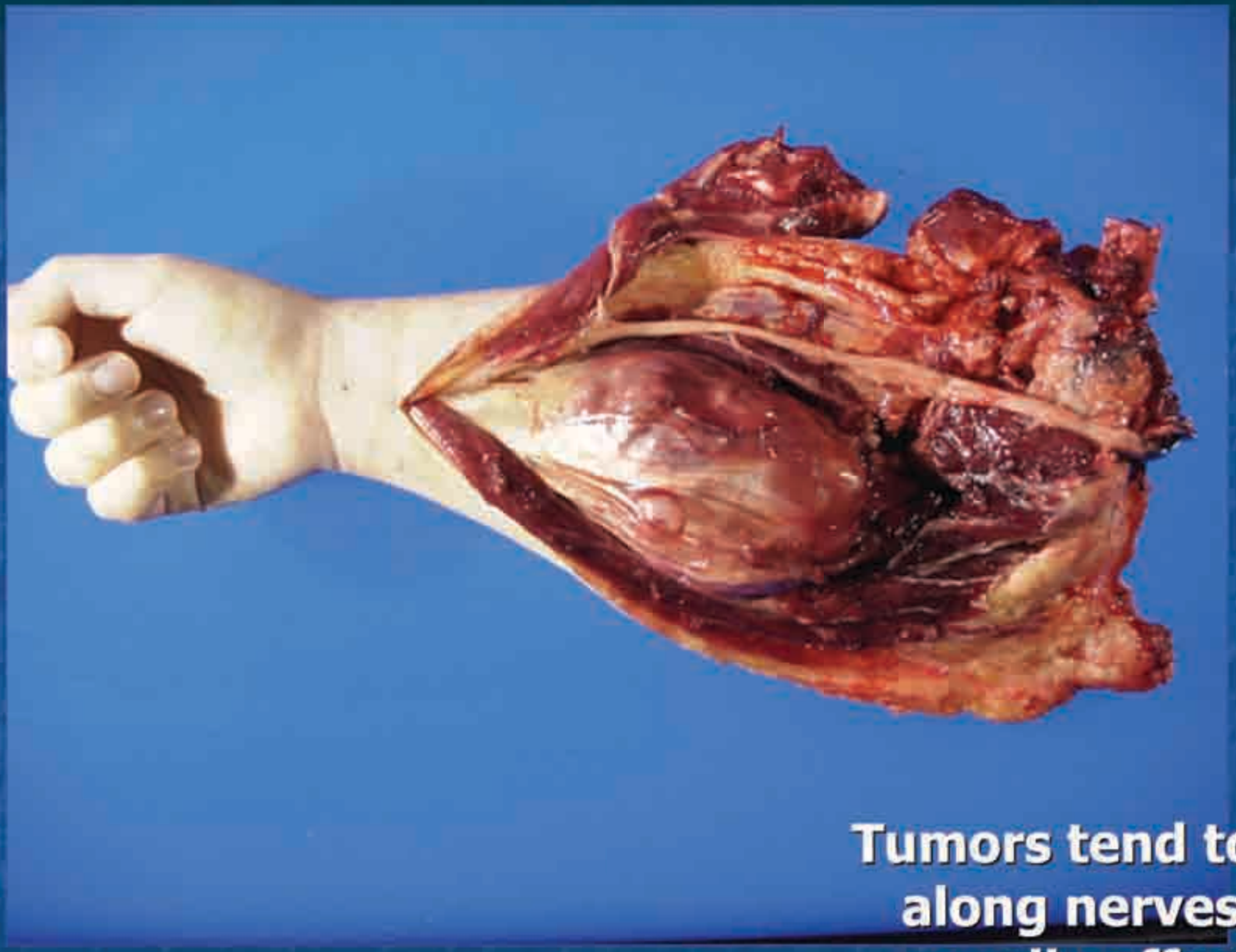
Bone, core needle biopsy:
H & E stain, 40x





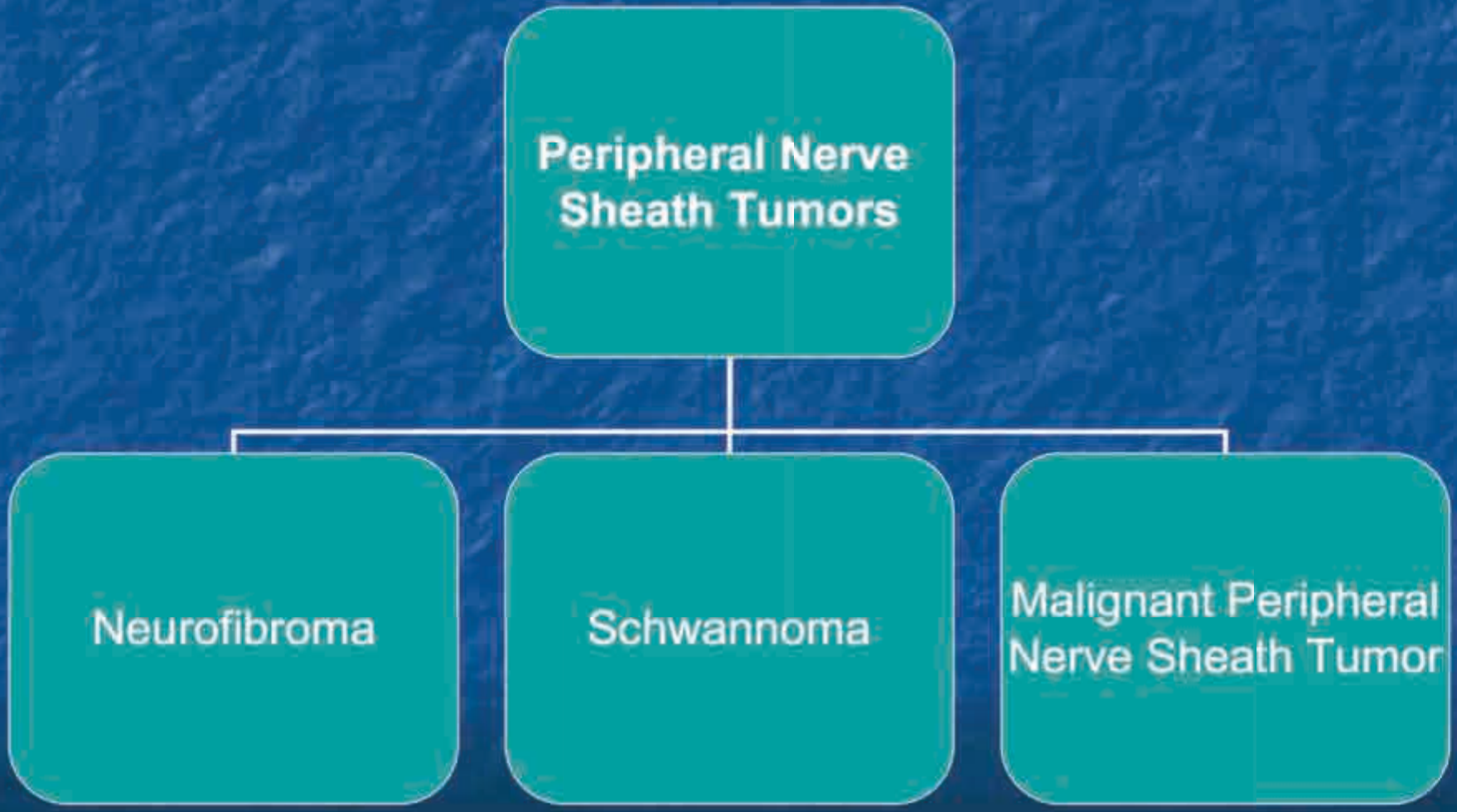
Malignant Peripheral Nerve Sheath Tumor

- Sarcomas arise from peripheral nerves or cells associated with nerve sheath, MPNSTs comprise 5-10% of all soft tissue sarcomas
- Fast growing tumors
- Generally occur in adulthood 20-50 years of age
- Occur spontaneously or in association with neurofibromatosis
- Present as a palpable mass, pain is variable complaint
- Increased incidence in patients with history of radiation exposure



Tumors tend to arise along nerves and usually affect the extremities.

Peripheral Nerve Sheath Tumors



Malignant Peripheral Nerve Sheath Tumors (MPNST)

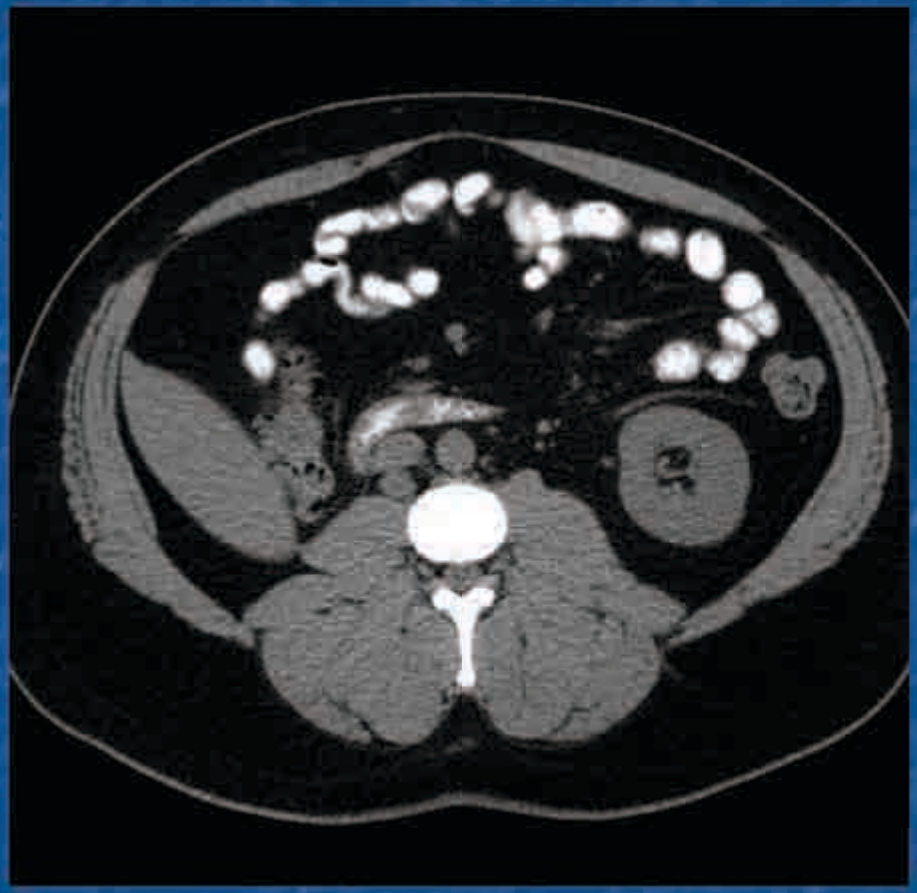
- 50% occur in association with NF1
- MPNST are usually high grade sarcomas→ require resection, chemotherapy, and radiotherapy
  - Even with aggressive therapy, local recurrence seen in 50% of patients
  - 5 year survival rate 10-40%

MPNST

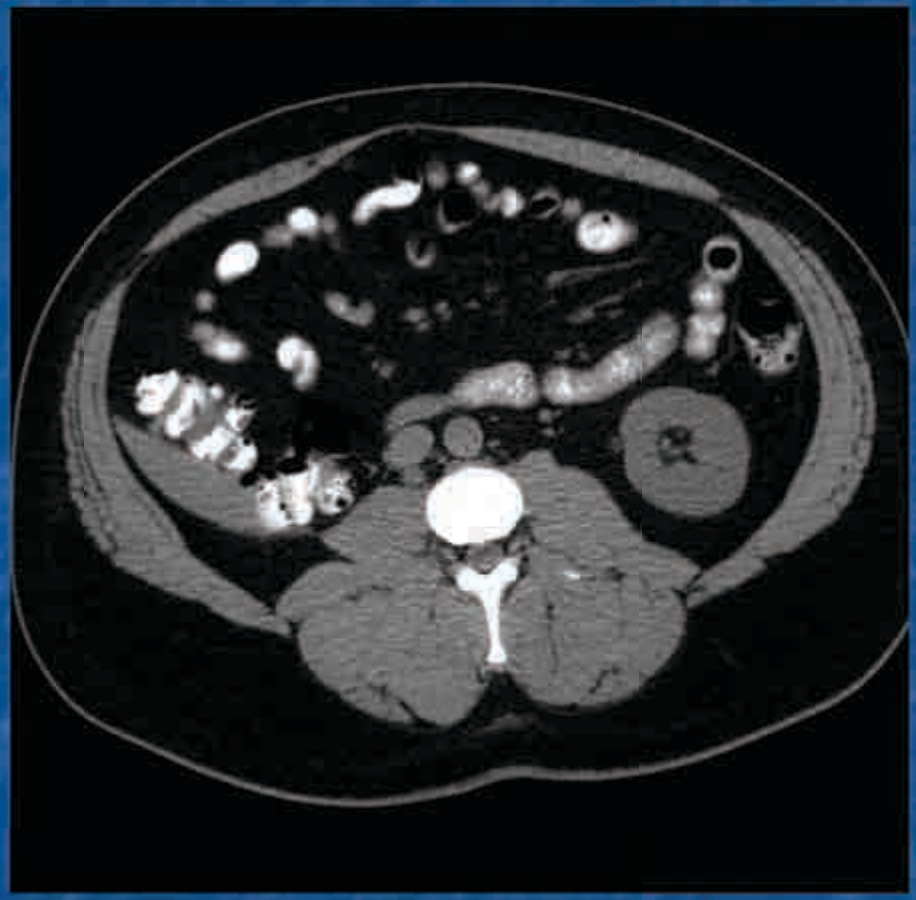
- Although malignant and benign peripheral nerve sheath tumors cannot be reliably distinguished by imaging→ certain findings raise suspicion of a malignant tumor
  - > 5 cm in size
  - Ill defined margins suggesting infiltration of adjacent tissues and associated edema
  - Heterogeneous with central necrosis common in malignant lesions

Case 5

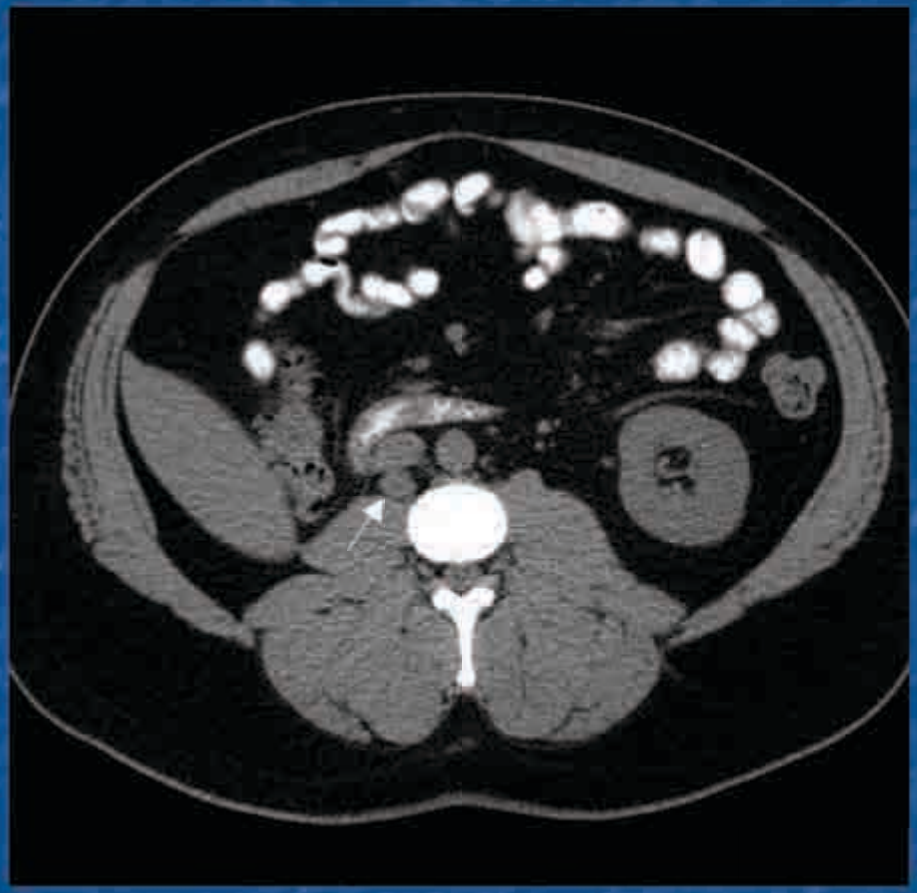
- 36 year old male with history of urothelial carcinoma diagnosed in 2007, status post right nephrectomy, resection of the right ureter and partial cystectomy
- Presenting for surveillance imaging



CT abdomen 2/2010



CT abdomen 11/2009



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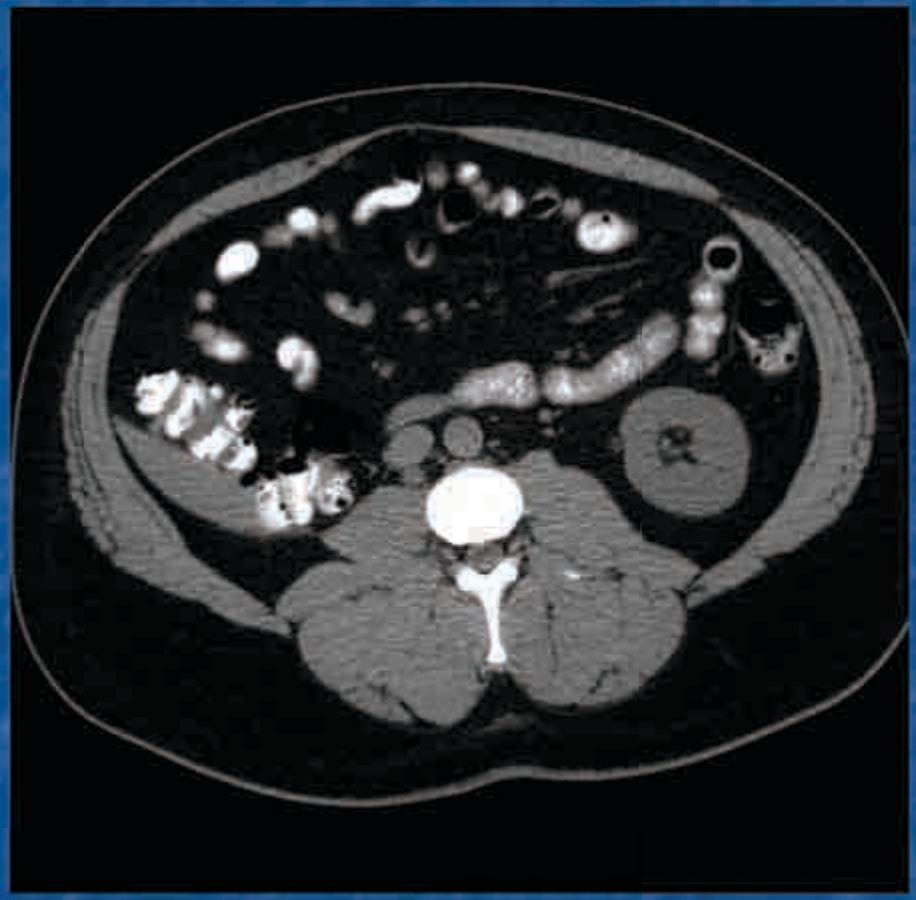
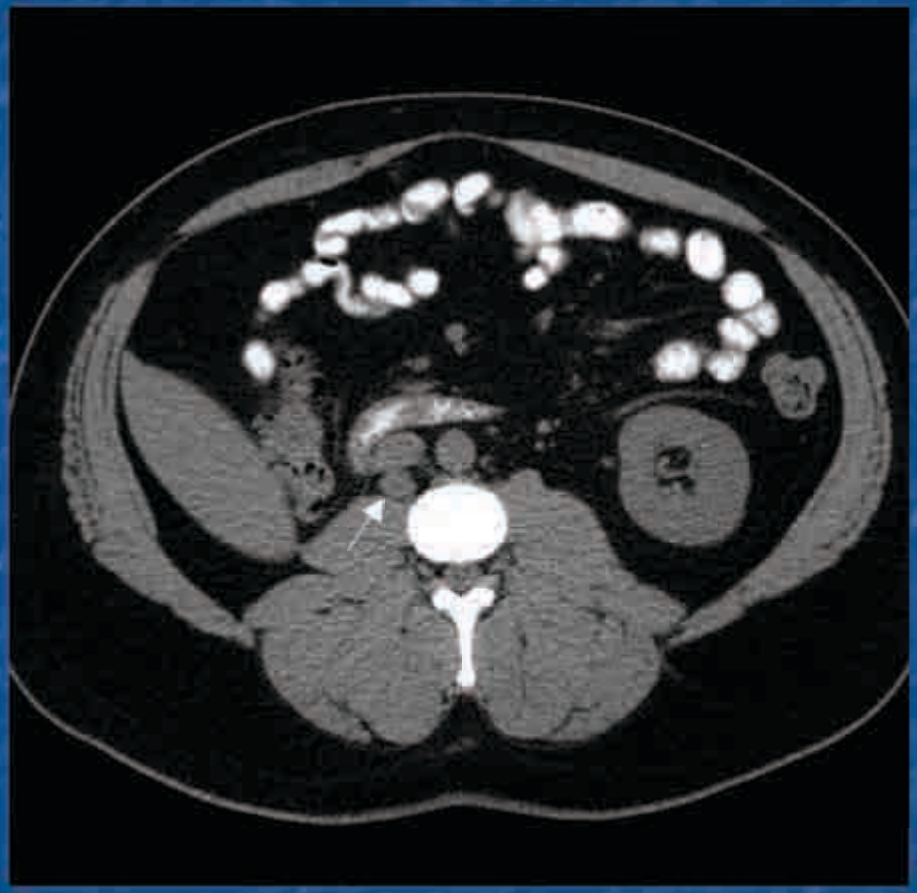


CT abdomen 11/2009



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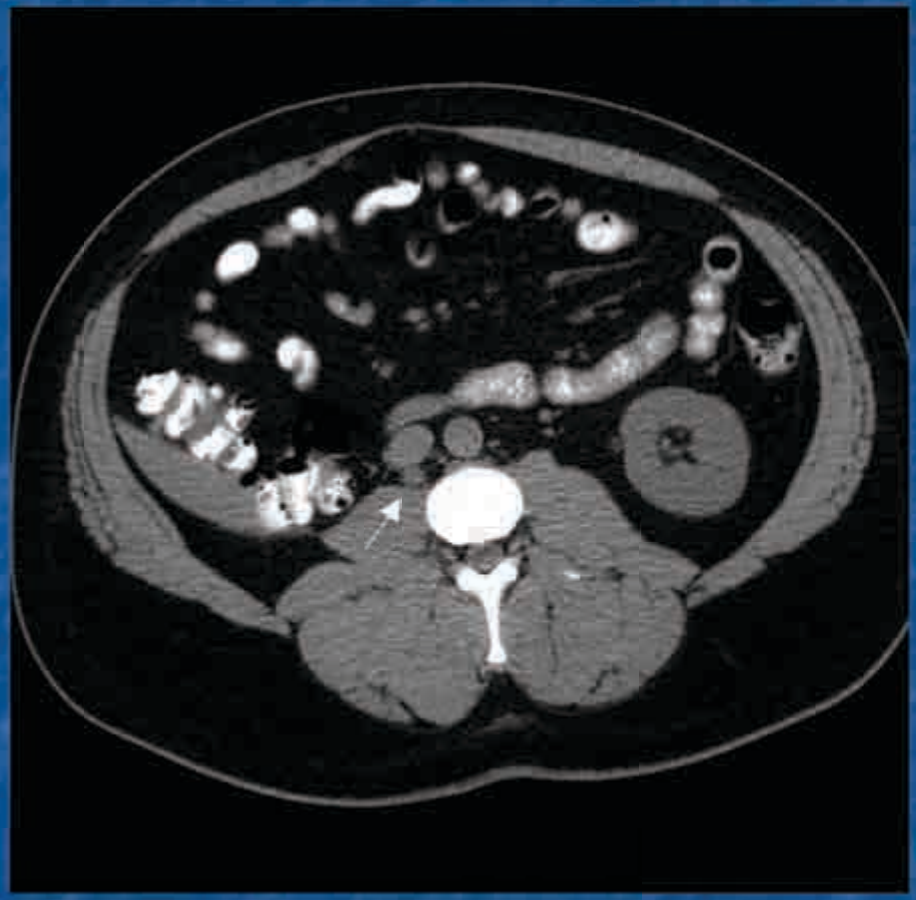
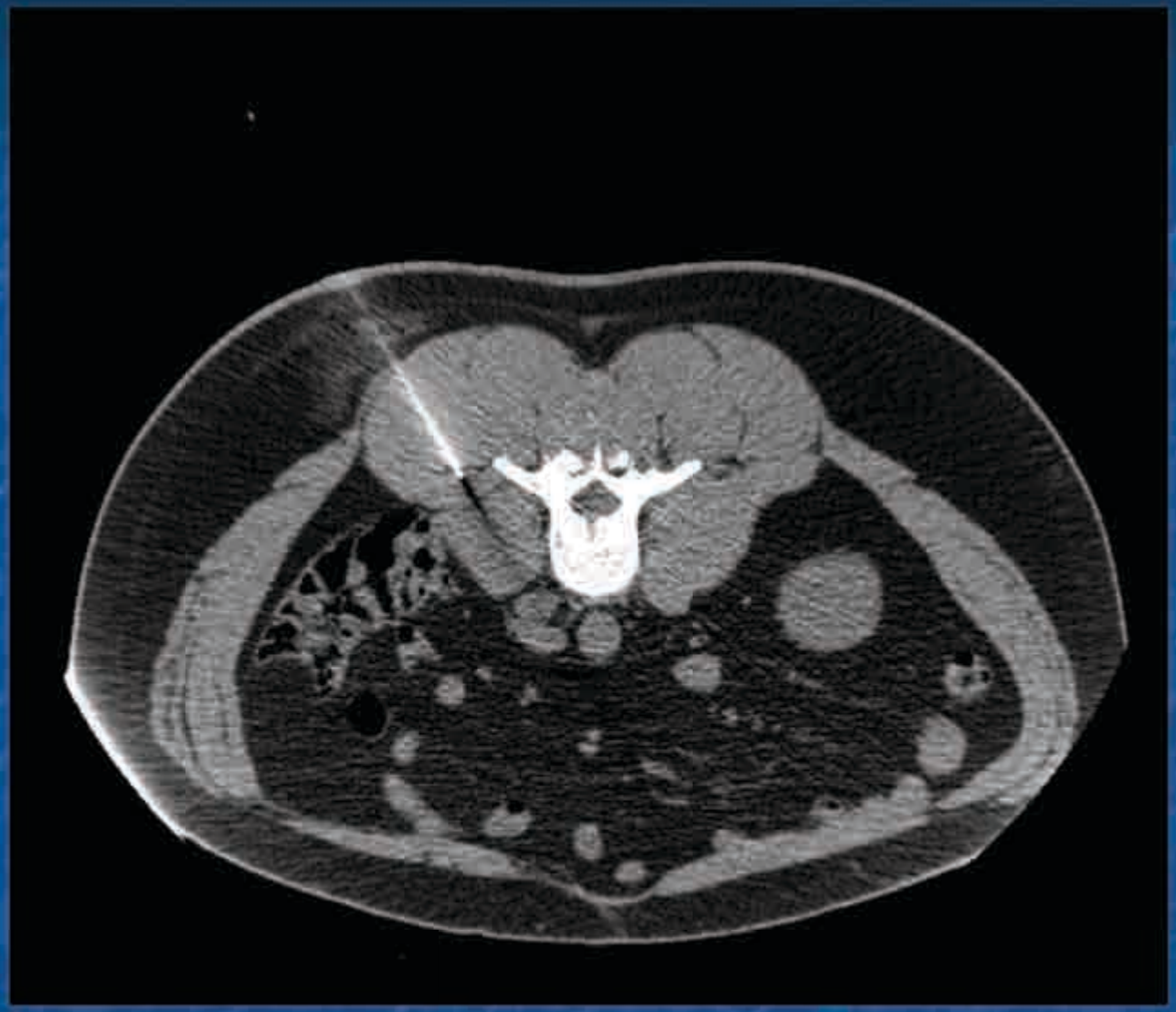


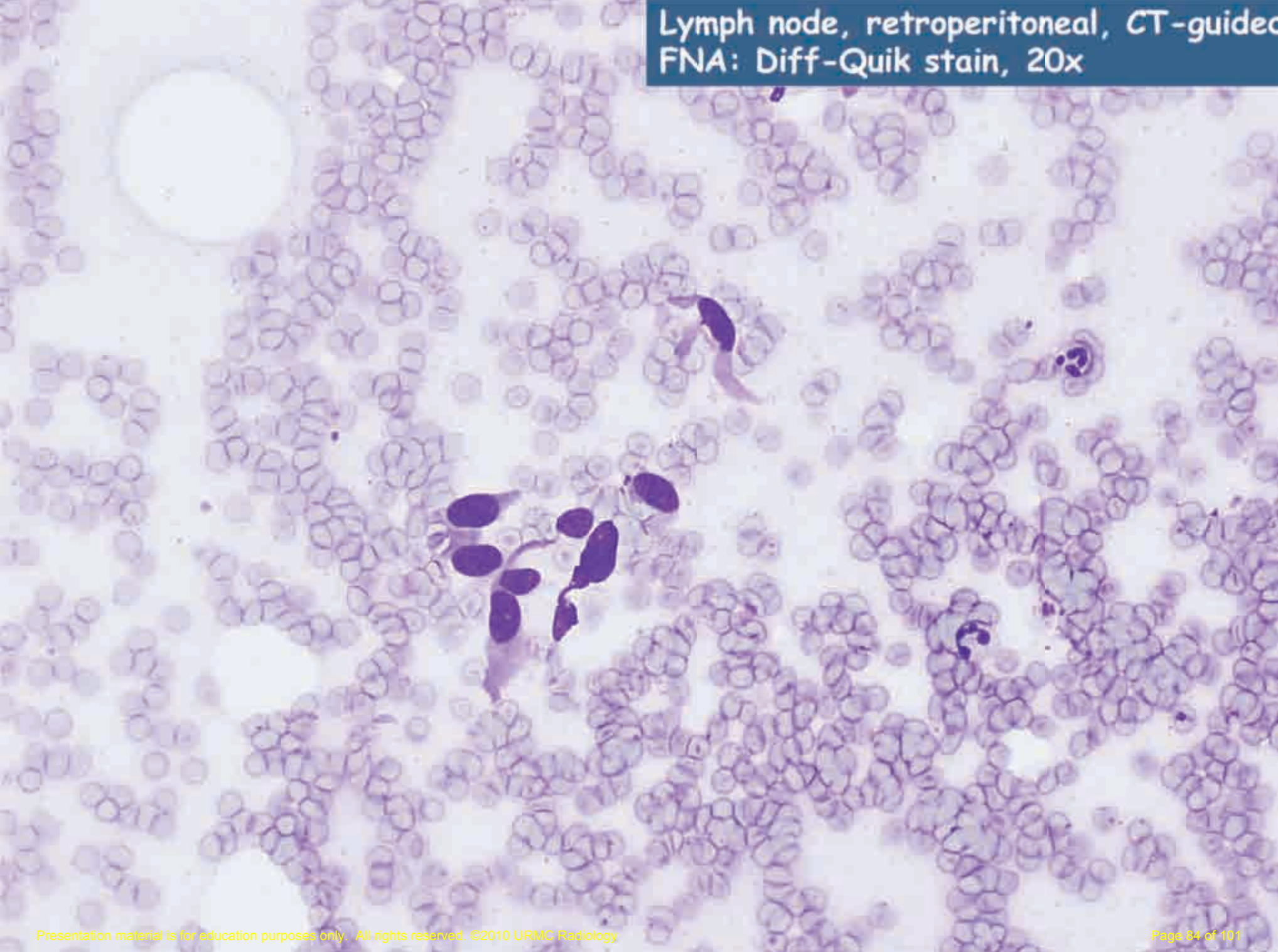
CT abdomen 11/2009

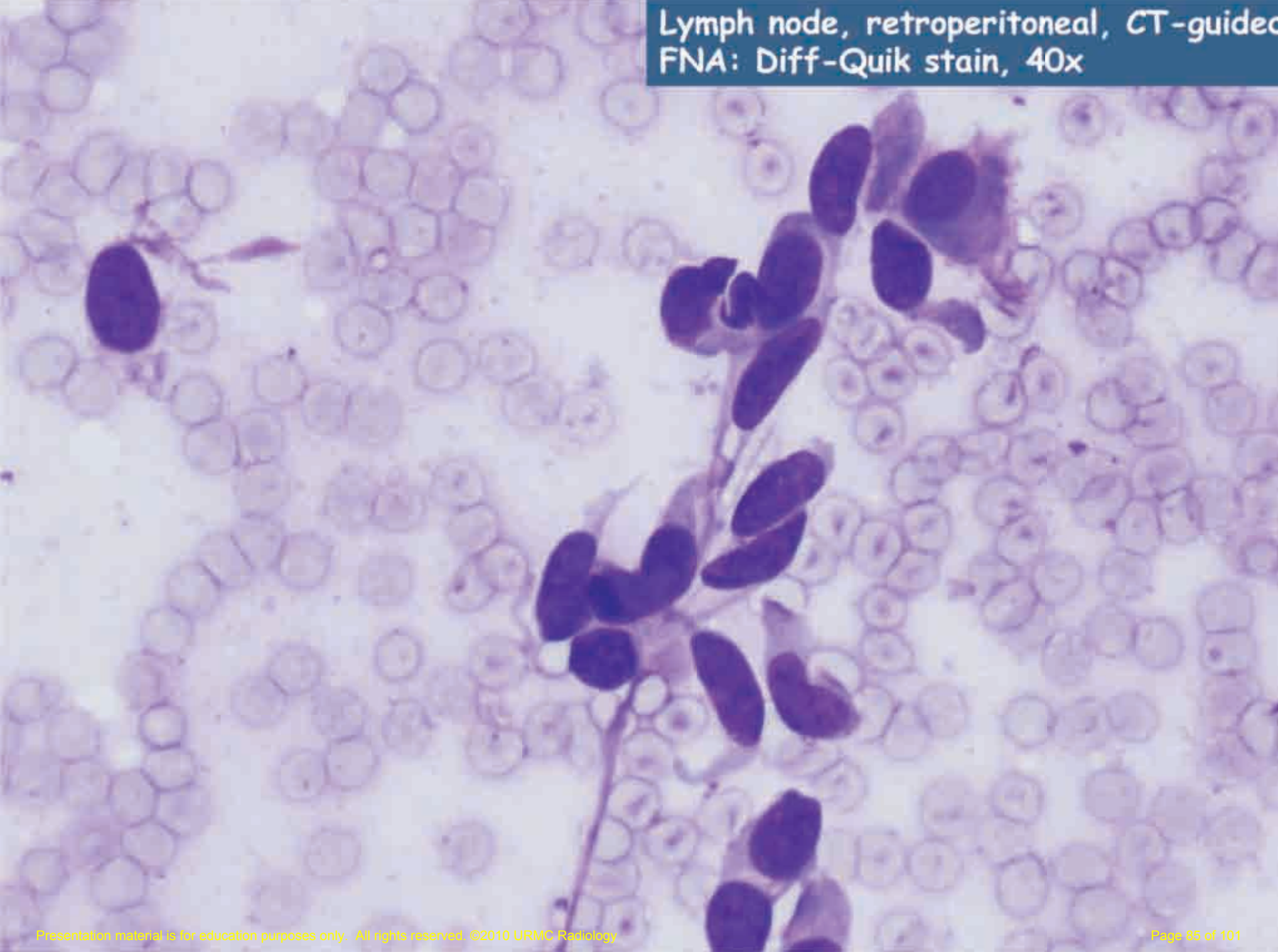
Retroperitoneal Lymph Node Involvement in Urothelial Carcinoma of the Kidney and Ureter

Renal Pelvis and Upper Ureter	**Middle Ureter**	**Lower Ureter**
Retroperitoneal Lymph Nodes	Retroperitoneal Lymph Nodes	Pelvic Lymph Nodes
(Include retrocrural, paracaval, para-aortic, and interaortocaval)	Pelvic Lymph Nodes	(Include common, external, and internal iliac, and obturator)

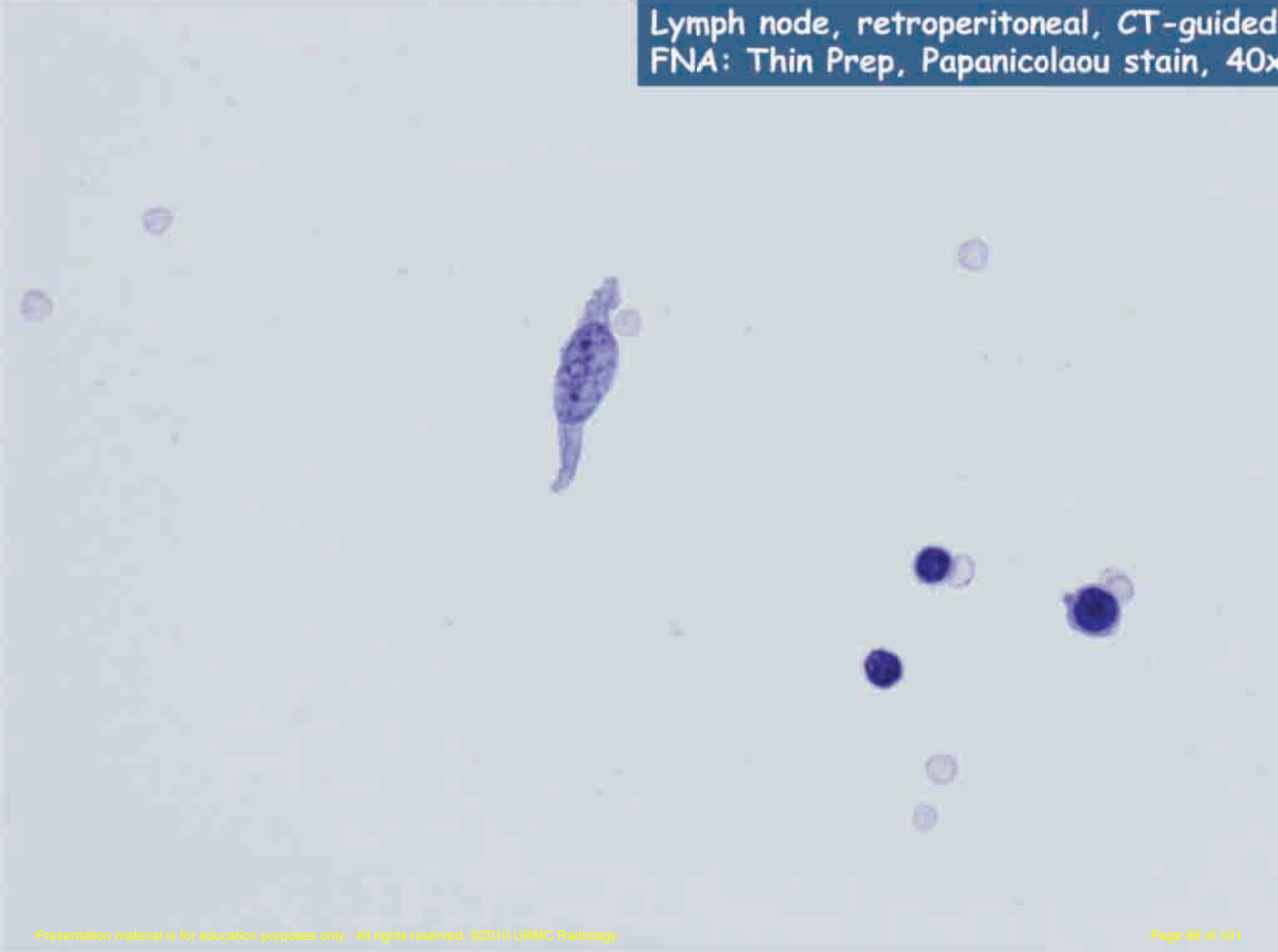


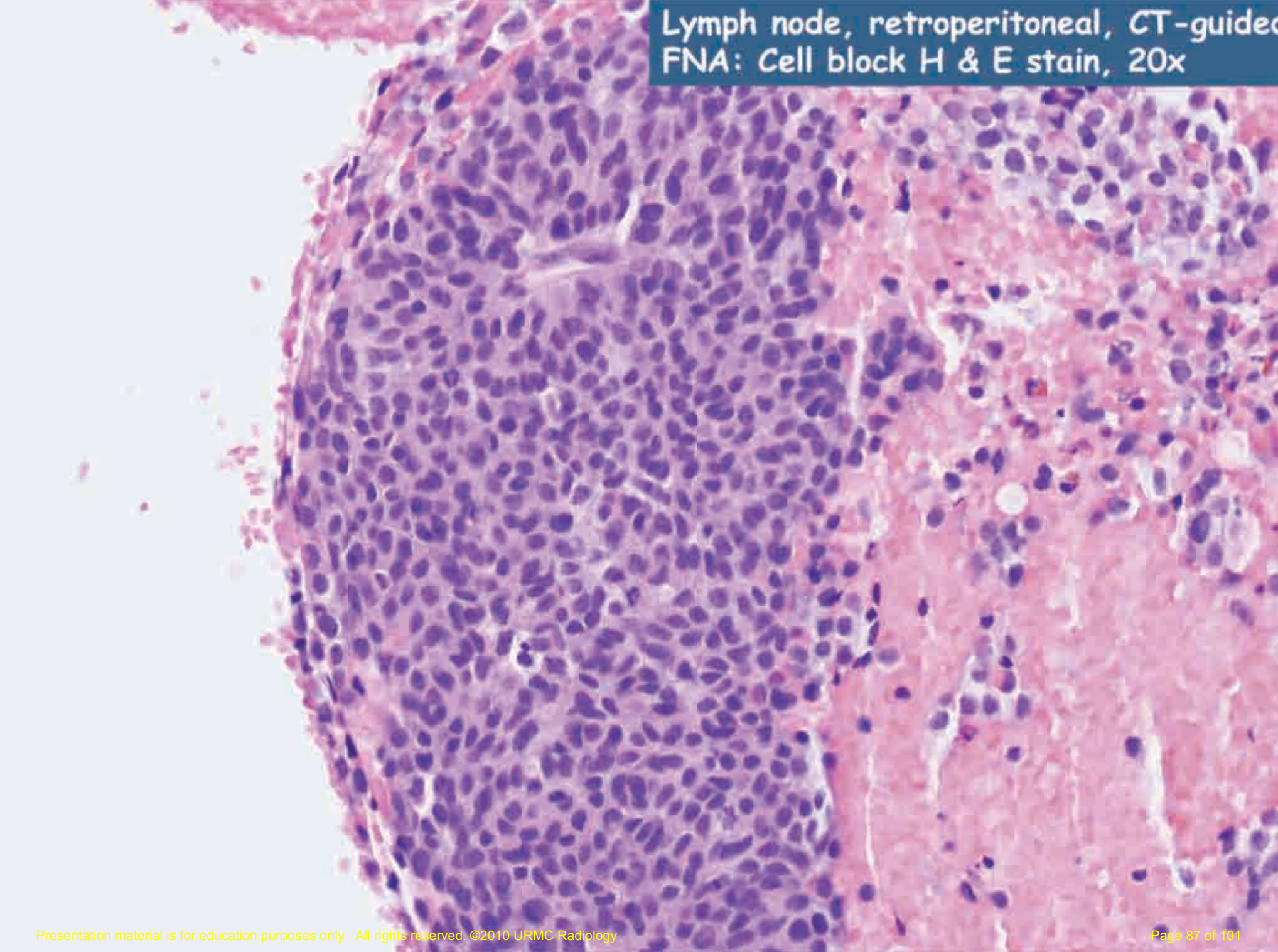
CT guided biopsy 3/2010

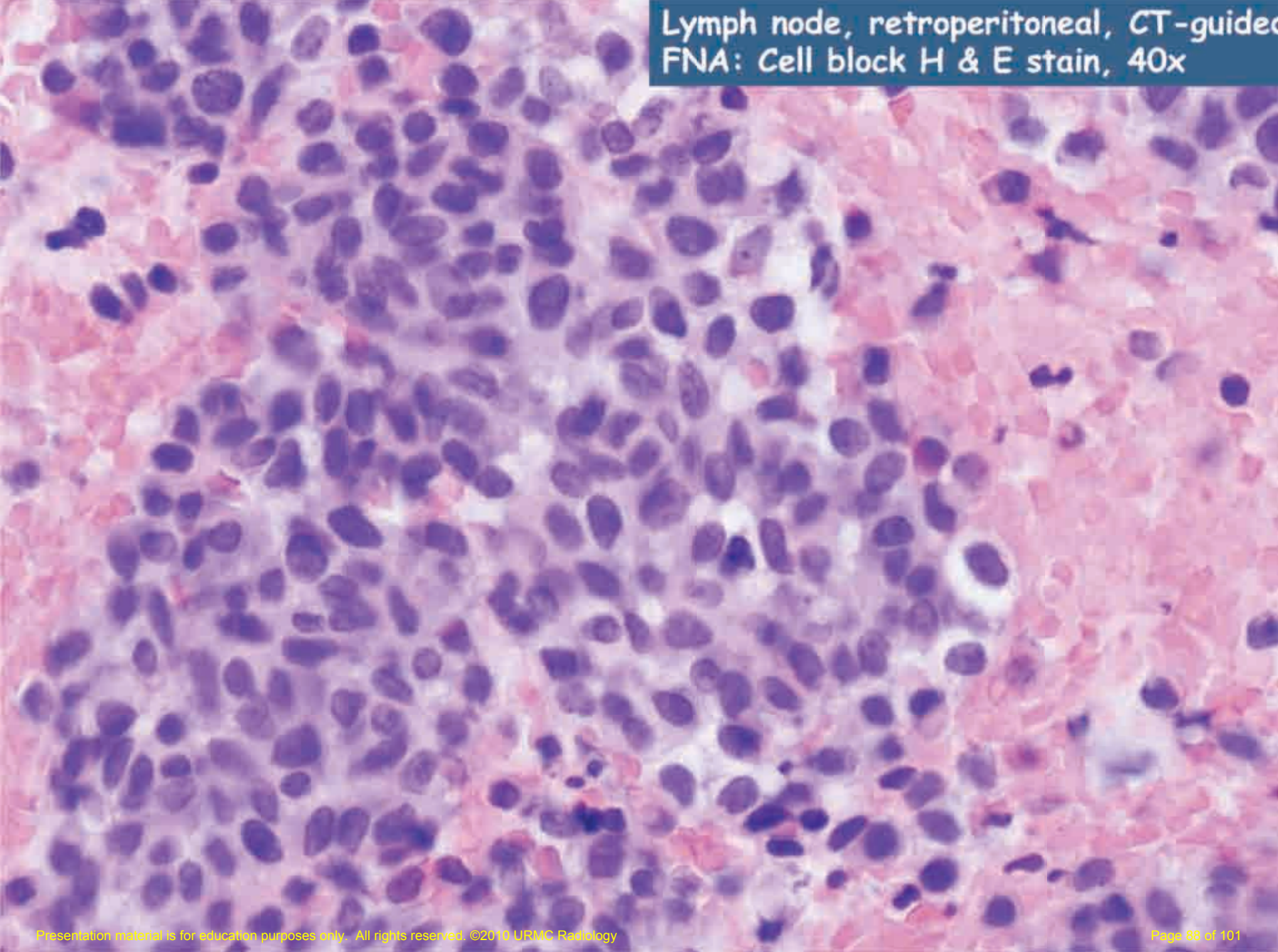


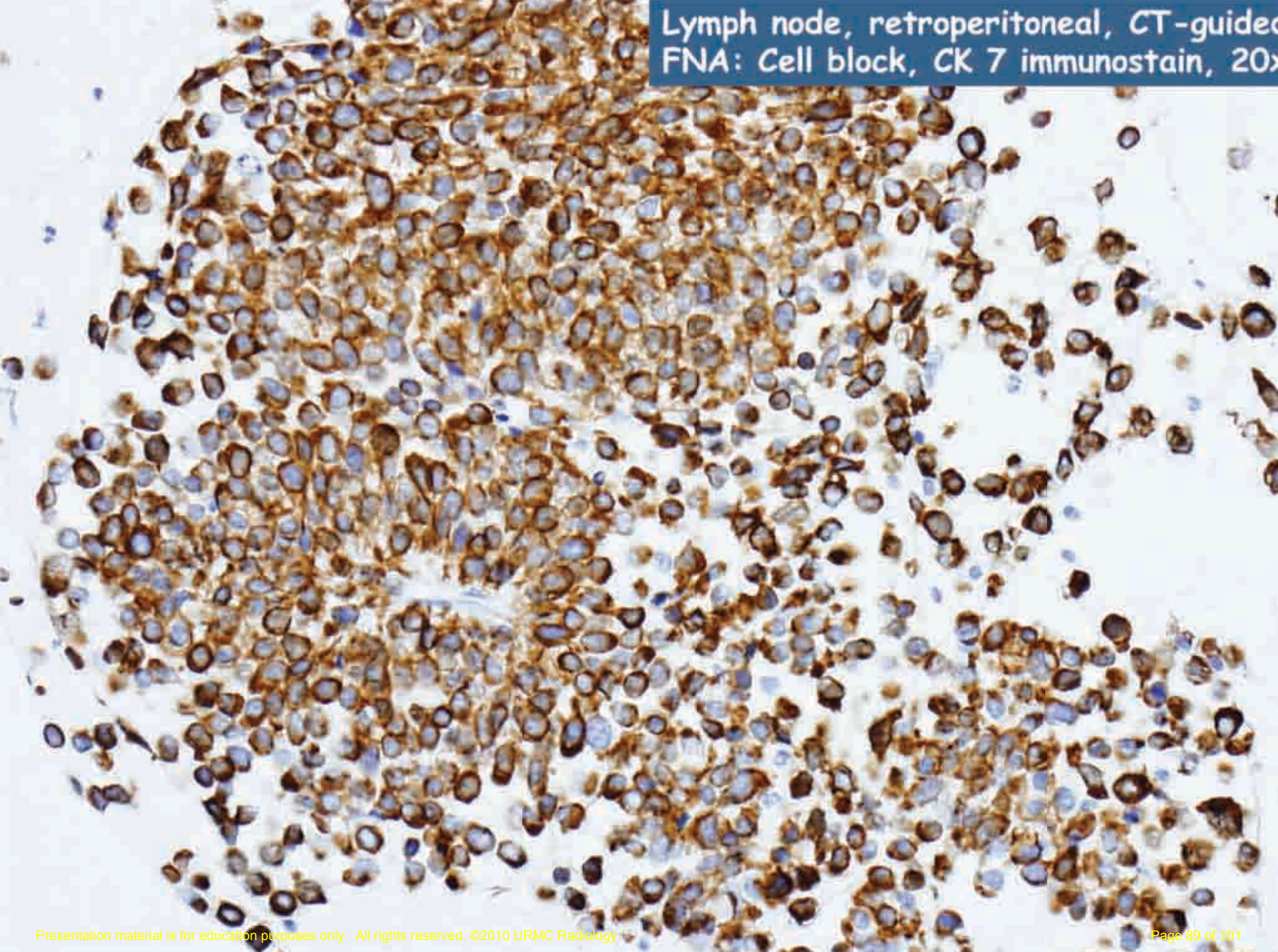


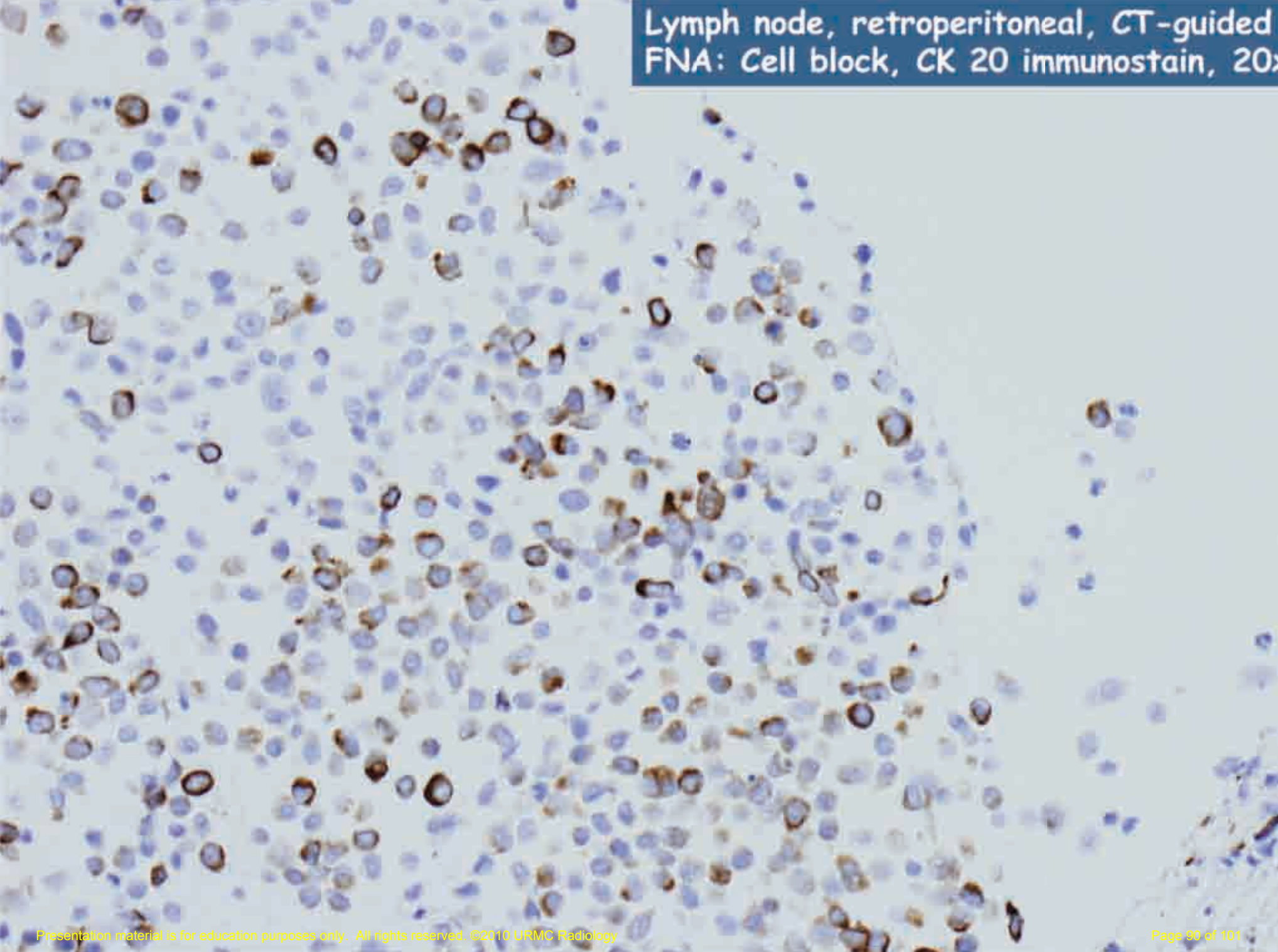
Lymph node, retroperitoneal, CT-guided
FNA: Thin Prep, Papanicolaou stain, 40x











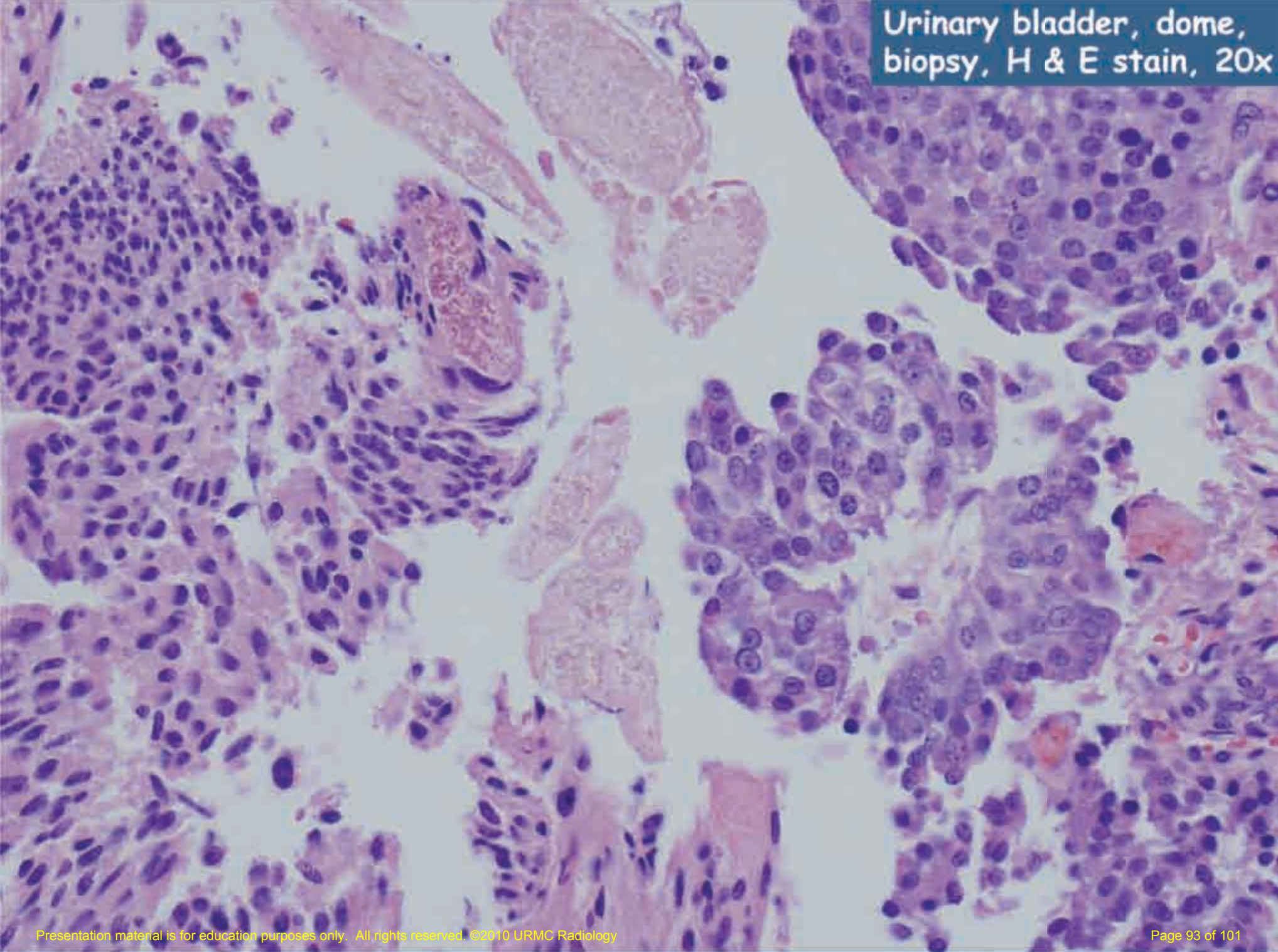
Lymph node, retroperitoneal, CT-guided fine needle aspiration:

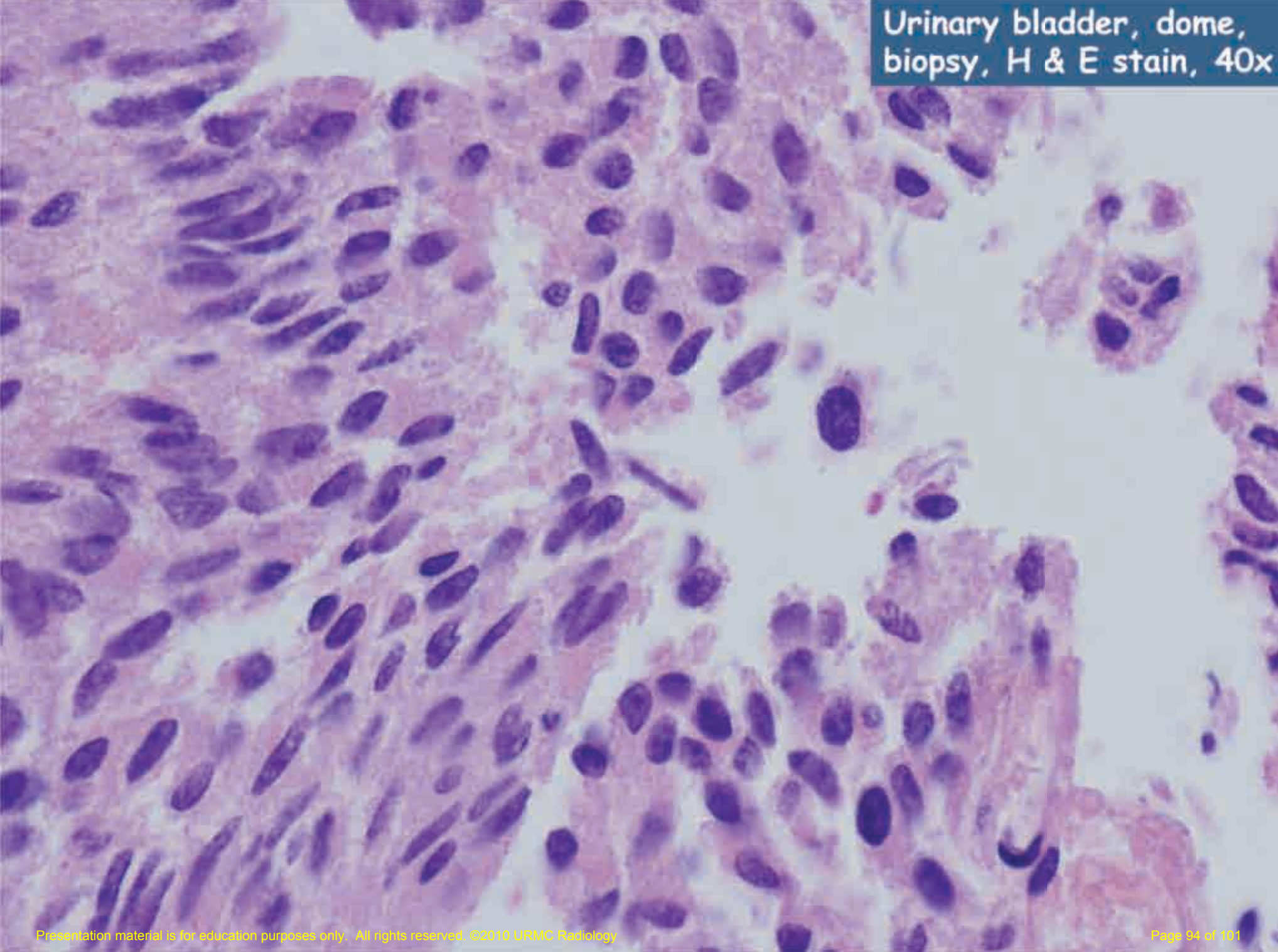
Malignant tumor cells present consistent with papillary urothelial carcinoma. Cellular evidence of lymph node is not identified.

Tumor cells are positive for CK 7 and CK 20.

Urinary bladder, dome, biopsy:

High grade papillary urothelial carcinoma, non-invasive.



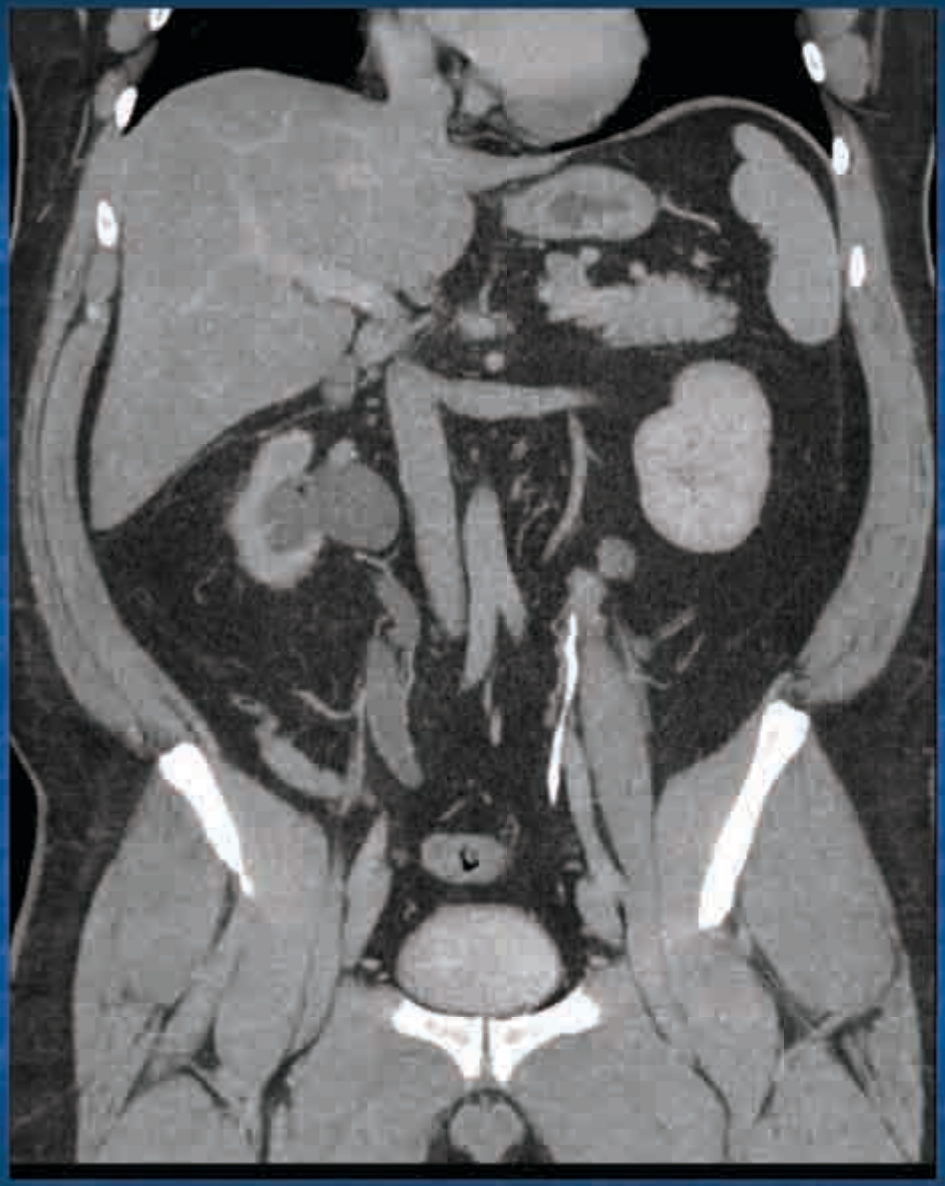


Papillary Urothelial Carcinoma

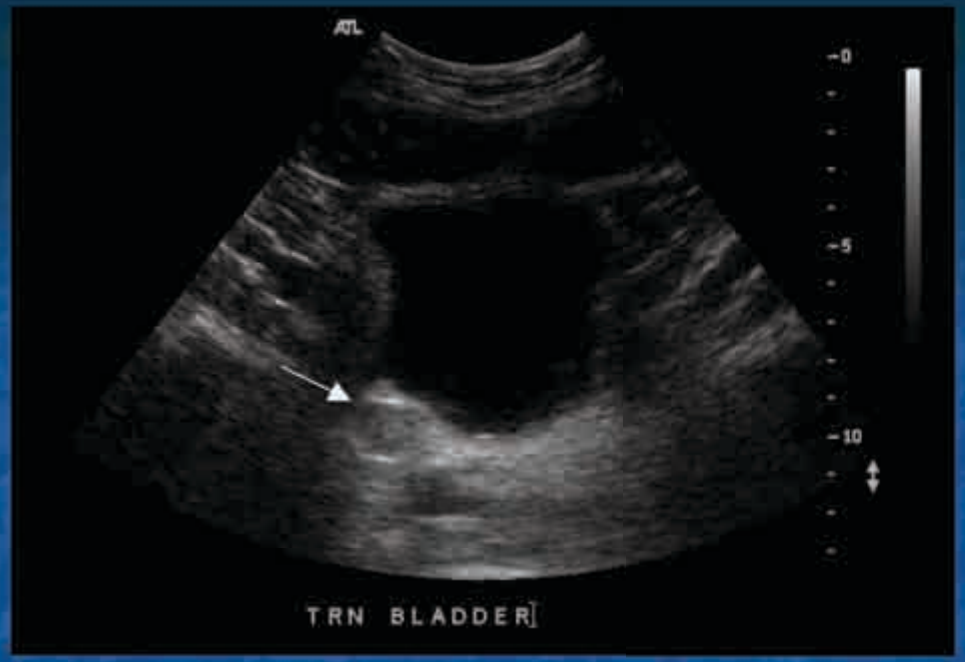
- ~ 120,000 tumors of the urinary tract – U.S. annually
- 75-85% are superficial tumors
- Majority occur in the urinary bladder
- Cytologic monitoring of urine is especially helpful in the follow-up of patients with known and previously conservatively treated bladder tumors

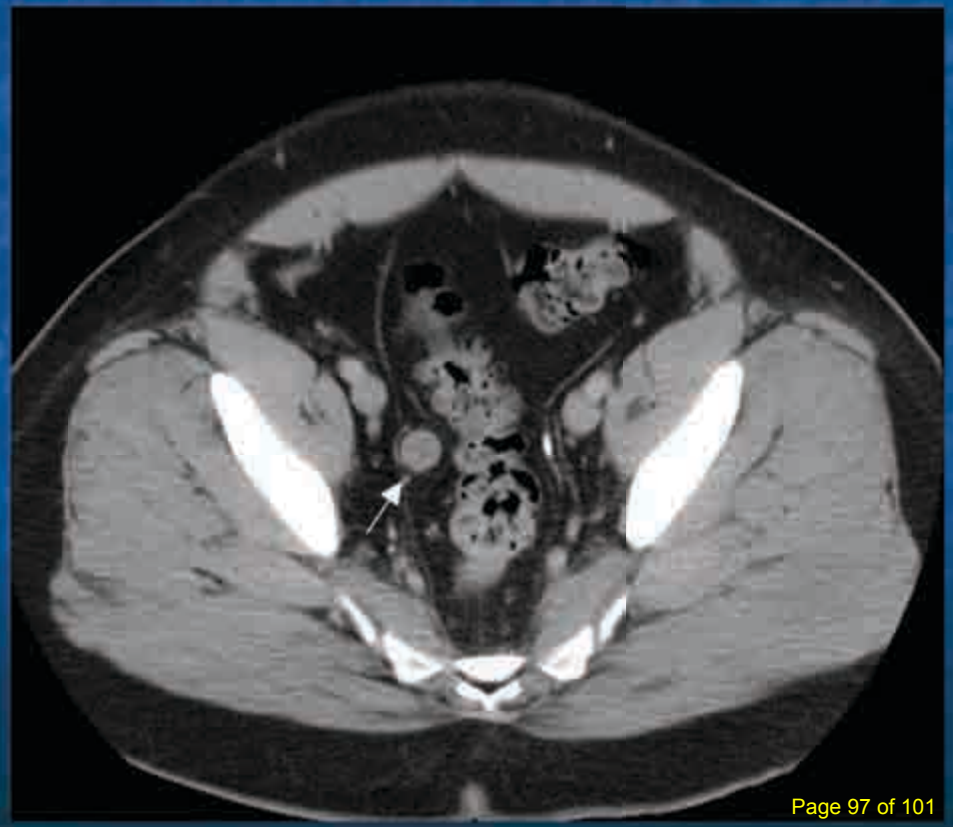
Urinary Tract Urothelial Neoplasm

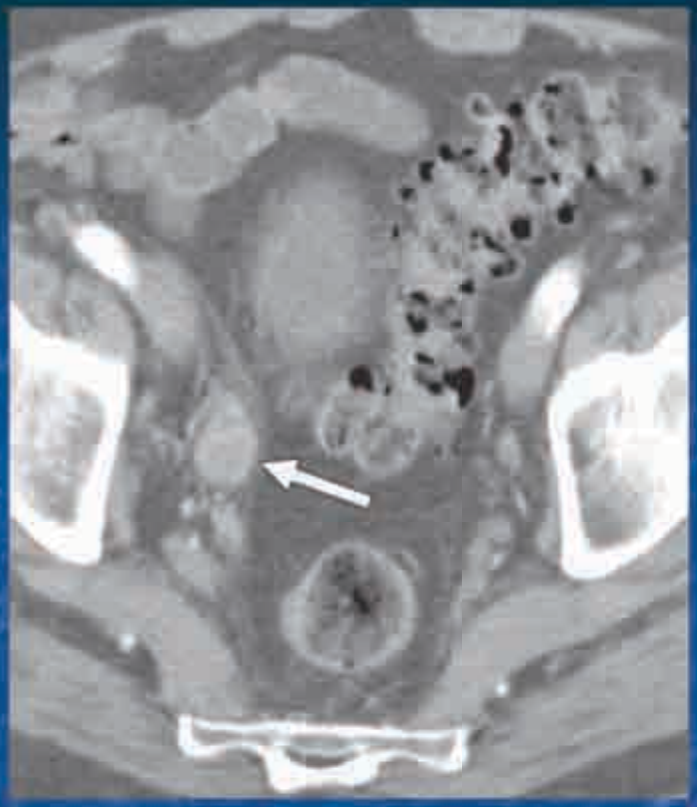
- Urothelial tumors involving the renal pelvis account for up to 7% of primary renal tumors, and urothelial tumors involving the ureter constitute ~1% of upper tract neoplasms
- Imaging Findings
  - CT appearance of upper urinary tract neoplasms
    - Focal intraluminal mass
    - Urothelial wall thickening with luminal narrowing
    - Infiltrating mass
  - Enhancement of infiltrating mass or focal area of wall thickening

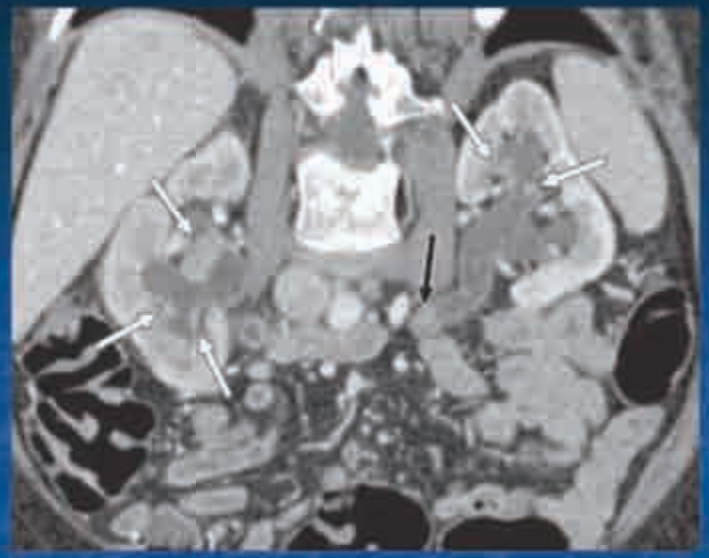


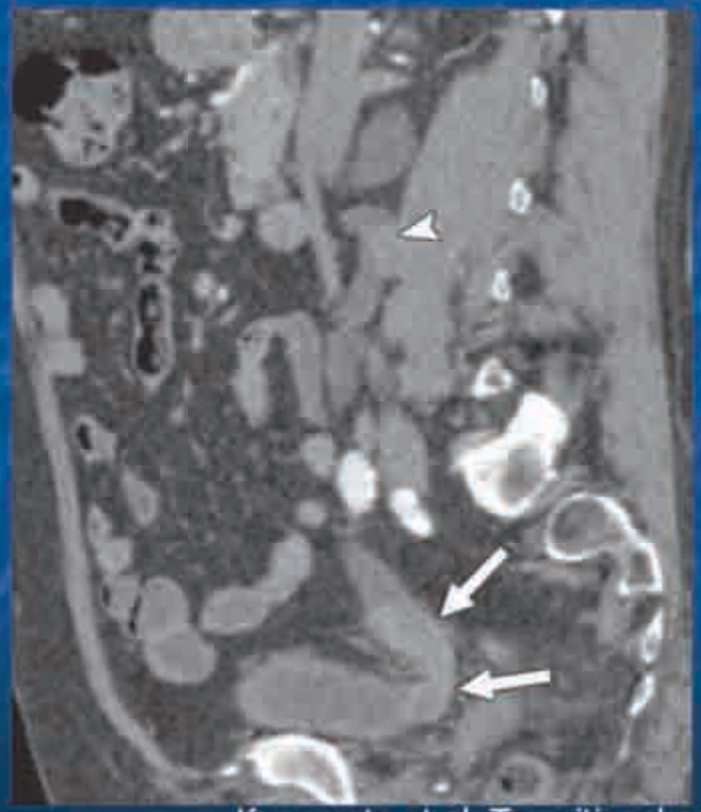
CT 2/2010











Corticomedullary phase coronal image shows multifocal enhancing masses in renal pelvis and calyces of bilateral kidneys as well as the ureter.

Kawamoto et al. Transitional cell neoplasm of the upper urinary tract: evaluation with MDCT. *AJR* 2008; 191: 416-422.

Suggested Panels for the Classification of Various Tumors

Tumor Type	Common Immunomarkers
Carcinomas (Epithelial Tumors)	Pankeratin, CK 7 and CK 20, TTF-1, Napsin-A, CDX-2, CalR, CK 5/6, CEA, EMA, B72.3, Hep-Par1
Lymphomas	CD45, CD 3, CD 20, CD 30, CD 15, Kappa, Lambda, CD138 (plasma cell)
Sarcomas (Mesenchymal Tumors)	S-100, Myogenin, MSA, SMA, Vimentin CD 99, CD 31, CD 34, C-kit
Melanoma	S-100, HMB-45, Melan-A, Cytokeratin (-)
Neural/NE	Chromogranin, Synaptophysin, CD 56, GFAP

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