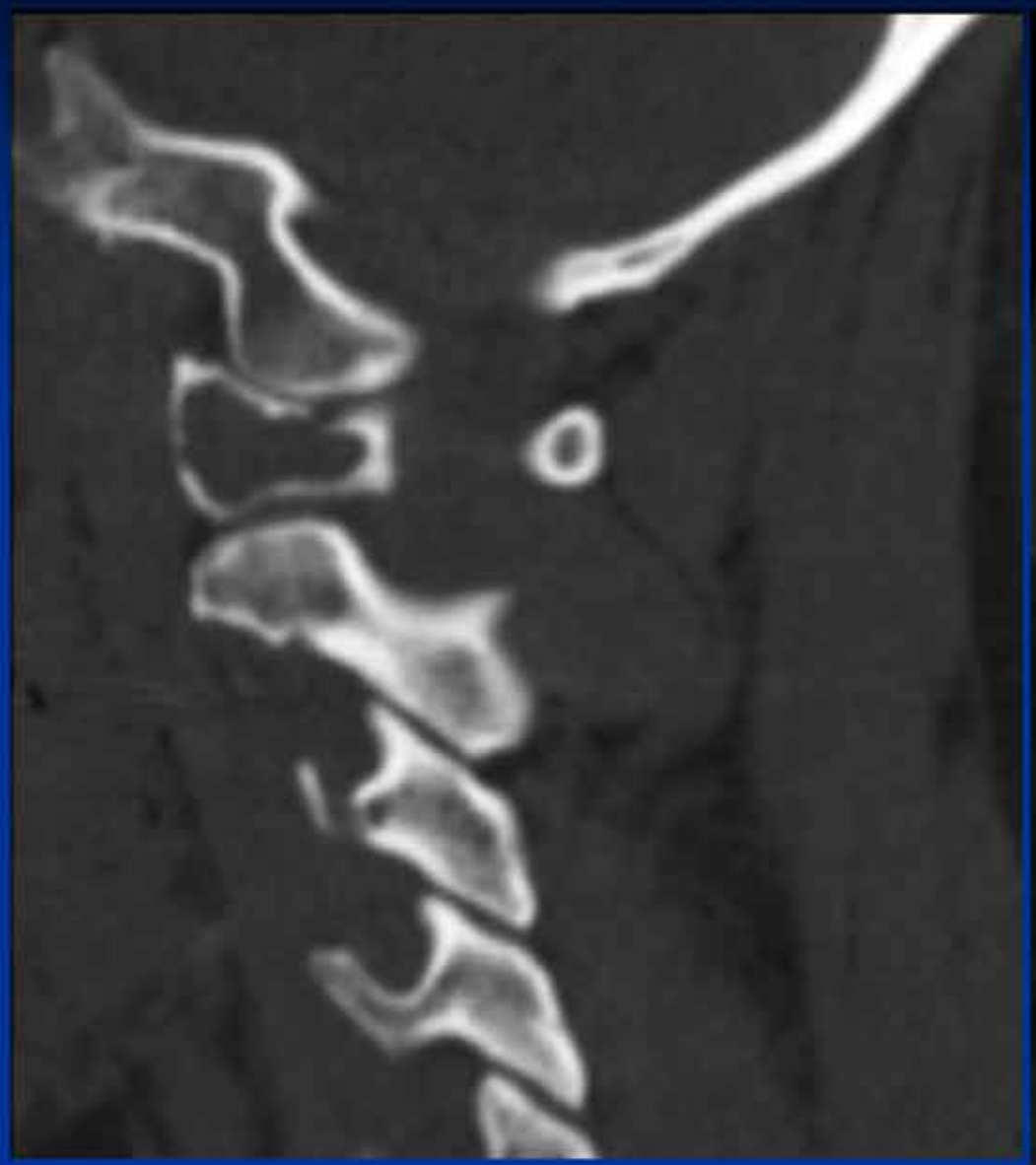
Radiology / Pathology Conference

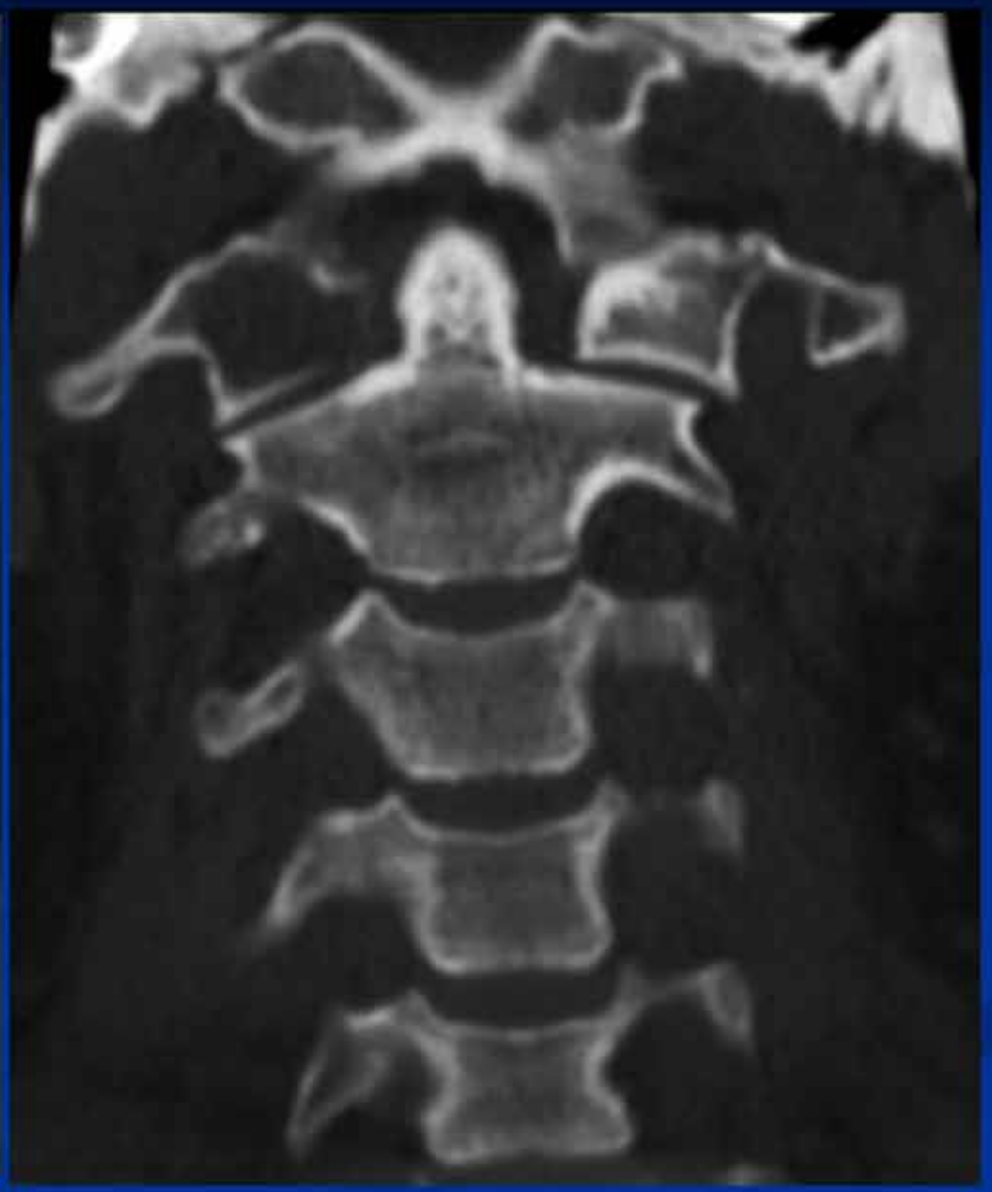
July 29, 2011

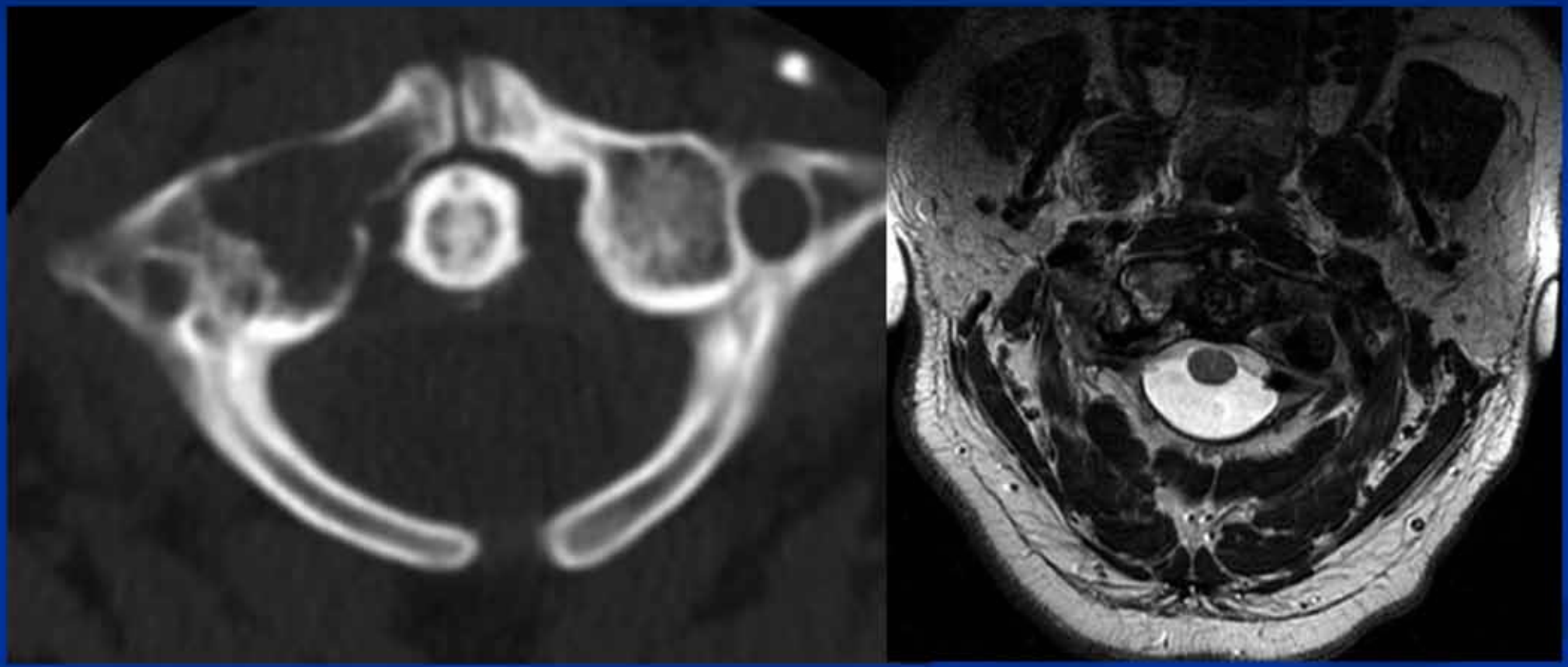
Ellen Giampoli, MD

Scott Schiffman MD

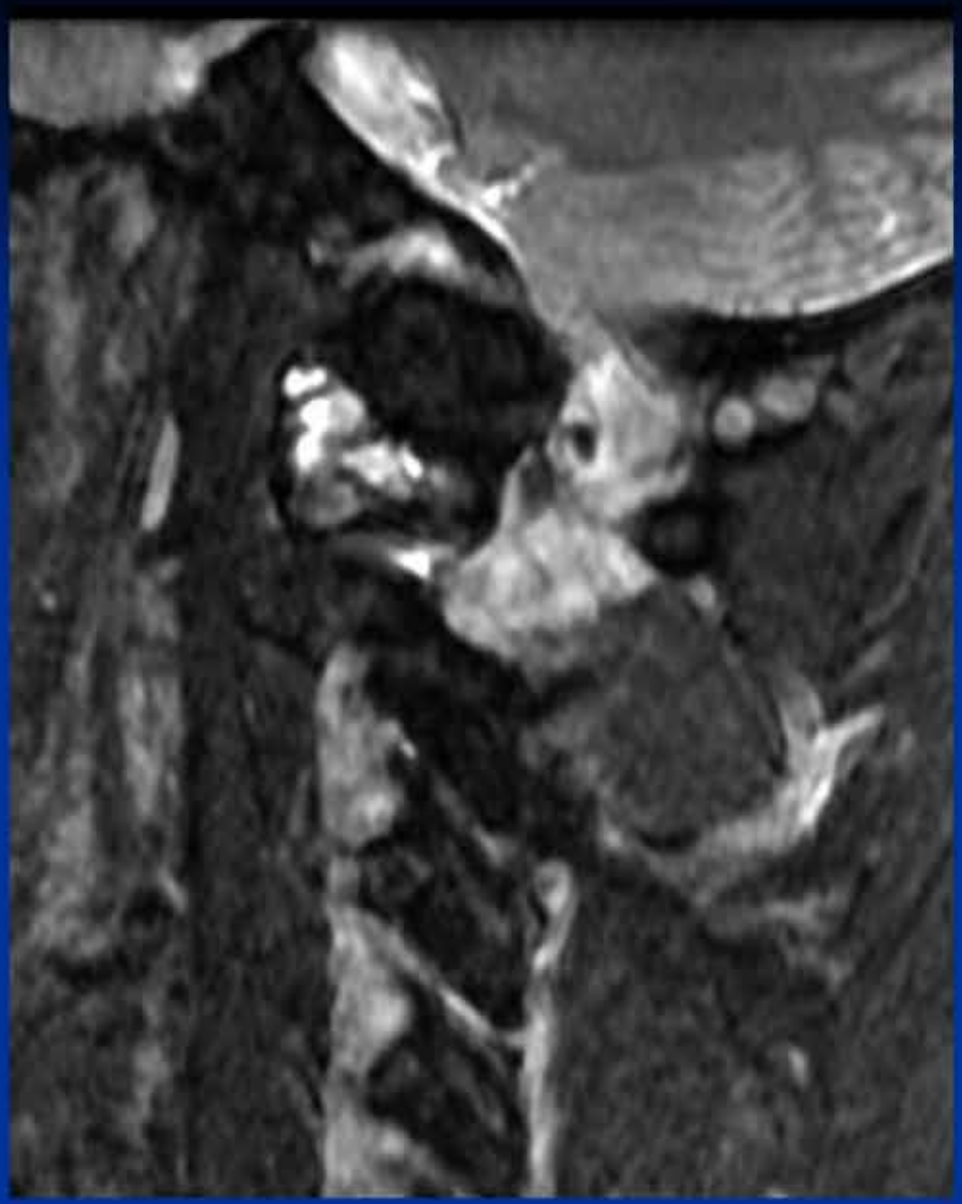
Case 1
27 yo M pain in the neck

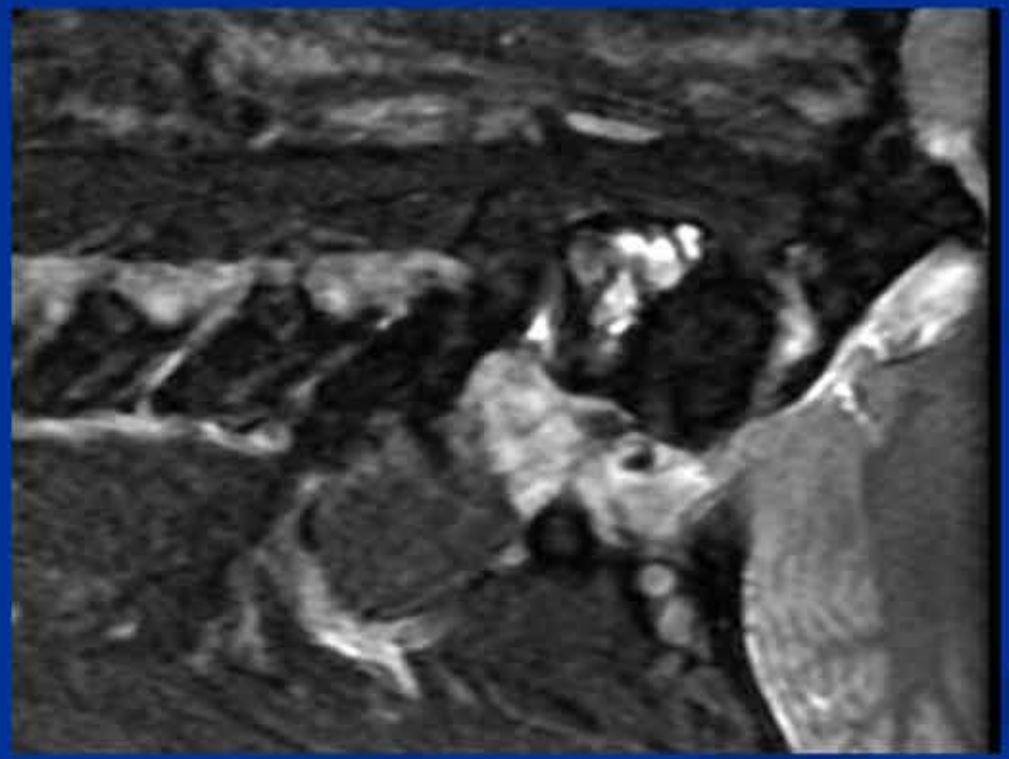




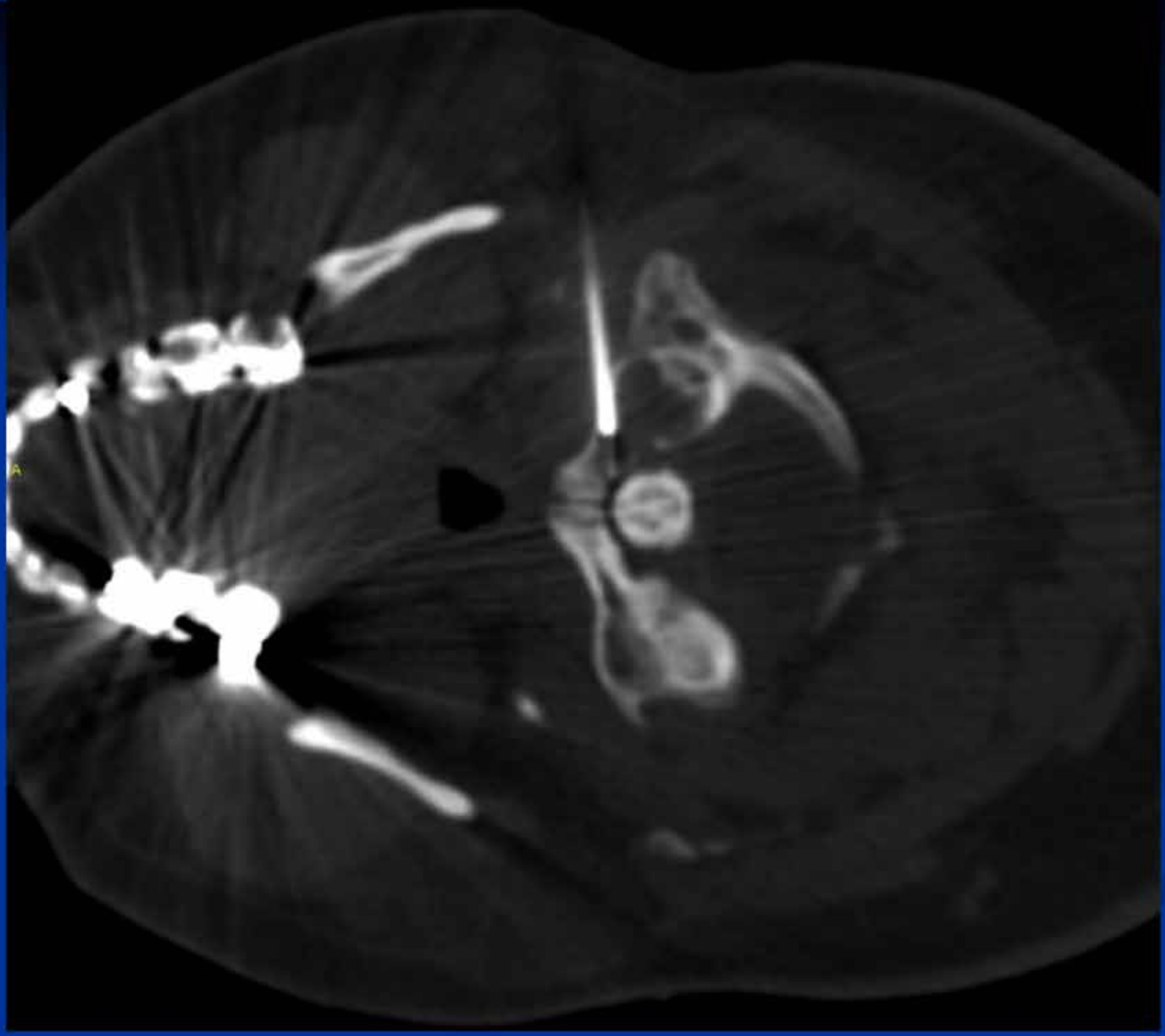


T2

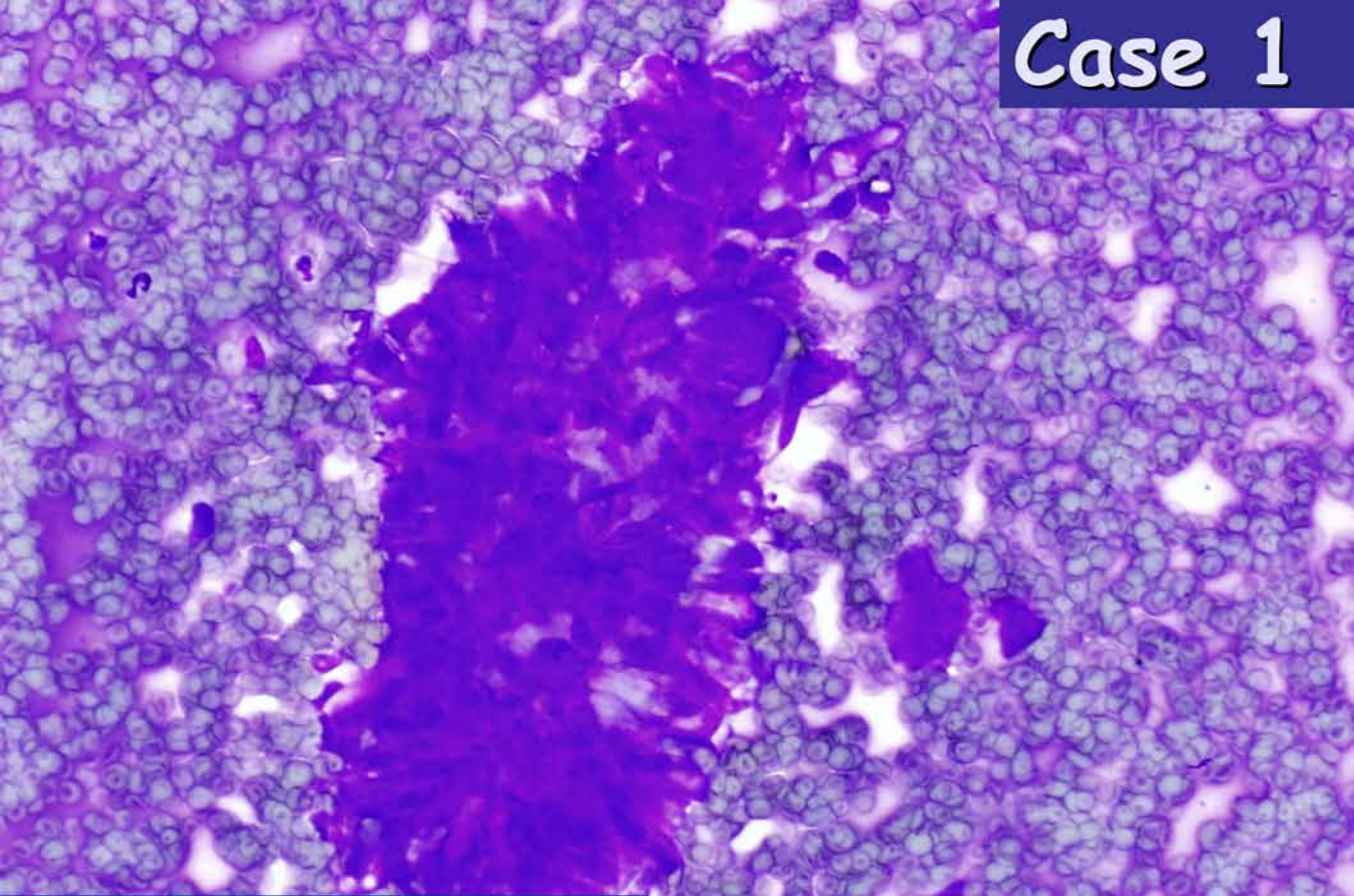




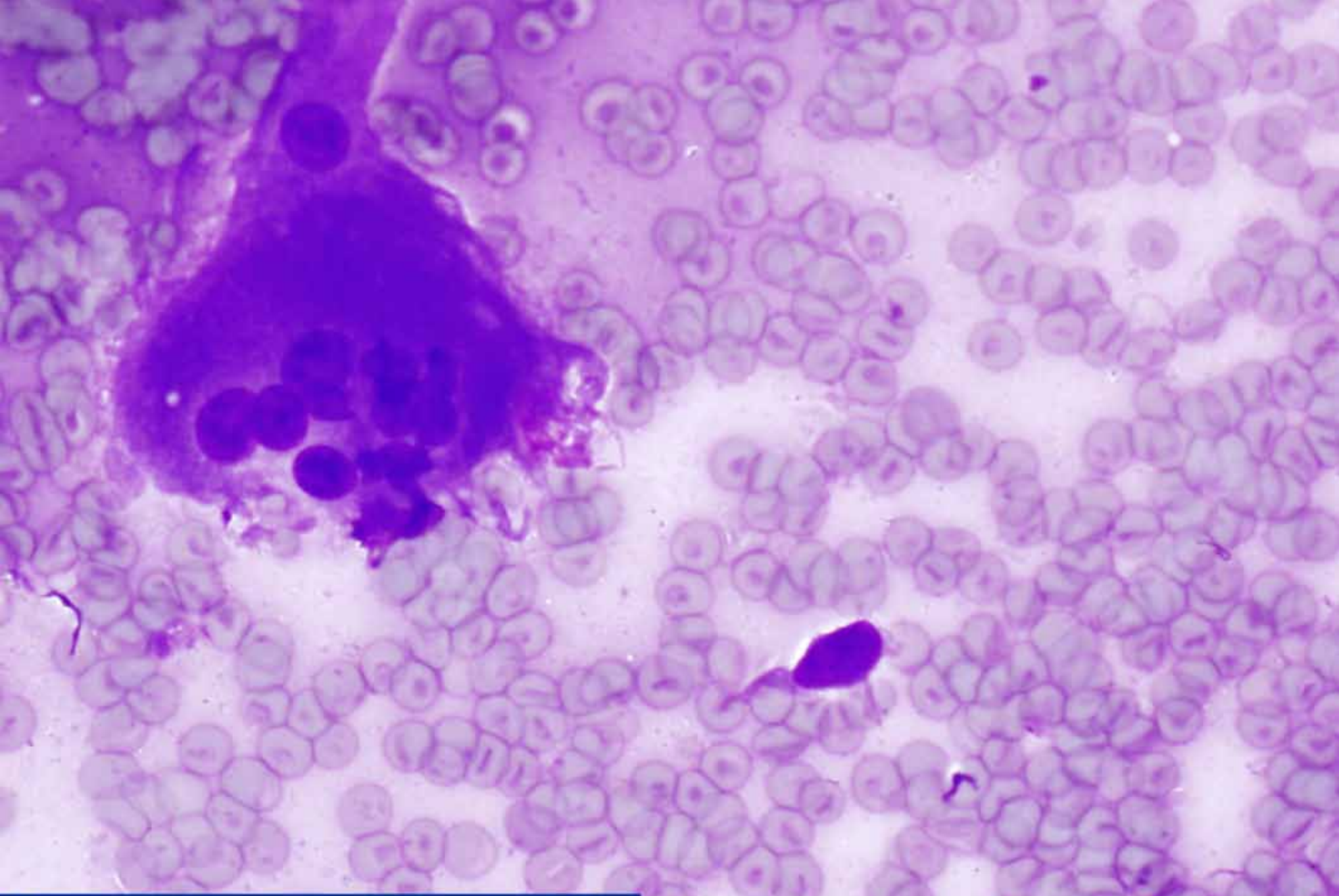
T2 Fat Sat



Case 1

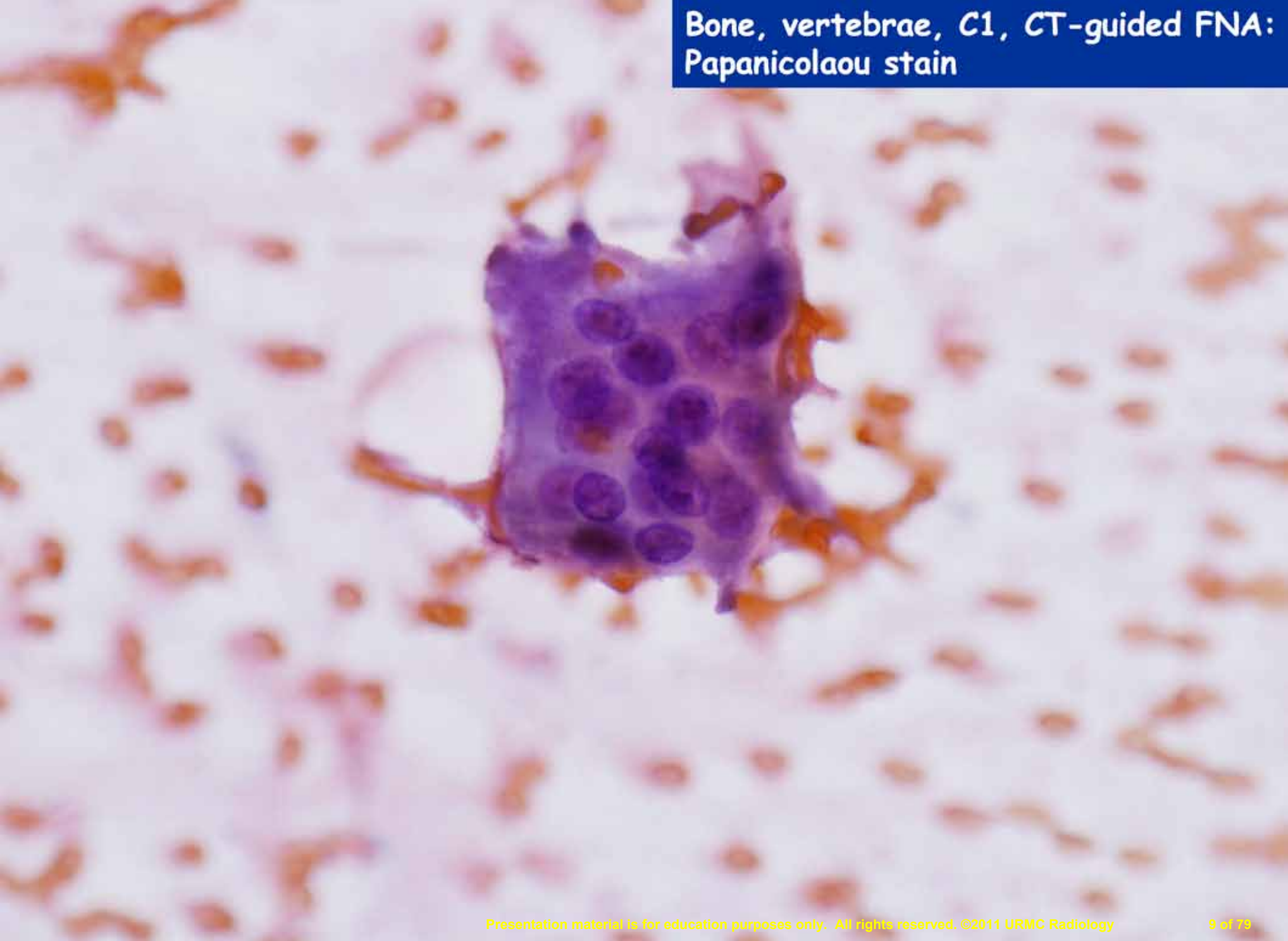


Bone, vertebrae, C1, CT-guided FNA:
Diff-Quik stain

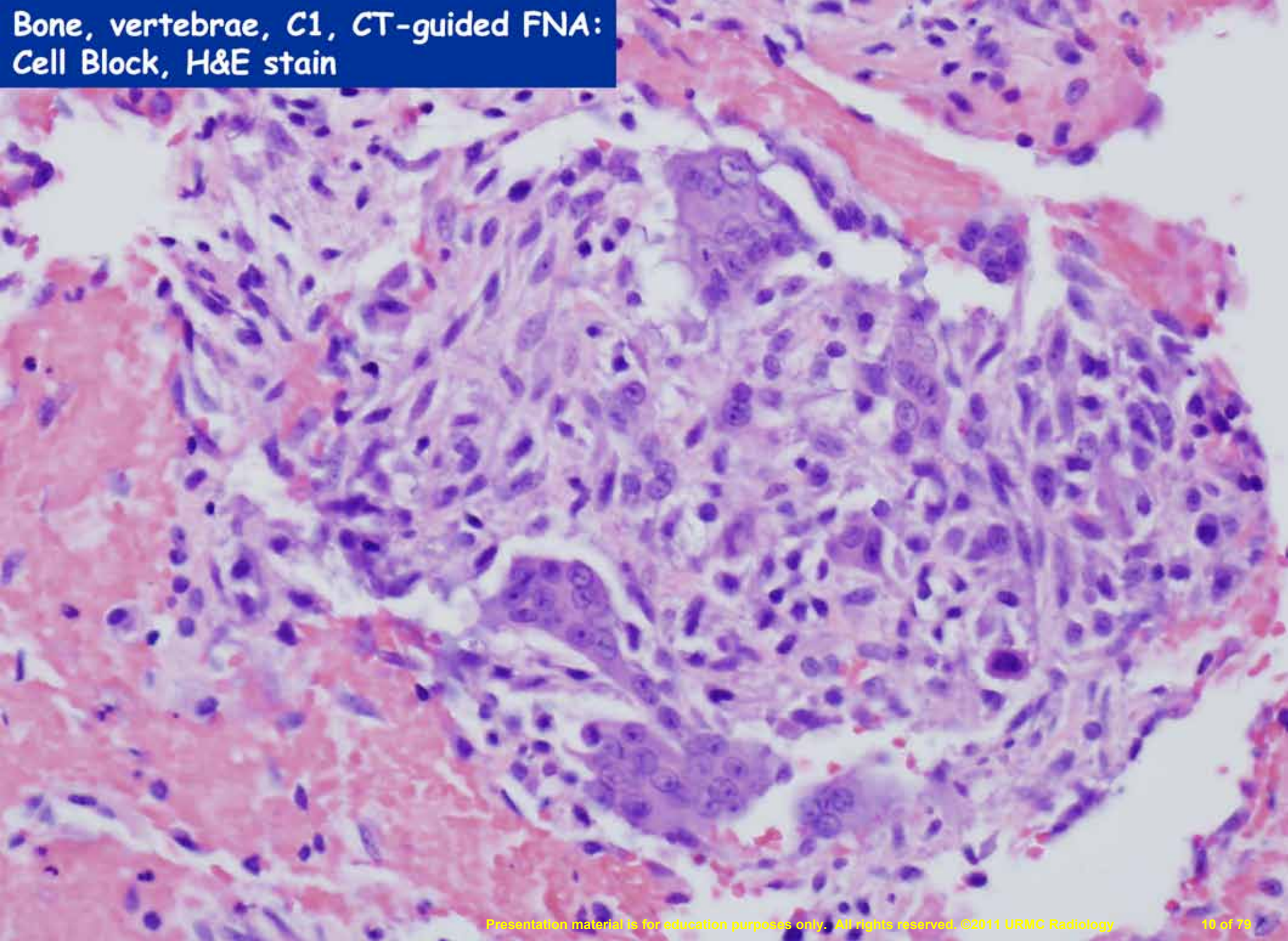


Bone, vertebrae, C1, CT-guided FNA:
Diff-Quik stain

Bone, vertebrae, C1, CT-guided FNA: Papanicolaou stain



Bone, vertebrae, C1, CT-guided FNA:
Cell Block, H&E stain



Bone, vertebrae, C1, CT-guided fine needle aspiration:

Cytologic findings are consistent with clinical/radiographic impression of an aneurysmal bone cyst. Malignant tumor cells not identified.

Cell block and cytologic preparations examined.

Aneurysmal Bone Cyst

- Benign tumor of bone
- Most frequently occurs in spine and longer bones of body
- Symptoms include bone pain and swelling
- Can originate in injured bone or in an existing bone tumor such as chondroblastoma or osteoblastoma

Solitary Lytic Bone Lesion

- Differential Diagnosis (Mnemonic = FOGMACHINES)

  F = Fibrous Dysplasia

  O = Osteoblastoma

  G = Giant Cell Tumor

  M = Metastasis / Myeloma

  A = Aneurysmal Bone Cyst

  C = Chondroblastoma

  H = Hyperparathyroidism(brown tumours)/ Hemangioma

  I = Infection

  N = Non-ossifying Fibroma

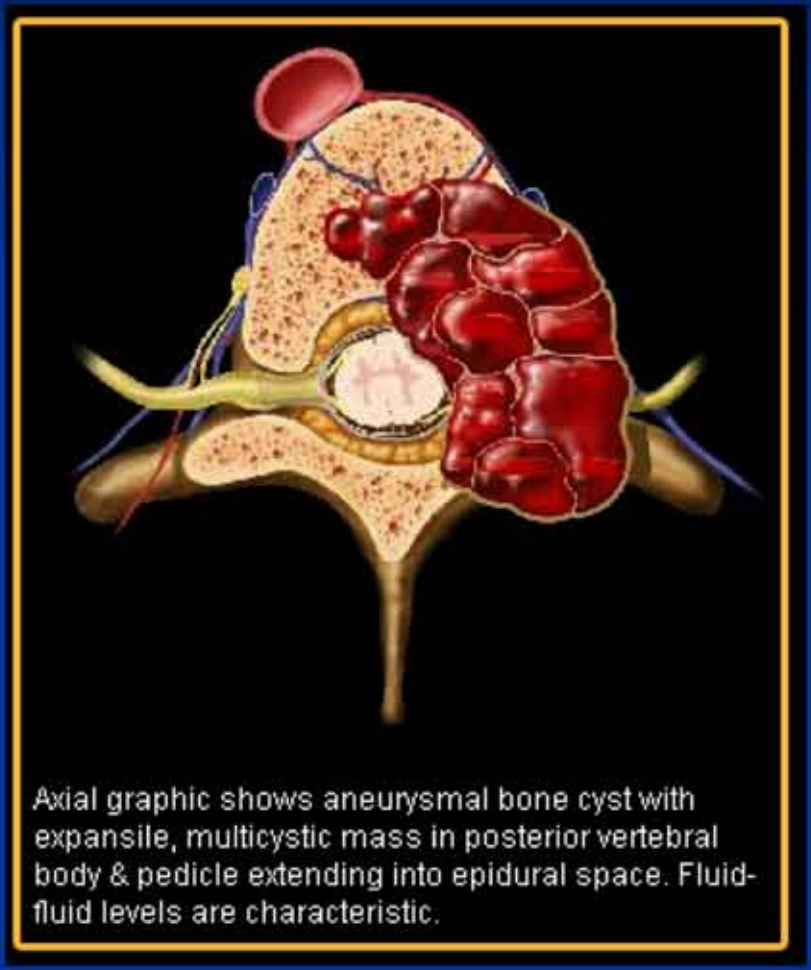
  E = Eosinophilic Granuloma / Enchondroma

  S = Solitary Bone Cyst

Lytic lesion in posterior elements

- Differential Diagnosis (Mnemonic = GOAPE)
  G – Giant Cell Tumor
- O - Osteoblastoma
- A – Aneurysmal Bone Cyst
- P - Plasmacytoma
- E – Eosinophilic Granuloma

Aneurysmal Bone Cyst

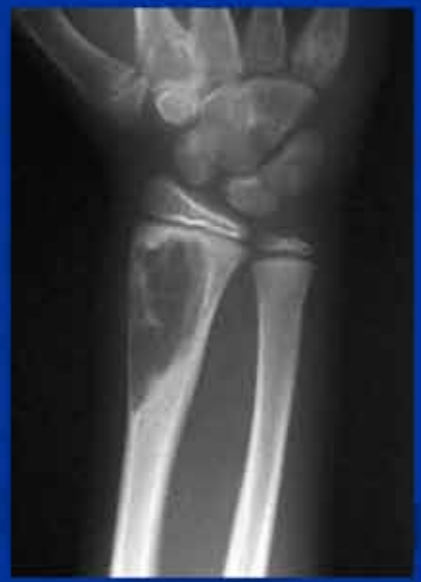


Axial graphic shows aneurysmal bone cyst with expansile, multicystic mass in posterior vertebral body & pedicle extending into epidural space. Fluid-fluid levels are characteristic.

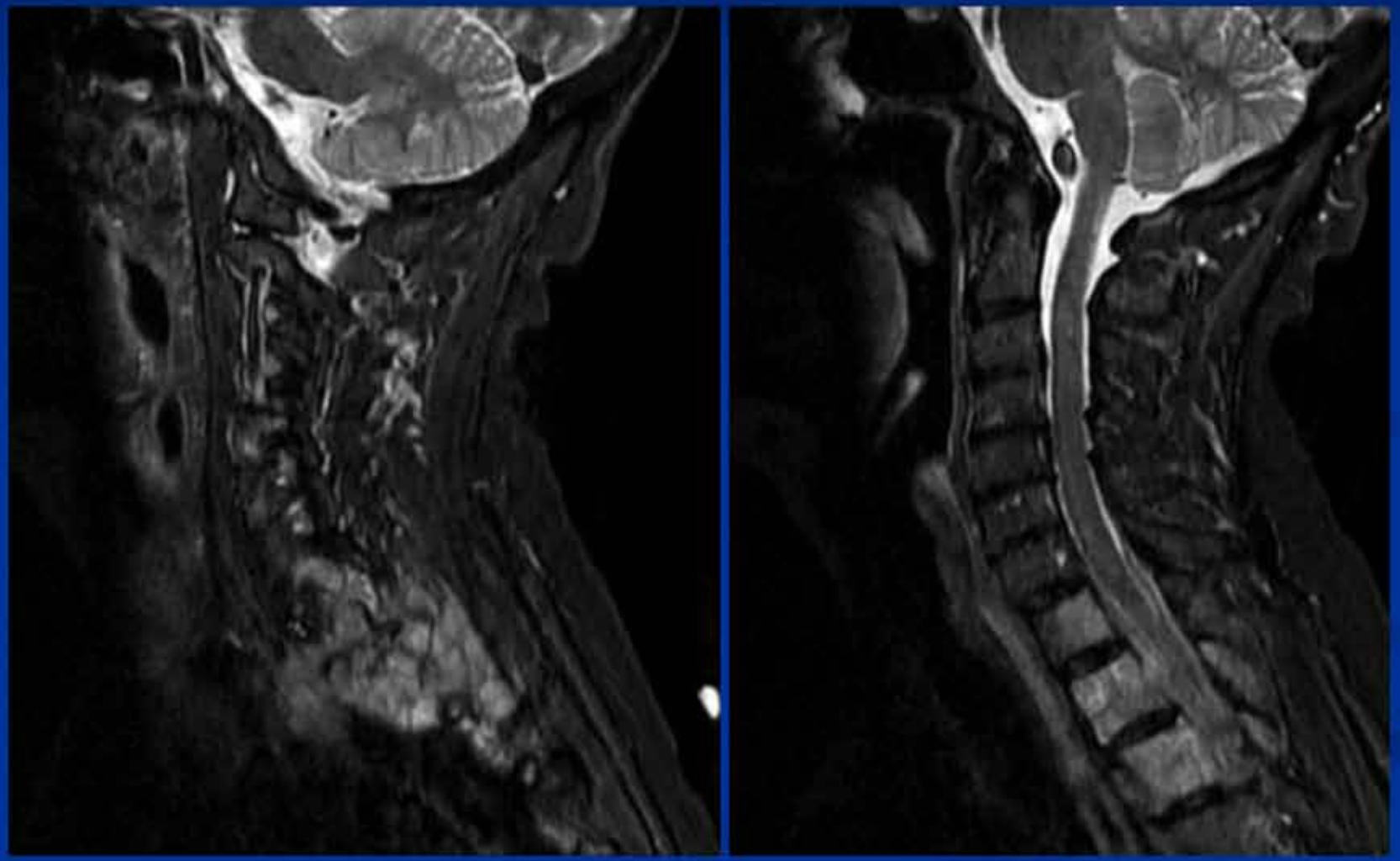
Location

- Long tubular bones: 70-80%
- Pelvis: 5-10%
- Spine (posterior elements): 15%
  - 75-90% extend into vertebral body
- Hands: 10-15%

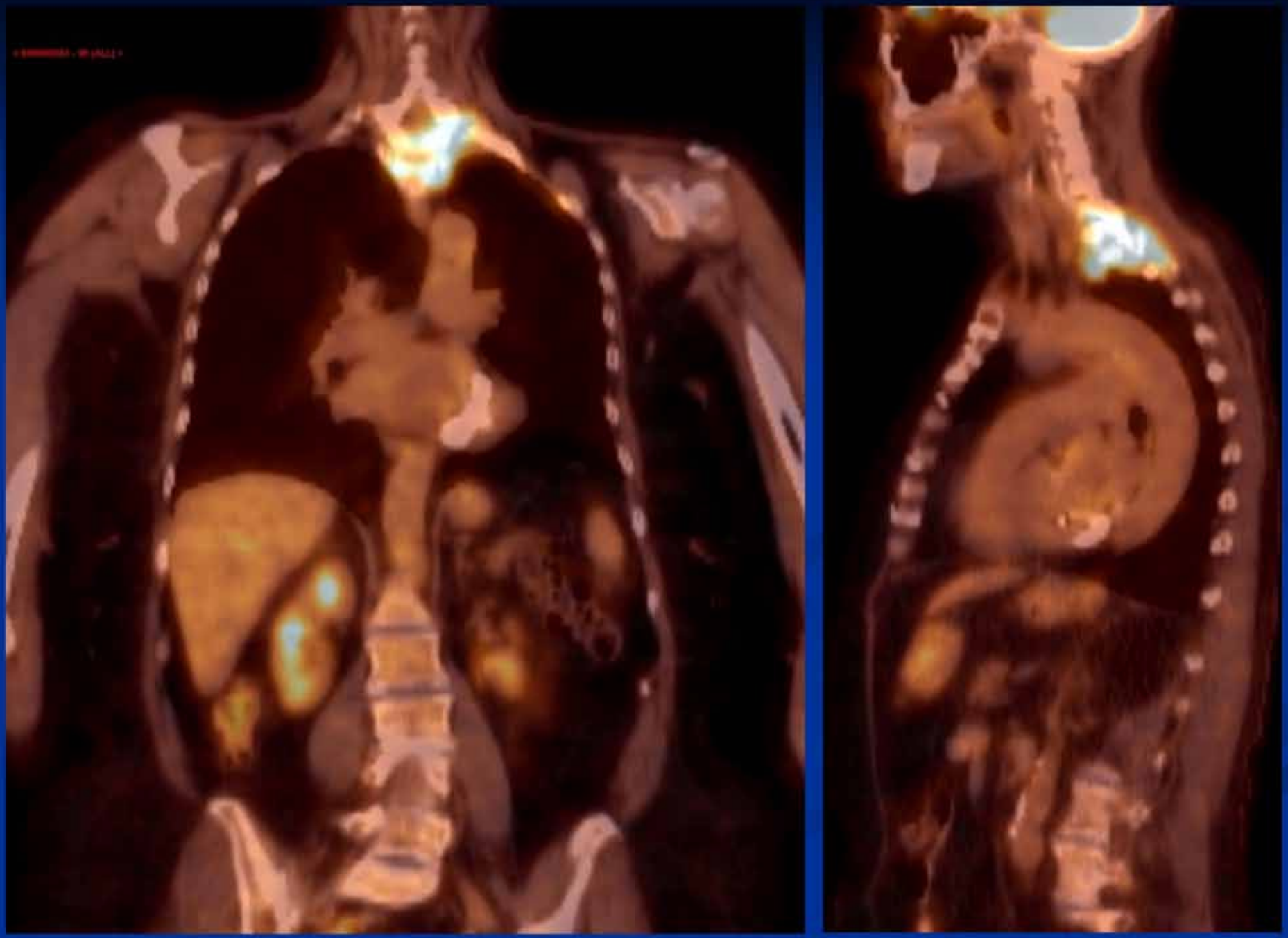
- Metaphysis: 80-90%
- Diaphysis: 10-20%
- Predominantly intramedullary

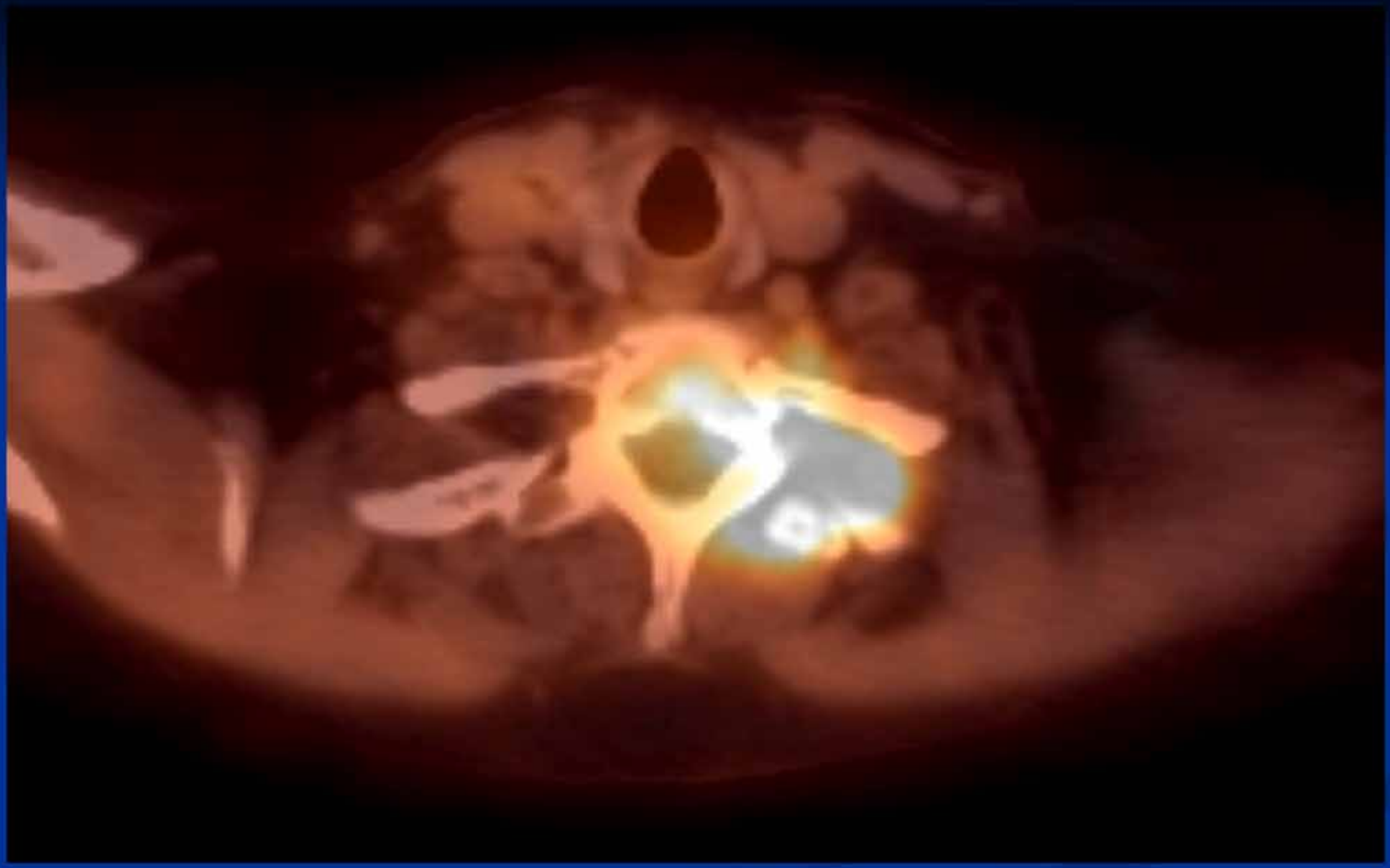


Case 2: 74 yo F with new onset left arm numbness and pain

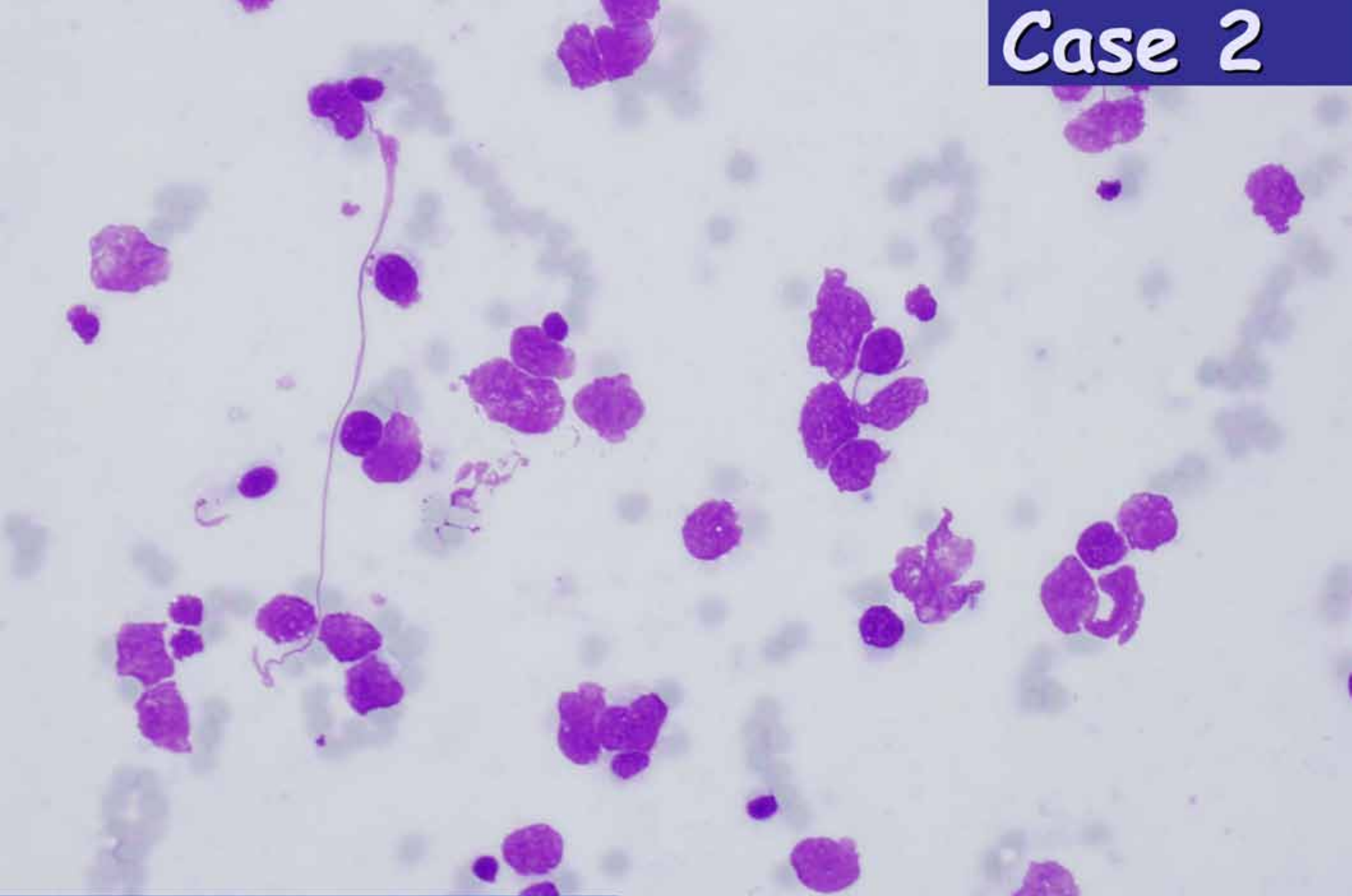


STIR



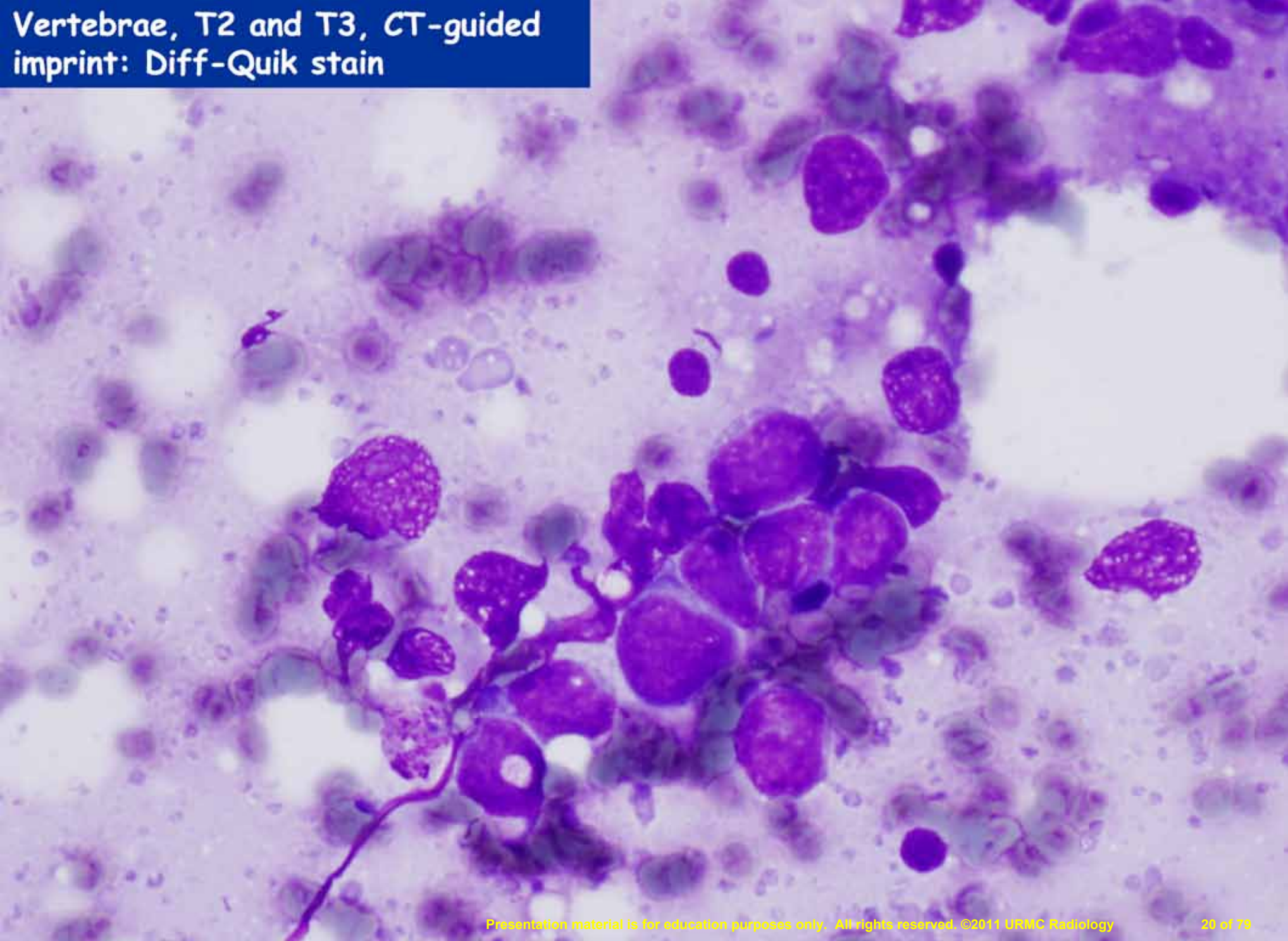


Case 2

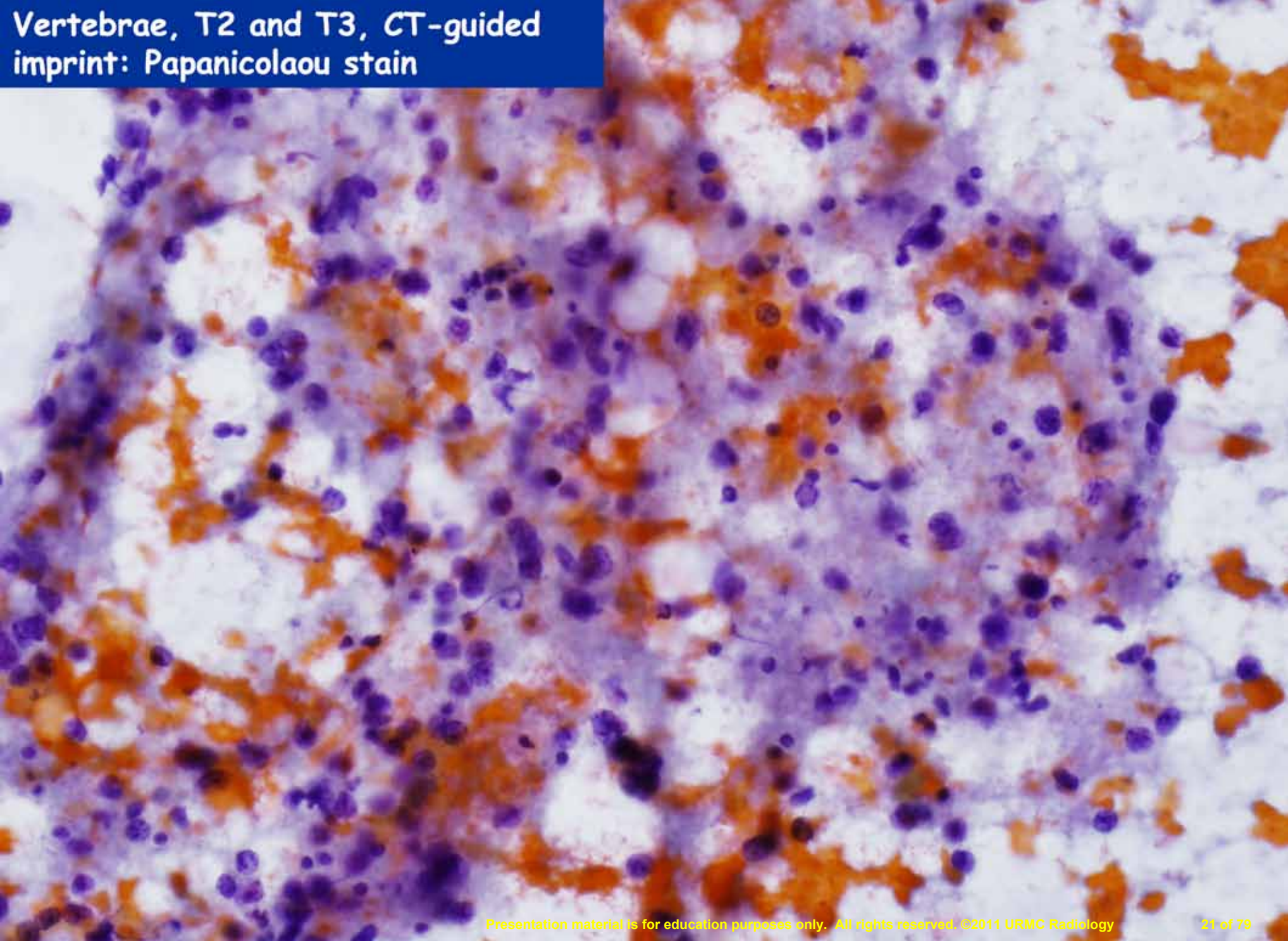


Vertebrae, T2 and T3, CT-guided imprint: Diff-Quik stain

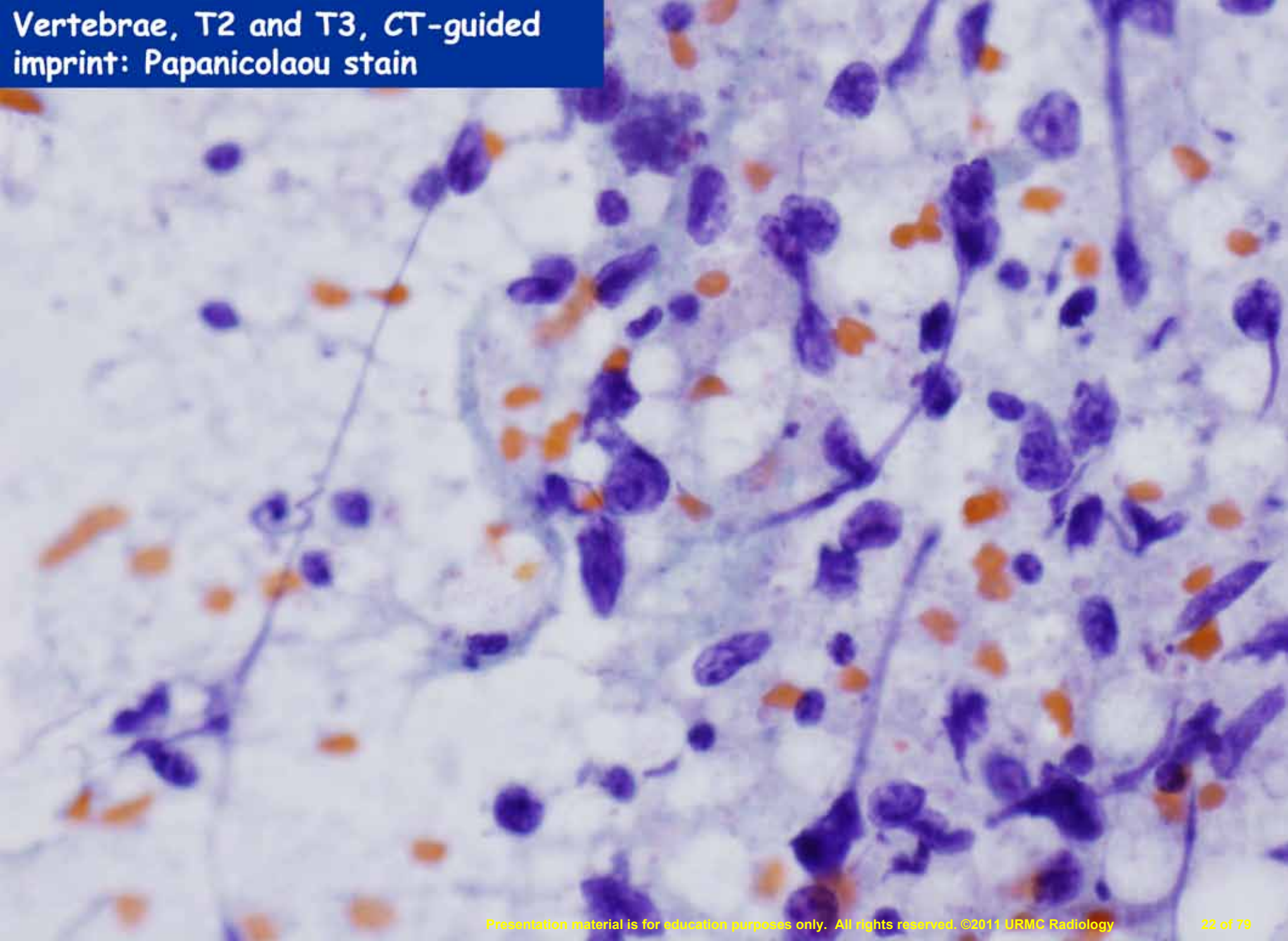
Vertebrae, T2 and T3, CT-guided imprint: Diff-Quik stain



Vertebrae, T2 and T3, CT-guided imprint: Papanicolaou stain

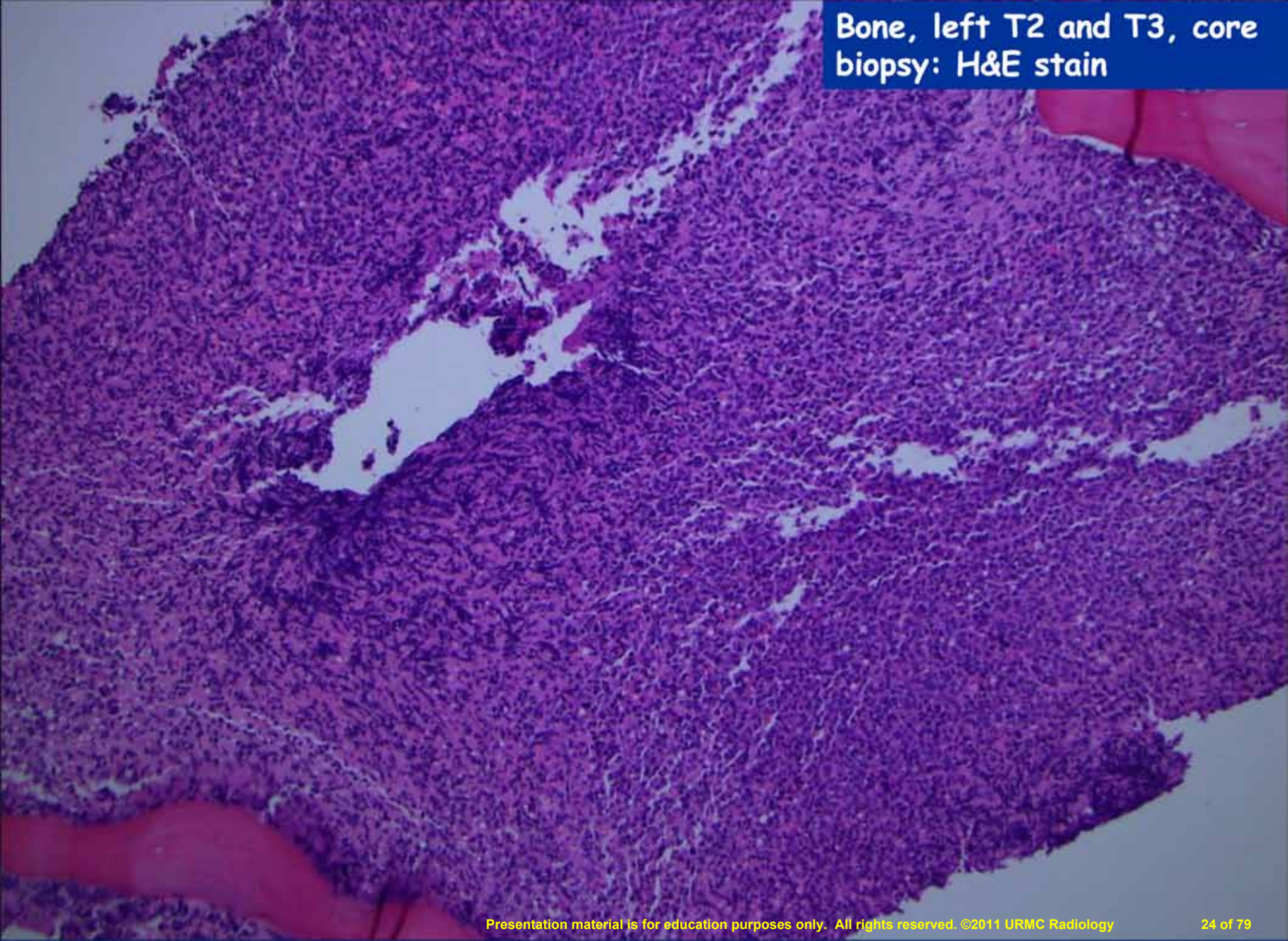


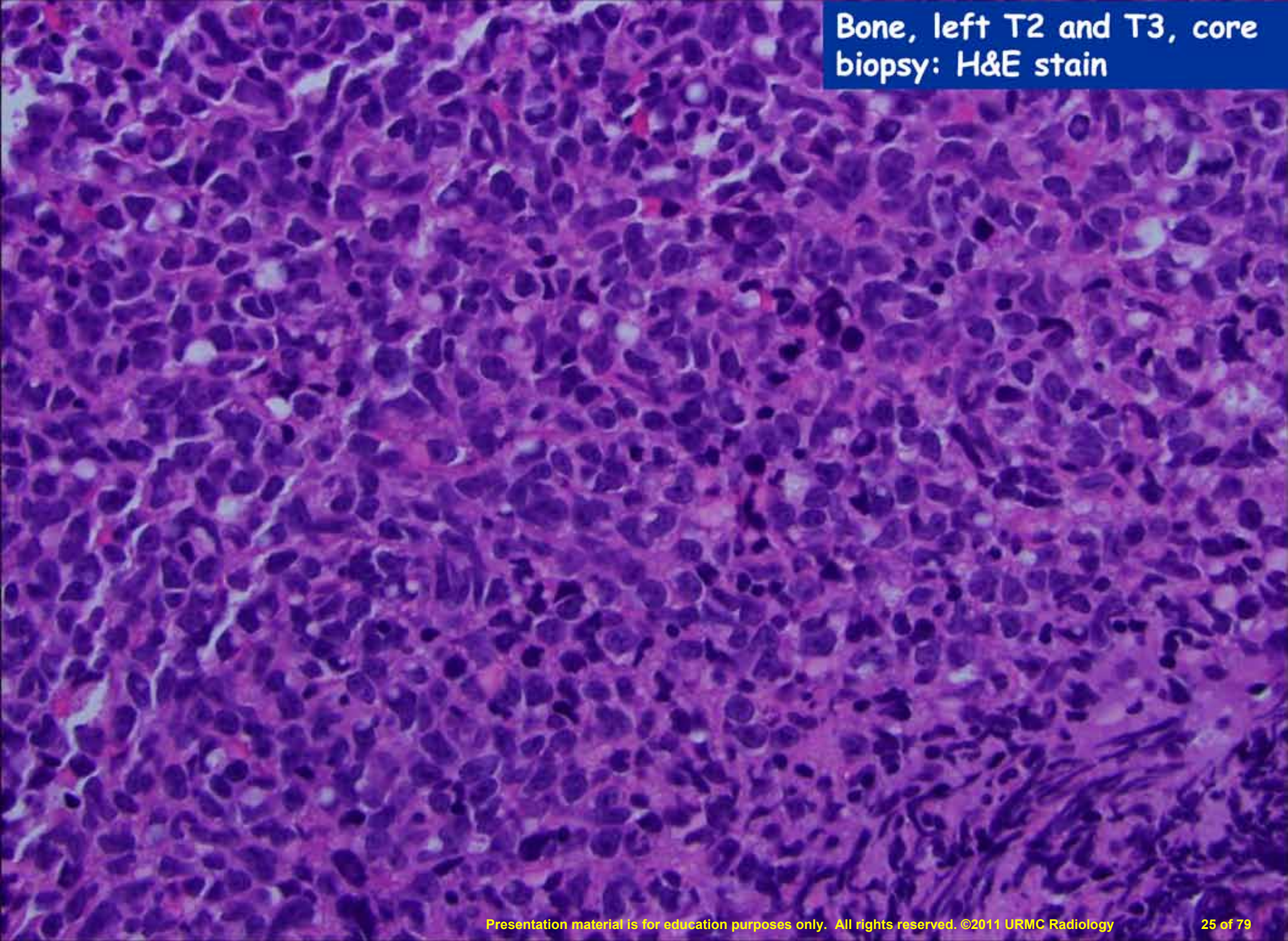
Vertebrae, T2 and T3, CT-guided imprint: Papanicolaou stain



Vertebra, T2 and T3, CT-guided core biopsy touch imprint:

Malignant tumor cells present, favor origin from large cell lymphoma.





Bone, left T2 and T3, core biopsy:

Diffuse Large B-cell lymphoma.

A monoclonal B-cell population is detected and is positive for CD 20 (bright), CD 10, Kappa and negative for CD 45, CD 19, CD 5, CD 23 and Lambda.

Diffuse Large B cell Lymphoma

- Comprise 1/3 of all non-Hodgkin's lymphomas
- Occur in all age groups
- Male to female ratio – 1.2:1
- Positive for B-lineage marker CD20

Diffuse Large B cell Lymphoma

- Malignant lymphoma of bone – large destructive lytic mass – erodes cortex and often forms a soft tissue component
- Most common primary lymphoma of bone is large B cell lymphoma
- Immunohistochemically tumor cells express LCA and B cell markers
- Treatment includes both radiation and chemotherapy
- Primary lymphoma of bone 75% 10-year survival, less with systemic disease

Paraspinal Mass

- Neoplasms
  - Neural tumors
    - Ganglioneuroma, neuroblastoma (vertically oriented elongated masses, common in ages 5-15)
    - Schwannoma, neurofibroma (round masses)
    - Paraganglioma
  - Metastases
  - Chest wall invasion – Lymphoma, Pancoast Tumor
- Inflammation/Infection
  - Paraspinal abscess (TB or staph – spondylitis)
- Trauma
  - Hematoma
  - Pseudomeningocele
- Lymphadenopathy
- Meningocele

Benign Lesions → Rib Erosion, not destruction

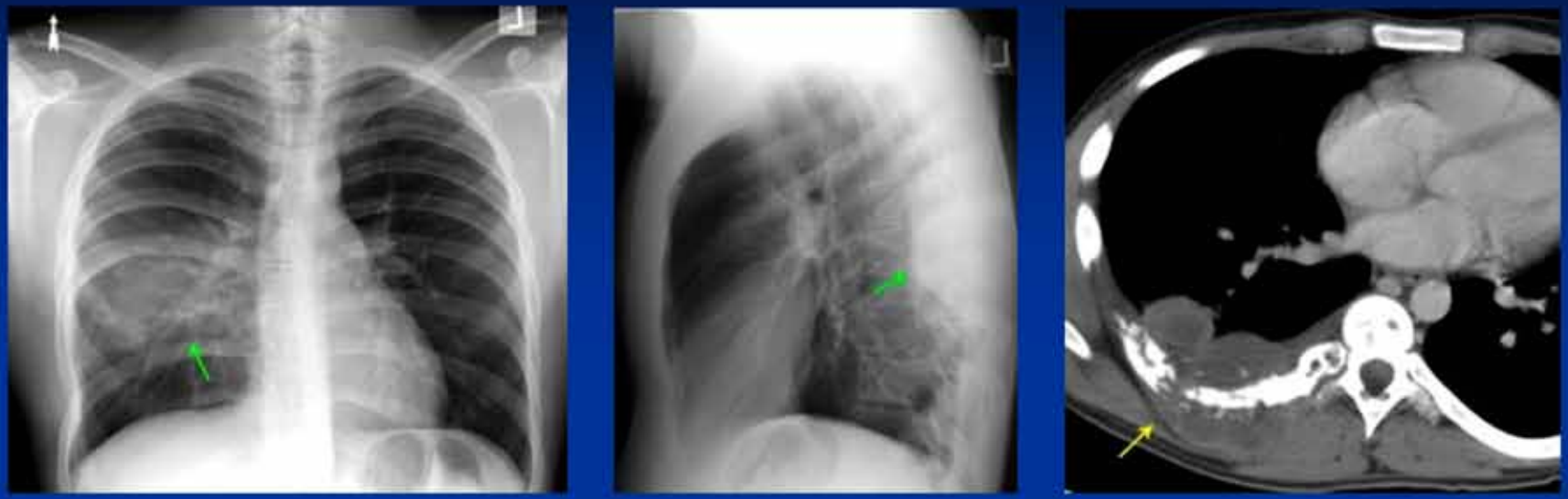
Lipoma
Schwannoma
Neurofibroma

Malignant lesions → Rib destruction

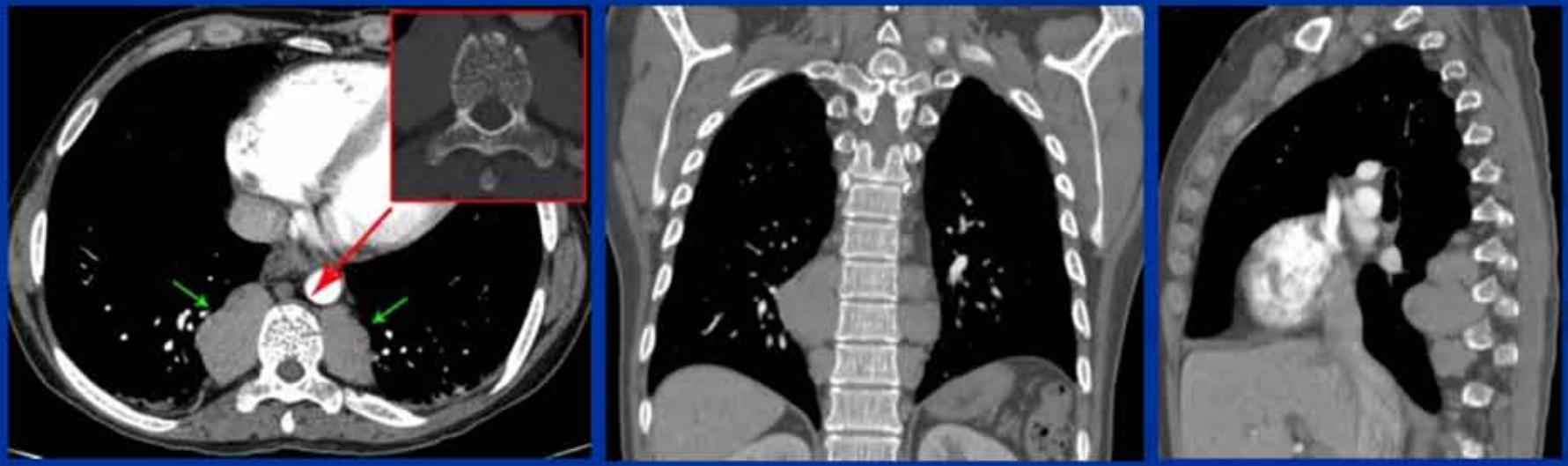
Multiple Myeloma
Metastases – Most common:
Breast, Lung, Renal
Lymphoma

Ewing's Sarcoma, Neuroblastoma in pediatric patients

Paraspinal Mass Examples

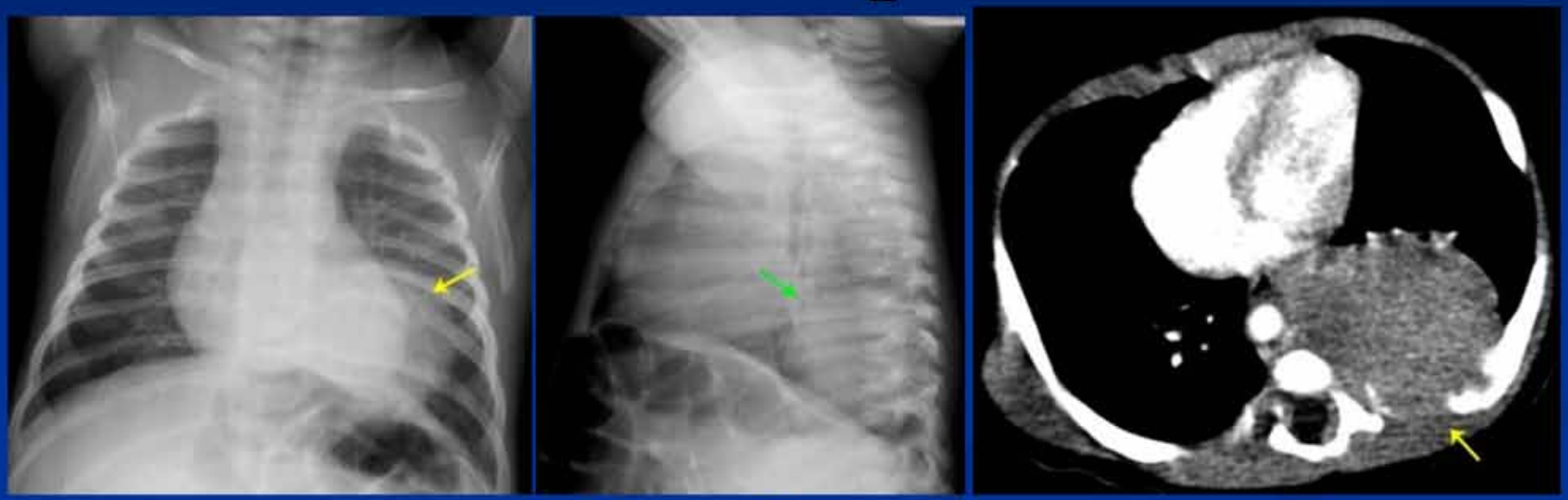


Large B cell Lymphoma



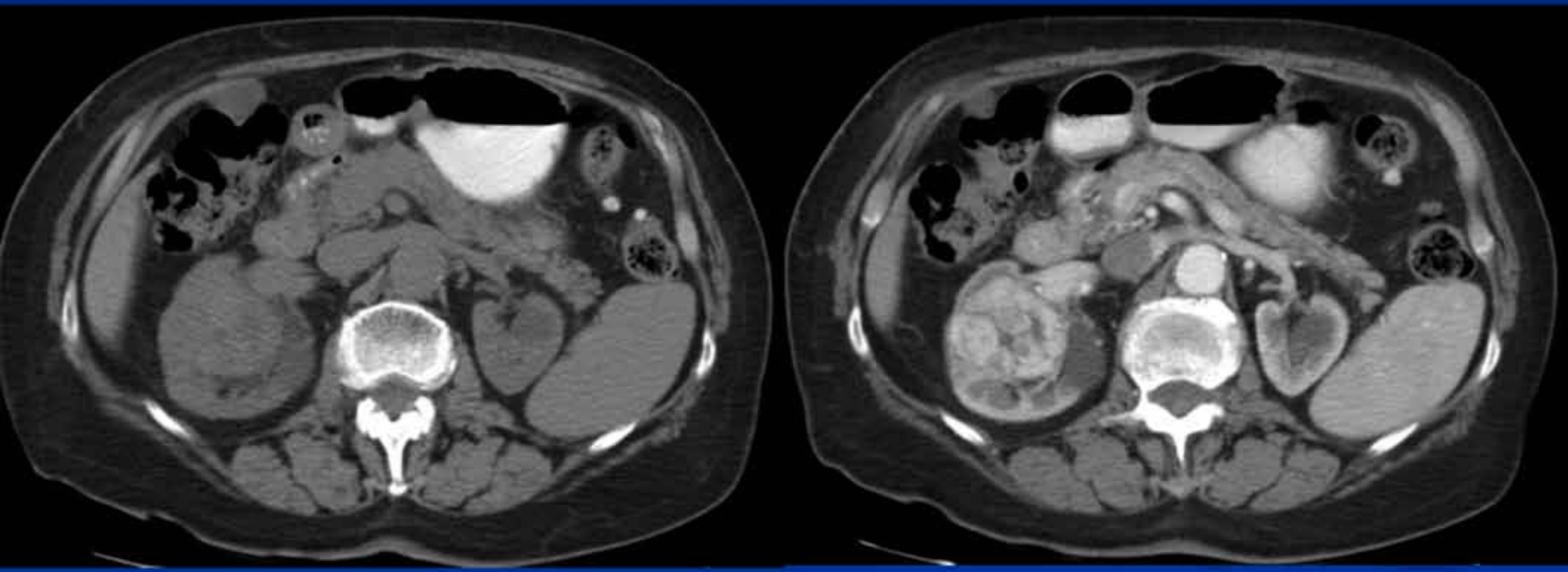
Extramedullary Hematopoesis

Paraspinal Mass Pediatric Example



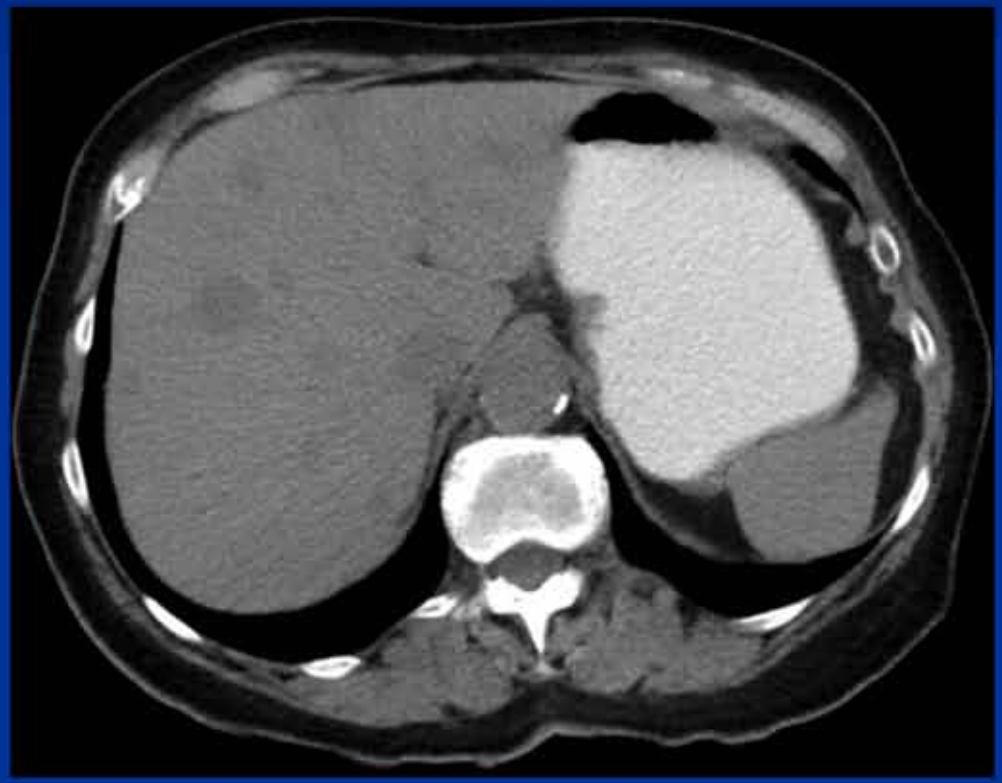
Neuroblastoma

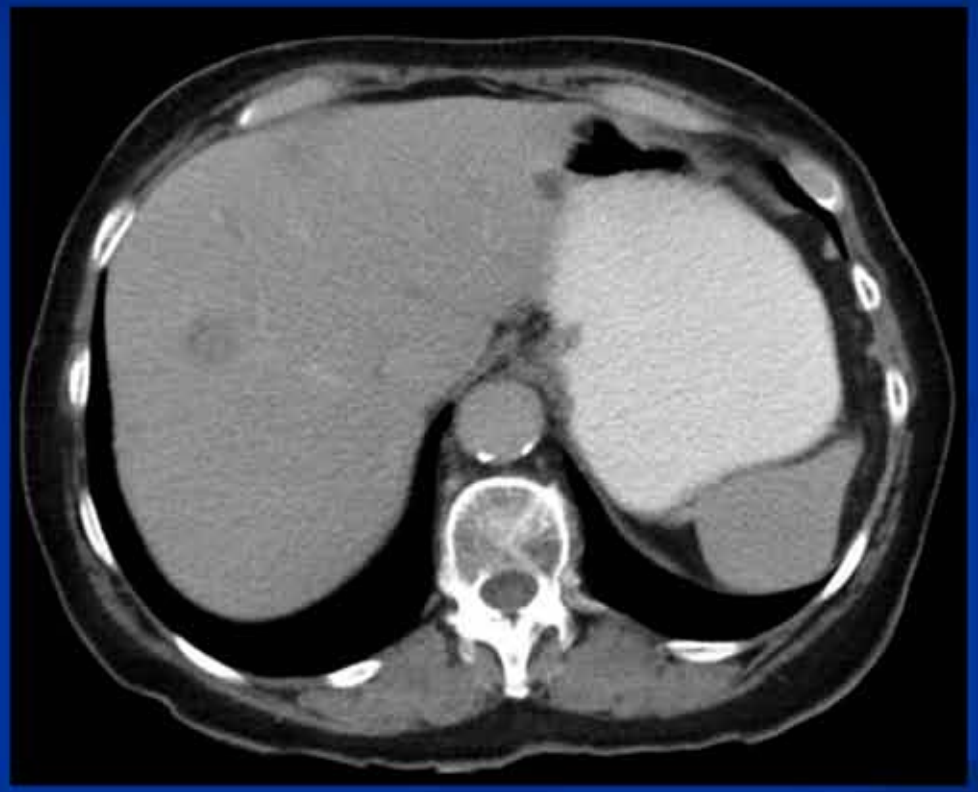
Case 3: 87 yo F with history of breast cancer s/p lumpectomy 15 years ago.



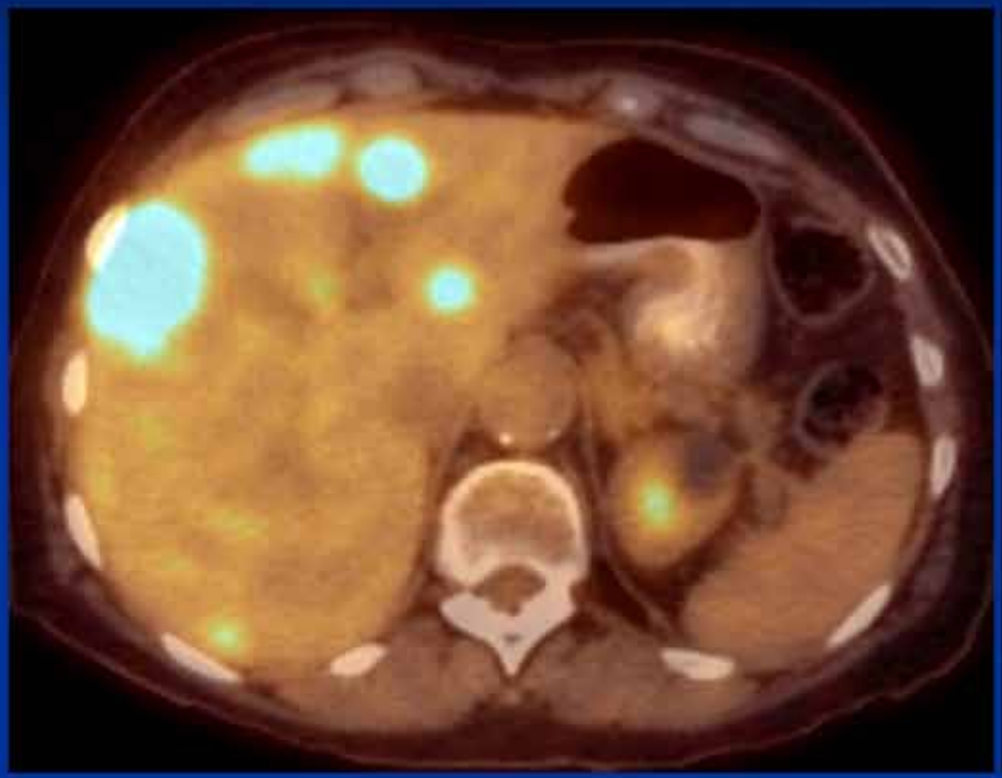
2009

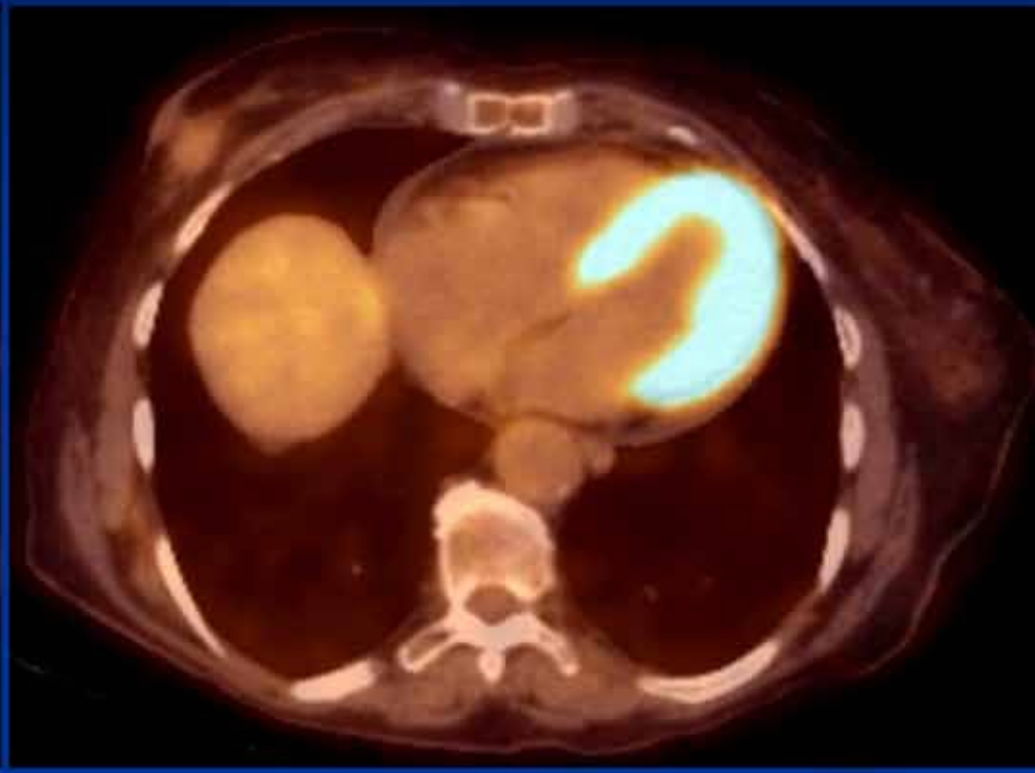
87 yo F with history of breast ca, renal ca, s/p nephrectomy (11/09)

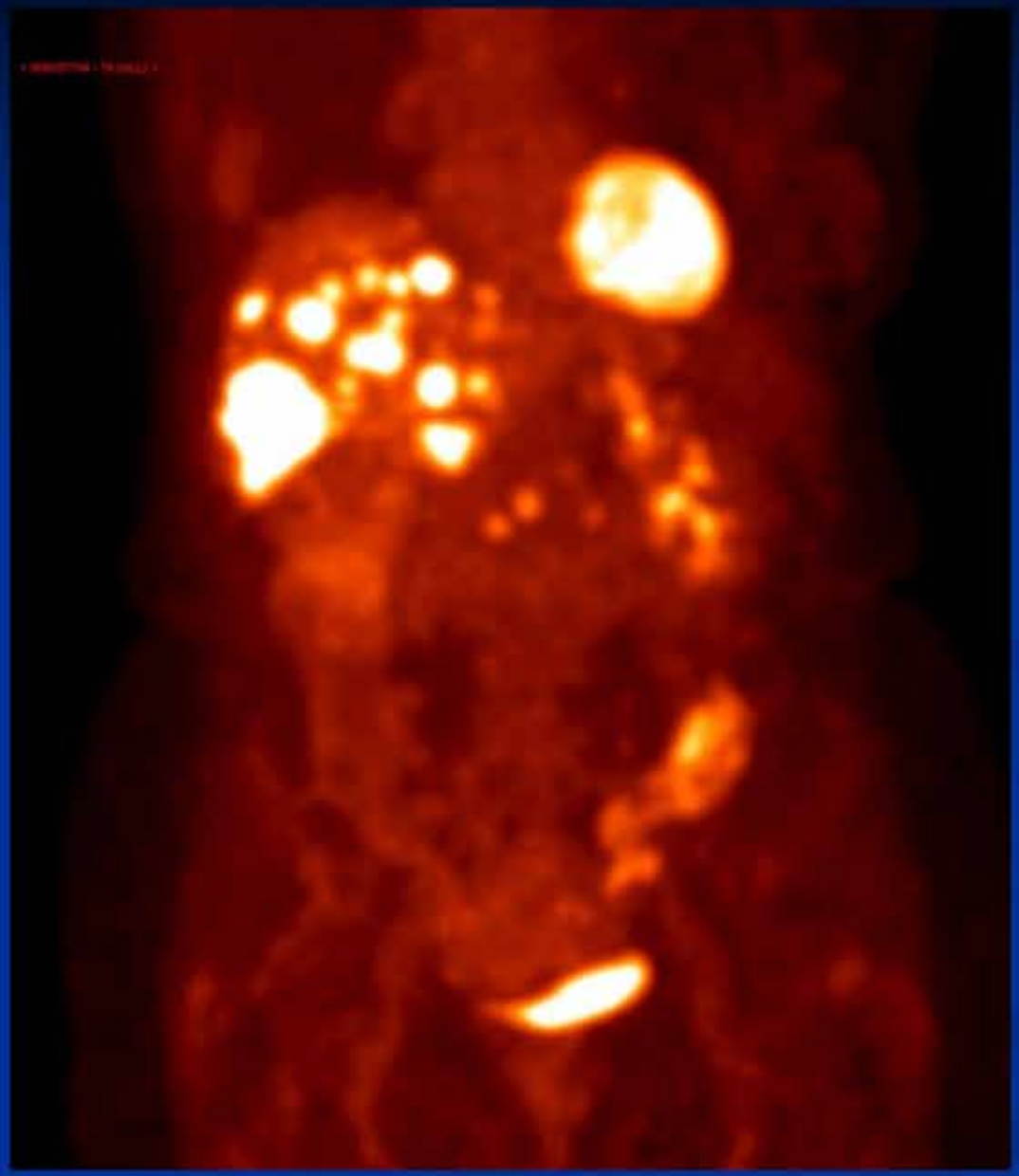




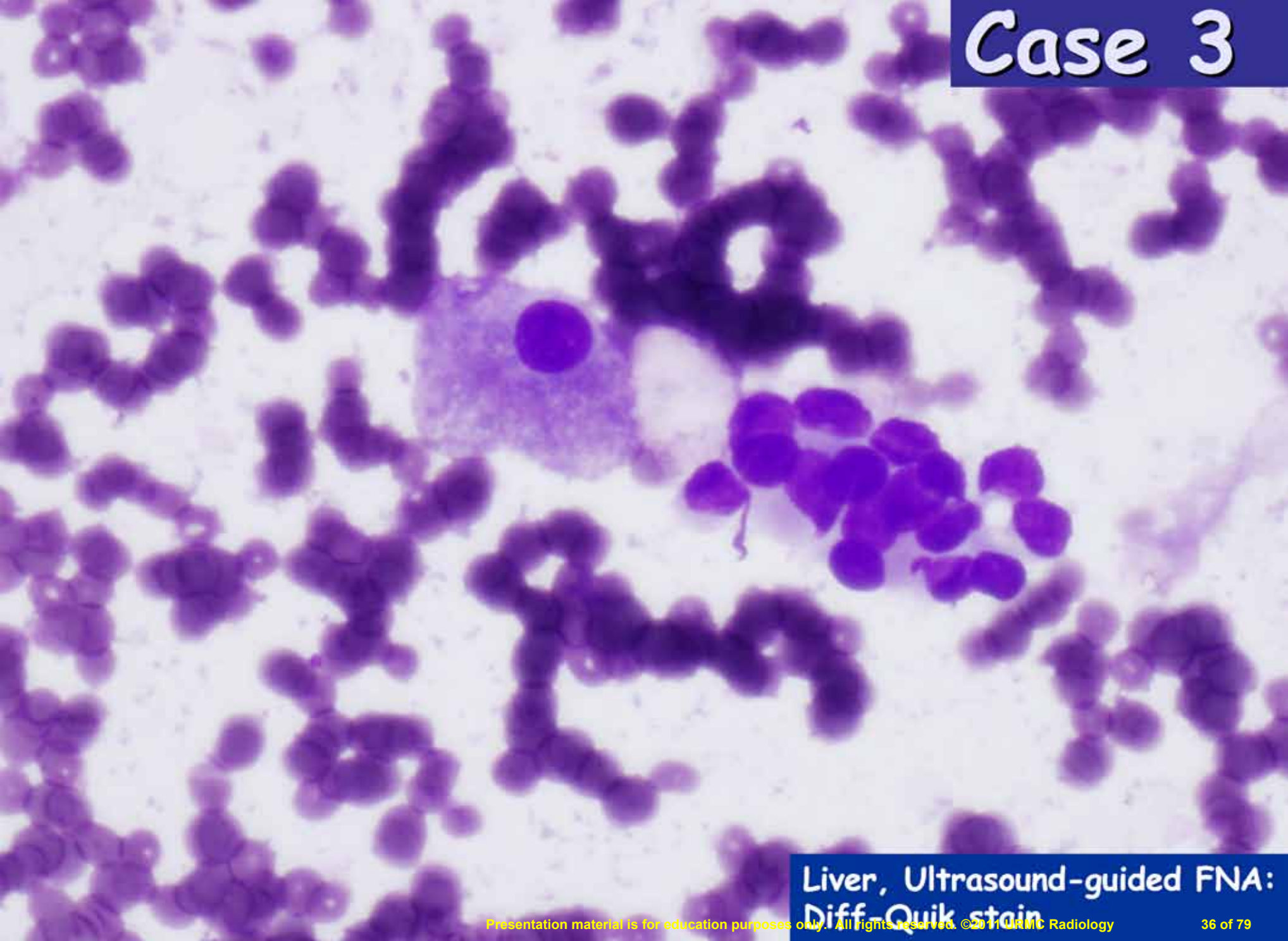
6/3/2011





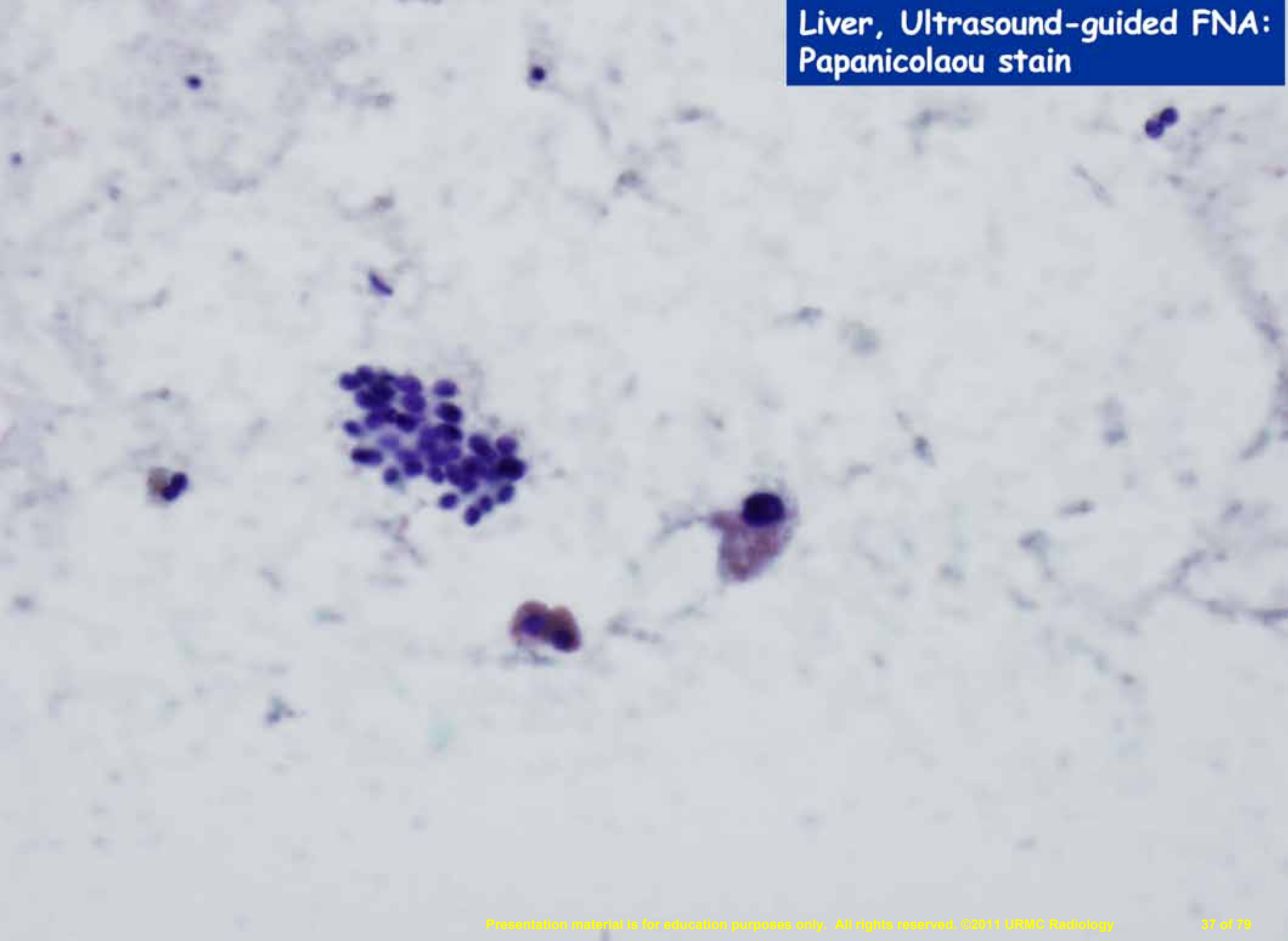


Case 3

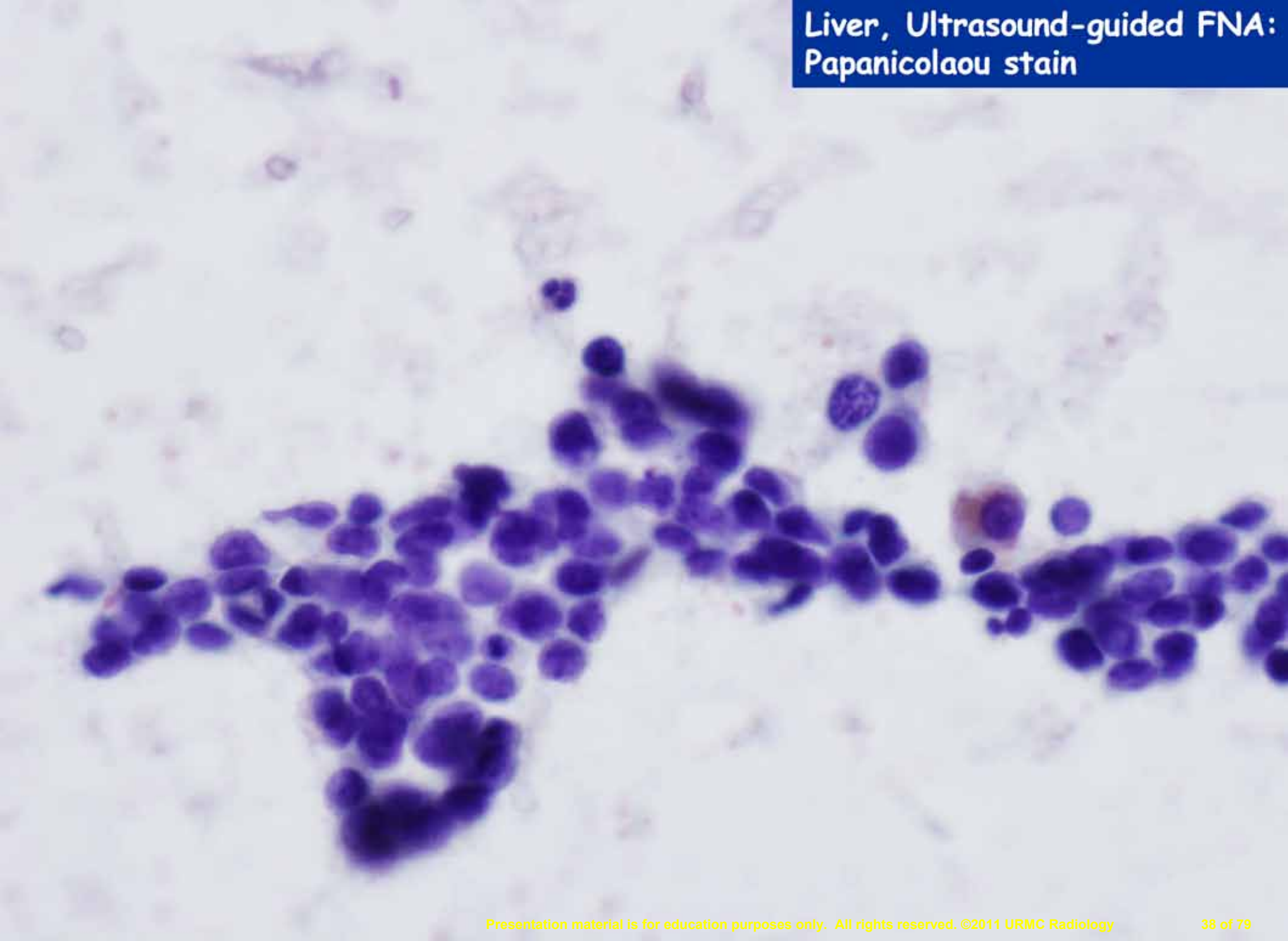


Liver, Ultrasound-guided FNA:
Diff-Quik stain

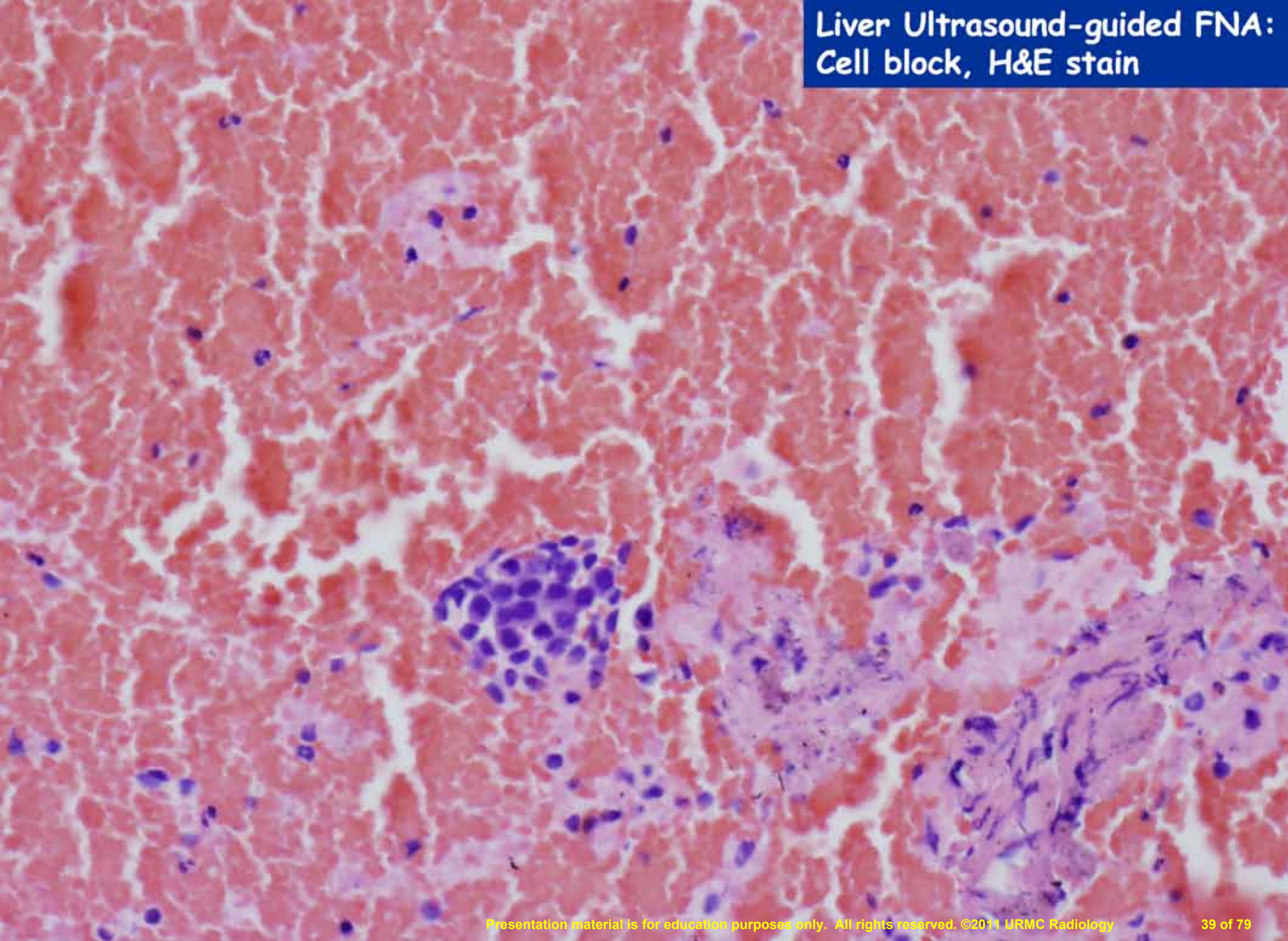
Liver, Ultrasound-guided FNA: Papanicolaou stain



Liver, Ultrasound-guided FNA: Papanicolaou stain



Liver Ultrasound-guided FNA: Cell block, H&E stain

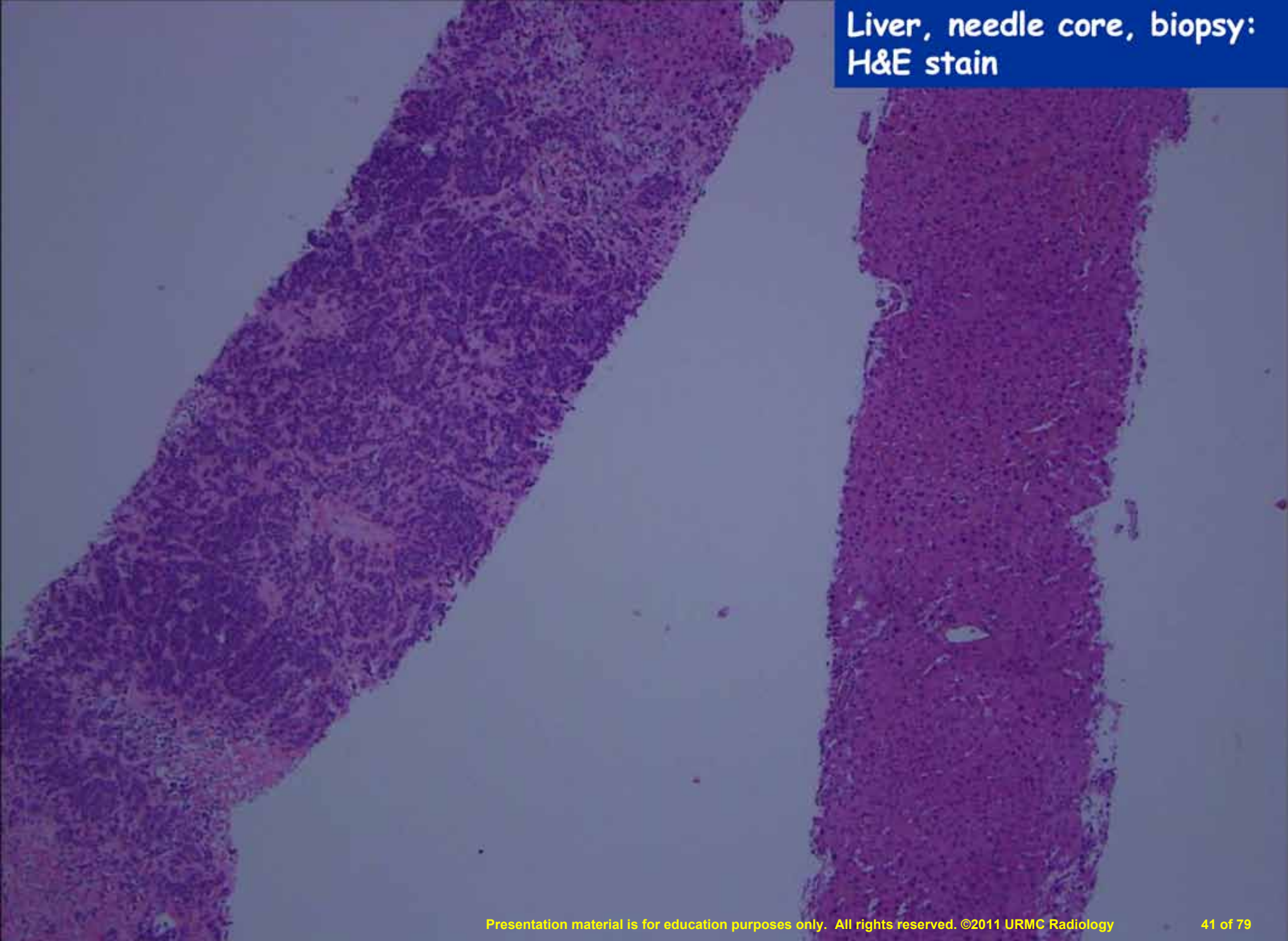


Liver, Ultrasound-guided fine needle aspiration:

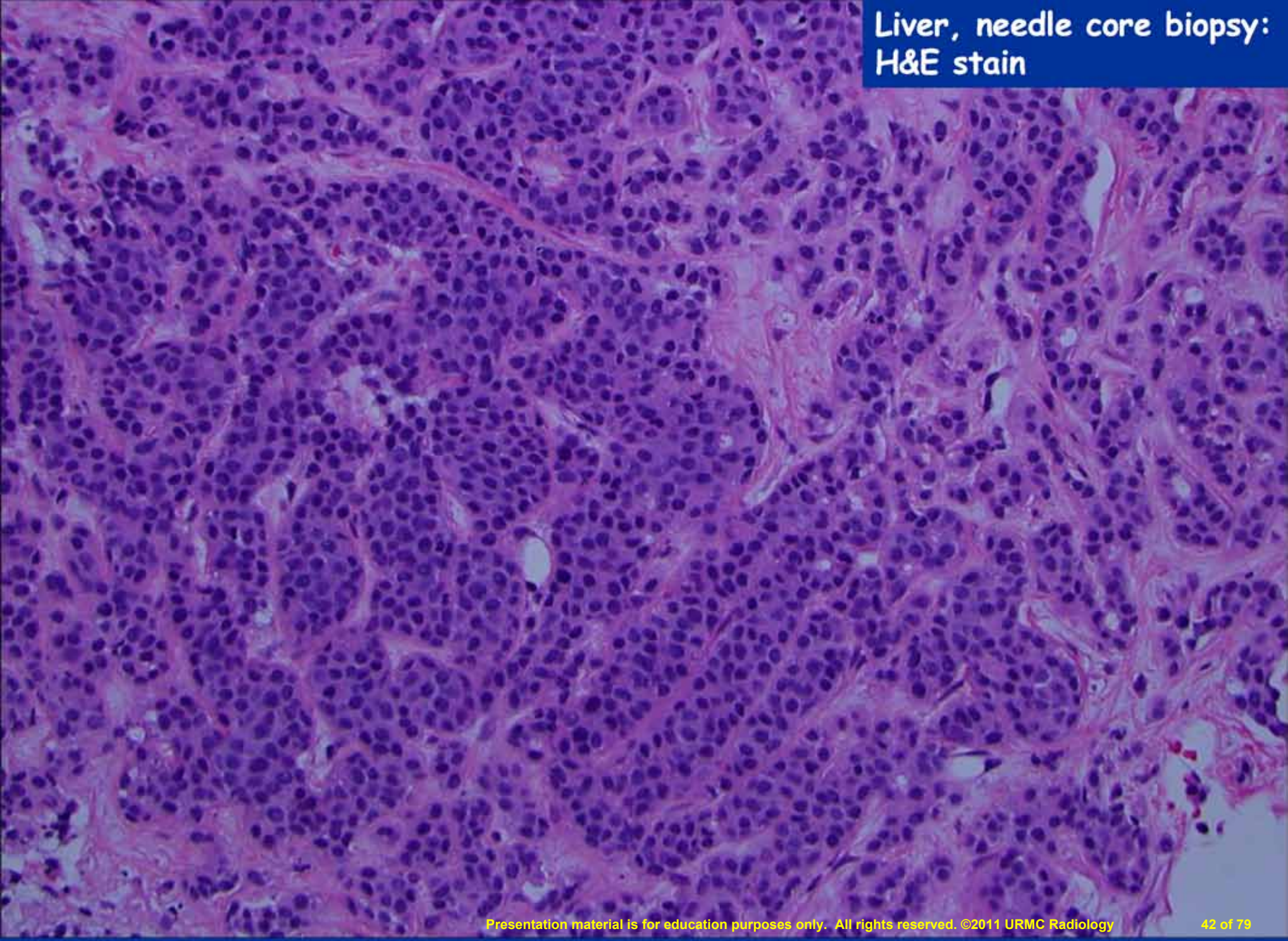
Positive for carcinoma, most likely non-hepatocyte origin.

Cell block and cytologic preparations examined.

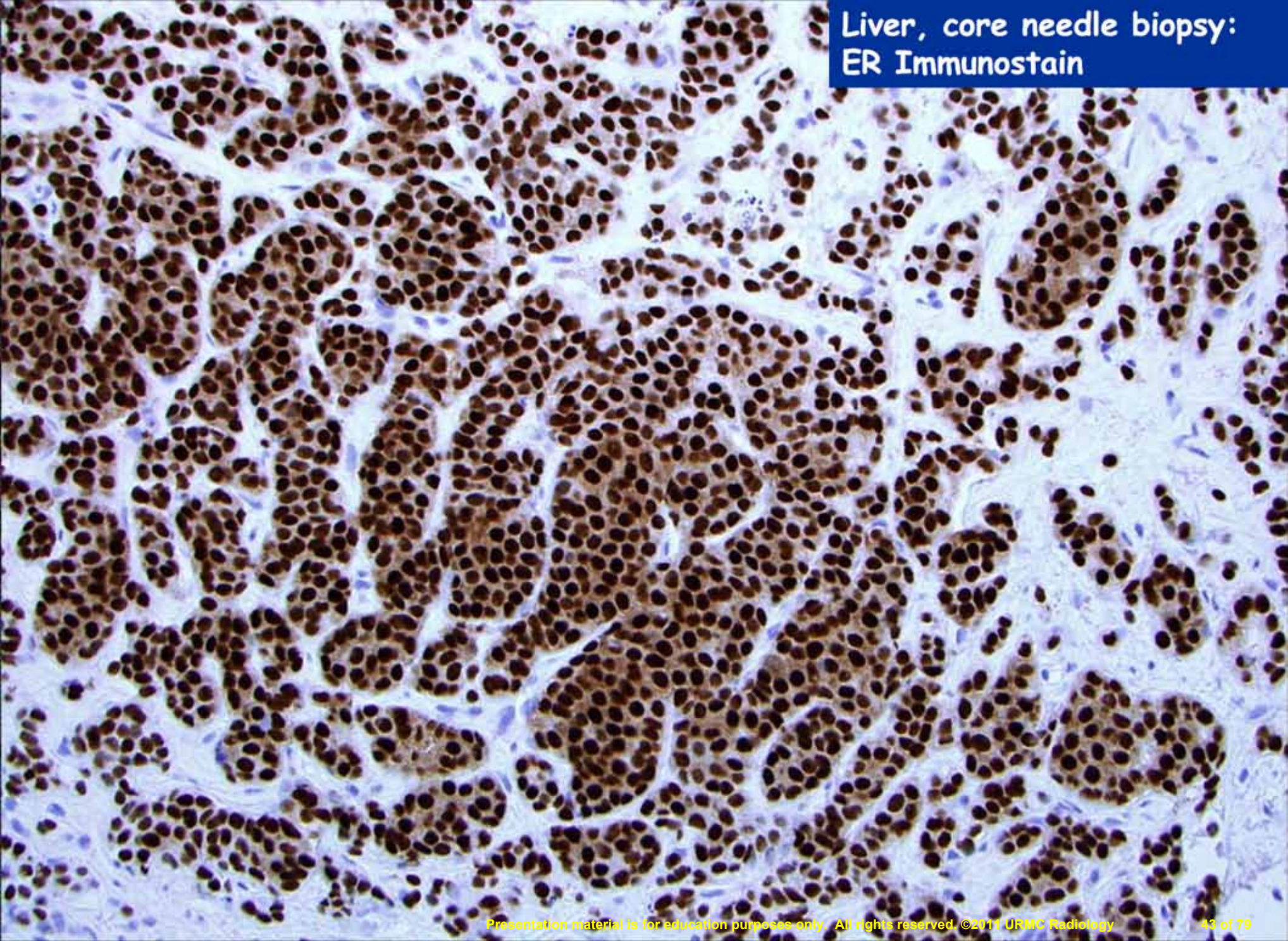
Liver, needle core, biopsy: H&E stain



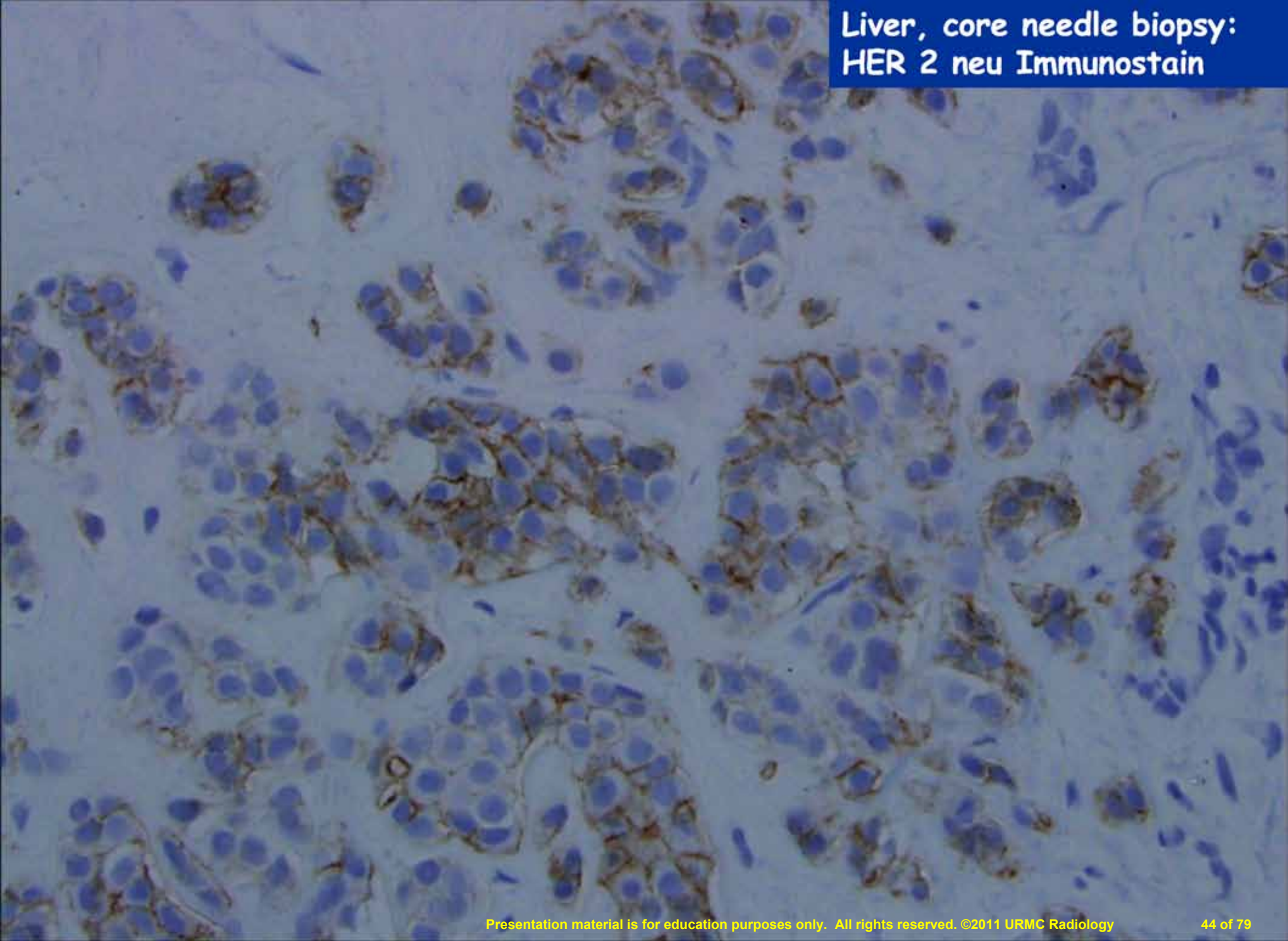
Liver, needle core biopsy: H&E stain



Liver, core needle biopsy: ER Immunostain



Liver, core needle biopsy: HER 2 neu Immunostain



Liver, core needle biopsy:

Metastatic low grade carcinoma, consistent with breast primary.

Comment: The liver lesion is composed of low grade carcinoma with thick trabecular and nested growth pattern.
The tumor cells are different from the patient's renal cancer. Immunostains show the tumor cells are strongly positive for ER, weakly positive for PR and BRST-2 and negative for Her2. the findings are most consistent with a low grade breast ductal carcinoma.

Metastatic Breast Carcinoma

- Metastatic disease to liver is common
- Cancer cells reach liver through portal vein, hepatic artery, hilar lymphatics or direct extension
- Metastatic disease grows rapidly in liver
- Immunohistochemistry useful to confirm primary origin

Pattern of RCC Spread

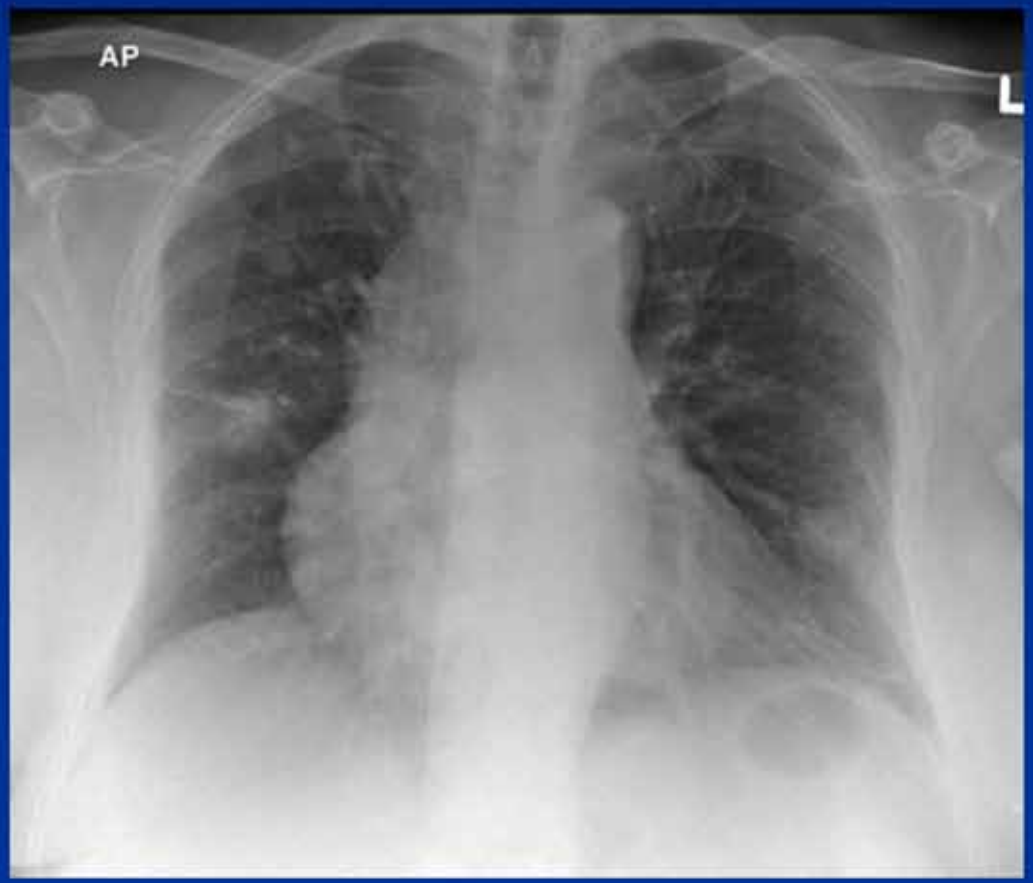
Axial CECT shows a low attenuation filling defect (white curved) in the left renal vein (white open) caused by extension of tumor from a large heterogeneous renal cell carcinoma (white arrow) in the left kidney. The IVC (black open) is free of tumor in this patient.

- Tumor extension or thrombus in renal vein (23%), inferior vena cava (7%)
- Local extension common
  - Nodal spread typically to para-aortic or aortocaval lymph nodes
- Most common metastatic locations include lung, liver, bone, adrenal, and opposite kidney

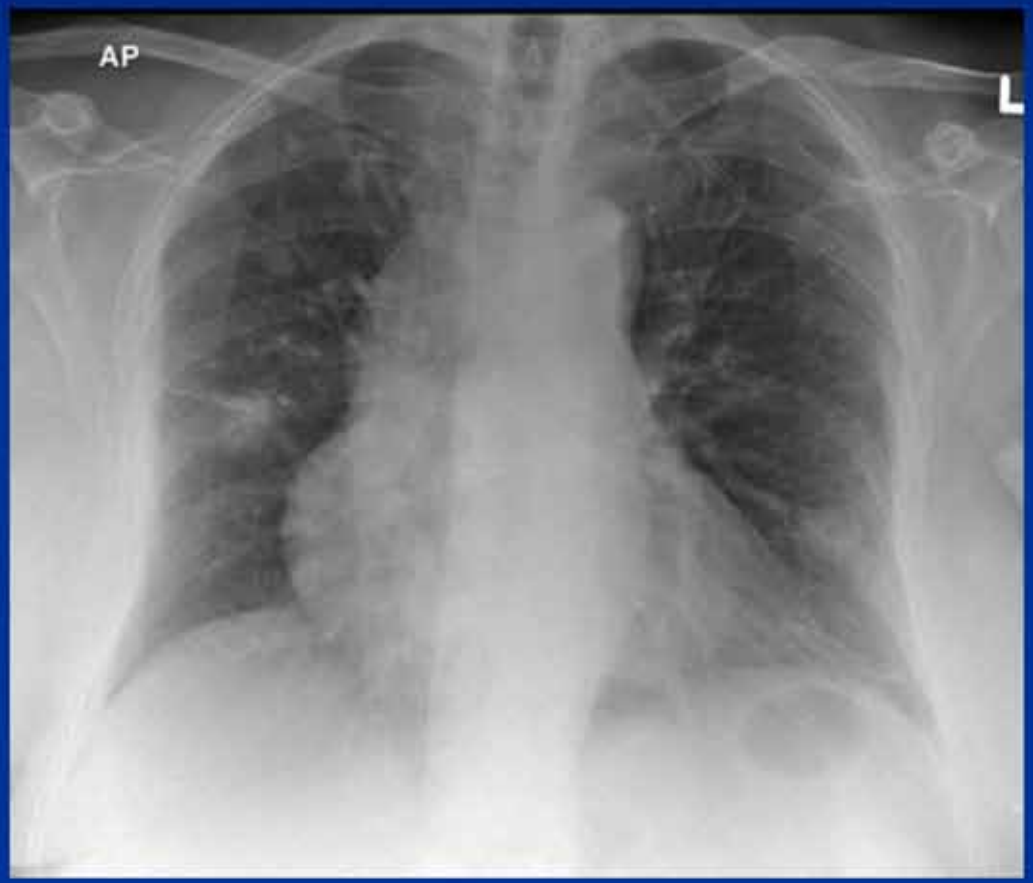
RCC Staging

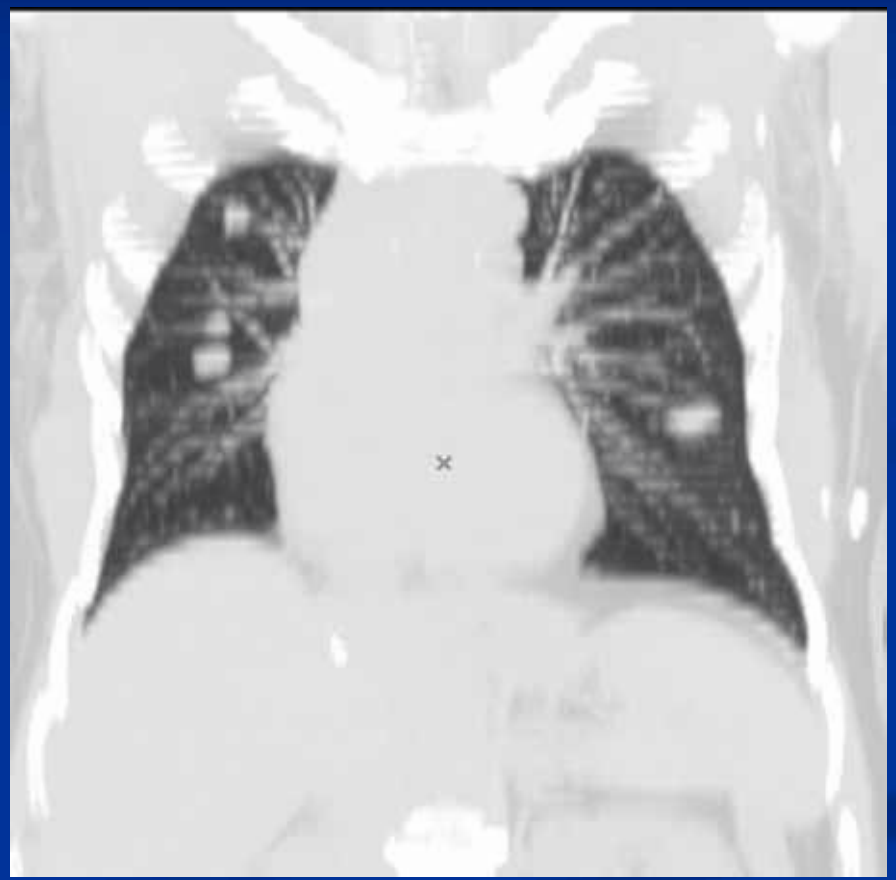
- Staging
  - Stage I: Solid mass ≤ 7 cm, confined to kidney
  - Stage II: > 7 cm but still organ confined; spread to perinephric fat
  - Stage III: Invasion of renal vein or vena cava, involvement of ipsilateral adrenal gland &/or perinephric fat, or spread to one local lymph node
  - Stage IV: Invasion of adjacent organs, more than one local node, or distant metastases

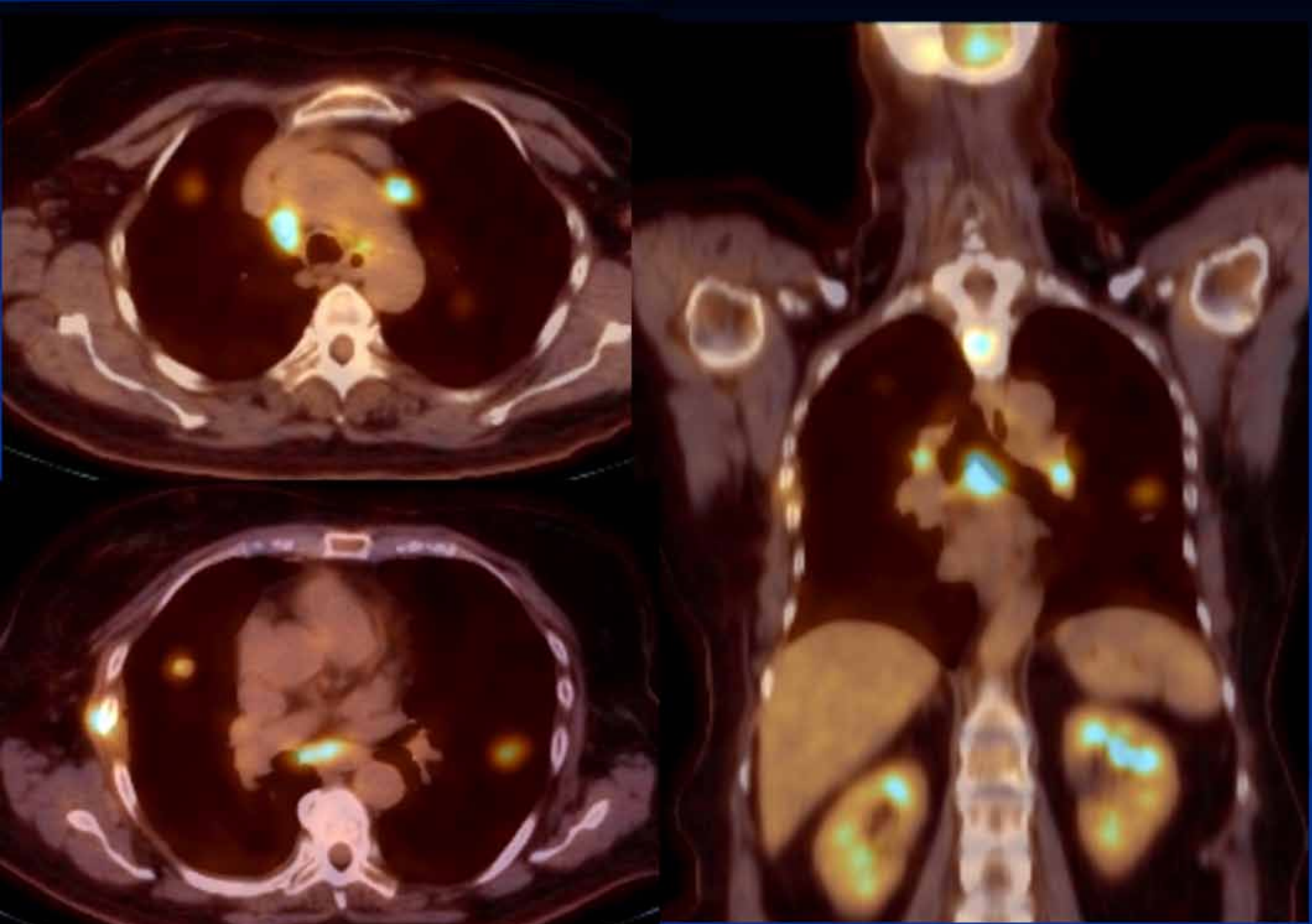
Case 4: 67 yo F with h/o Stage IIB left breast ca s/p mastectomy and adjuvant chemo 2002



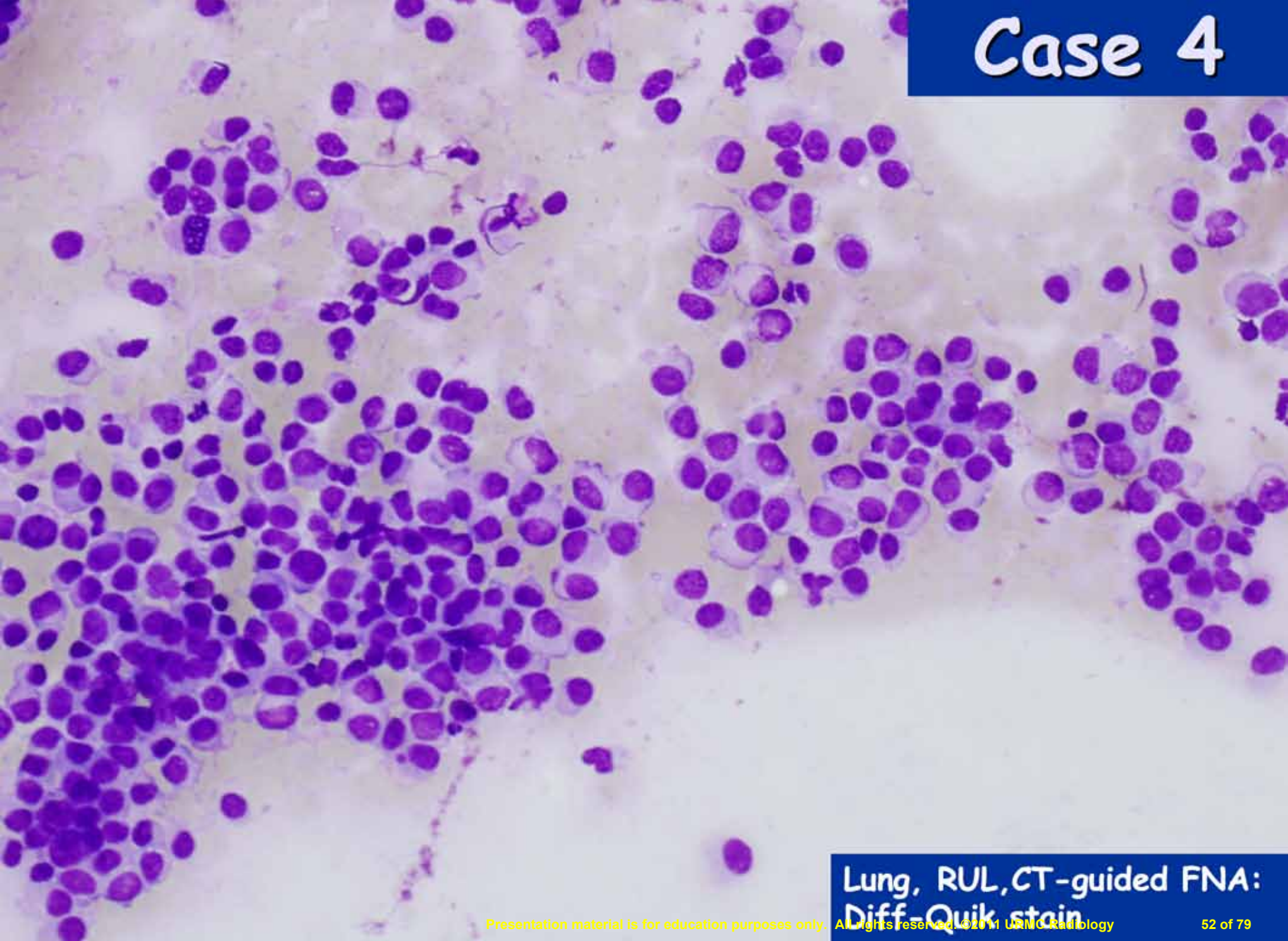
Case 4: 67 yo F with h/o Stage IIB left breast ca s/p mastectomy and adjuvant chemo 2002





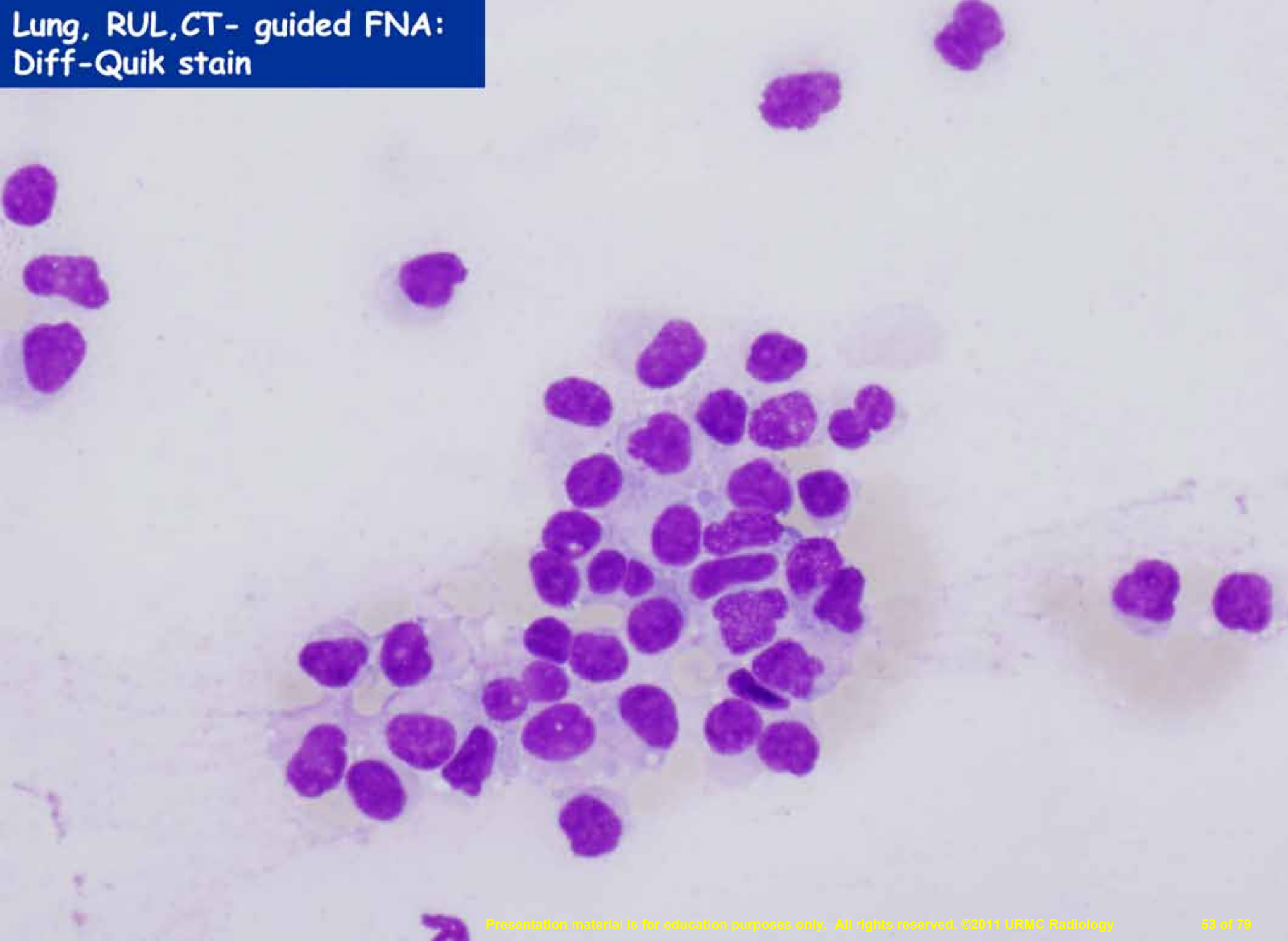


Case 4

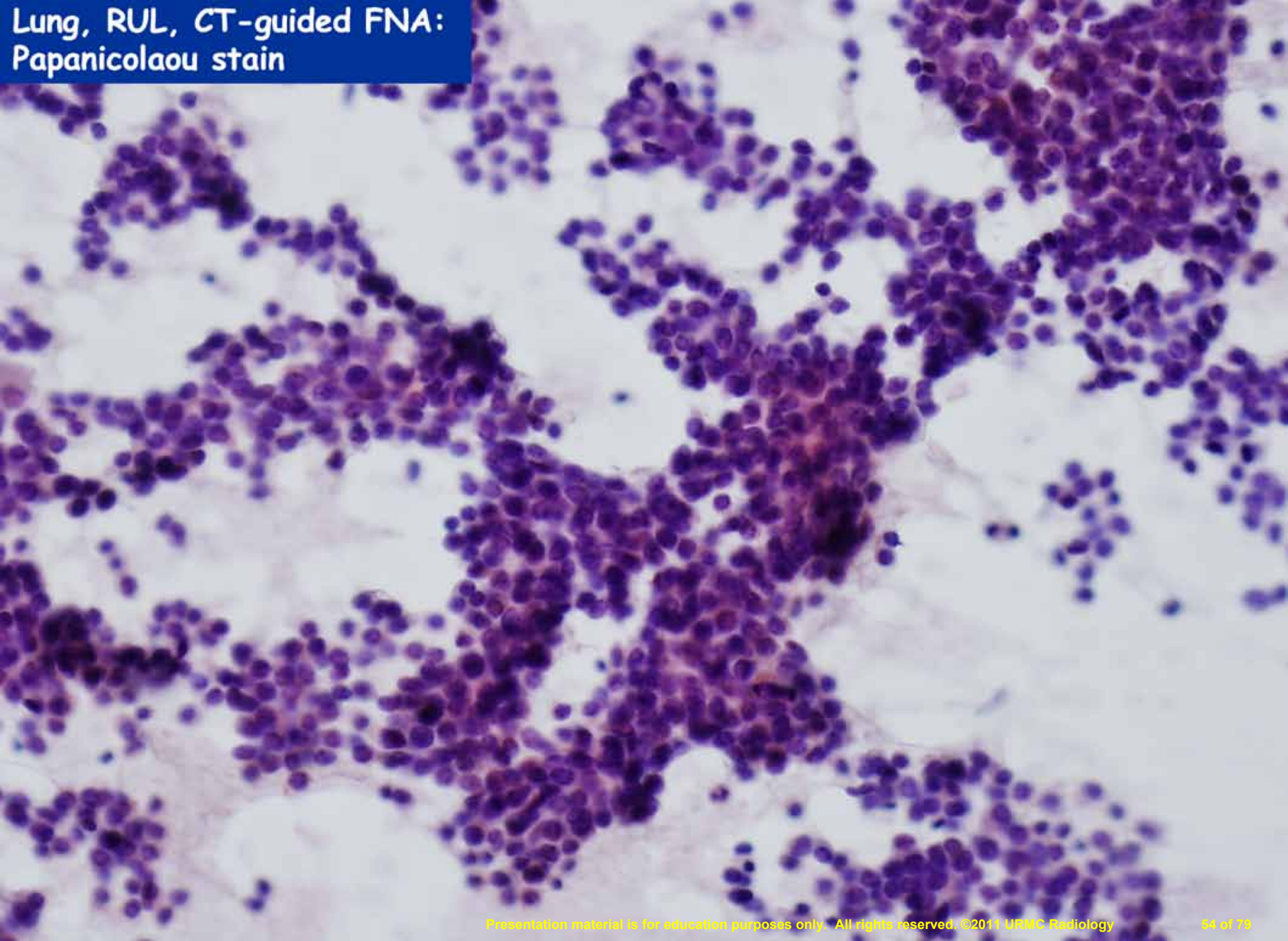


Lung, RUL, CT-guided FNA: Diff-Quik stain

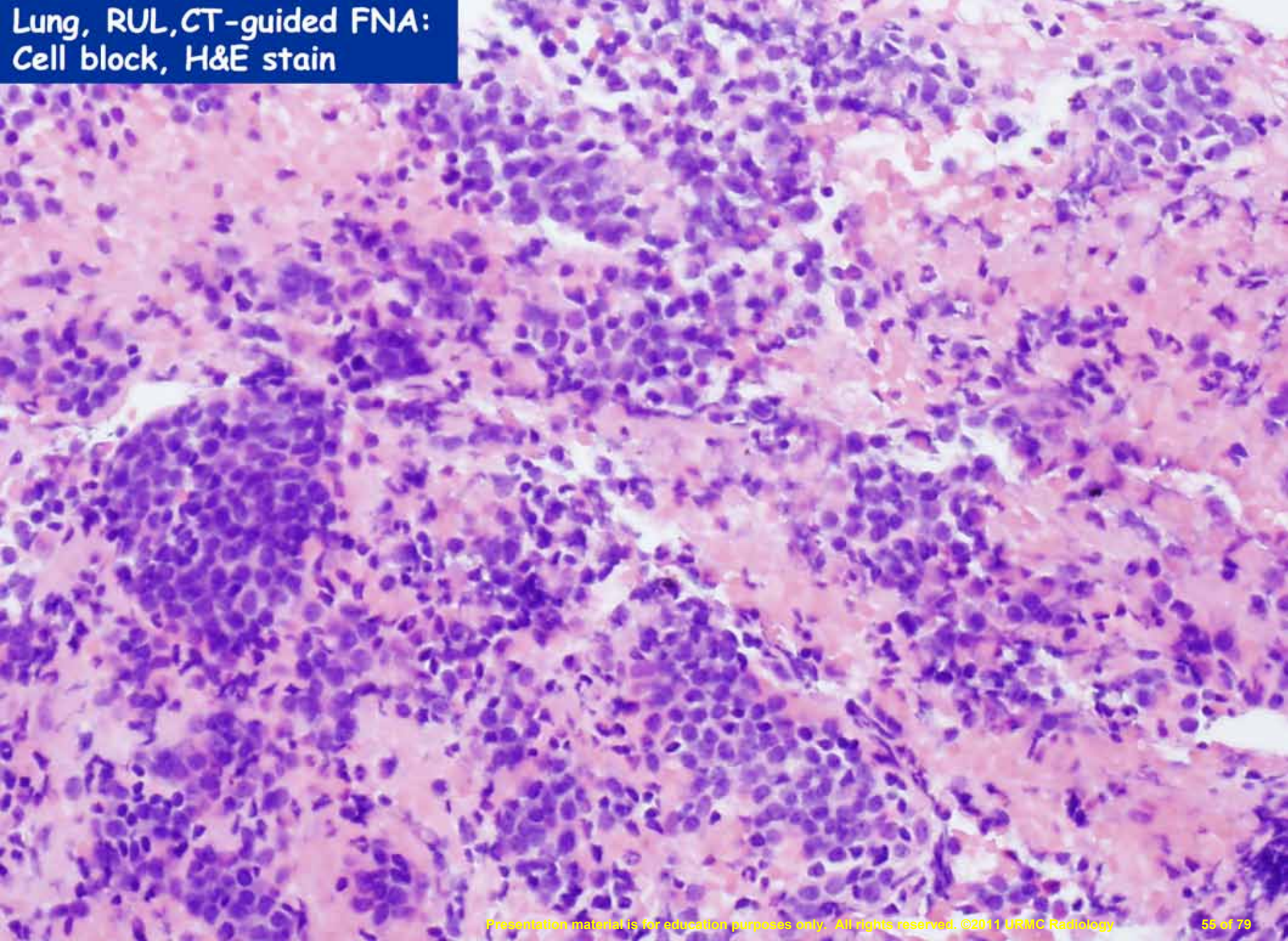
Lung, RUL,CT- guided FNA: Diff-Quik stain



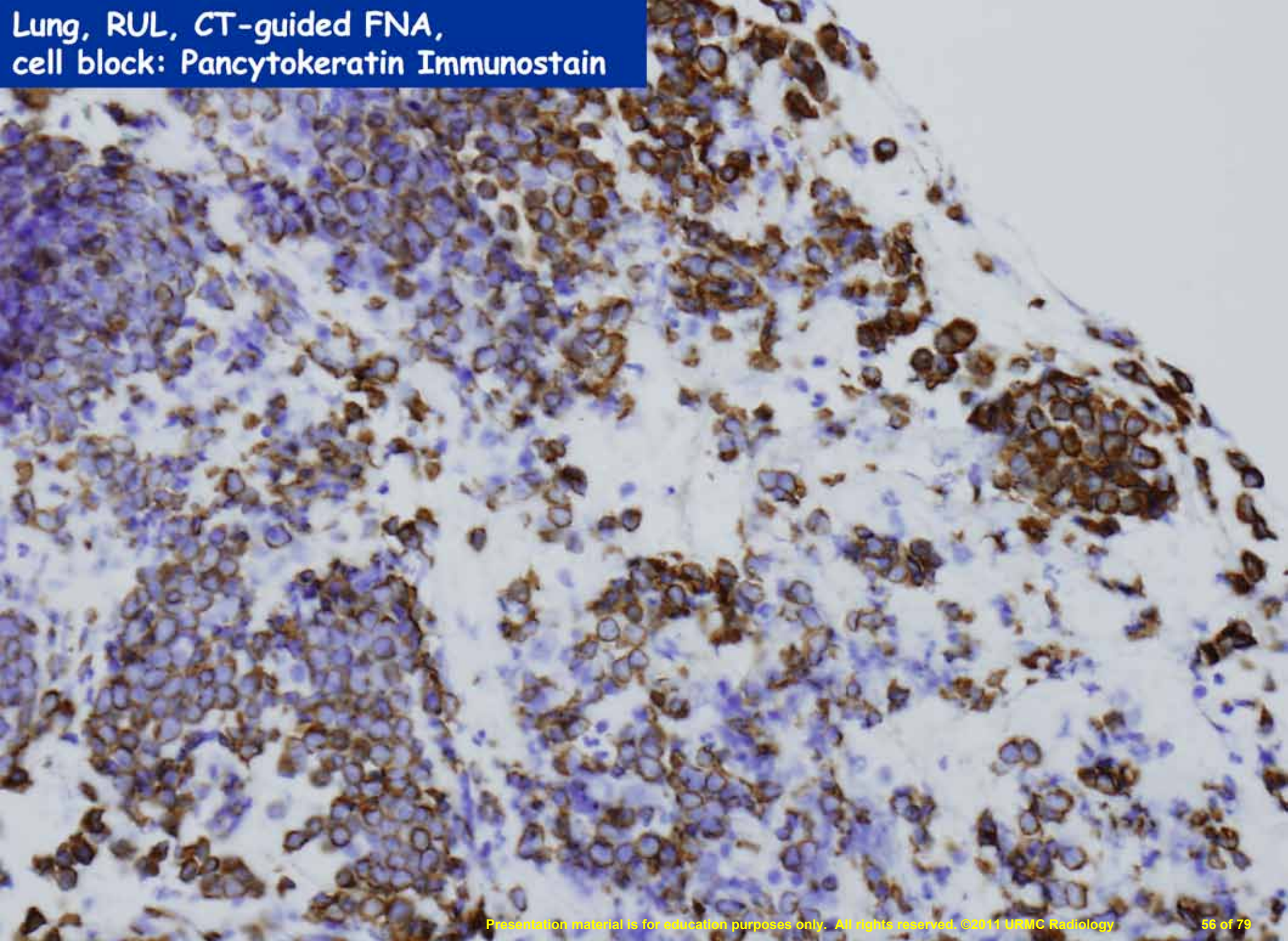
Lung, RUL, CT-guided FNA:
Papanicolaou stain



Lung, RUL, CT-guided FNA:
Cell block, H&E stain



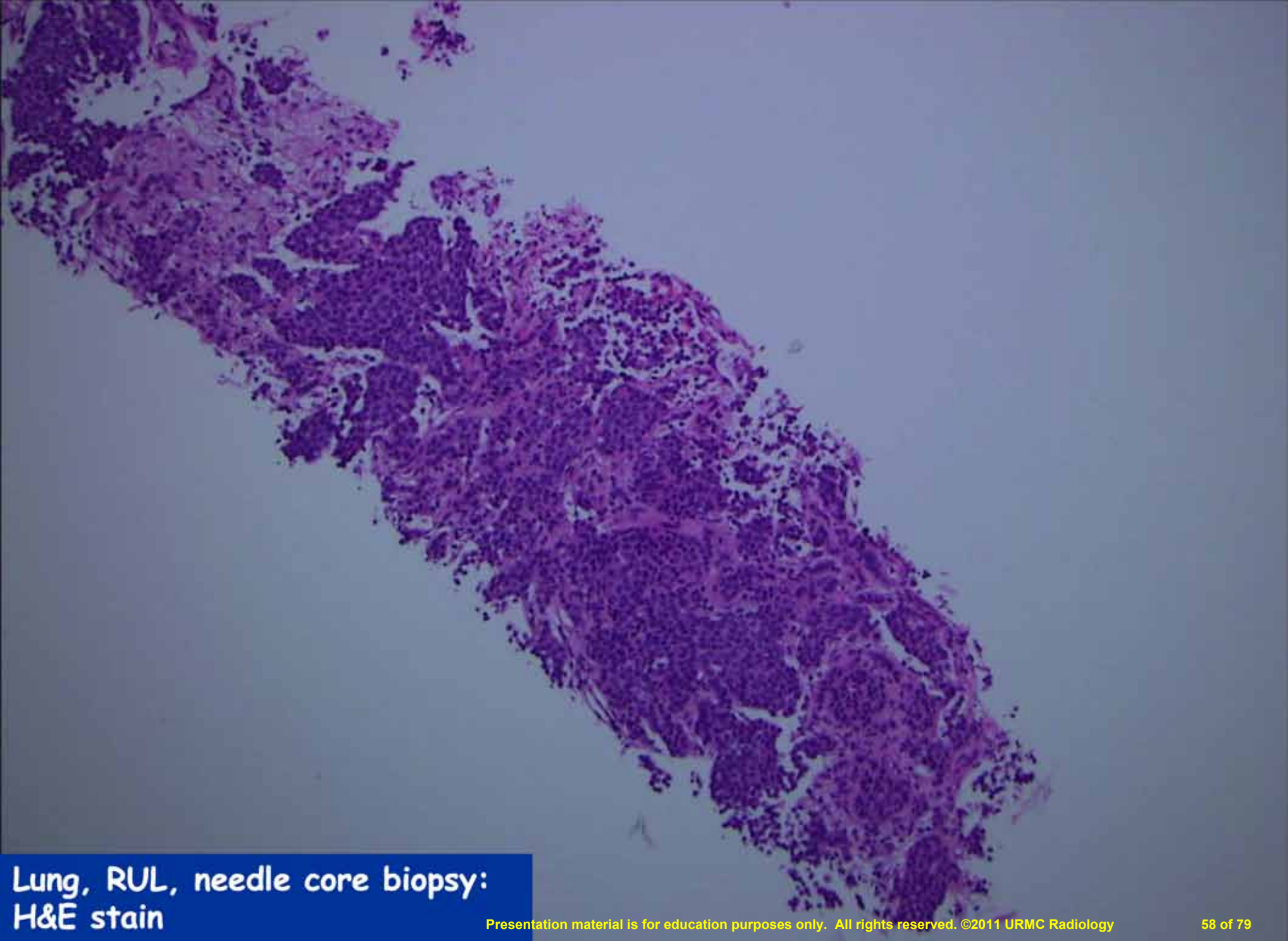
Lung, RUL, CT-guided FNA, cell block: Pancytokeratin Immunostain



Lung, right upper lobe, CT-guided fine needle aspiration:

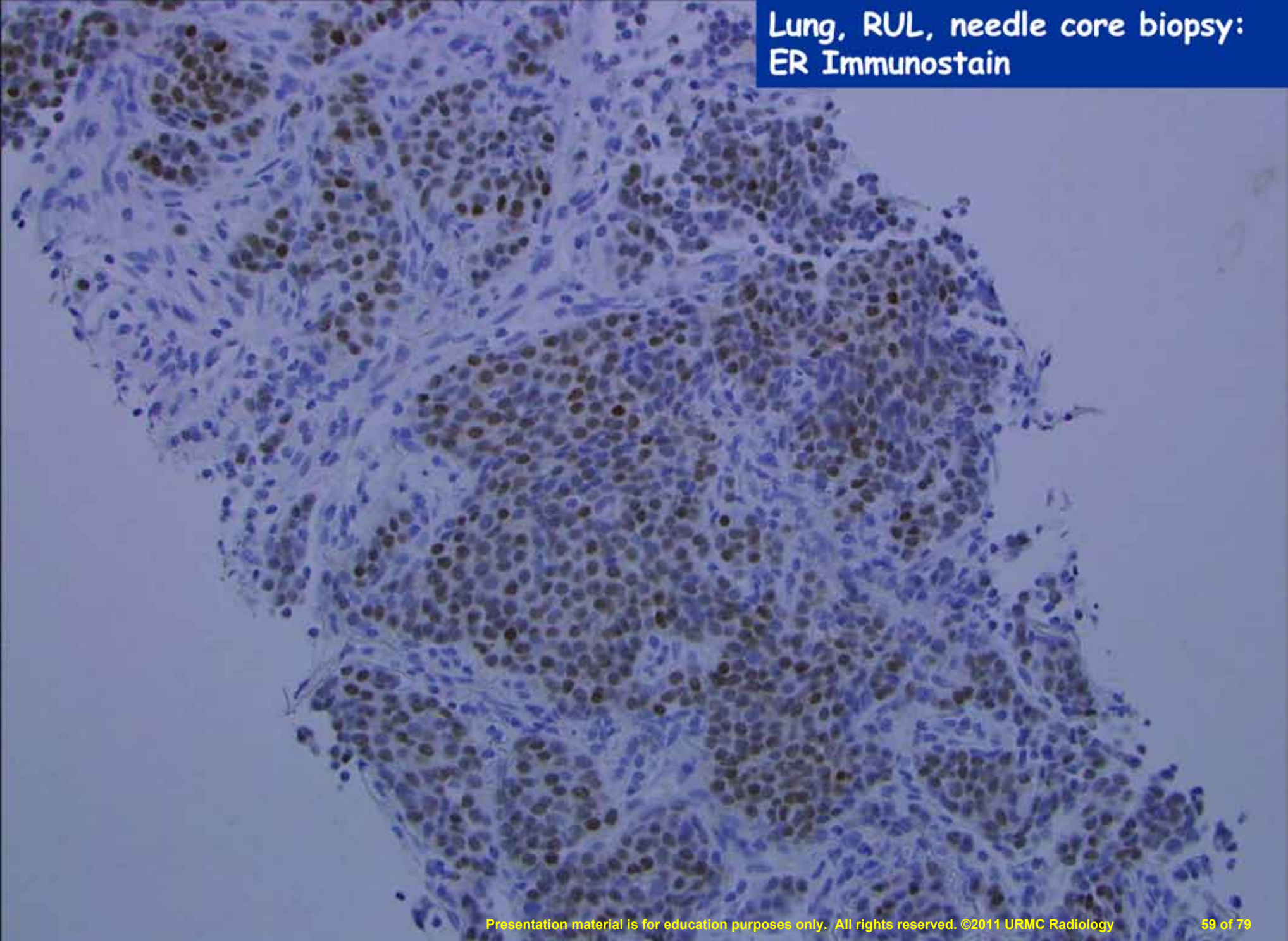
Malignant tumor cells present derived from adenocarcinoma, favor breast carcinoma.

Comment: Immunohistochemical stains show that the tumor cells do not mark with synaptophysin, chromogranin, CD56, and TTF-1. They do mark with pancytokeratin. This staining pattern supports epithelial differentiation.



Lung, RUL, needle core biopsy:
H&E stain

Lung, RUL, needle core biopsy: ER Immunostain



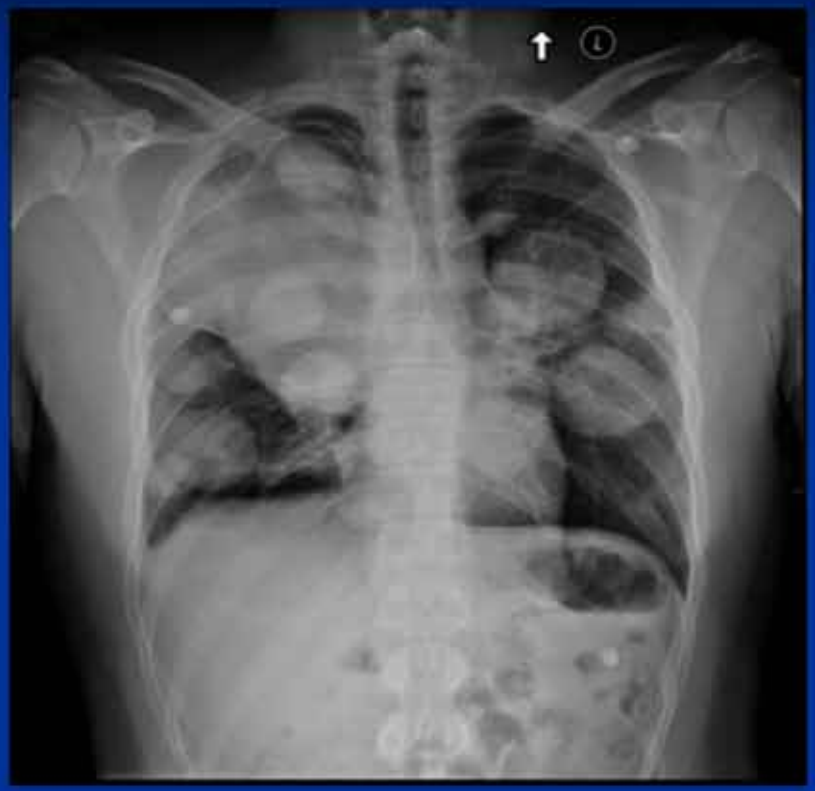
Metastatic Breast Carcinoma

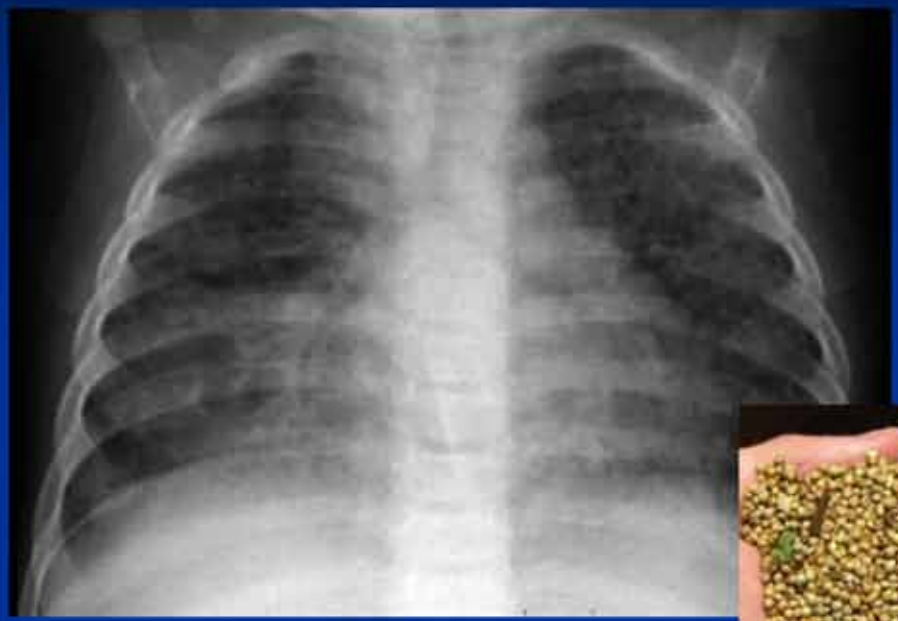
- Adenocarcinoma is the most common true metastatic neoplasm detected in lung
- Among these, breast, kidney and colon are most often seen
- Ductal carcinoma of breast may show scattered tumor cells singly or in clusters
- Metastatic disease versus primary lung cancer needs to be determined. Immunohistochemical stains should be performed.

Pulmonary Metastases

- Large differential diagnosis for multiple pulmonary nodules:
  - Mets, multifocal infection (viral, fungal, bacterial), septic emboli, Wegners Granulomatosis, Sarcoid, Rheumatoid, Silicosis
- Mets have a lower lobe predominance: Hematogenous spread
- Most common tumors to spread to the lung:
  - Breast, Colon, Uterus, Kidney, Prostate, Head and Neck, Pancreas, Stomach

Patterns of Pulmonary Metastases





Cannonball

Mets: Colon, Renal, Sarcoma, Melanoma

Miliary

Tuberculosis, Histoplasmosis

Metastases (thyroid, choriocarcinoma)

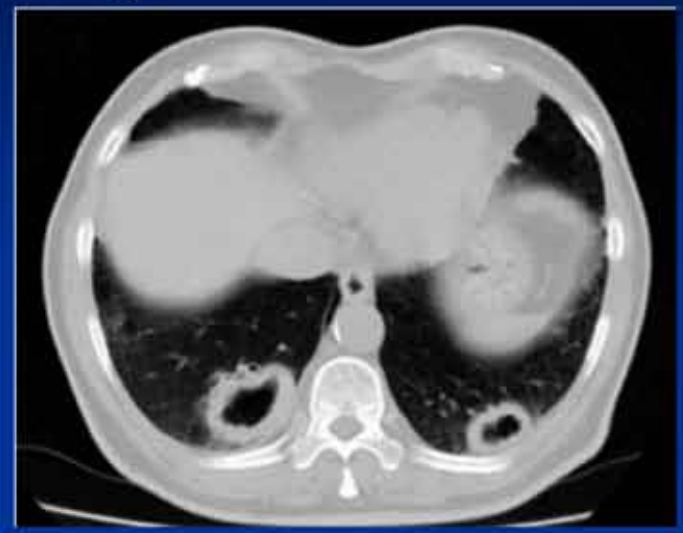
Viral pneumonia

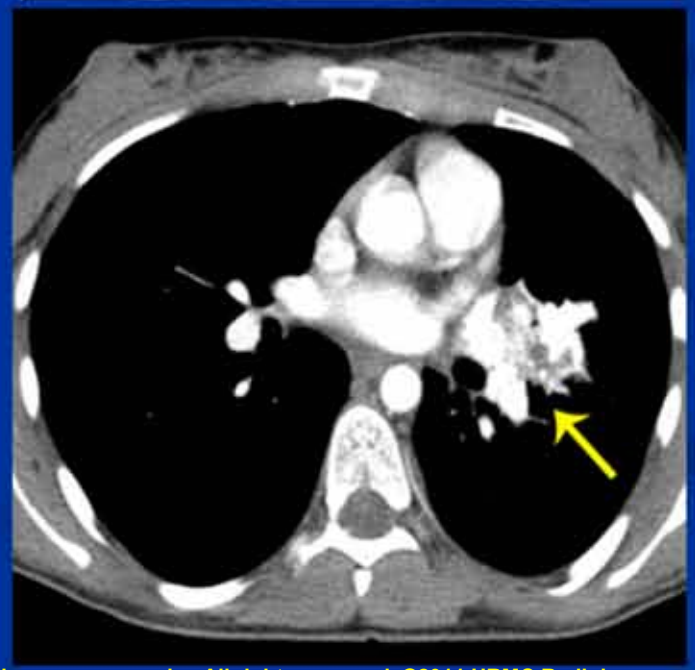
Sarcoidosis

Patterns of Pulmonary Metastases

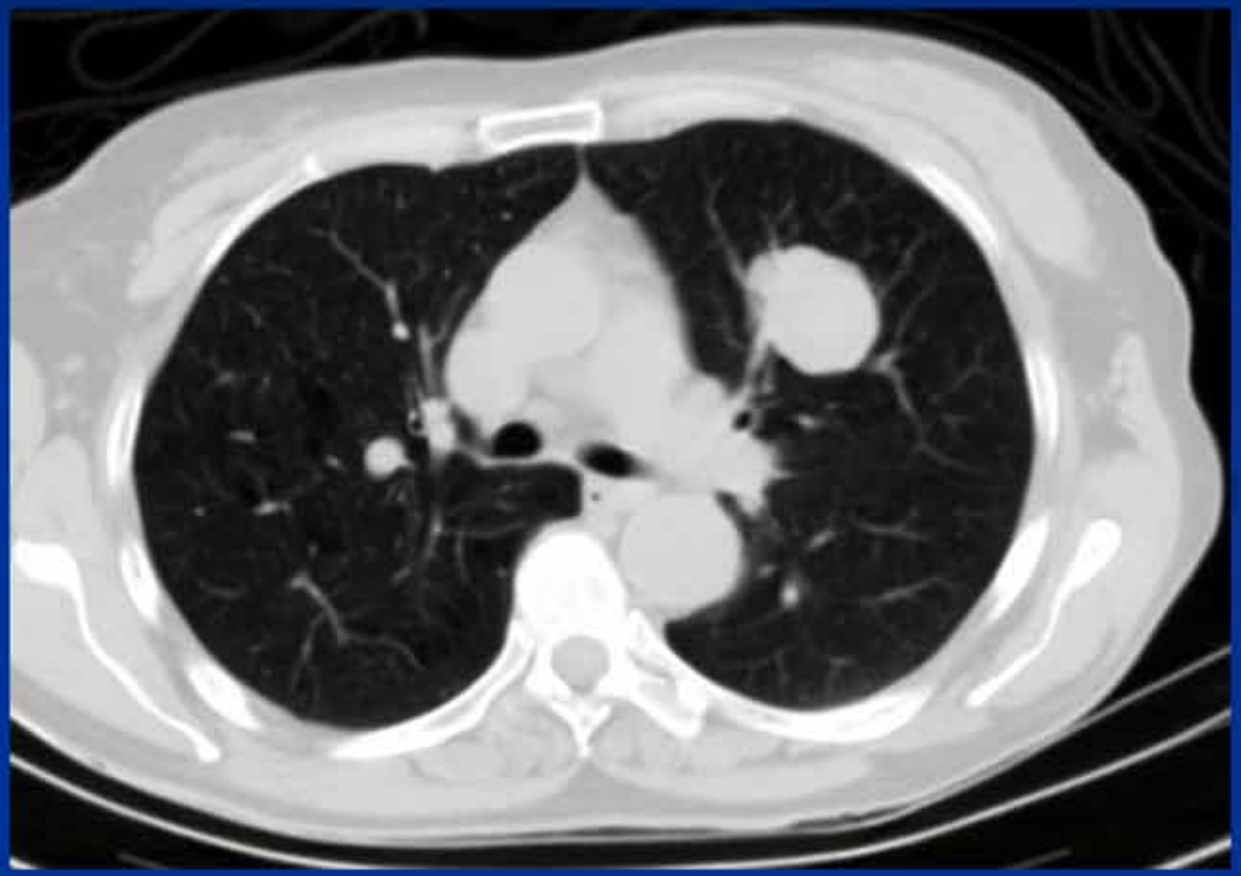
- Cavitating
  - Septic emboli
  - Metastases (squamous – head and neck, cervix, adeno – breast, colon, osteosarcoma → PTX)
  - Wegener granulomatosis
  - Rheumatoid

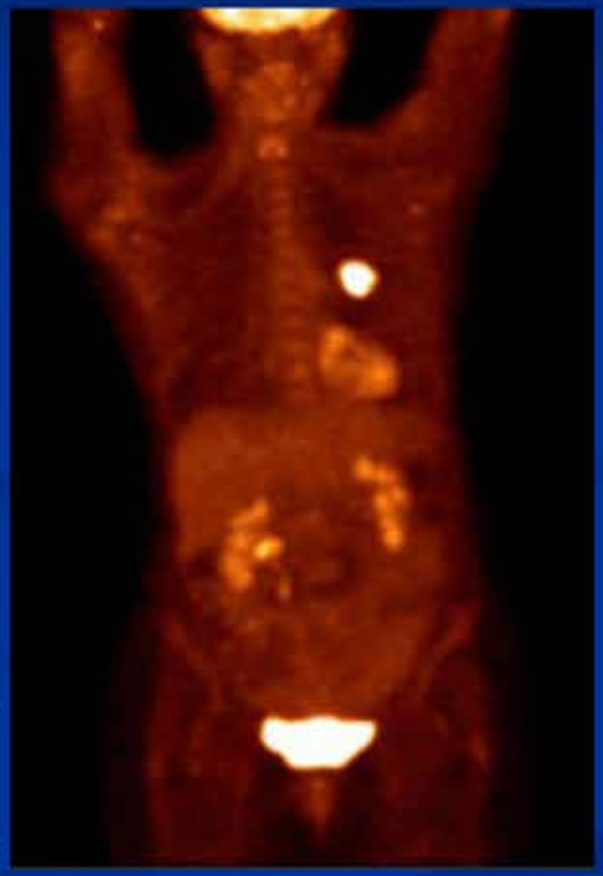
- Calcified:
  - Tuberculosis, histoplasmosis
  - Calcified metastases: Osteosarcoma, chondrosarcoma, papillary thyroid, breast, ovary, mucinous adenocarcinoma





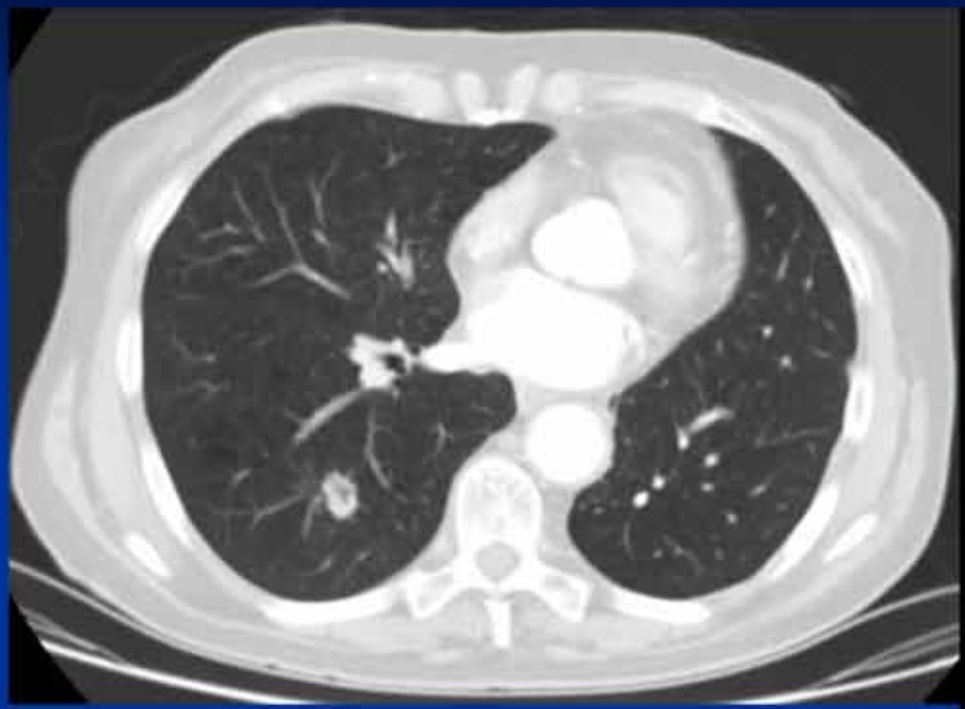
Case 5: 69 yo F with history of smoking

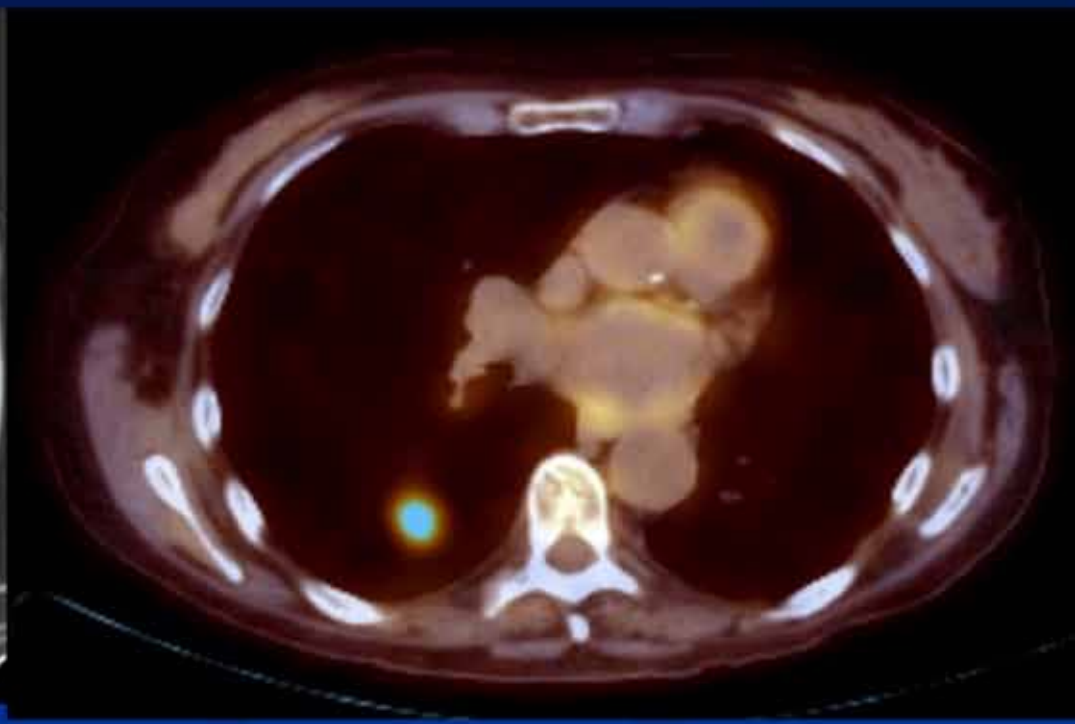




2008

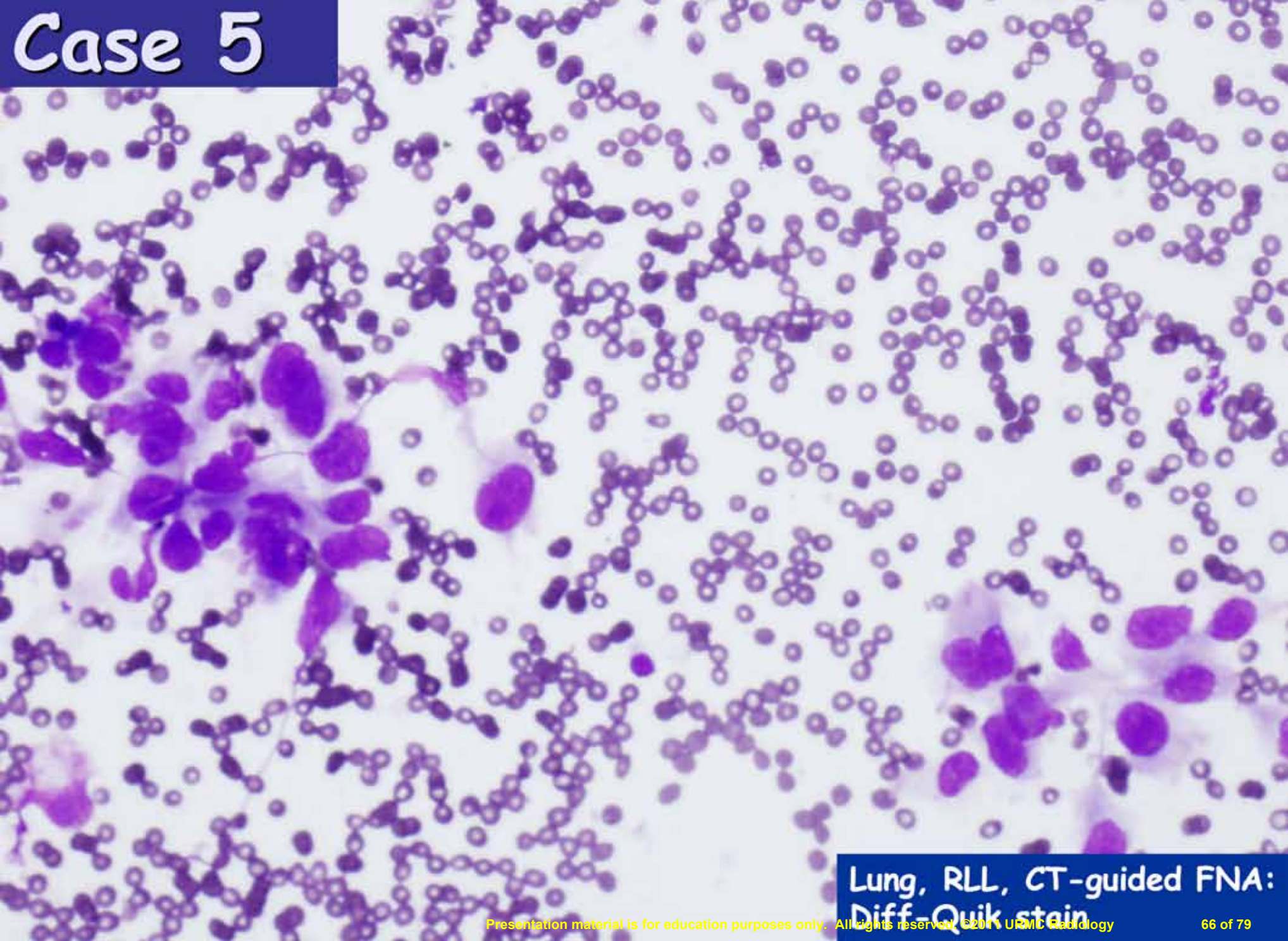
69 yo F with history of LUL lung mass s/p lobectomy 2008



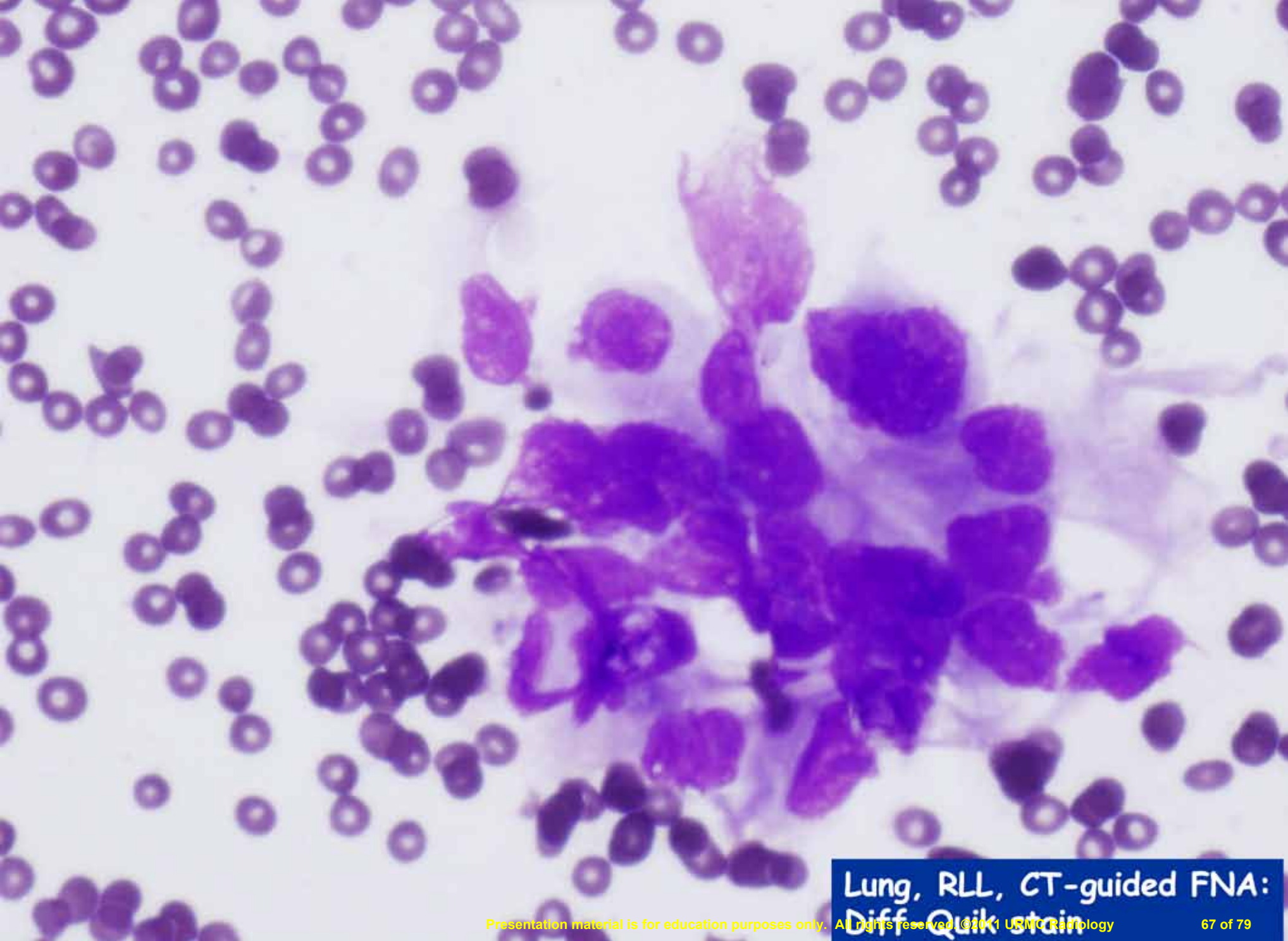


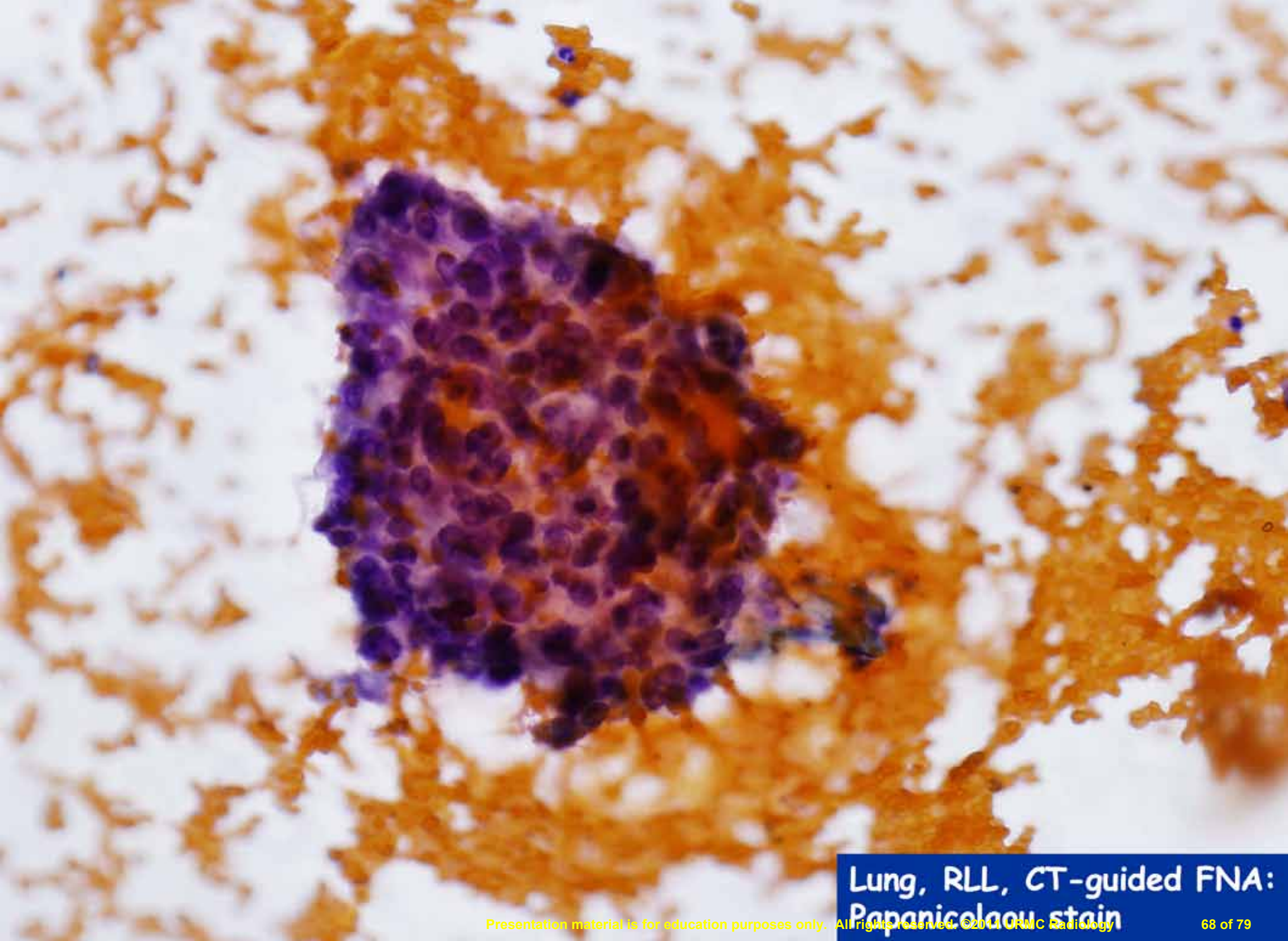
6/27/2011

Case 5



Lung, RLL, CT-guided FNA: Diff-Quik stain





Lung, RLL, CT-guided FNA: Papanicolaou stain

TTF-1

Lung, RLL, CT-guided FNA:
Immunohistochemical stains

Chromogranin

Napsin A

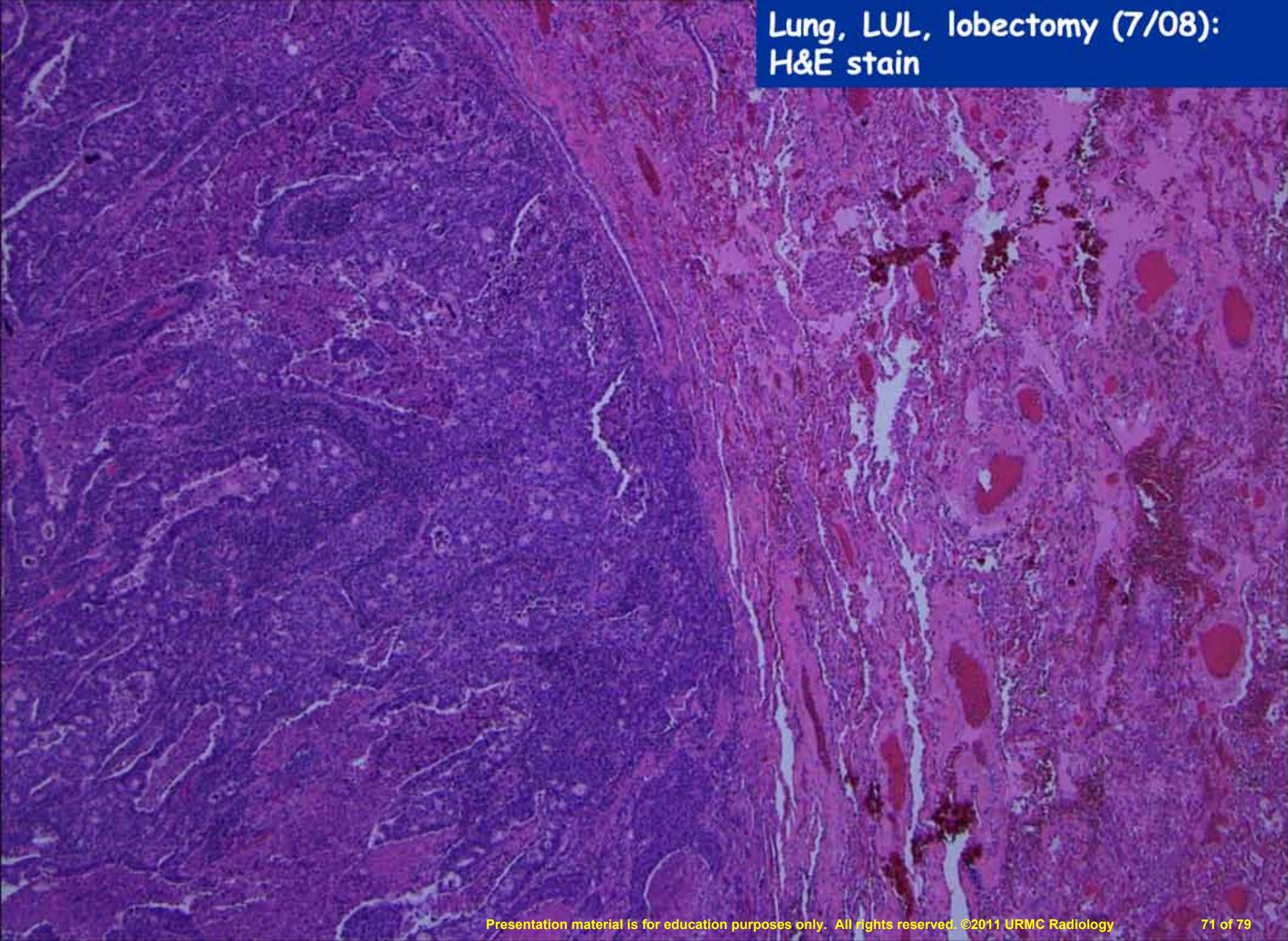
Lung, right lower lobe, CT-guided fine needle aspiration:

Positive for non-small cell carcinoma, most likely poorly differentiated adenocarcinoma.

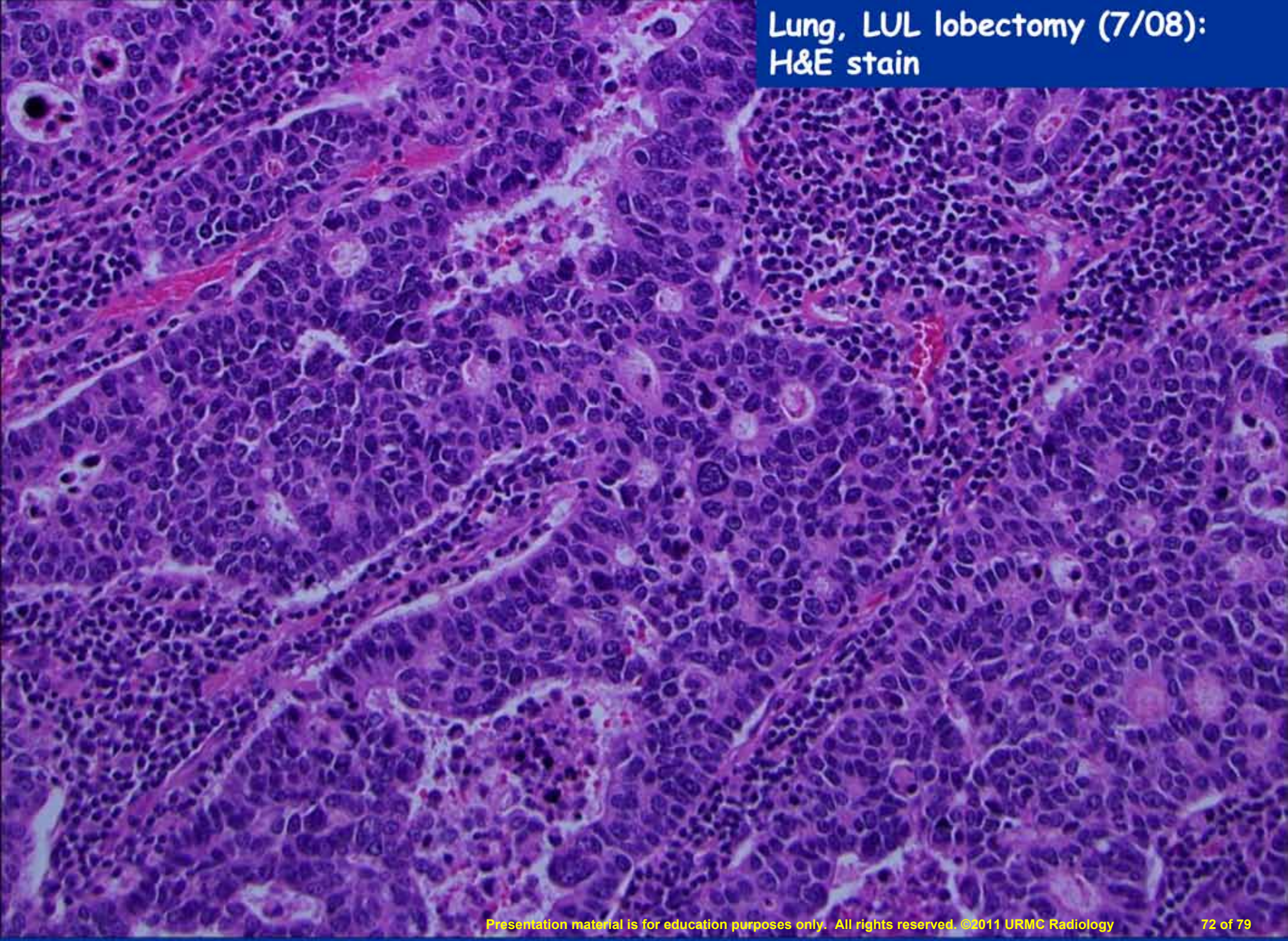
Tumor cells in cell block are positive for TTF-1, Napsin-A and negative for CK56, synaptophysin, and chromogranin.

Cell block and cytologic preparations examined.

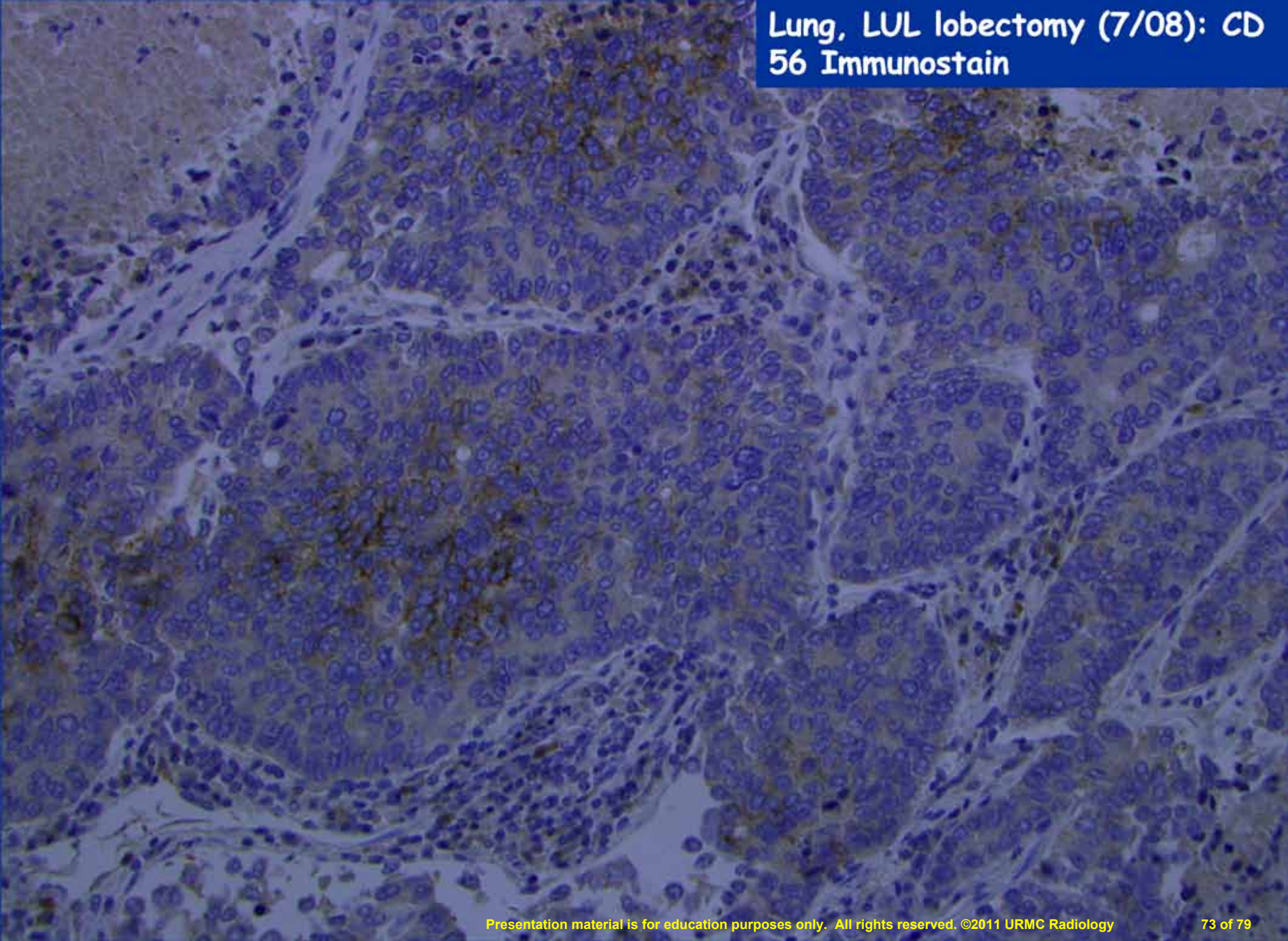
Lung, LUL, lobectomy (7/08): H&E stain



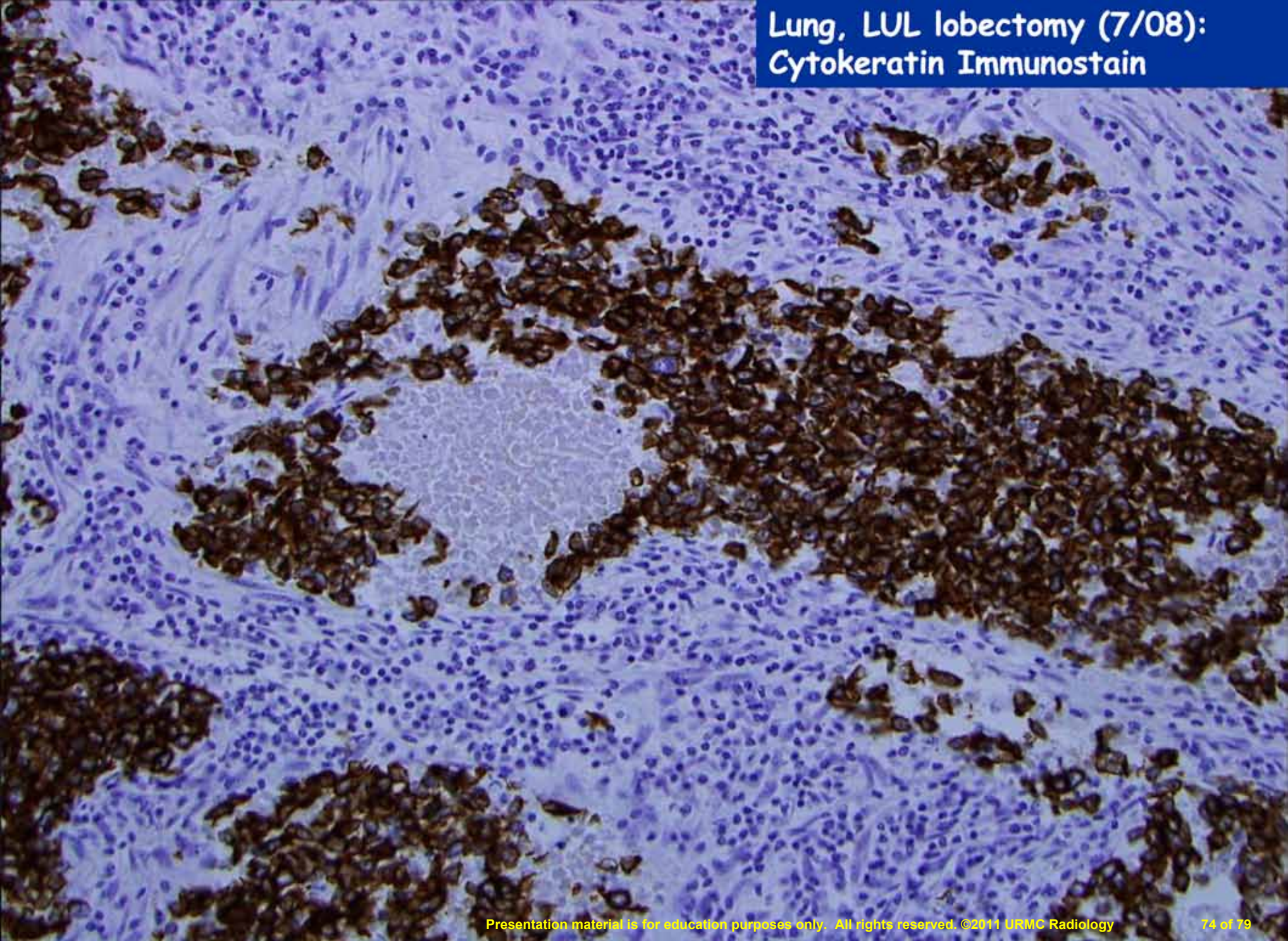
Lung, LUL lobectomy (7/08): H&E stain



Lung, LUL lobectomy (7/08): CD 56 Immunostain



Lung, LUL lobectomy (7/08): Cytokeratin Immunostain



Large Cell Neuroendocrine Carcinoma

- Histologic appearance of non-small cell carcinoma with some suggestion of neuroendocrine architecture (trabecular, palisading, rosettes) and usually high mitotic rate
  - Cells typically have large nuclei, prominent nucleoli, and moderate amounts of cytoplasm
- Confirmed by expression of neuroendocrine markers (synaptophysin, chromogranin, CD56), also can express CD117 (60%) and TTF1 (50%)
- Worse prognosis stage for stage than NSCLC in general (higher recurrence, lower 5 year survival)

Solitary Pulmonary Nodule

Lung Cancer/Metastasis/ Carcinoid
Hamartomas
Granulomas

Mimics

- 1st costochondral junction osteophytes
  - Inferior aspect 1st rib, more common right (right-handed)
- Nipple shadow
  - Bilateral, outer edge sharp, inner edge indistinct
- Skin lesions
  - Neurofibromas, moles
- Pulmonary vein confluence
  - Upper aspect right heart border
- Round atelectasis/pneumonia
- AVM

Solitary Pulmonary Nodule

- CT findings suggestive of malignancy
  - Spiculated margins (90%)
  - Lobulated contour
  - Air bronchograms (65%)
  - Cavitation with wall exceeding 15mm in thickness
  - Diameter > 2cm (95%), 90% of nodules < 2 cm are benign

Likelihood Ratios

AGE
20-29yrs 0.05 *50-59yrs 1.90*
30-39yrs 0.24 *60-69yrs 2.64*
40-49yrs 0.94

SMOKING (Pk-Yrs)
Nonsmoker 0.05 *30-39 0.94*
<30 Pk-Yrs 0.24 *>40 1.90*

HEMOPTYSIS
Absent 1.0 Present 5.08

HX PREV MALIG
No Prev Malig 1.0 Prev Malig 4.95

SIZE
0-1cm 0.52 *2.1-3.0cm 3.67*
1.1-2.0cm 0.74 *>3.0cm 5.23*

LOCATION
Upper/Middle 1.22 Lower 0.66

EDGE
Lobulated 0.74 *Spiculated 5.54*

GROWTH RATE
Not Known 1 *Malignant 3.4*
Benign 0.1

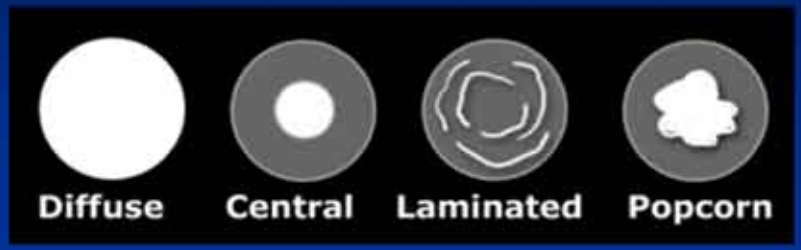
CAVITY WALL THICKNESS
Not Cavitated 1 5-15mm 0.72
<4mm 0.07 *>16mm 38*

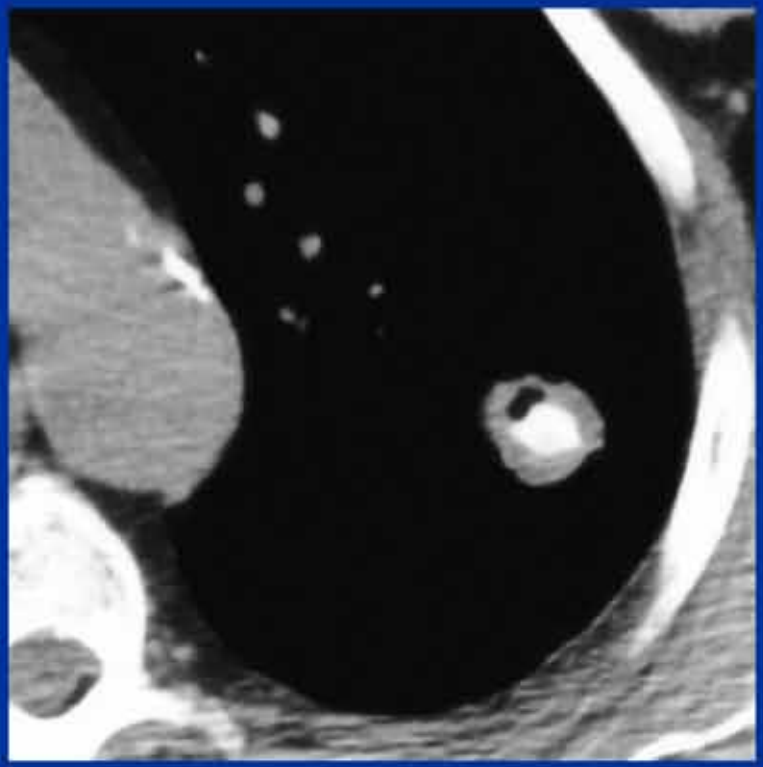
CALCIFICATION
None 2.2 Benign Pattern 0.01

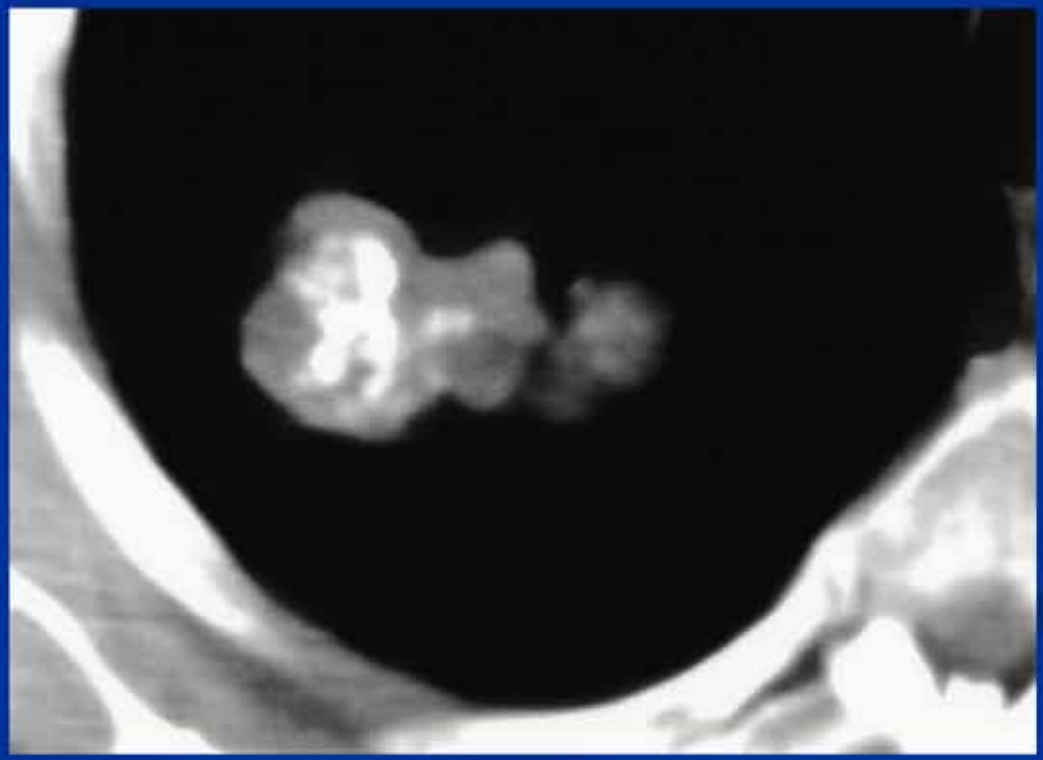
CONTRAST ENHANCEMENT
SUR <2.5 0.04 *SUR >2.5 2.32*

PET
<15 HU 0.04 *>15 HU 2.32*

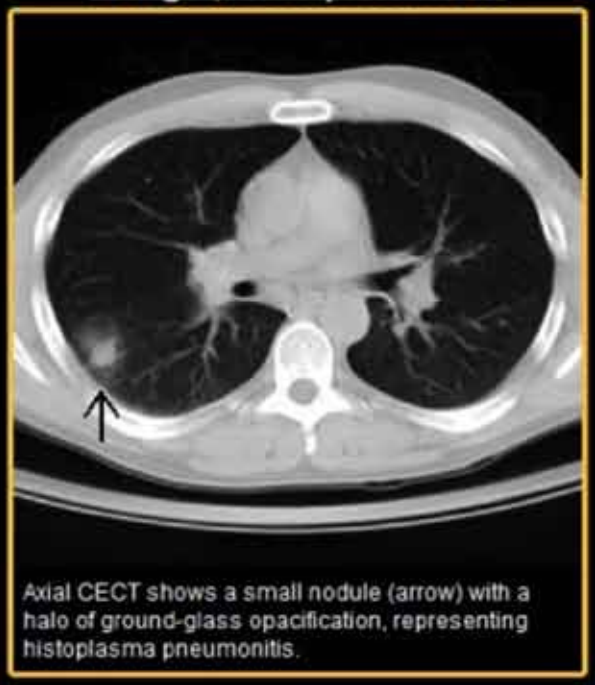
Benign Calcification Patterns





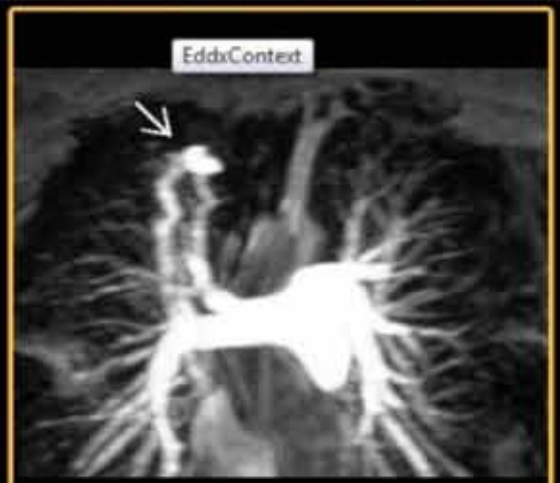


Fungal, Histoplasmosis



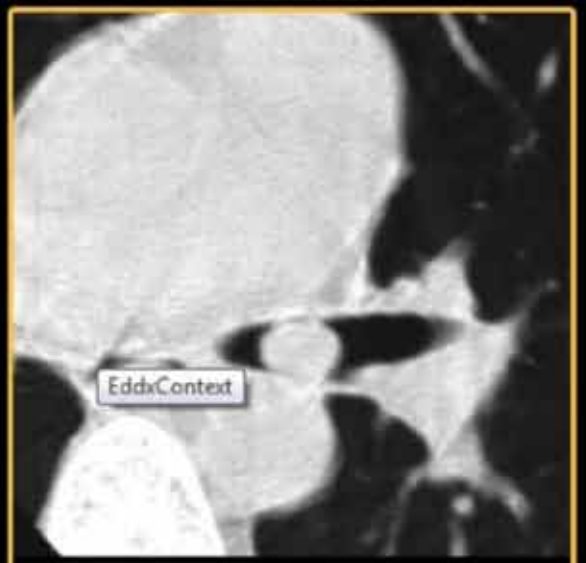
Axial CECT shows a small nodule (arrow) with a halo of ground-glass opacification, representing histoplasma pneumonitis.

Arteriovenous Malformation, Pulmonary



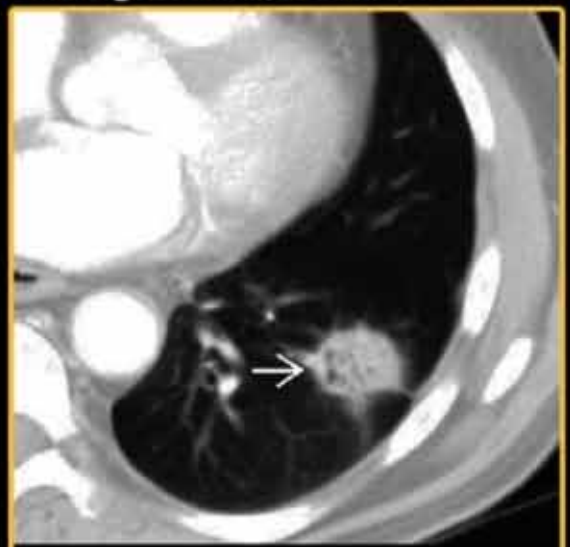
3D gadolinium-enhanced MRA shows a solitary AVM in the right upper lobe. A feeding artery originating from the right superior pulmonary artery and a draining vein are clearly demonstrated (arrow).

Carcinoid



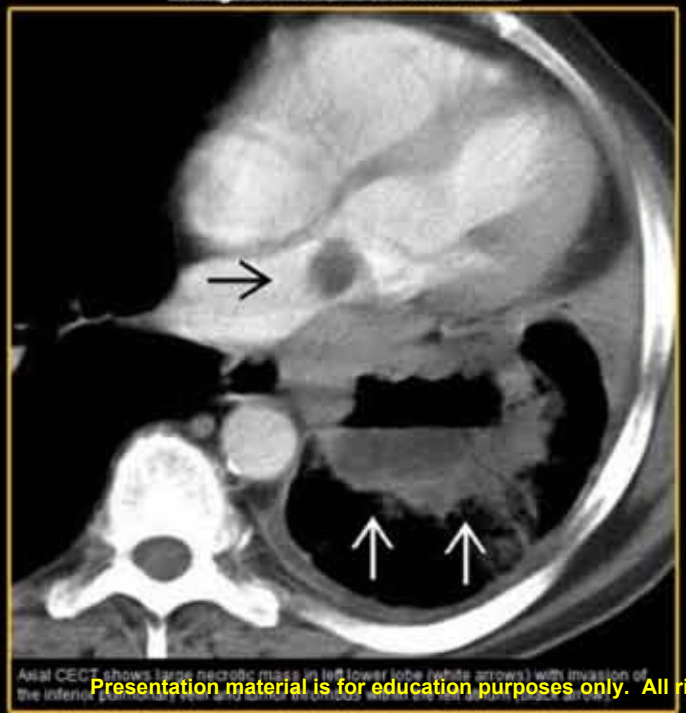
Axial NECT demonstrates the left distal main bronchial nodule, which caused air-trapping on the expiration images. A typical carcinoid tumor was found at surgery.

Lung Cancer, Non-Small Cell



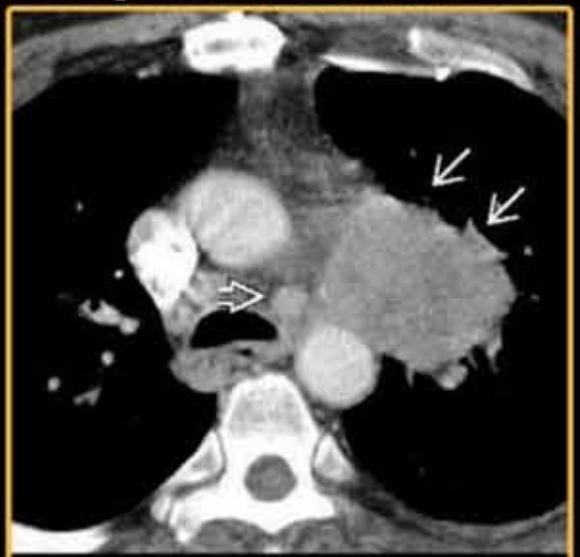
Axial CECT shows mixed density nodule with punctate regions of ground glass attenuation centrally (arrow) and spiculated margins. Biopsy proven adenocarcinoma.

Lung Cancer, Non-Small Cell



Axial CECT shows large necrotic mass in left lower lobe (white arrows) with invasion of the inferior pulmonary vein and tumor thrombus within the left main pulmonary artery.

Lung Cancer, Non-Small Cell



Axial CECT shows large mass invading the mediastinum (arrows) with metastatic left tracheobronchial lymph node (open arrow) diagnosed as large cell carcinoma at histology.