RadPath Conference

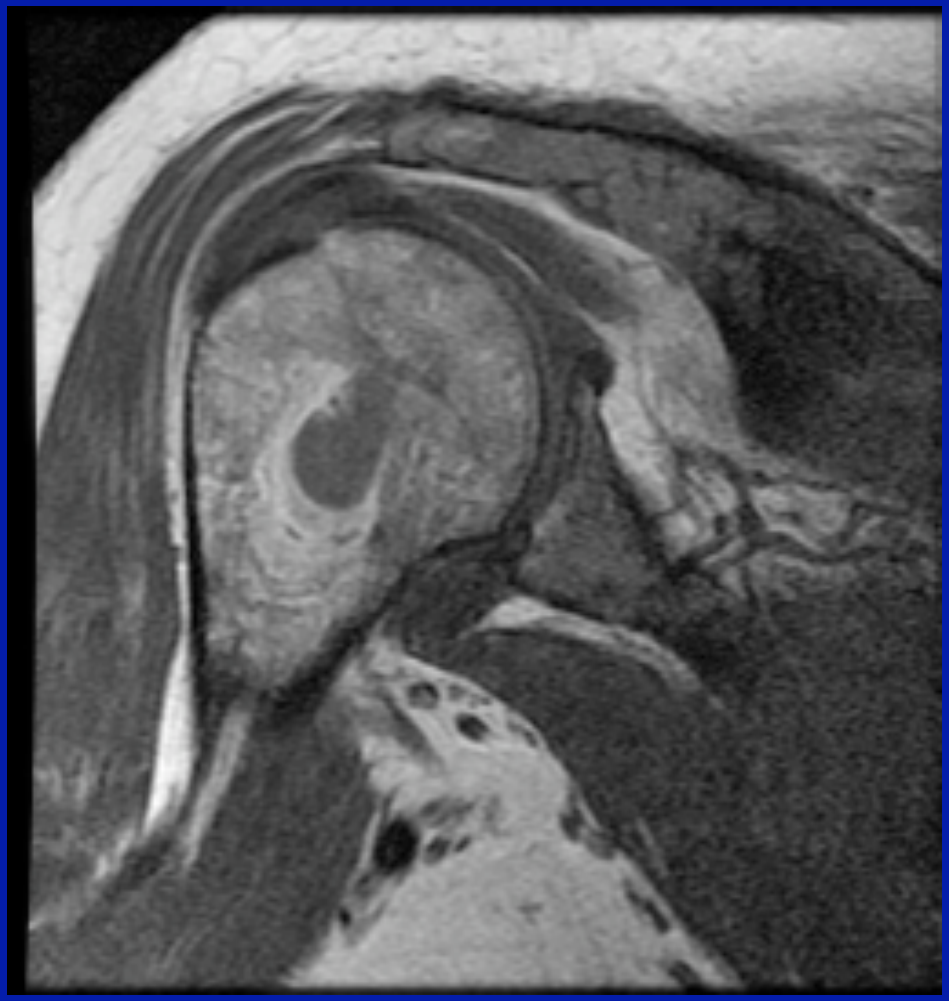
December 2009

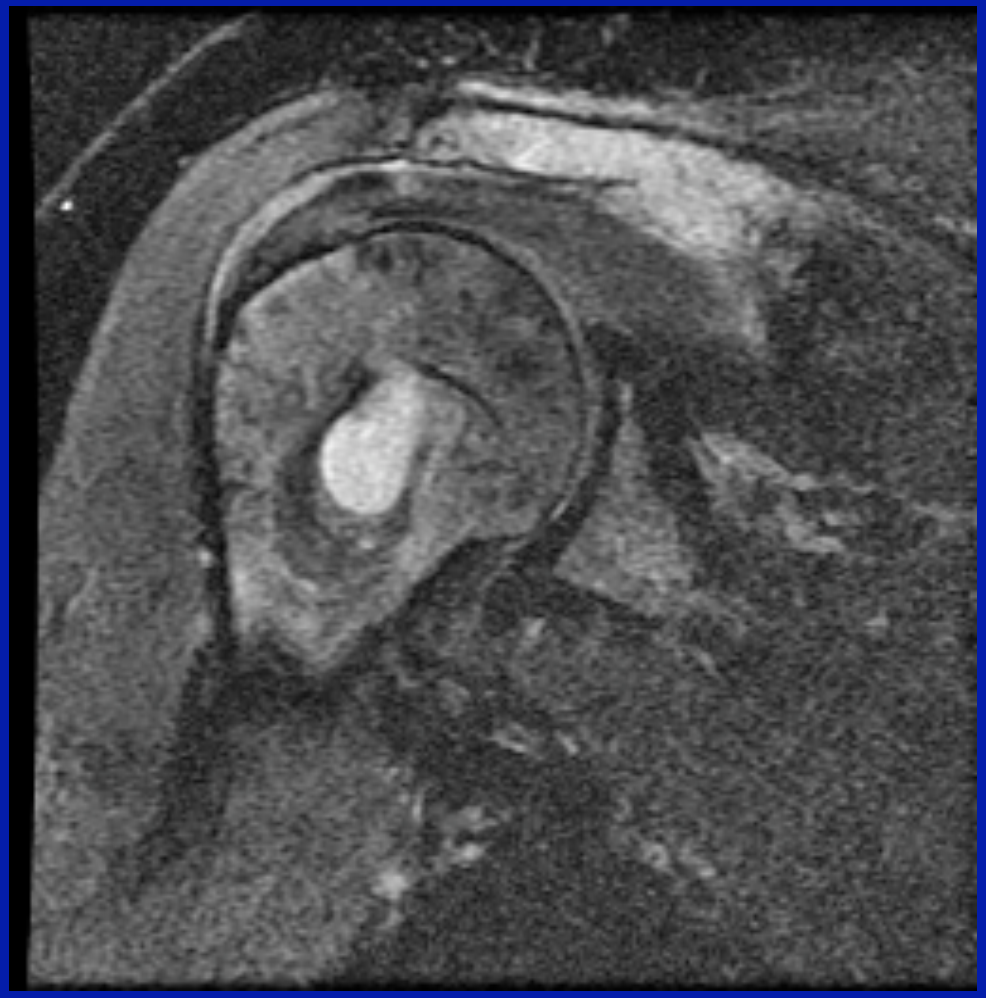
Ellen Giampoli, M.D.

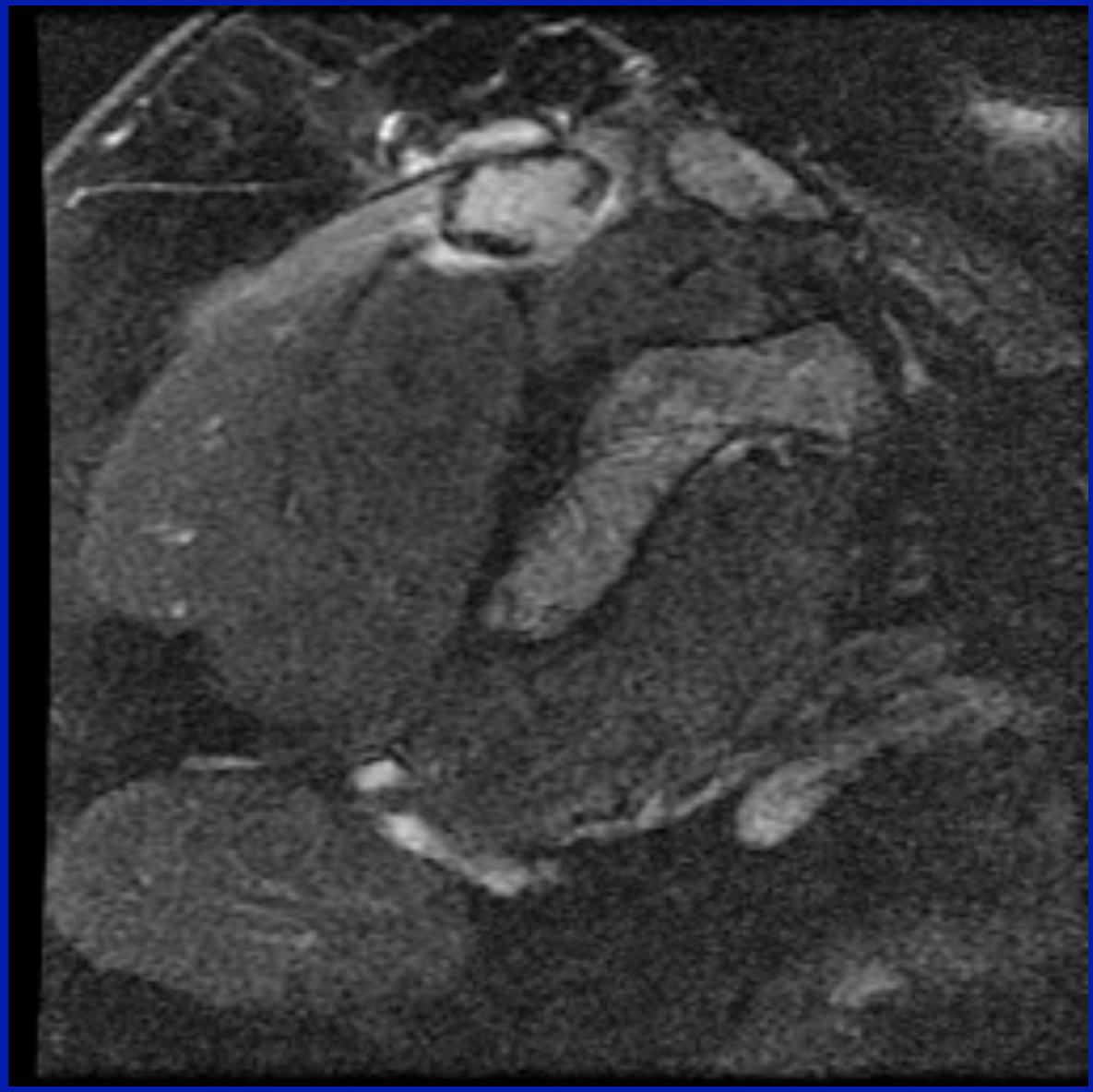
Aharon Wolf, M.D.

Case 1

- 59 year old female with shoulder pain





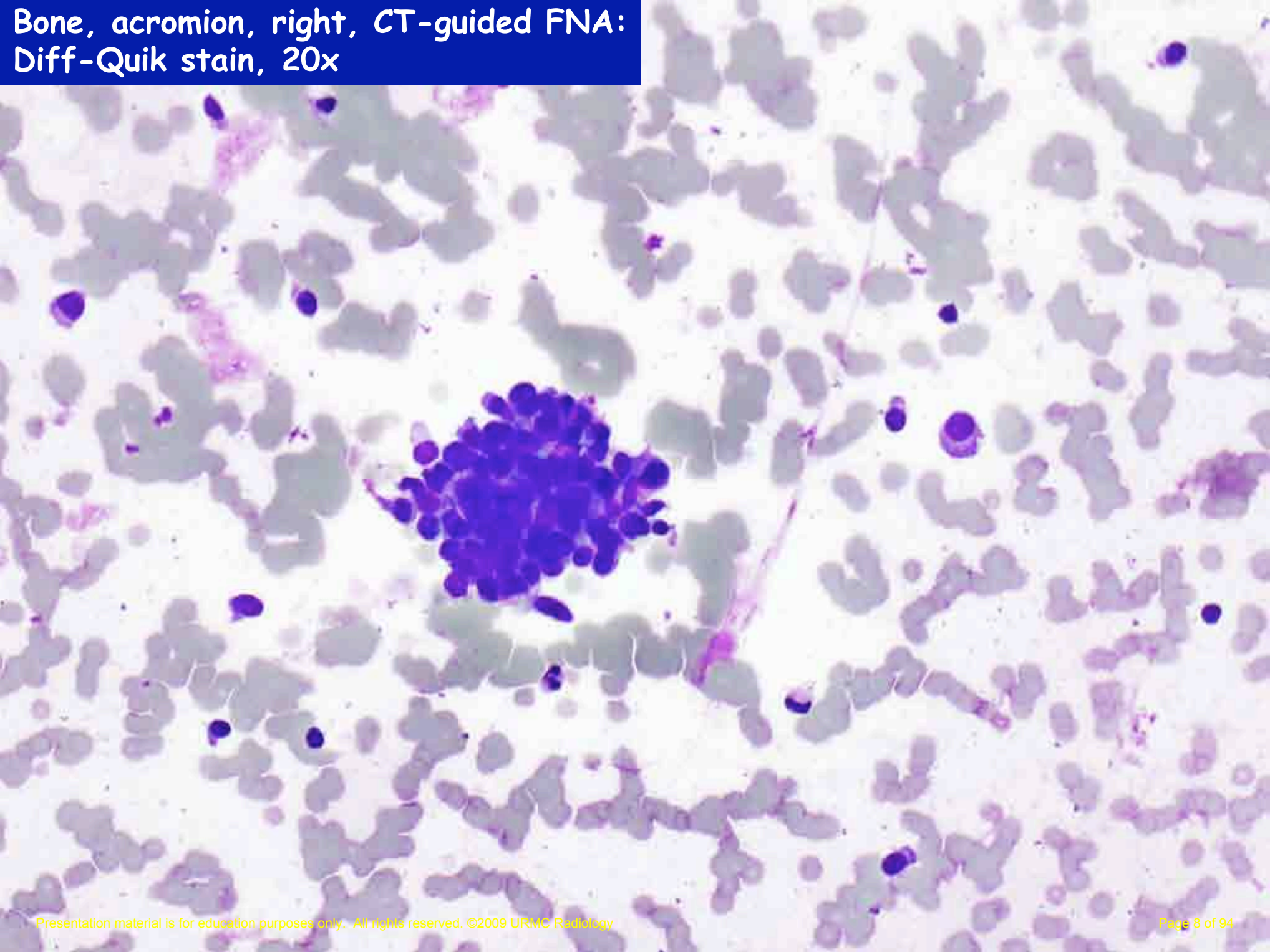


Patient had history of previously diagnosed plasma cell myeloma. FNA of proximal humerus and acromion was done.

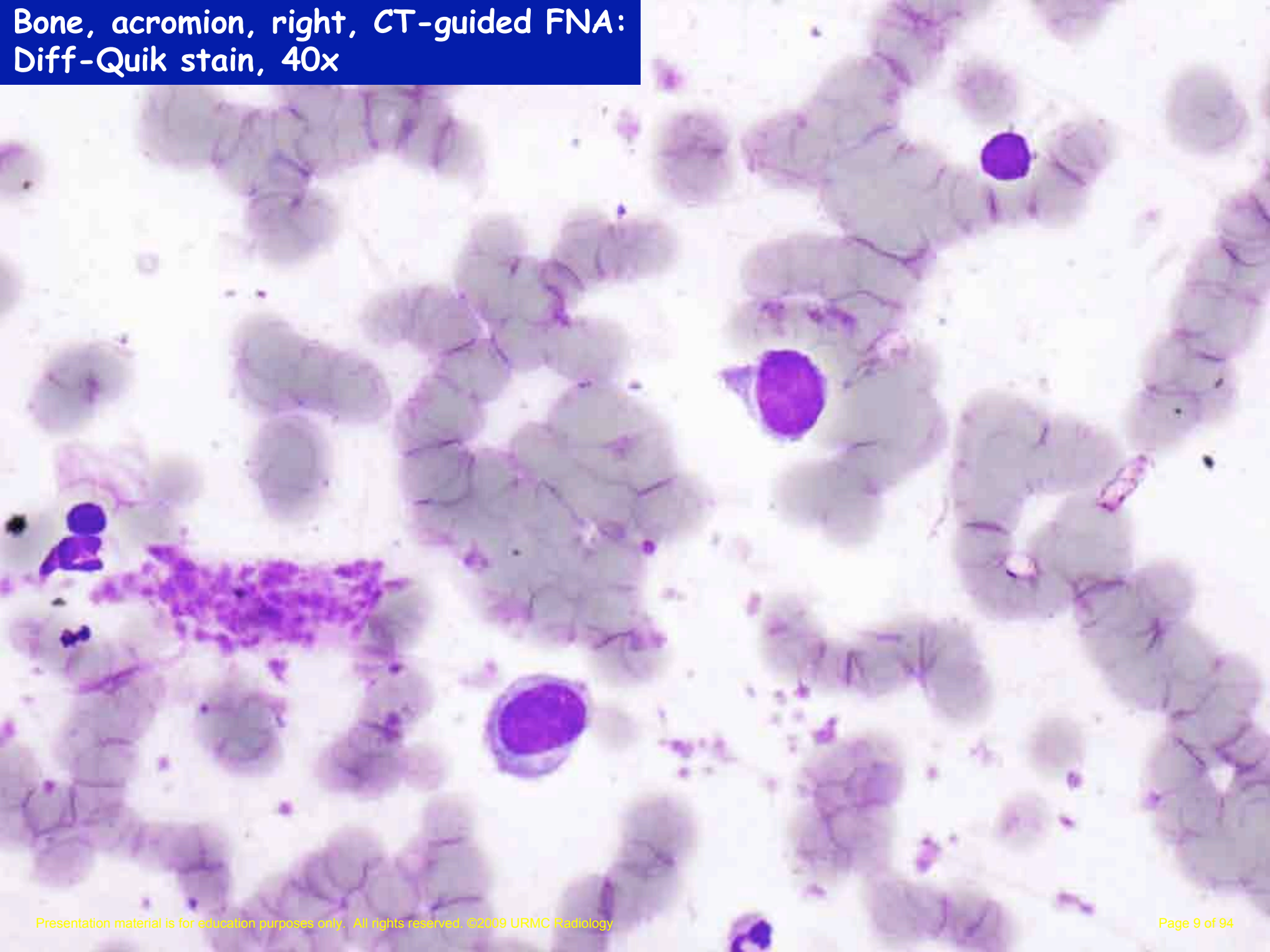
Suggested Panels for the Classification of Various Tumors

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
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

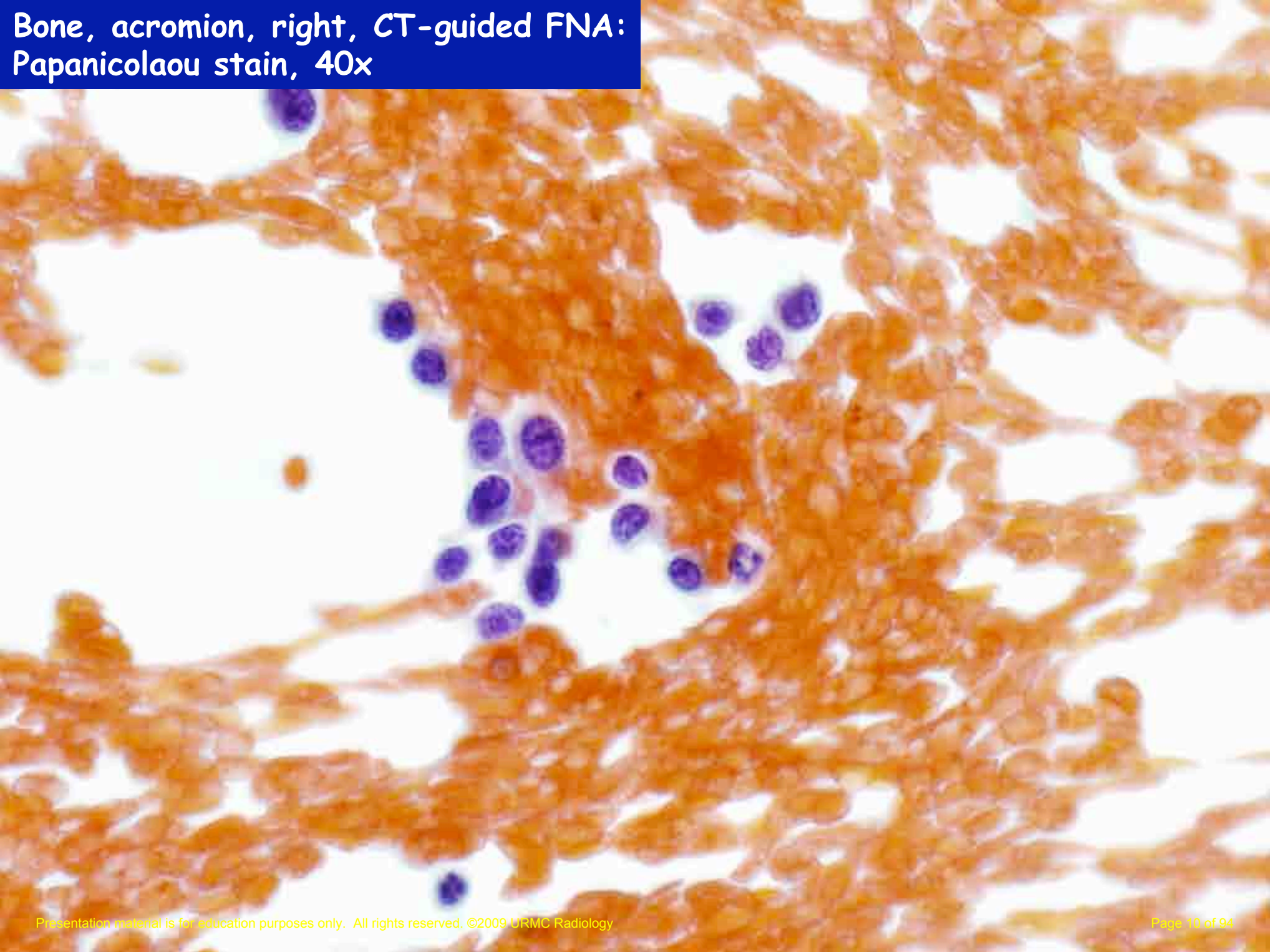
Bone, acromion, right, CT-guided FNA: Diff-Quik stain, 20x



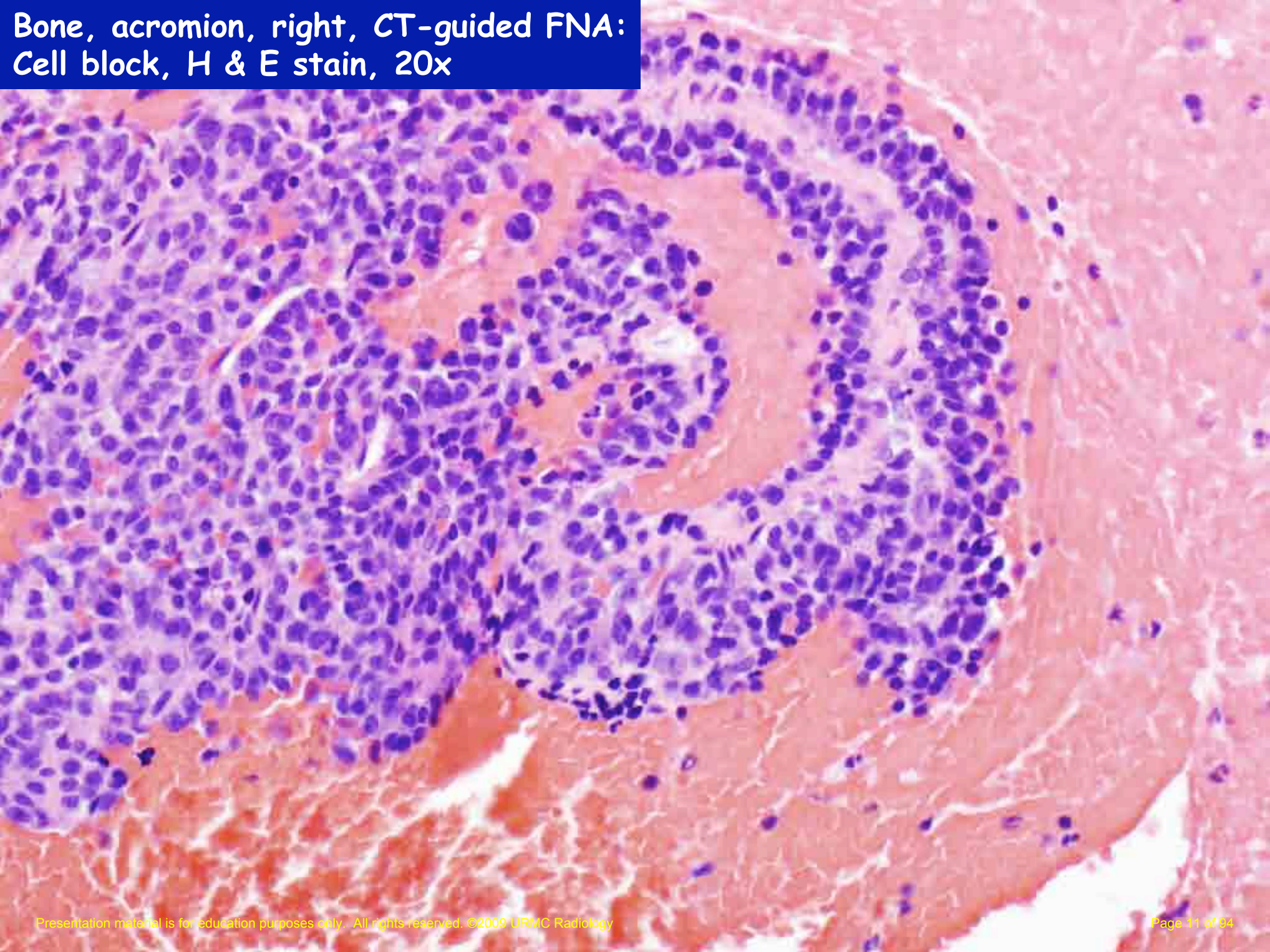
Bone, acromion, right, CT-guided FNA: Diff-Quik stain, 40x



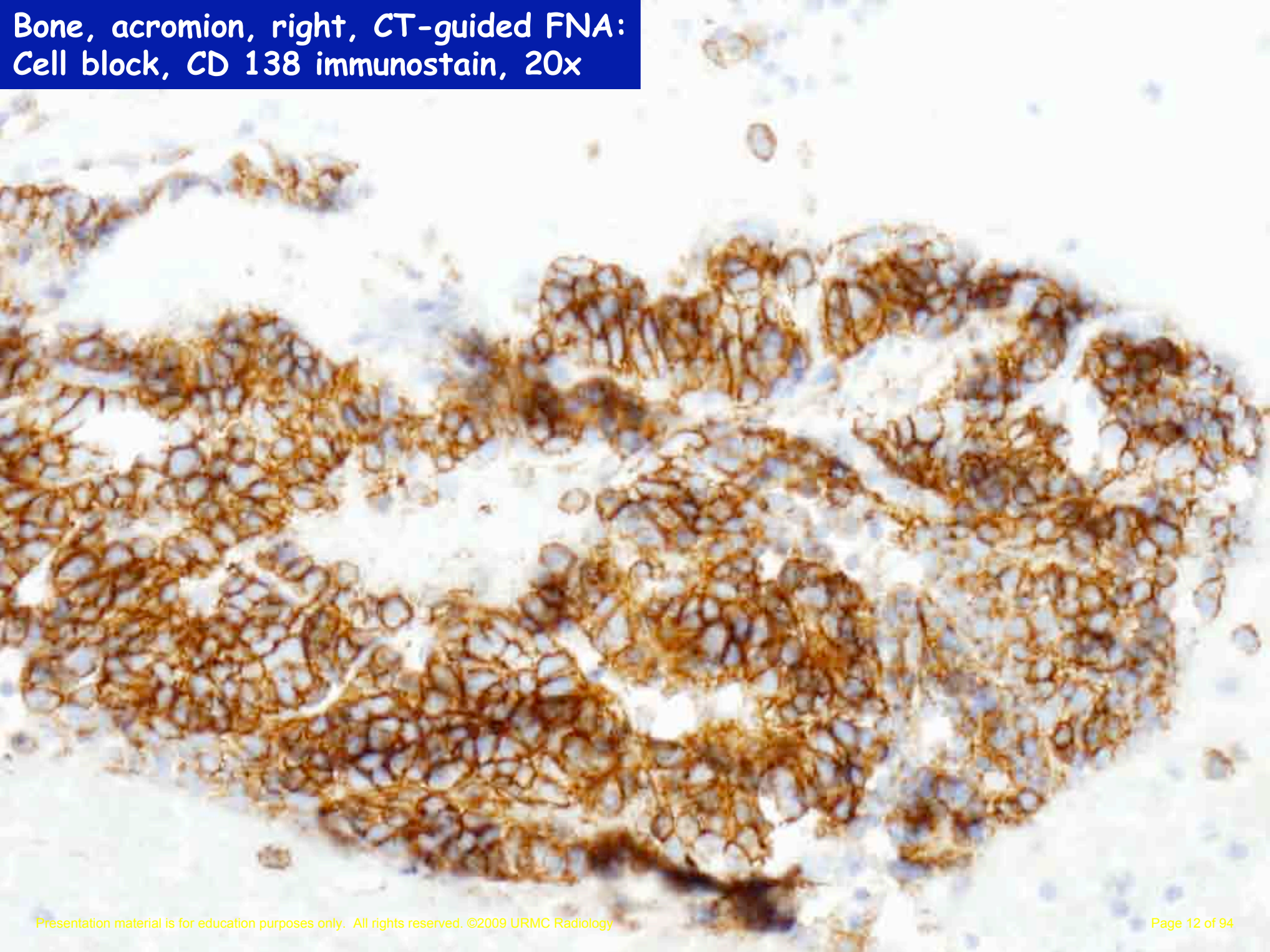
Bone, acromion, right, CT-guided FNA: Papanicolaou stain, 40x



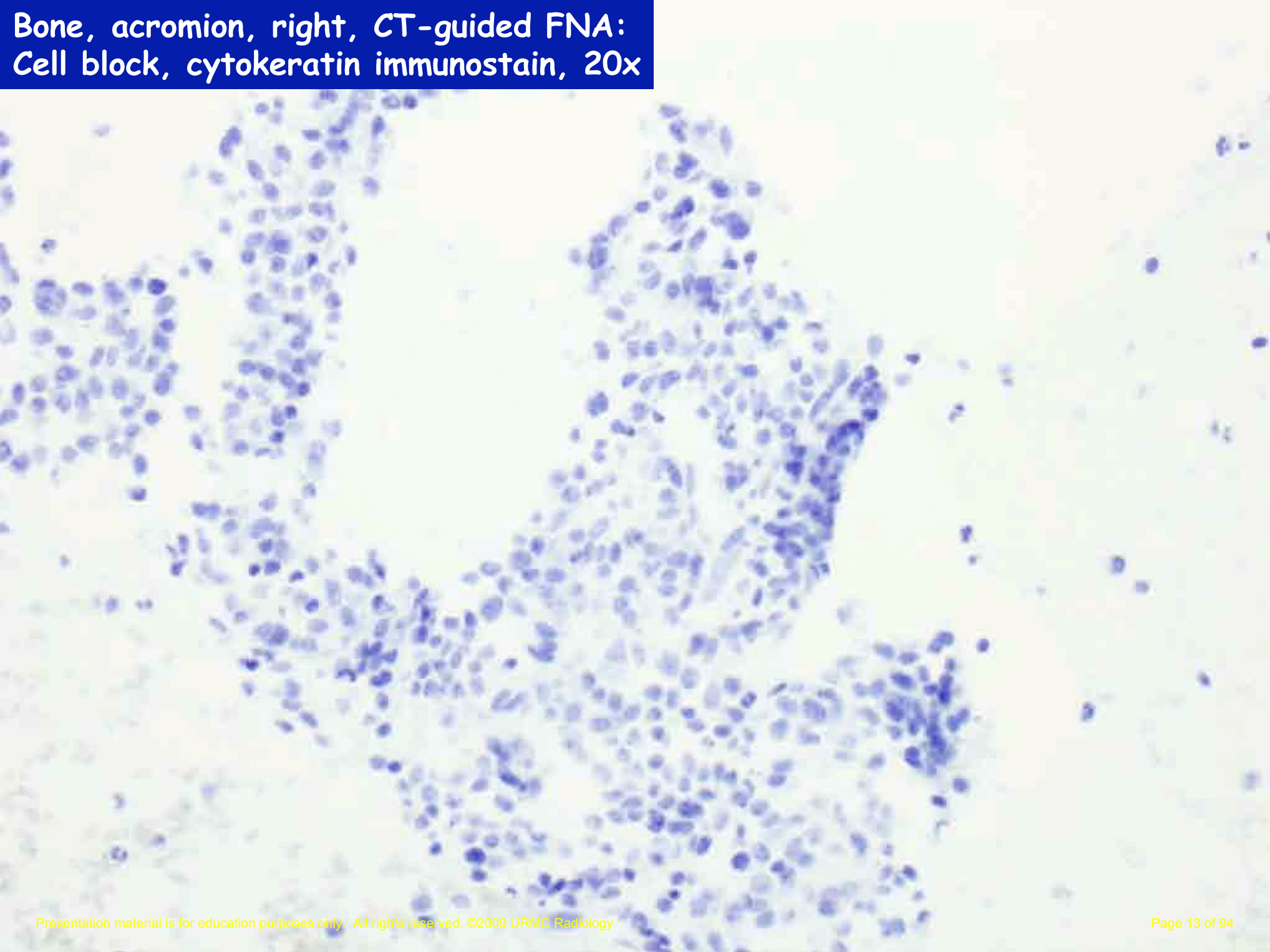
Bone, acromion, right, CT-guided FNA: Cell block, H & E stain, 20x



Bone, acromion, right, CT-guided FNA: Cell block, CD 138 immunostain, 20x



Bone, acromion, right, CT-guided FNA: Cell block, cytokeratin immunostain, 20x



Bone, acromion, right, CT-guided fine needle aspiration:

Cellular evidence of Plasma Cell Myeloma

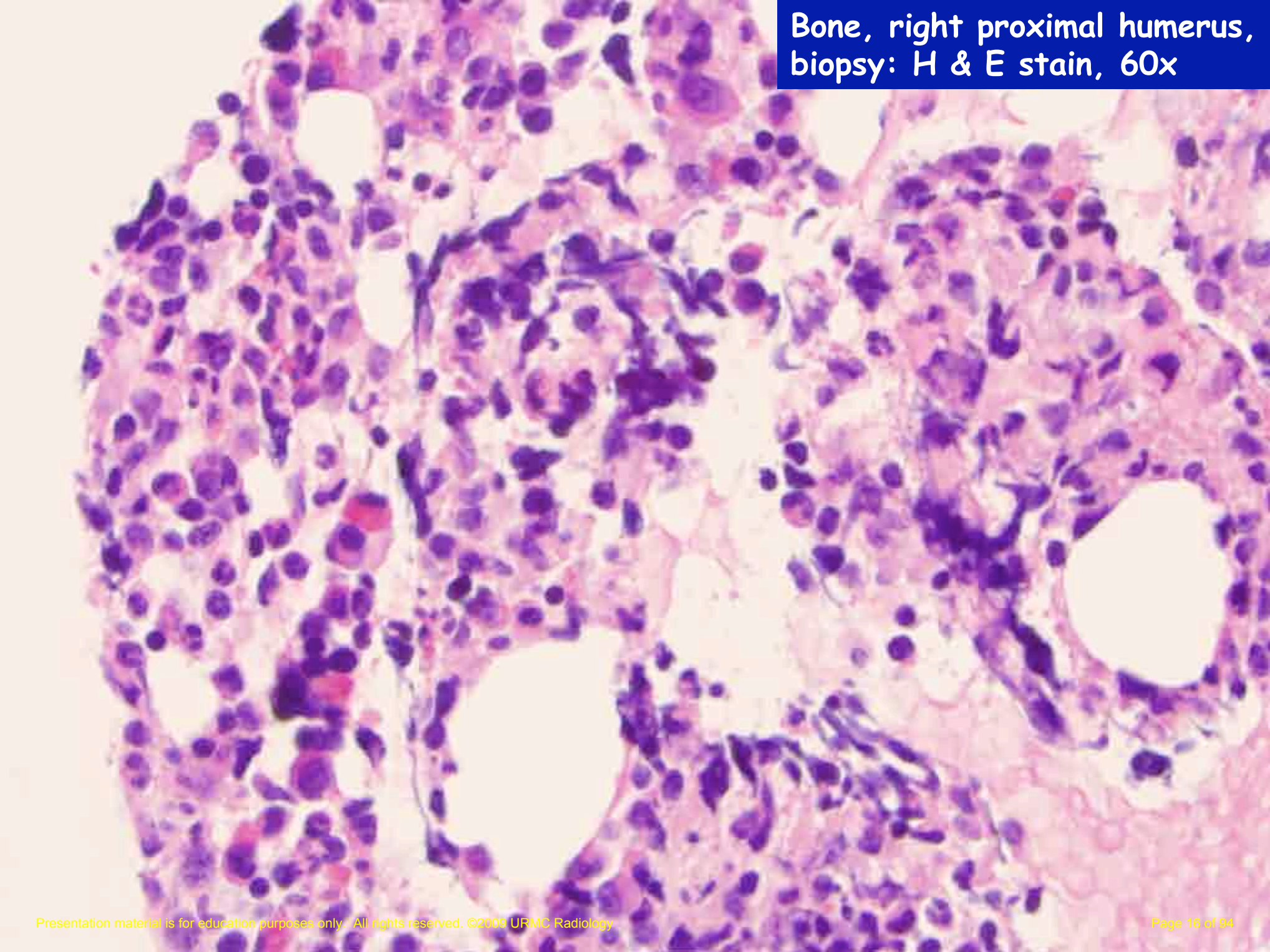
Comment: Immunostain for CD 138 is positive. A stain for broad spectrum cytokeratin is negative.

Bone, right, proximal humerus, core needle biopsy

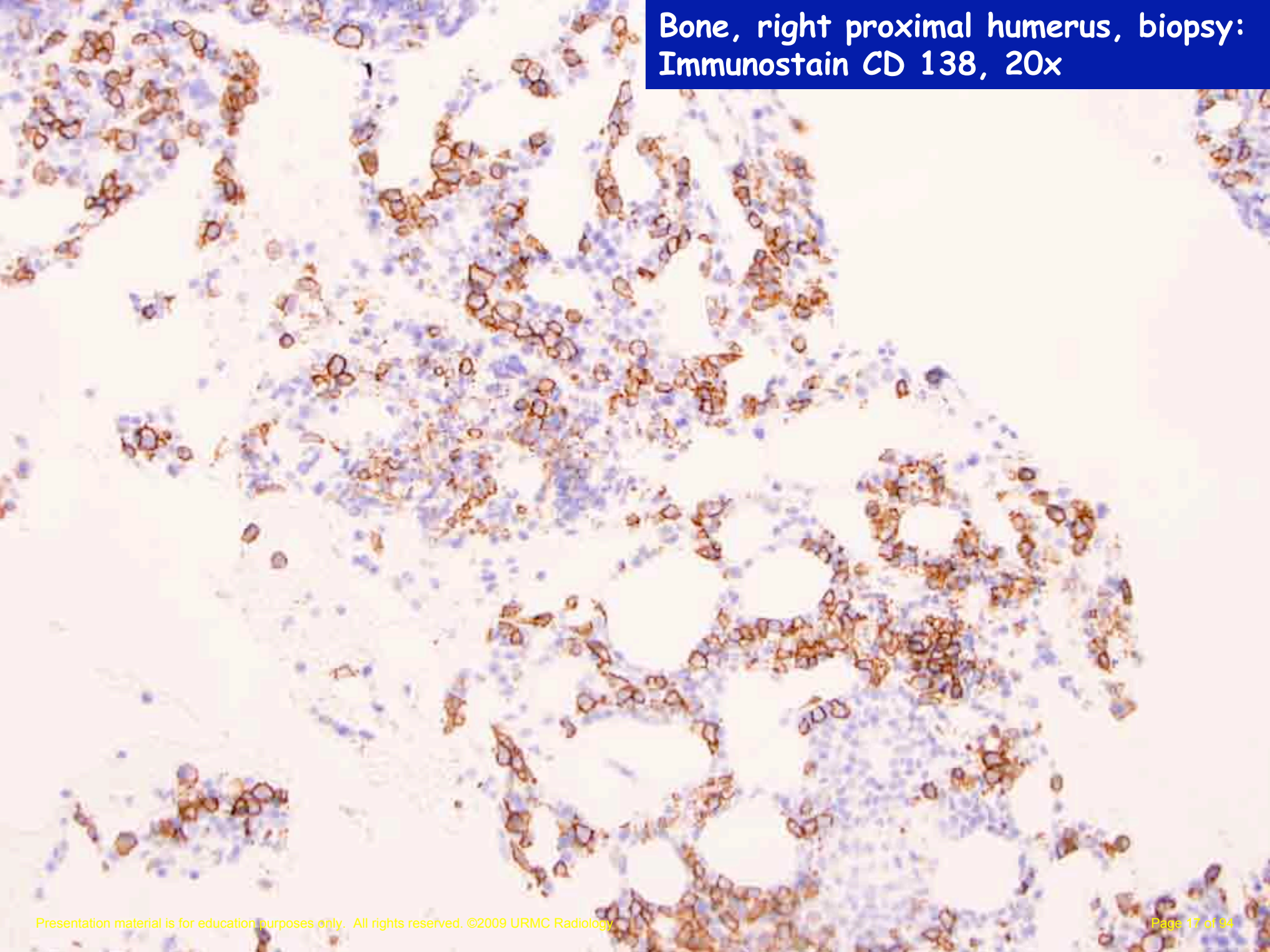
- Involved by previously diagnosed plasma cell myeloma
- Plasma cells comprise approximately 33% of cellularity
- Immunophenotype: CD 138, Kappa
- 3 mm of bone marrow sampled

The finding of clonal plasma cells in the context of multiple bone lesions is consistent with multiple myeloma.

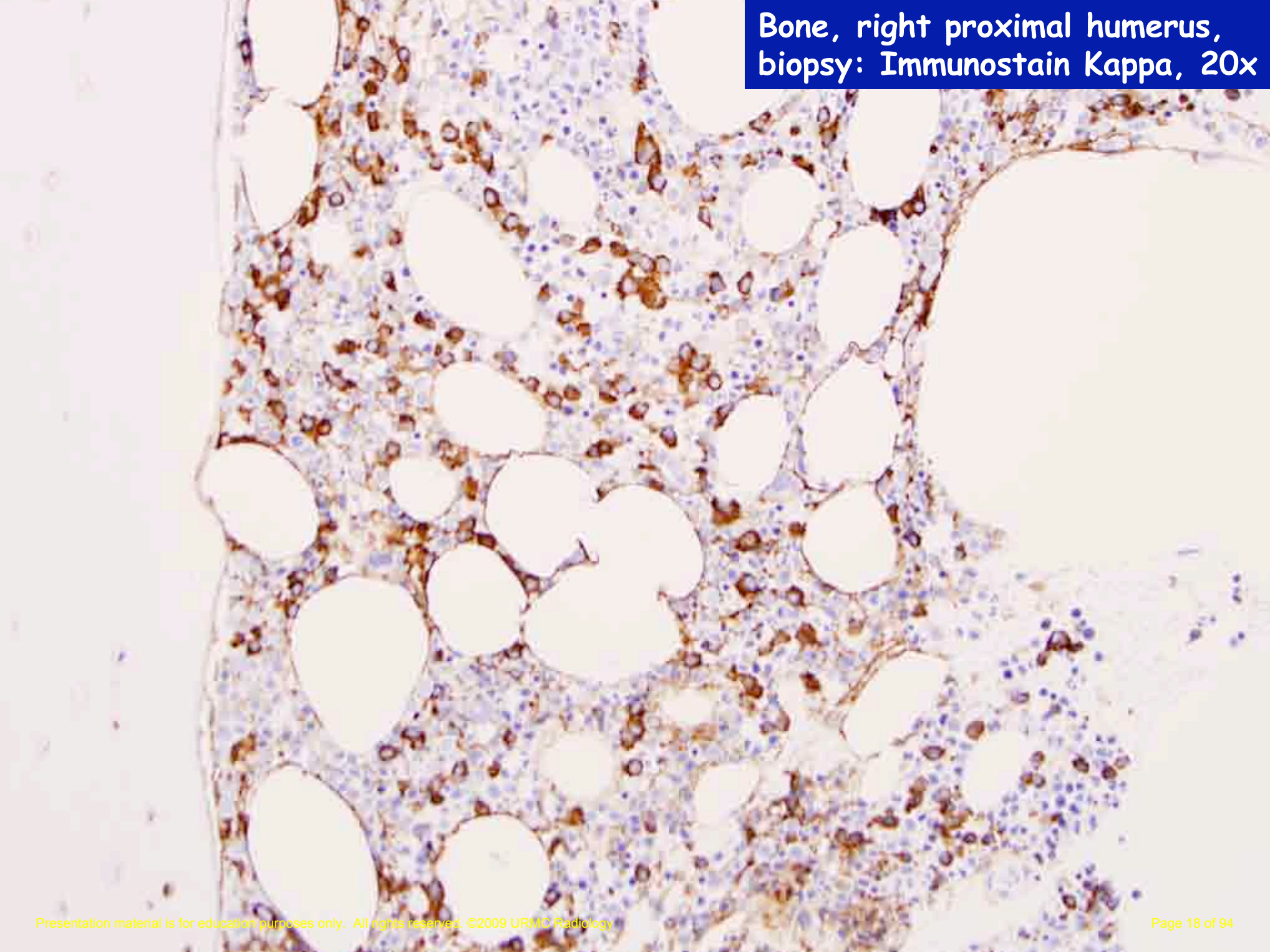
Bone, right proximal humerus, biopsy: H & E stain, 60x



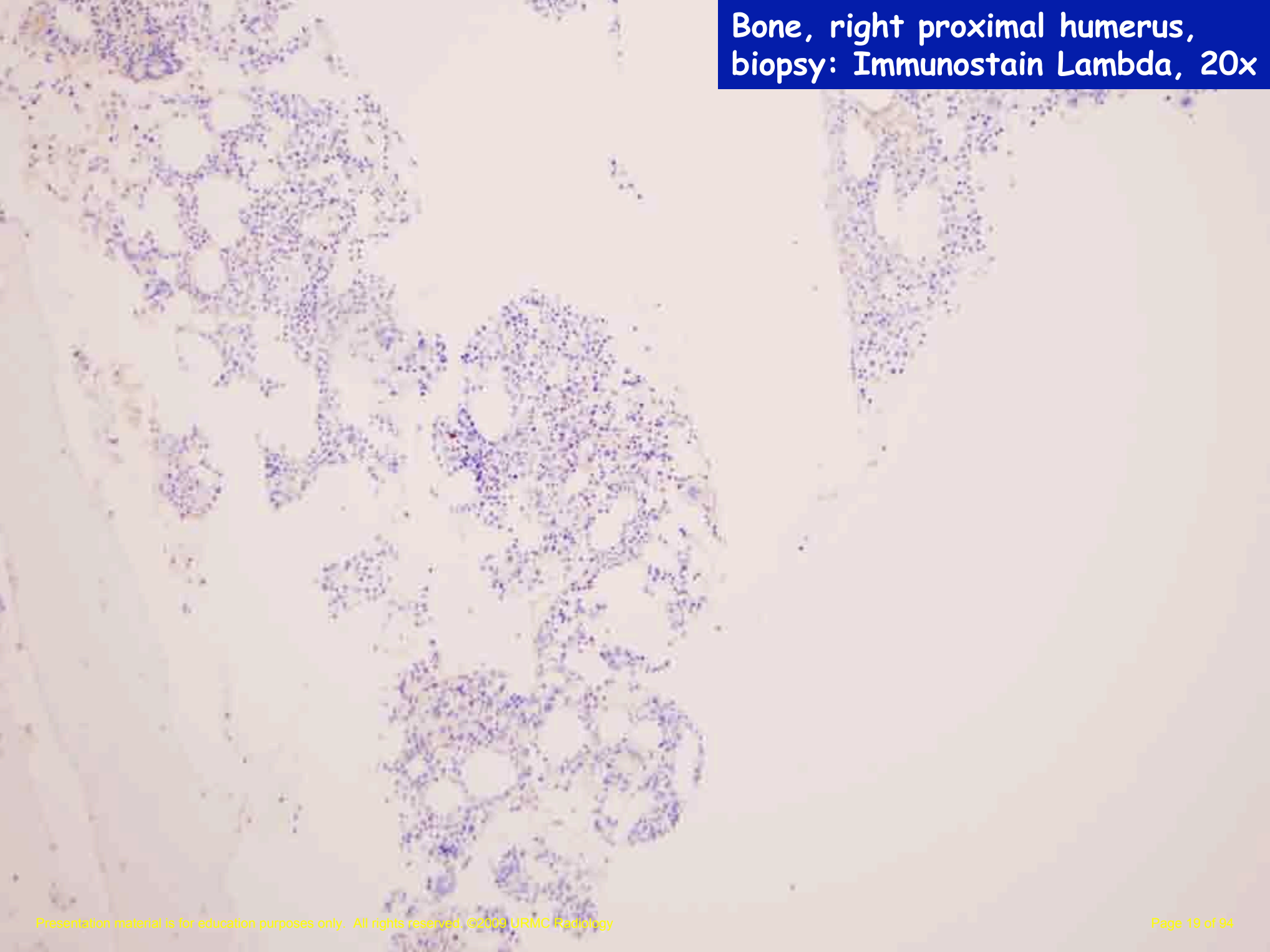
Bone, right proximal humerus, biopsy: Immunostain CD 138, 20x



Bone, right proximal humerus, biopsy: Immunostain Kappa, 20x



Bone, right proximal humerus, biopsy: Immunostain Lambda, 20x



Plasma Cell Myeloma (localized lesion)

- Malignant monoclonal proliferation of plasma cells
- Most common primary tumor of bone
- Patients are often decade younger than MM, often male
- Grossly, myeloma appears as soft, friable red mass; underlying bone is eroded and fragile
- Present with single lesion (myeloma) patients eventually develop lesions elsewhere (multiple myeloma-55% within ten years - FNA samples are identical

Plasma Cell Myeloma (localized lesion)

- CD 138 Immunostain + in normal and neoplastic plasma cells – in other lymphoproliferative disorders
- Suggested 30% bone marrow volume comprised of plasma cells – diagnosis of plasma cell myeloma is likely
- Localized disease treated with resection or radiation
- Advanced disease incurable treated with chemotherapy and radiation – prolong survival
- Bone marrow transplant is option for younger patients

Plasma Cell Myeloma (localized lesion)

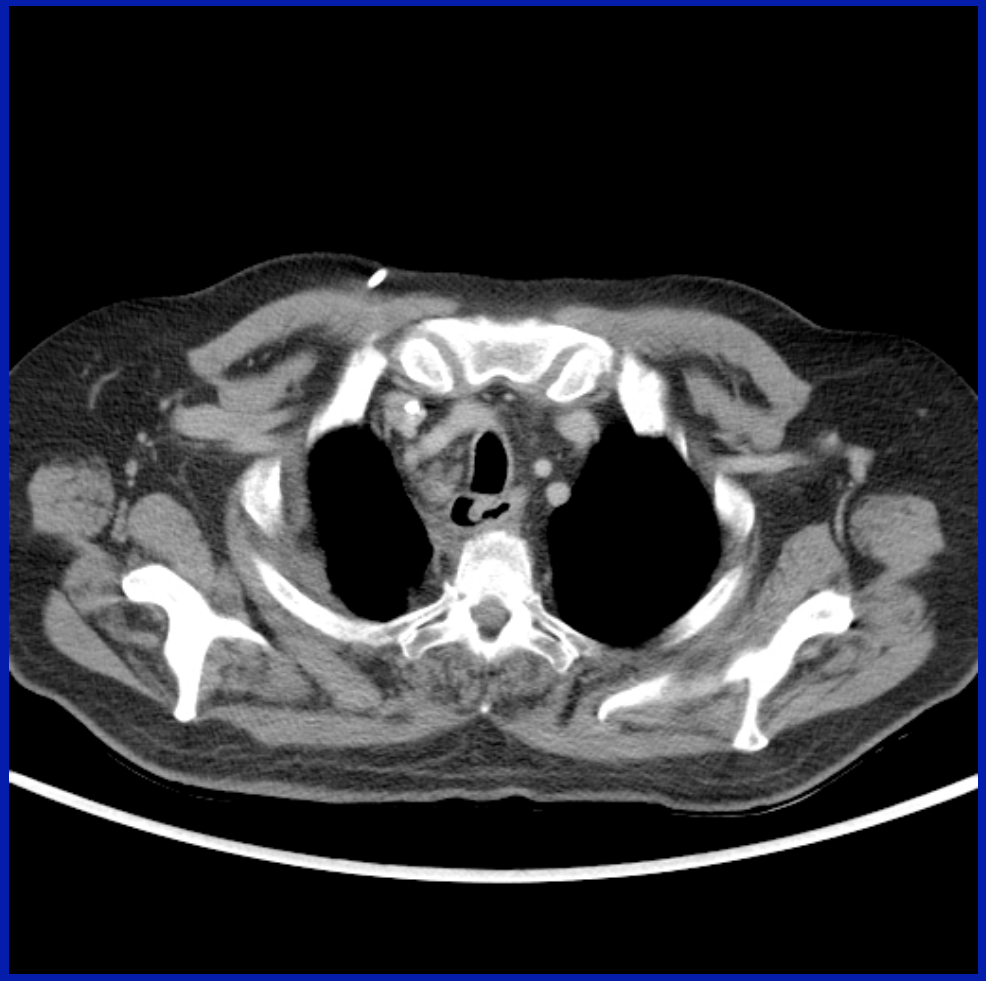
- **Molecular cytogenetic studies**

poor prognosis	t(4;14)(p16;q32 t(14;16)(q32;q23) -17p13
intermediate prognosis	(-13q14)
good prognosis	all others

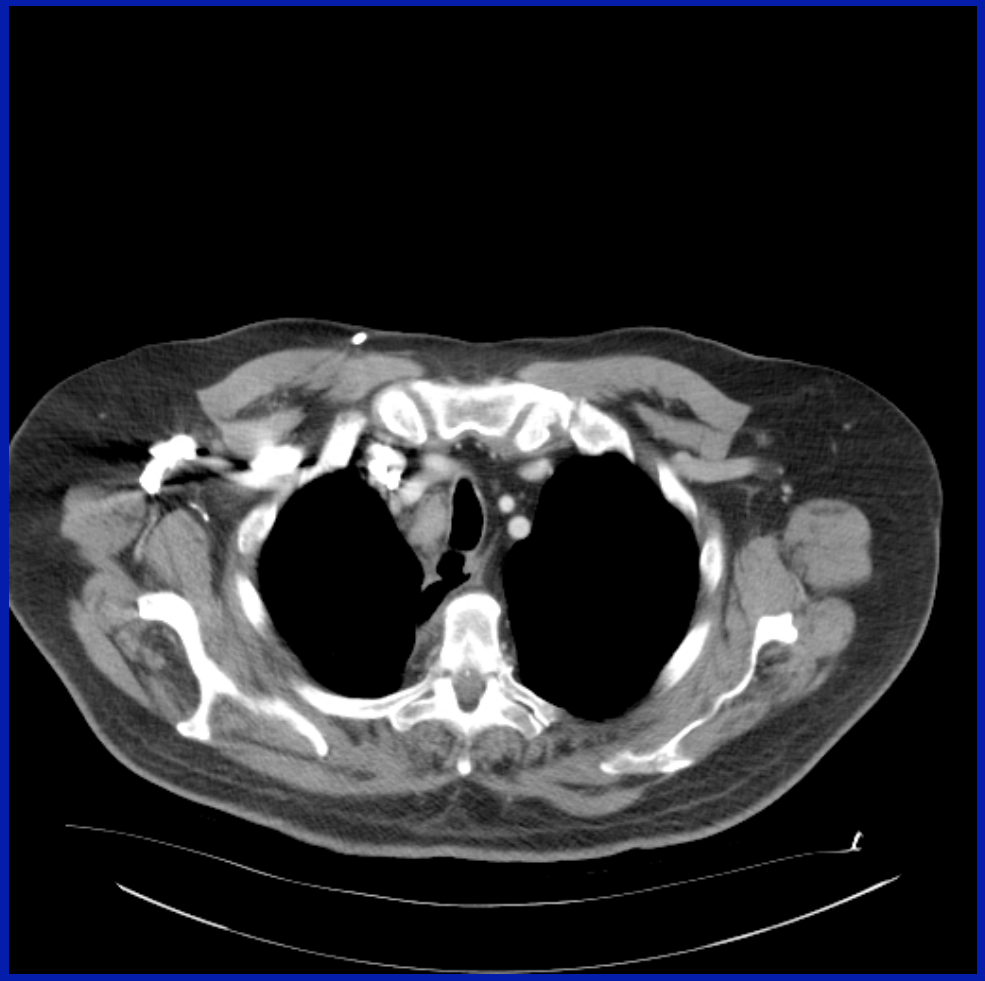
Case 2

- 68 year old male

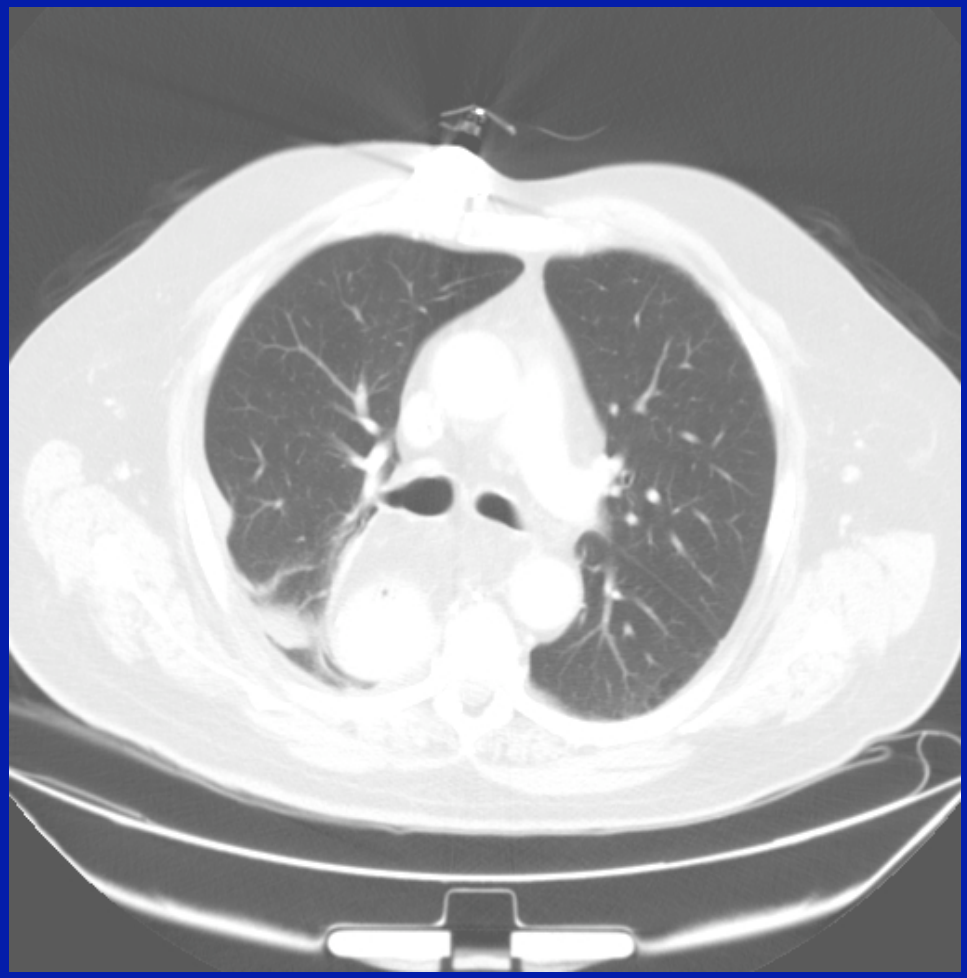
5/26



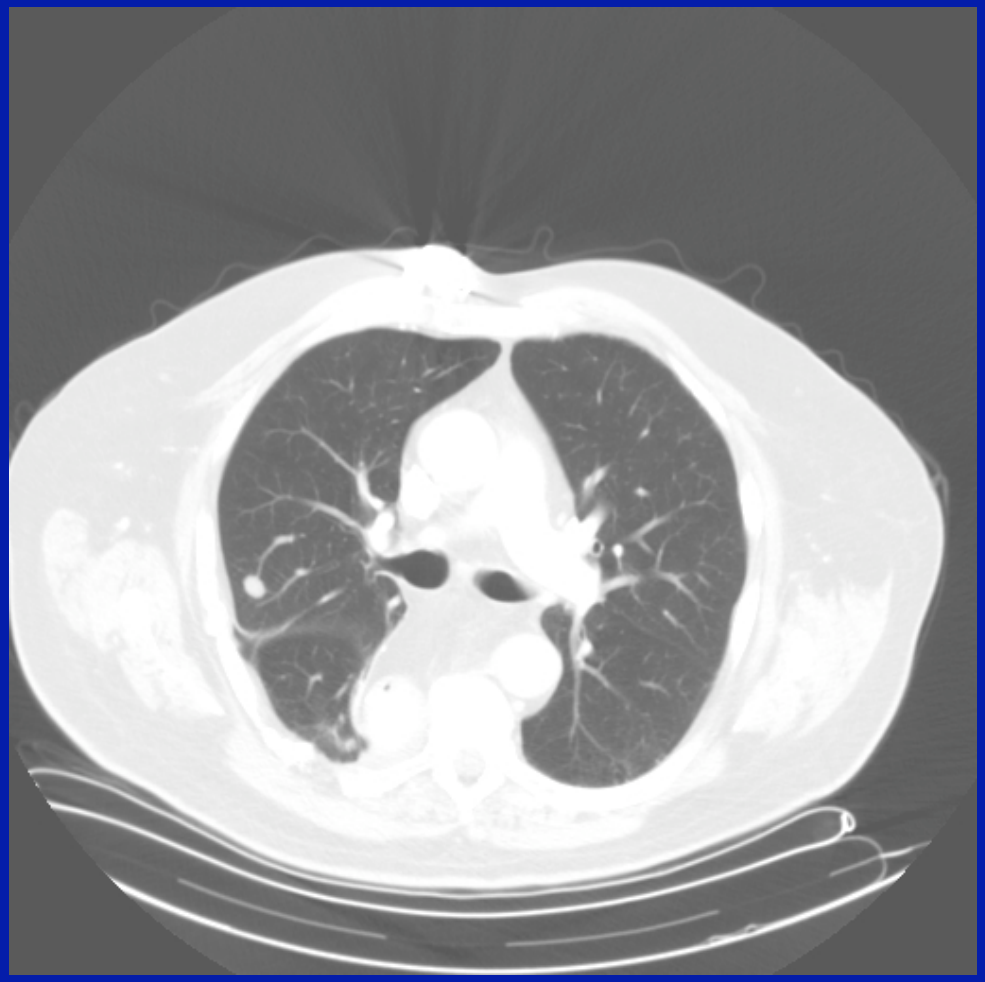
8/21



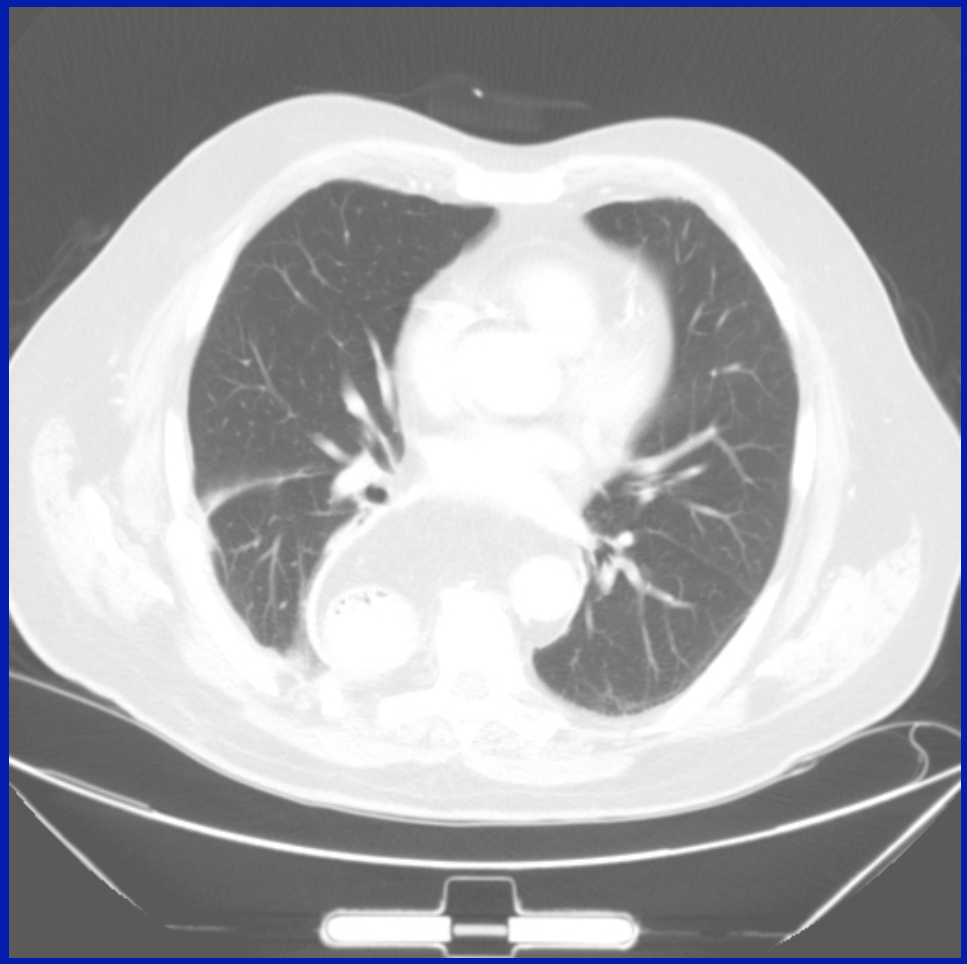
5/26



8/21

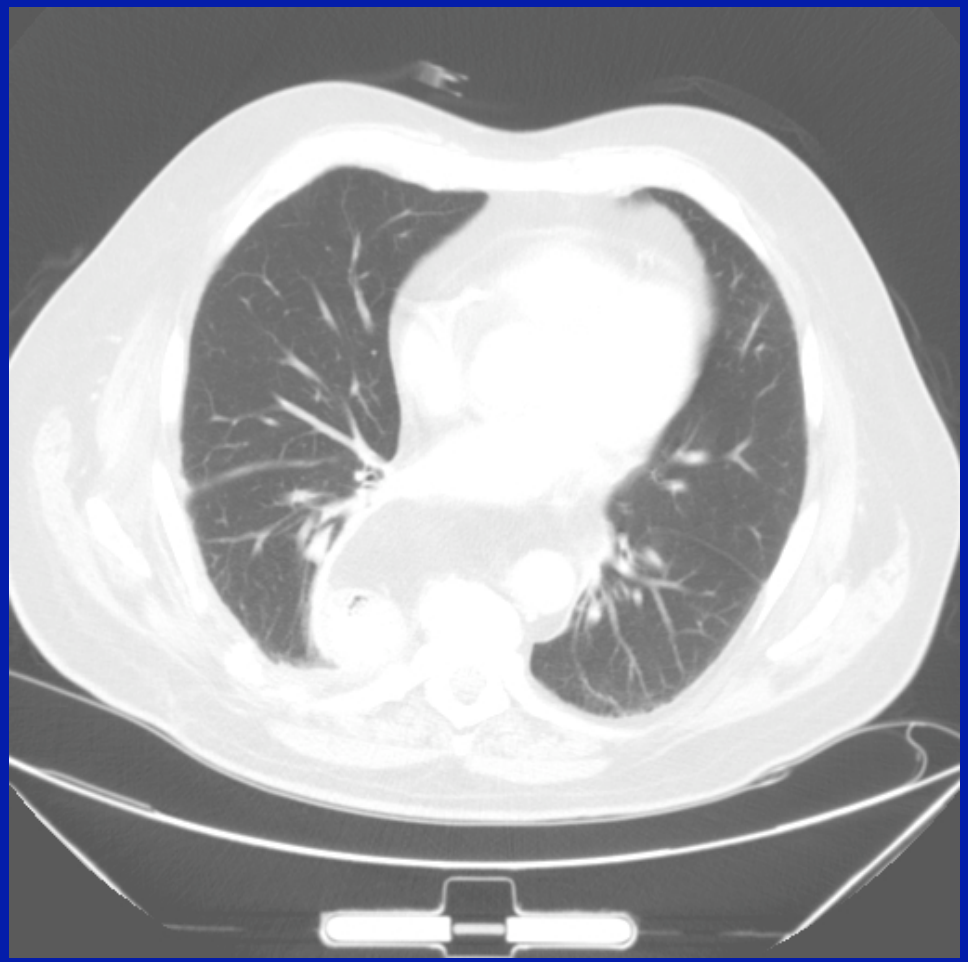


5/26



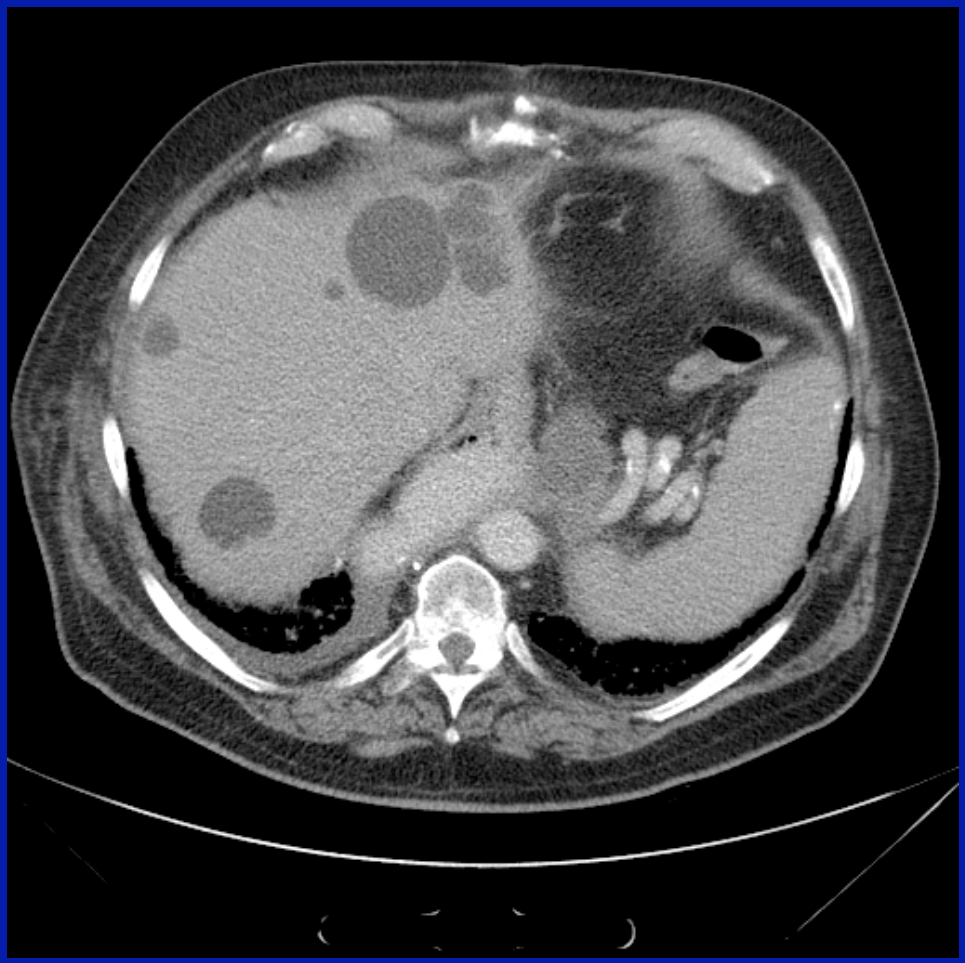
8/21

5/26

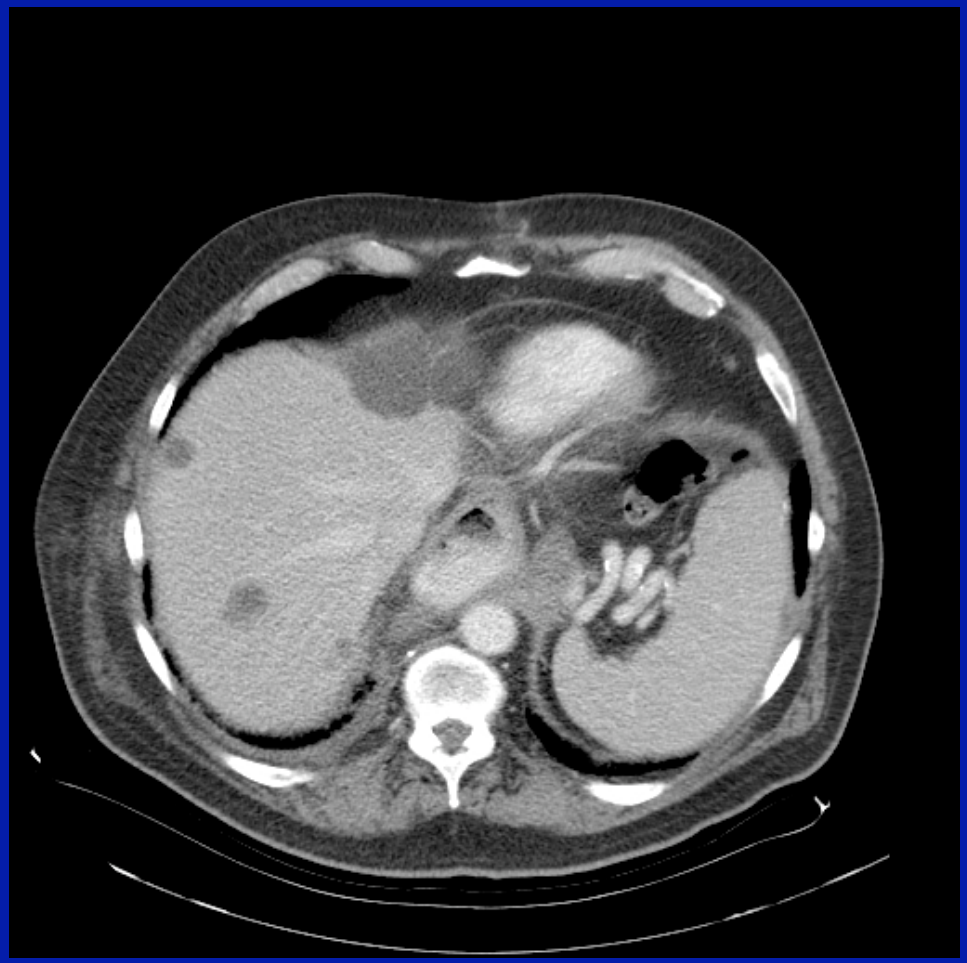


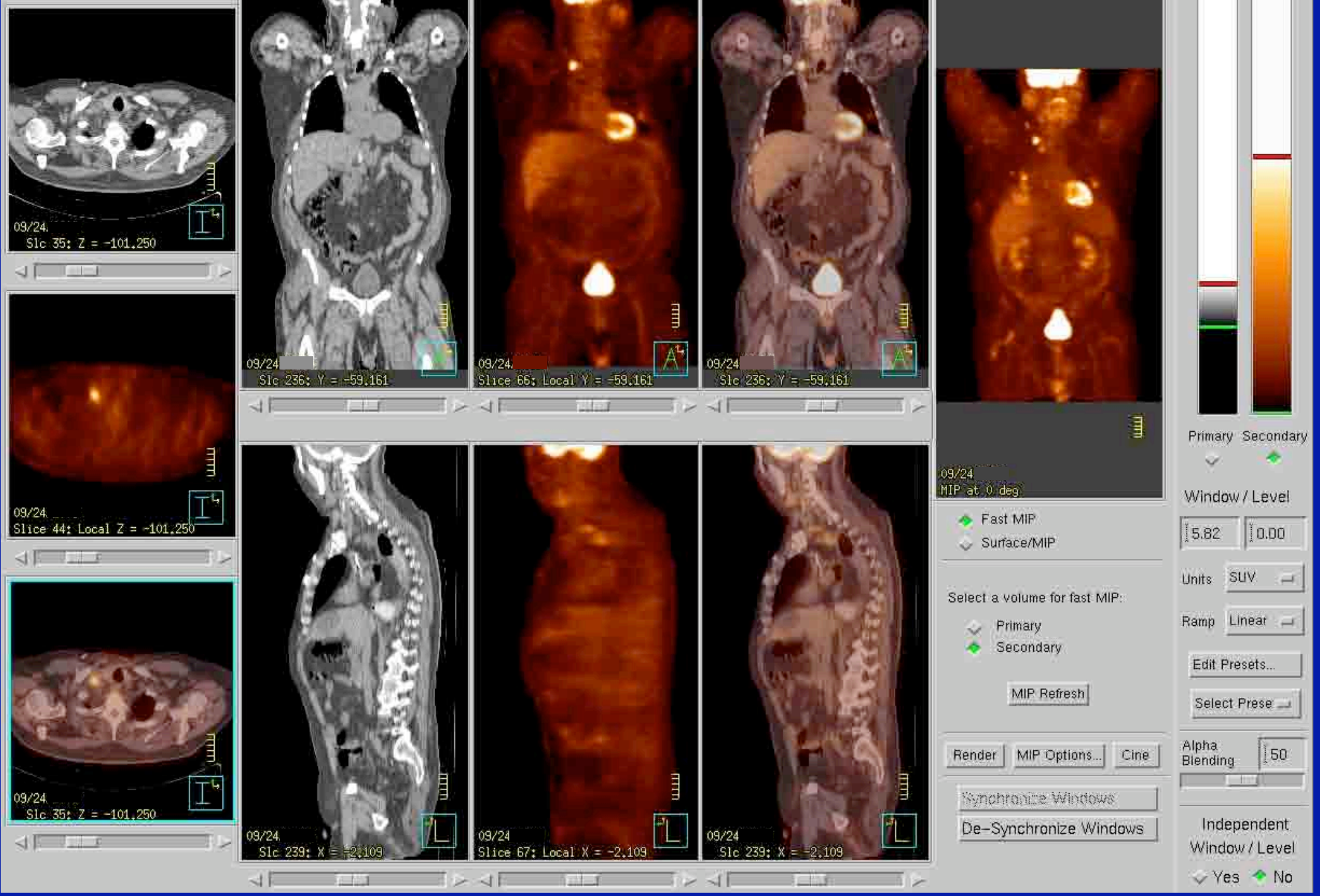
8/21

5/26

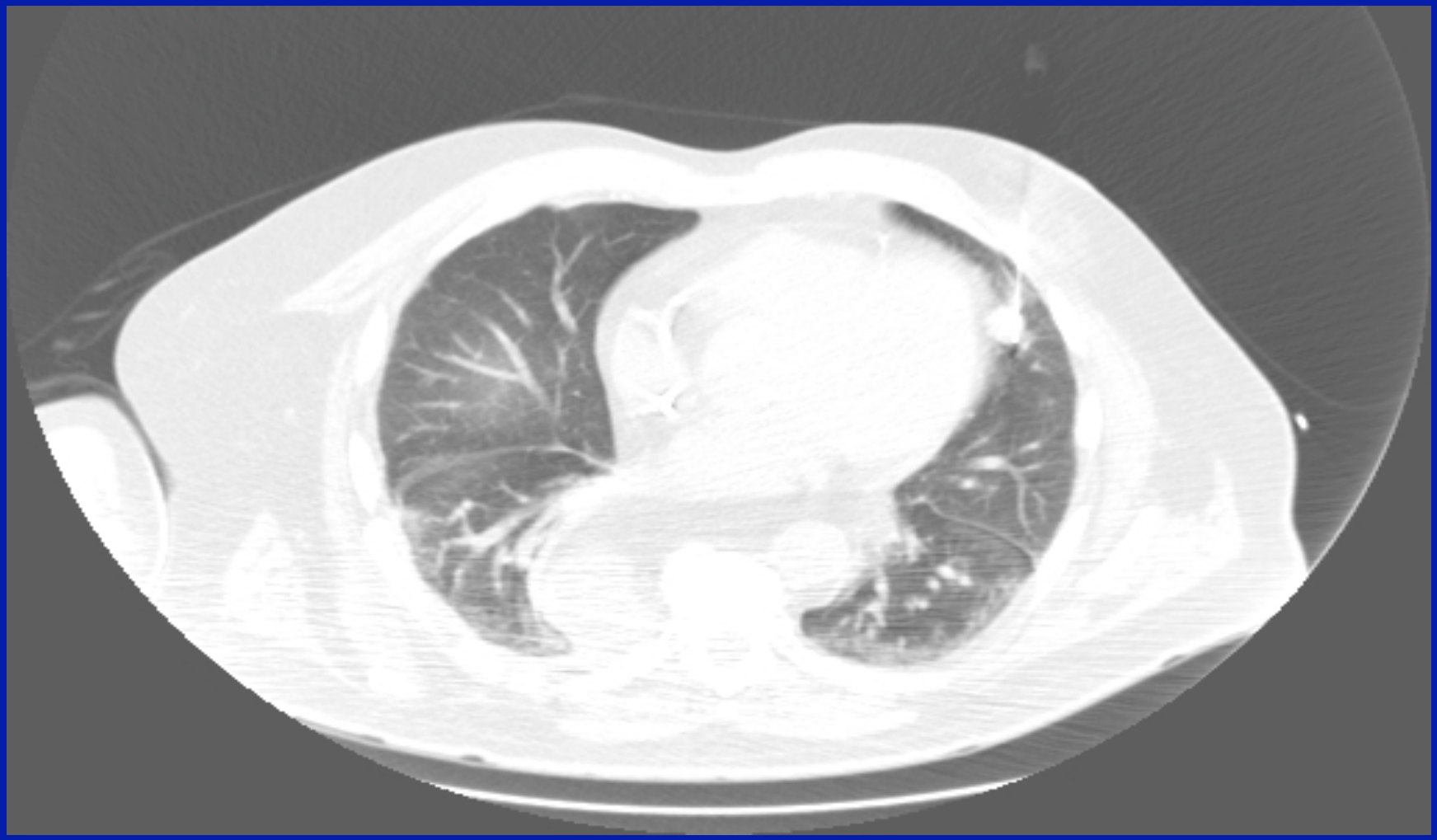


8/21

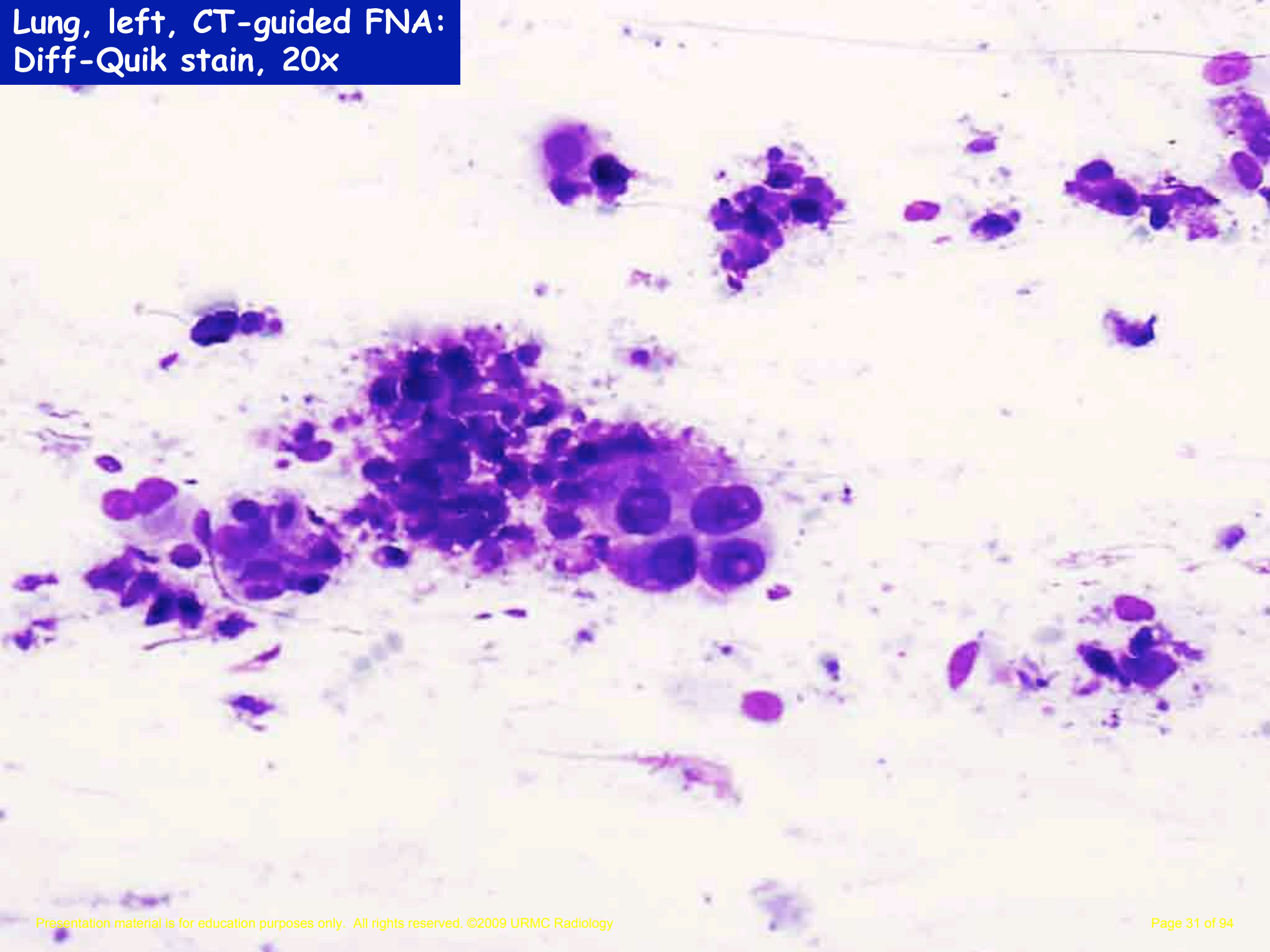




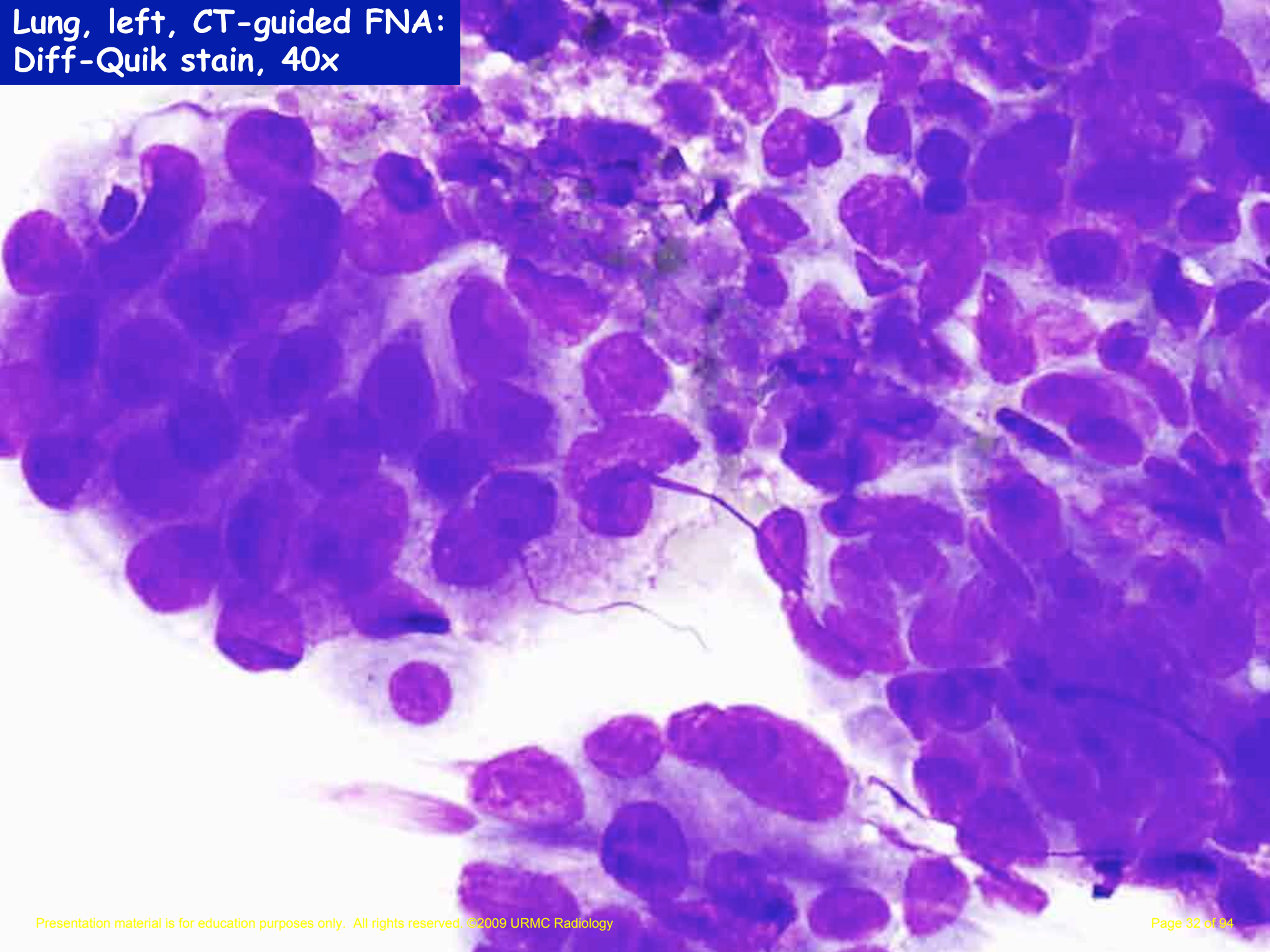
Patient had history of adenocarcinoma of the esophagus and esophagectomy. FNA of left lung was done.



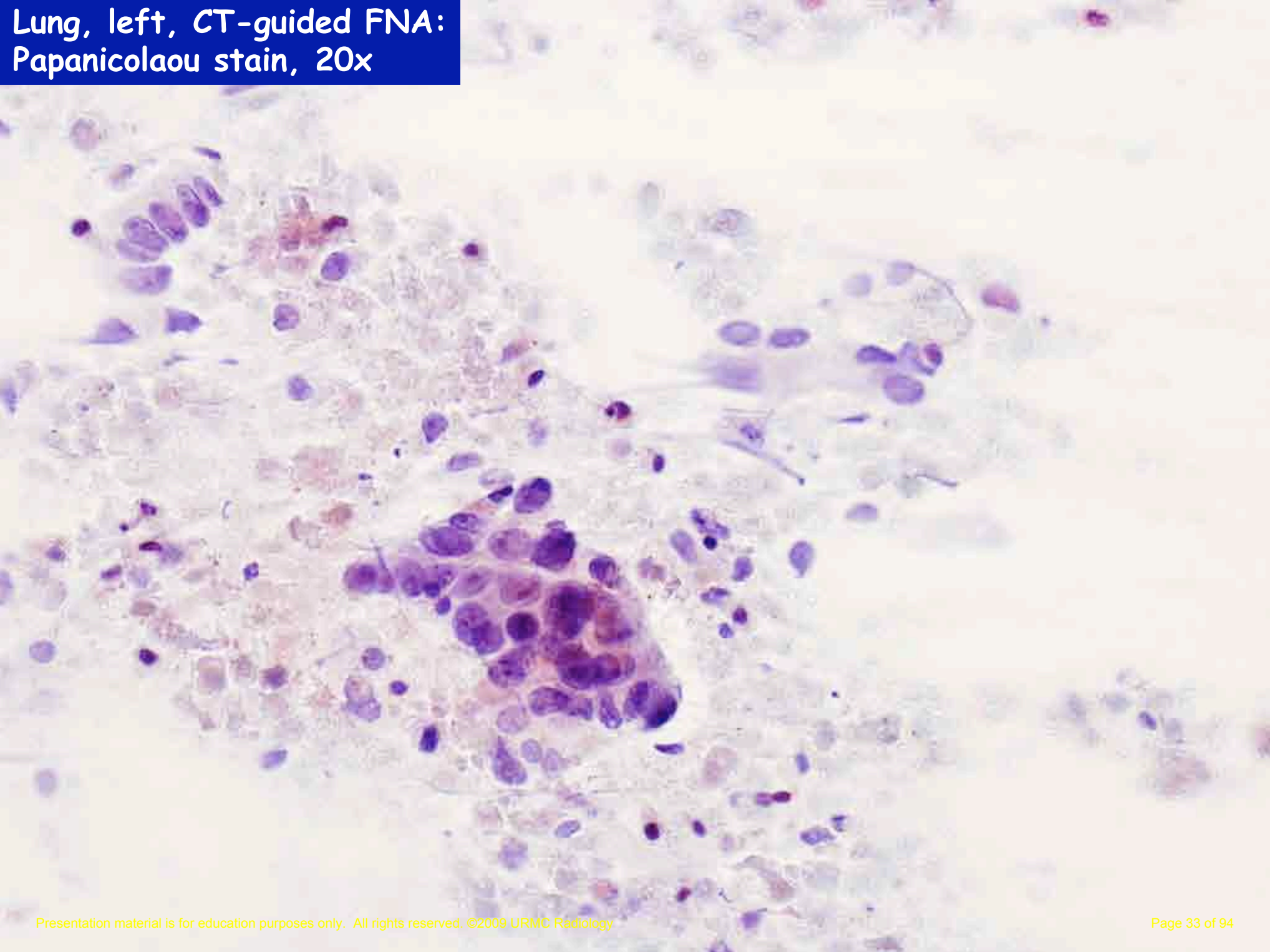
Lung, left, CT-guided FNA: Diff-Quik stain, 20x



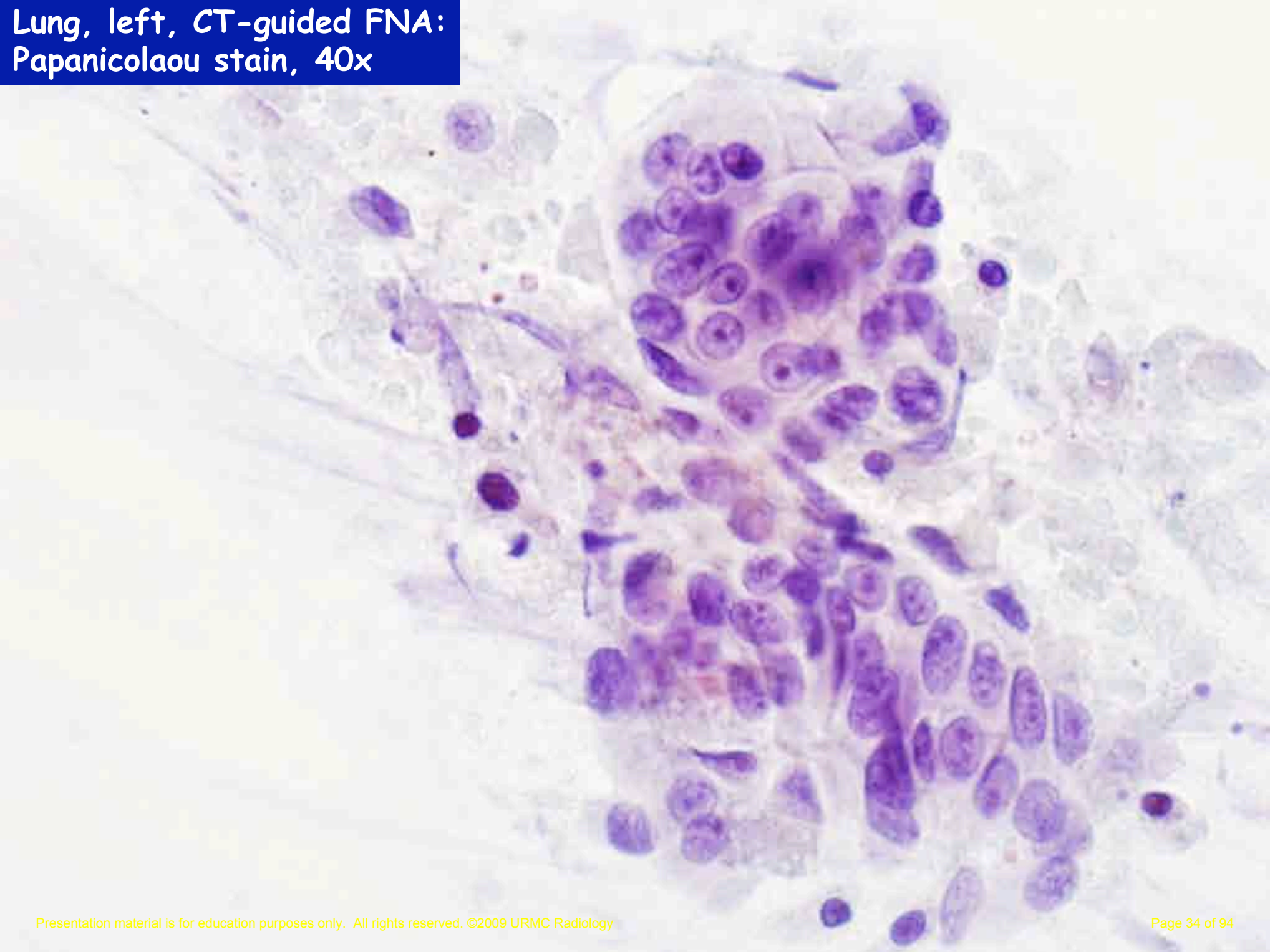
Lung, left, CT-guided FNA: Diff-Quik stain, 40x



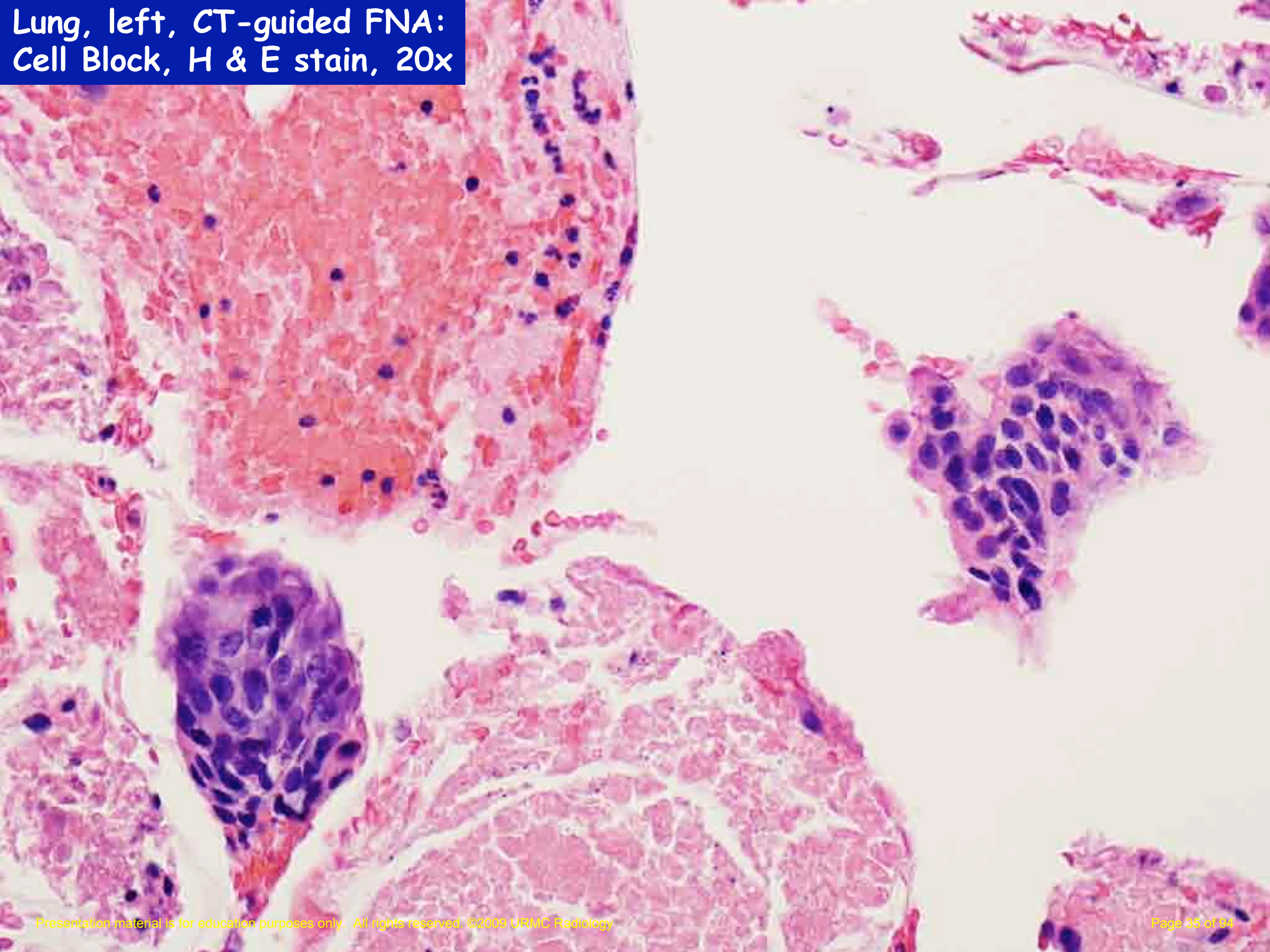
Lung, left, CT-guided FNA: Papanicolaou stain, 20x



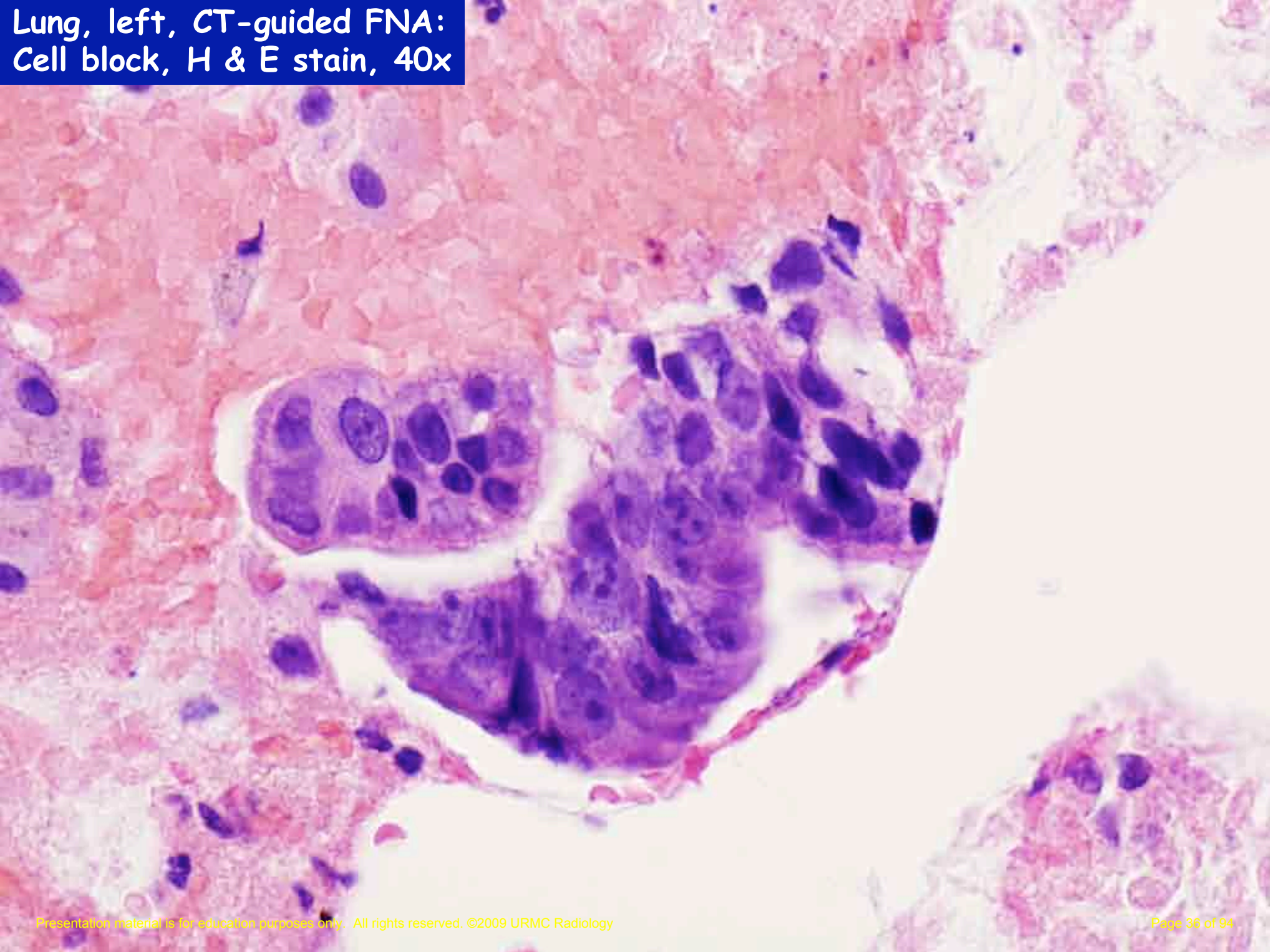
Lung, left, CT-guided FNA: Papanicolaou stain, 40x



Lung, left, CT-guided FNA: Cell Block, H & E stain, 20x



Lung, left, CT-guided FNA: Cell block, H & E stain, 40x



Lung, left, CT-guided fine needle aspiration:

Malignant tumor cells present derived from adenocarcinoma. The tumor is morphologically similar to the patient's previous esophageal primary tumor.

Distal esophagus and proximal stomach, esophagogastrectomy:

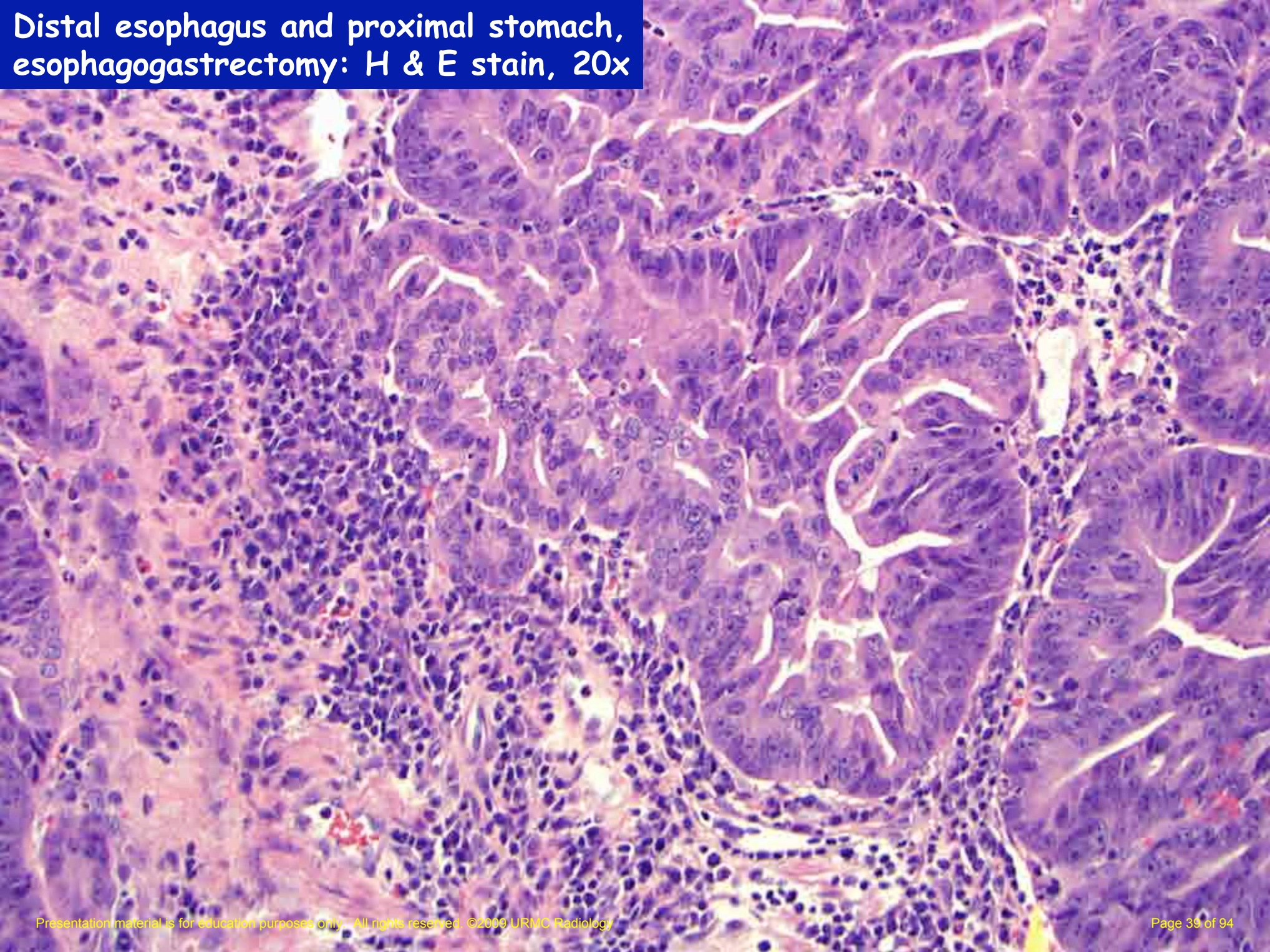
Adenocarcinoma, moderately differentiated.

- **Tumor site: Tumor present at the GE junction**
- **Tumor size: 4.3 cm (gross)**
- **Angiolymphatic invasion: present**
- **GE junction mucosa shows high grade dysplasia, Barrett's esophagus**

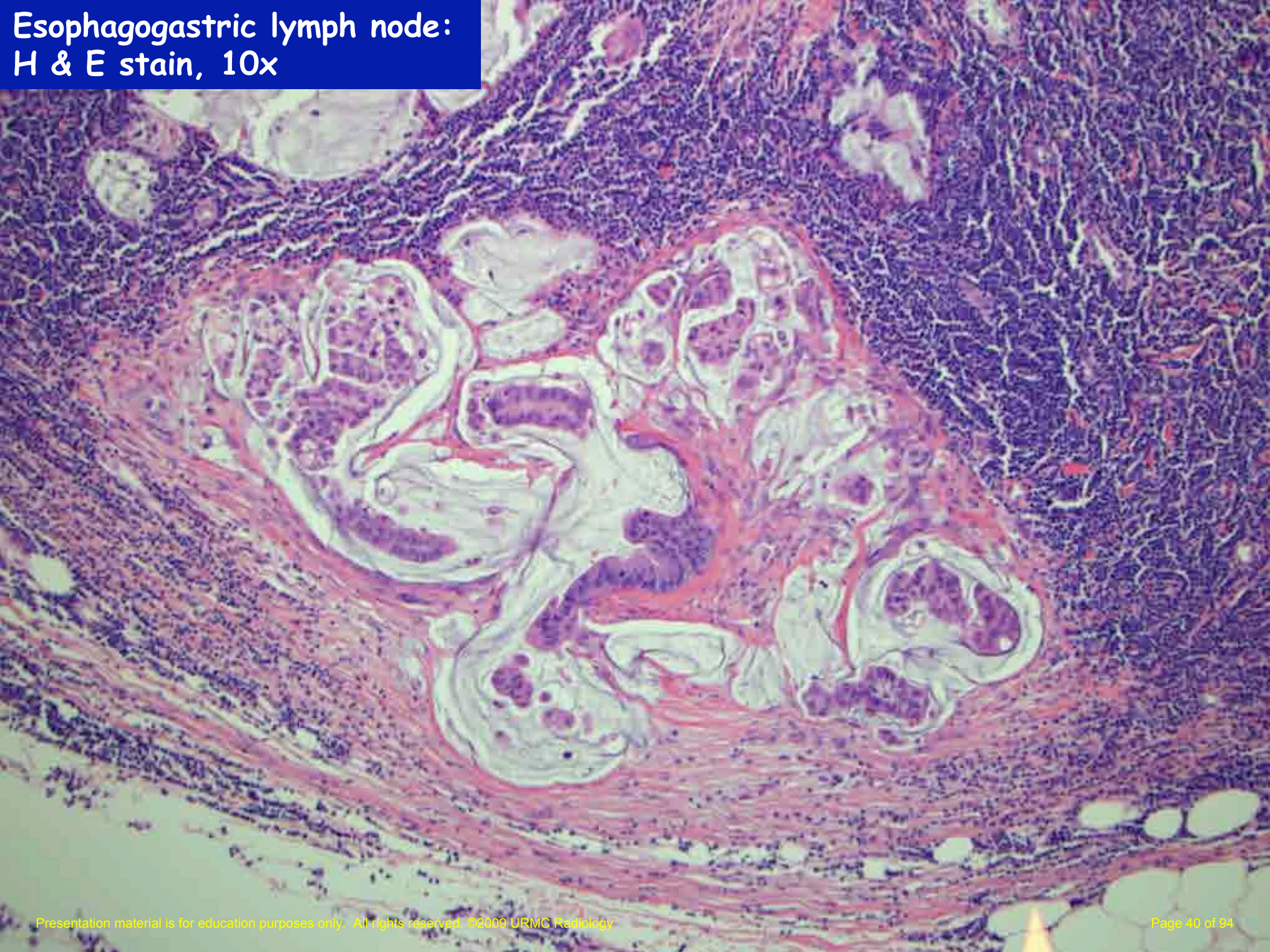
Metastatic adenocarcinoma present in 4/46 lymph nodes with extranodal extension.

Gastrointestinal stromal tumor of stomach, posterior wall, biopsy - 0.9 cm in size.

Distal esophagus and proximal stomach, esophagogastrectomy: H & E stain, 20x



Esophagogastric lymph node: H & E stain, 10x



Metastatic Adenocarcinoma to Lung

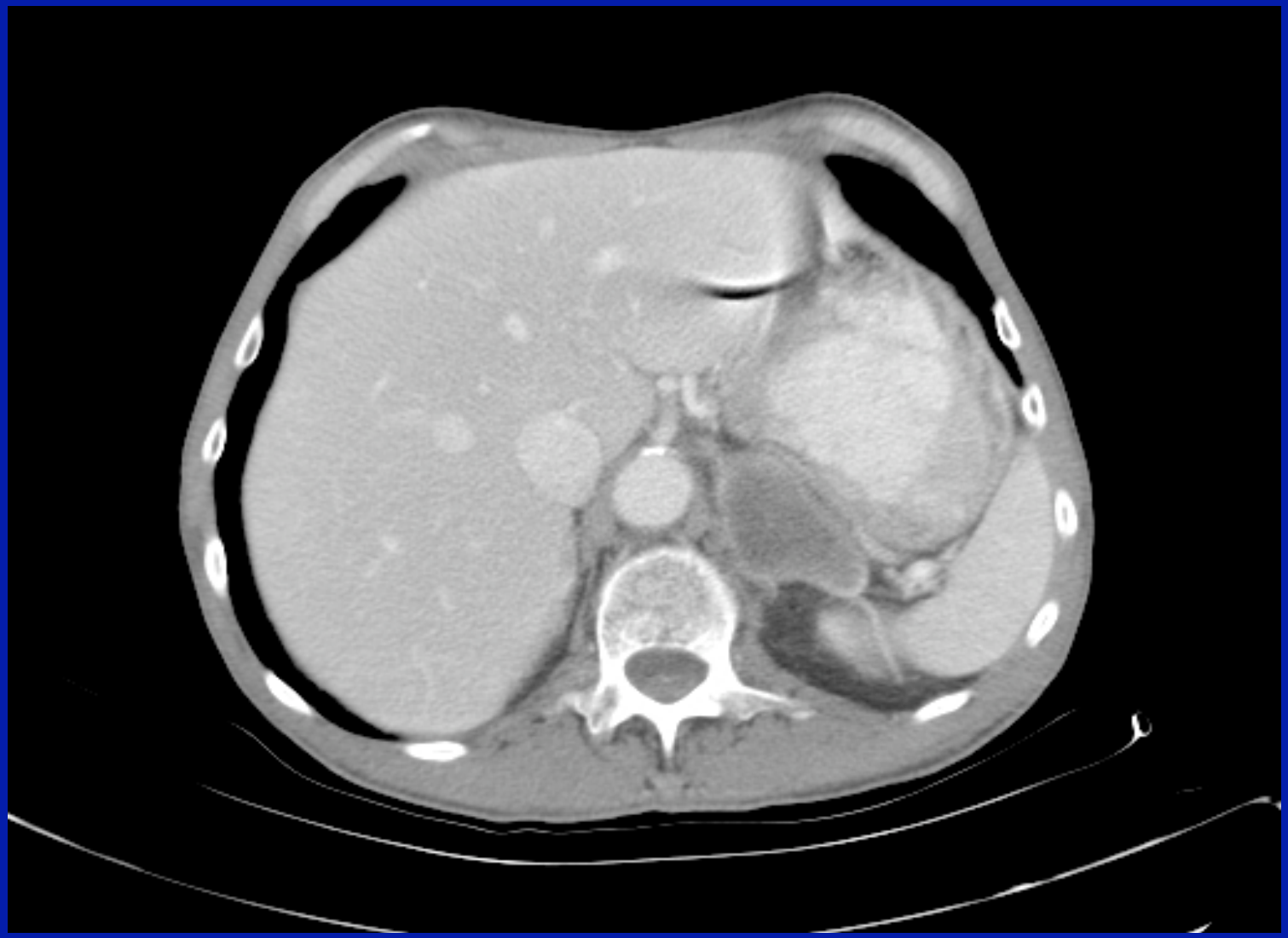
- Metastatic carcinoma – prior clinical history is extremely important
- Compare surgical pathology with cytopathology specimen
- Most patients present with advanced-stage disease. Small resectable tumors under 2 cm (65% to 80% - five year survival)

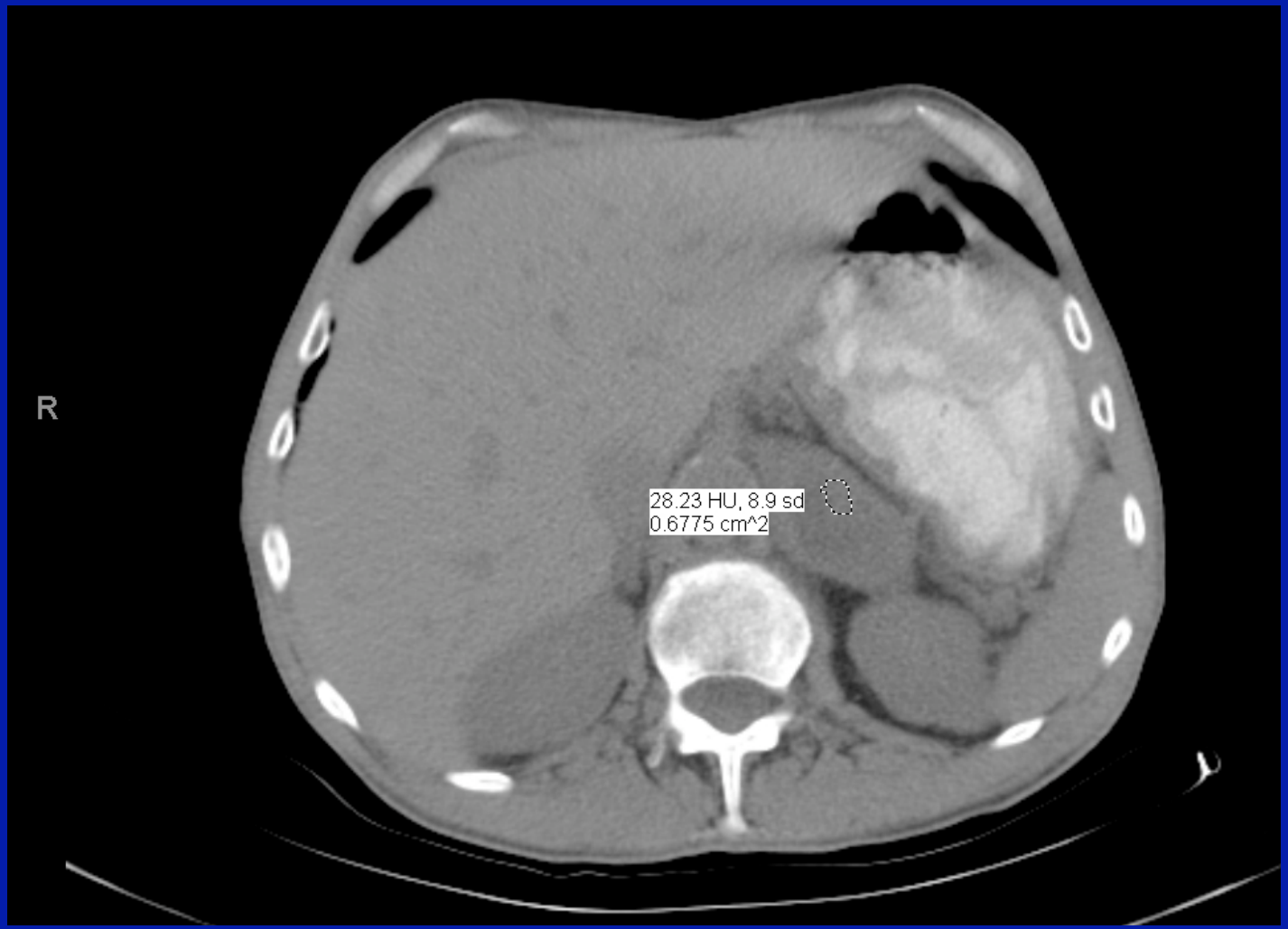
Metastatic Esophageal Adenocarcinoma

- Patient's with Barrett's esophagus – relative risk of adenocarcinoma 30-120 fold in comparison with patient's without
- Smoking factor – risk related to quantity and duration
- Abdominal obesity – risk factor, especially in men
- 75% of adenocarcinomas of esophagus located in distal esophagus, consequence of development from GERD and Barrett's
- Time of diagnosis ~50% of patient's have distant metastatic disease

Case 3

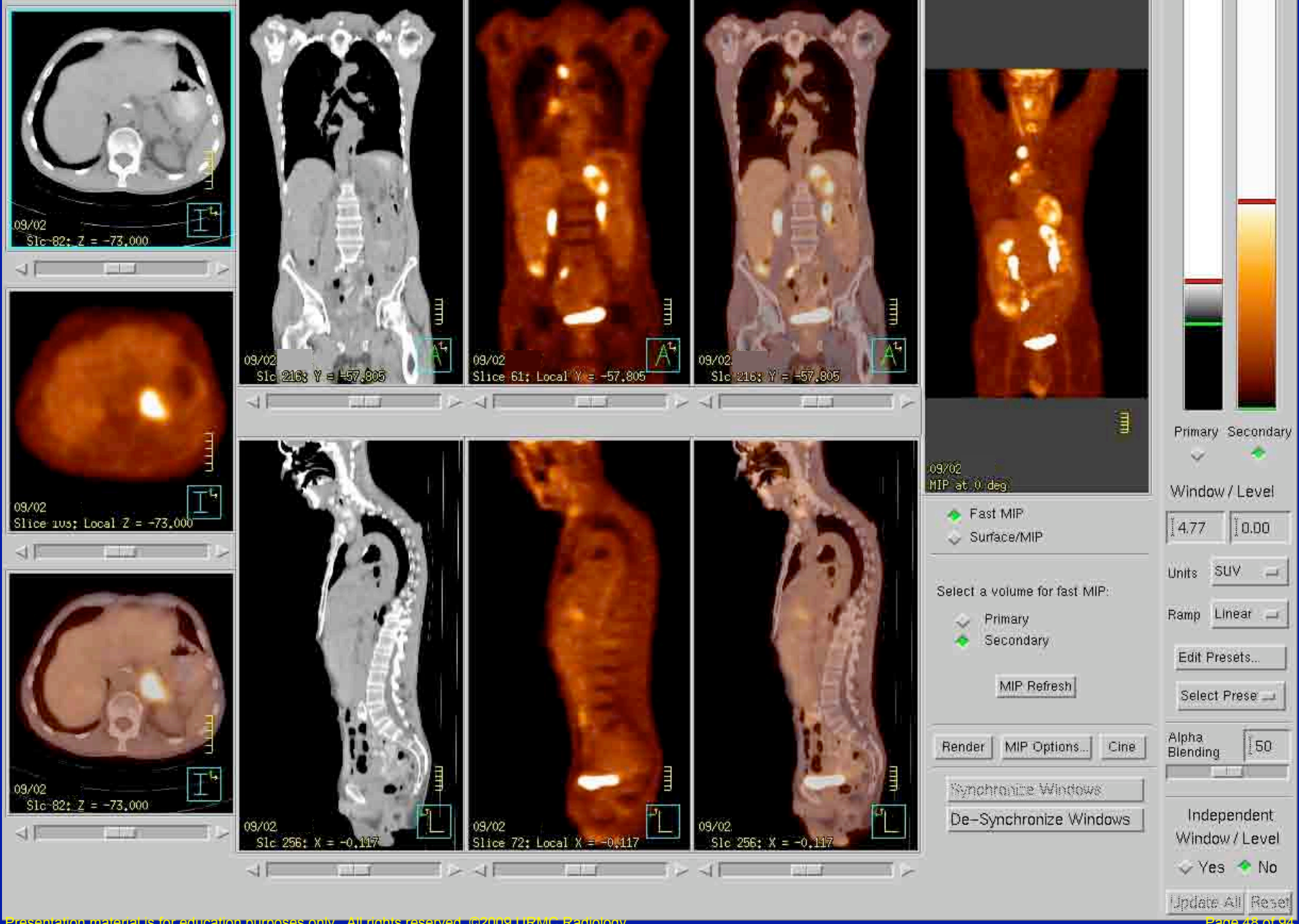
- 67 year old male





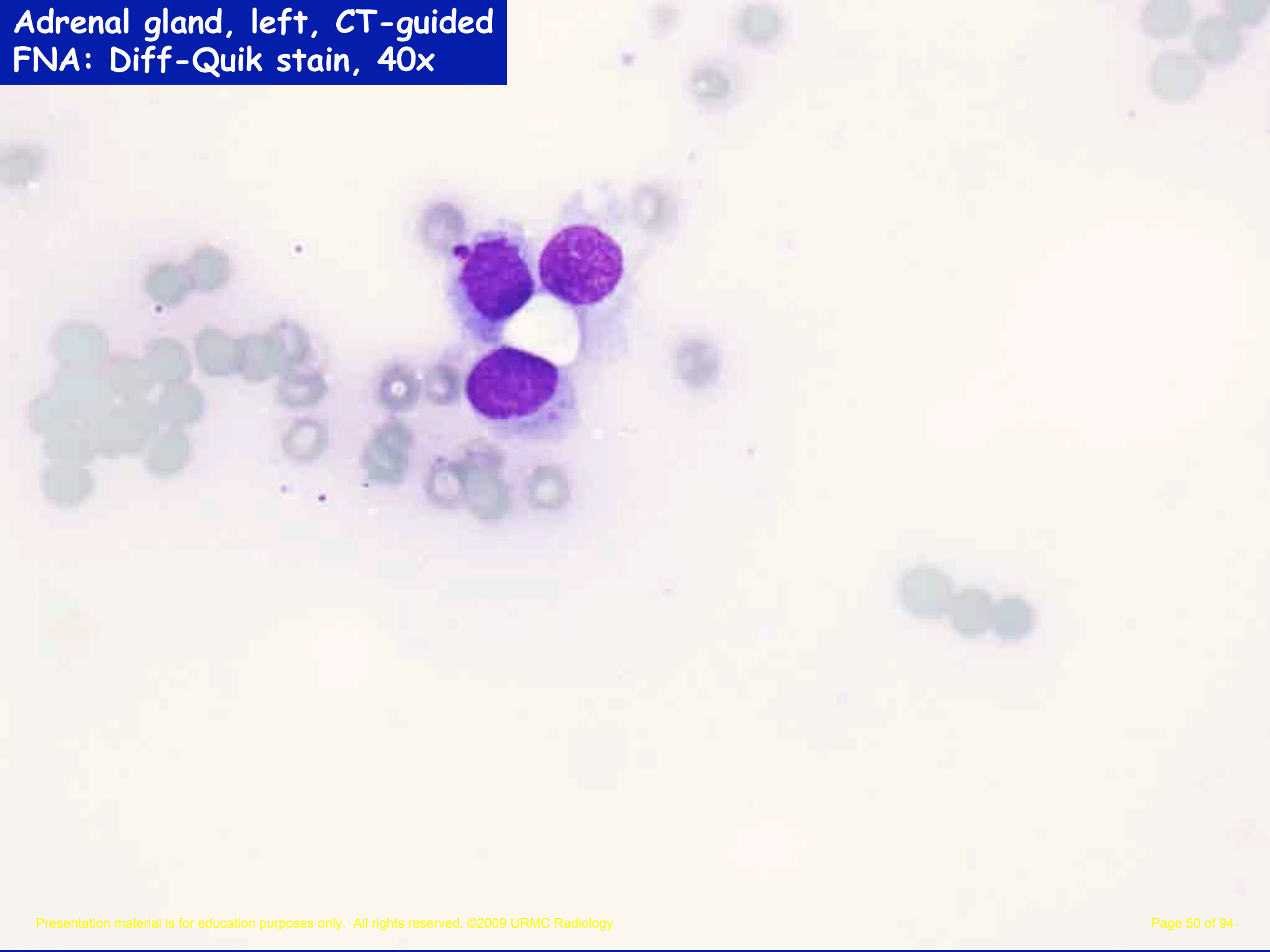
Adrenal Masses: Characterization

- Adrenal masses of 10 HU or less were correctly characterized as lipid-rich adenomas, in 96% of 166 adrenal masses.
- The sensitivity and specificity for characterizing an adrenal mass as an adenoma versus a nonadenoma were 98% (124 of 127 masses) and 92% (36 of 39 masses), respectively.
- Reference: Caoili EM, Korobkin M, Francis IR, et al. Adrenal masses: characterization with combined unenhanced and delayed enhanced CT. *Radiology* 2002;222 : 629-633

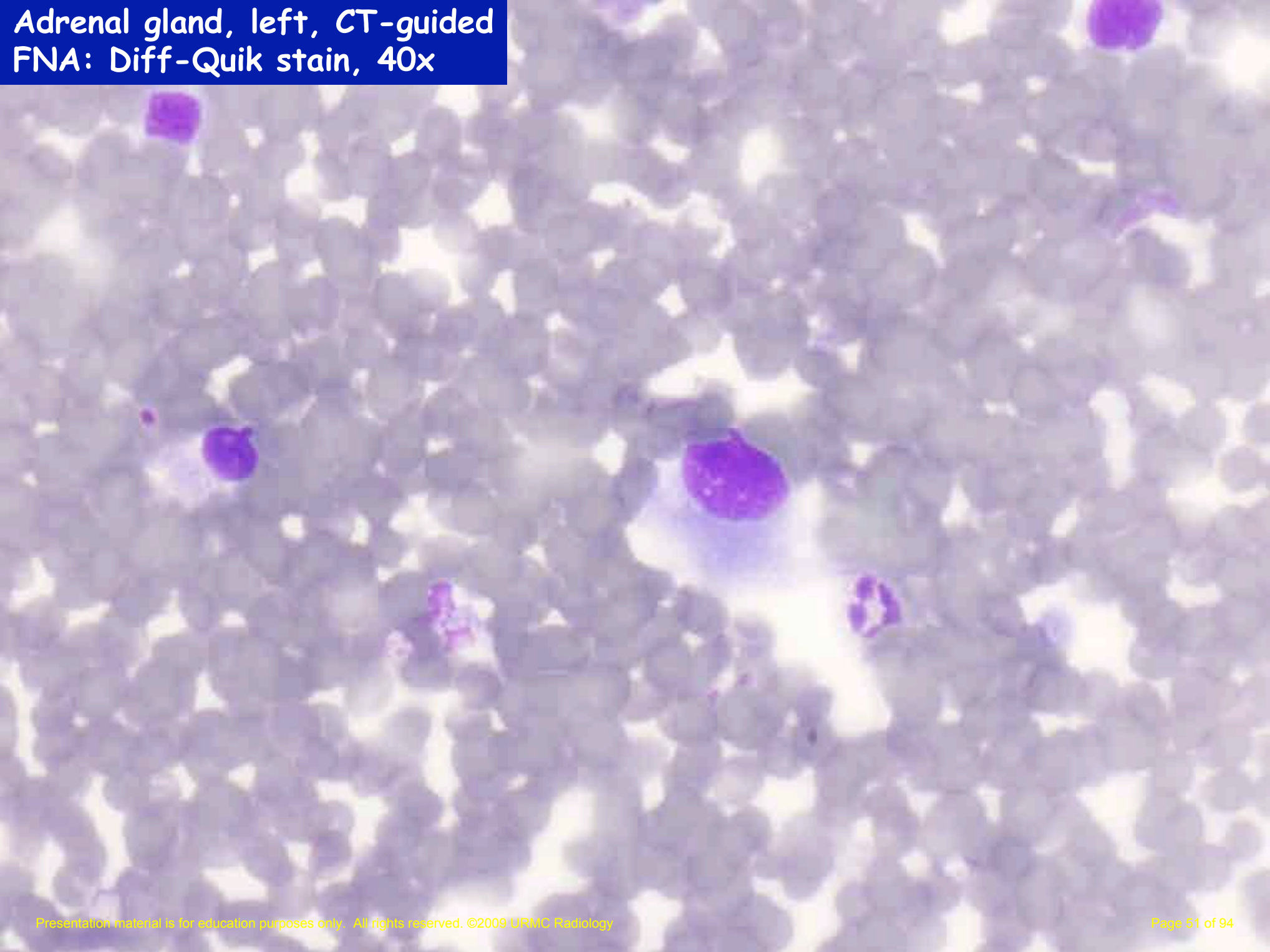


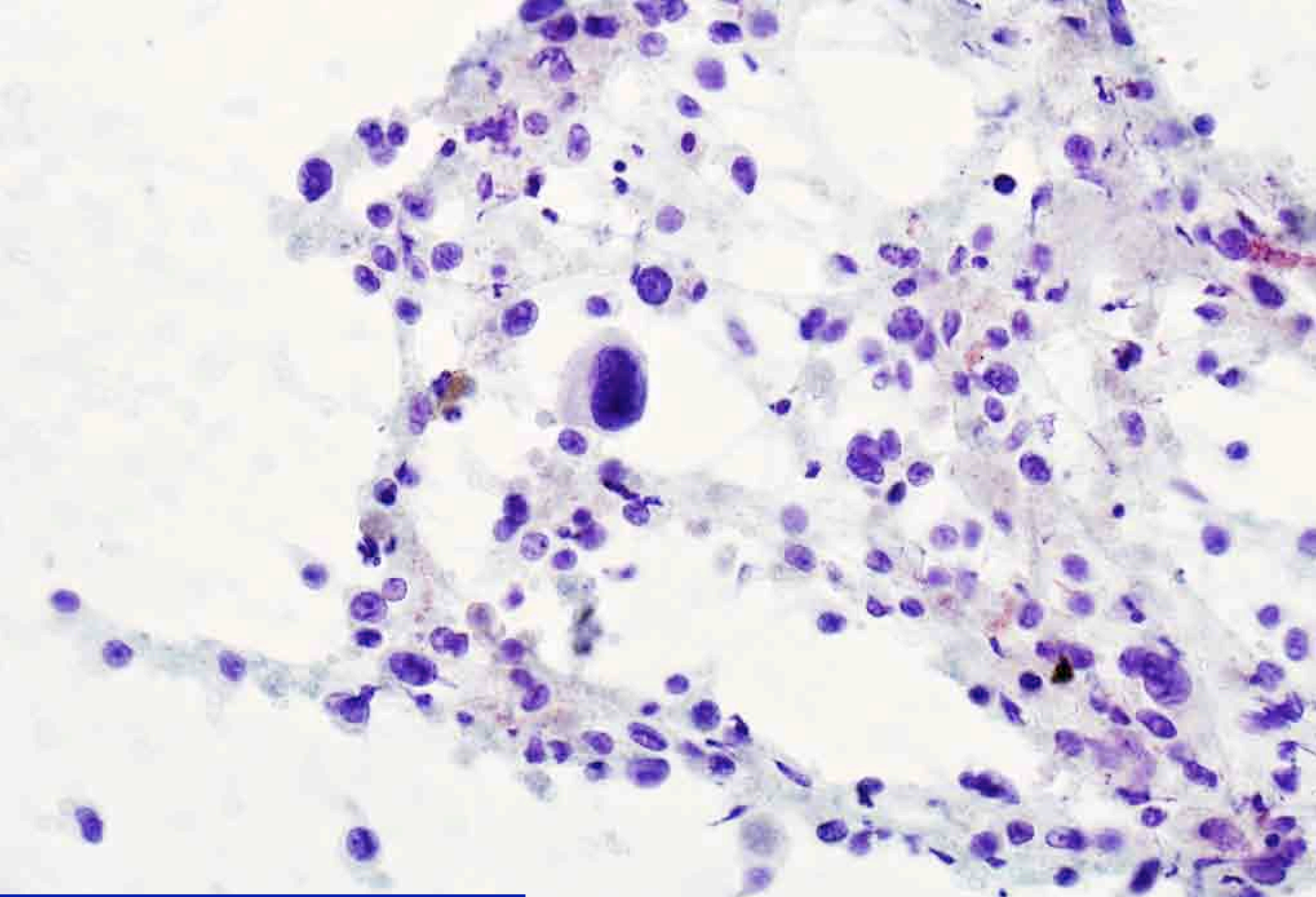
CT guided FNA of the adrenal was done.

Adrenal gland, left, CT-guided FNA: Diff-Quik stain, 40x



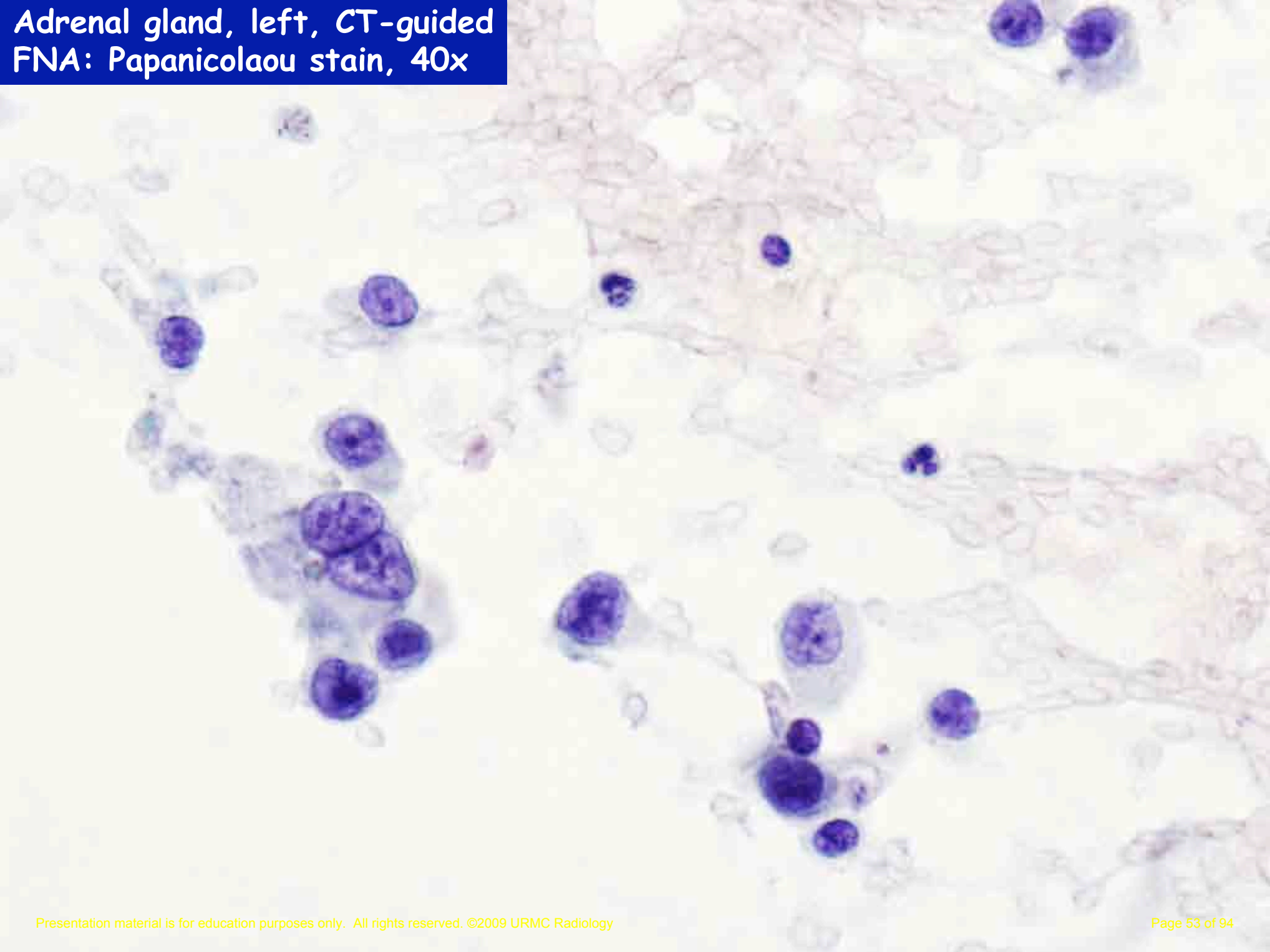
Adrenal gland, left, CT-guided FNA: Diff-Quik stain, 40x

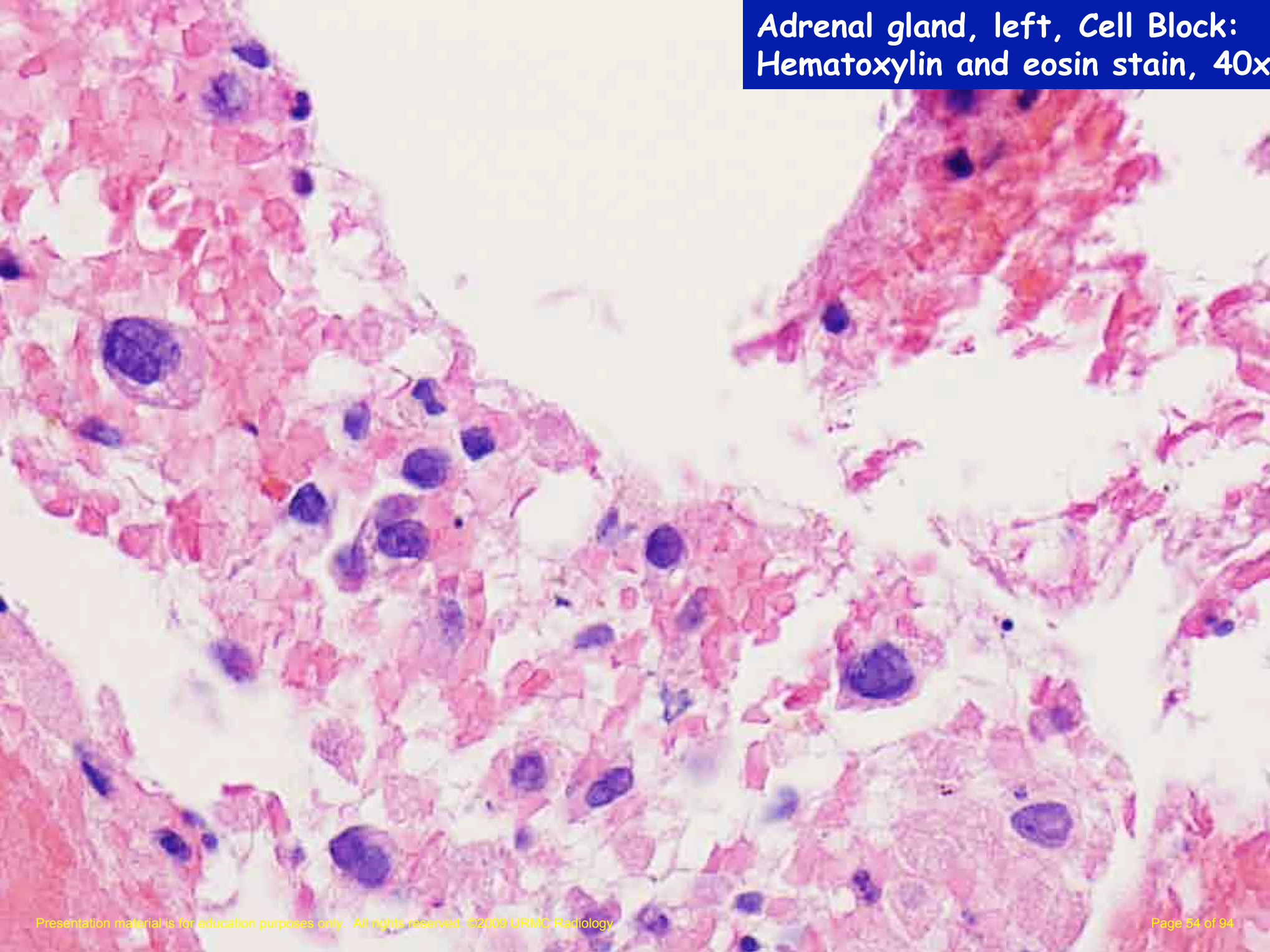




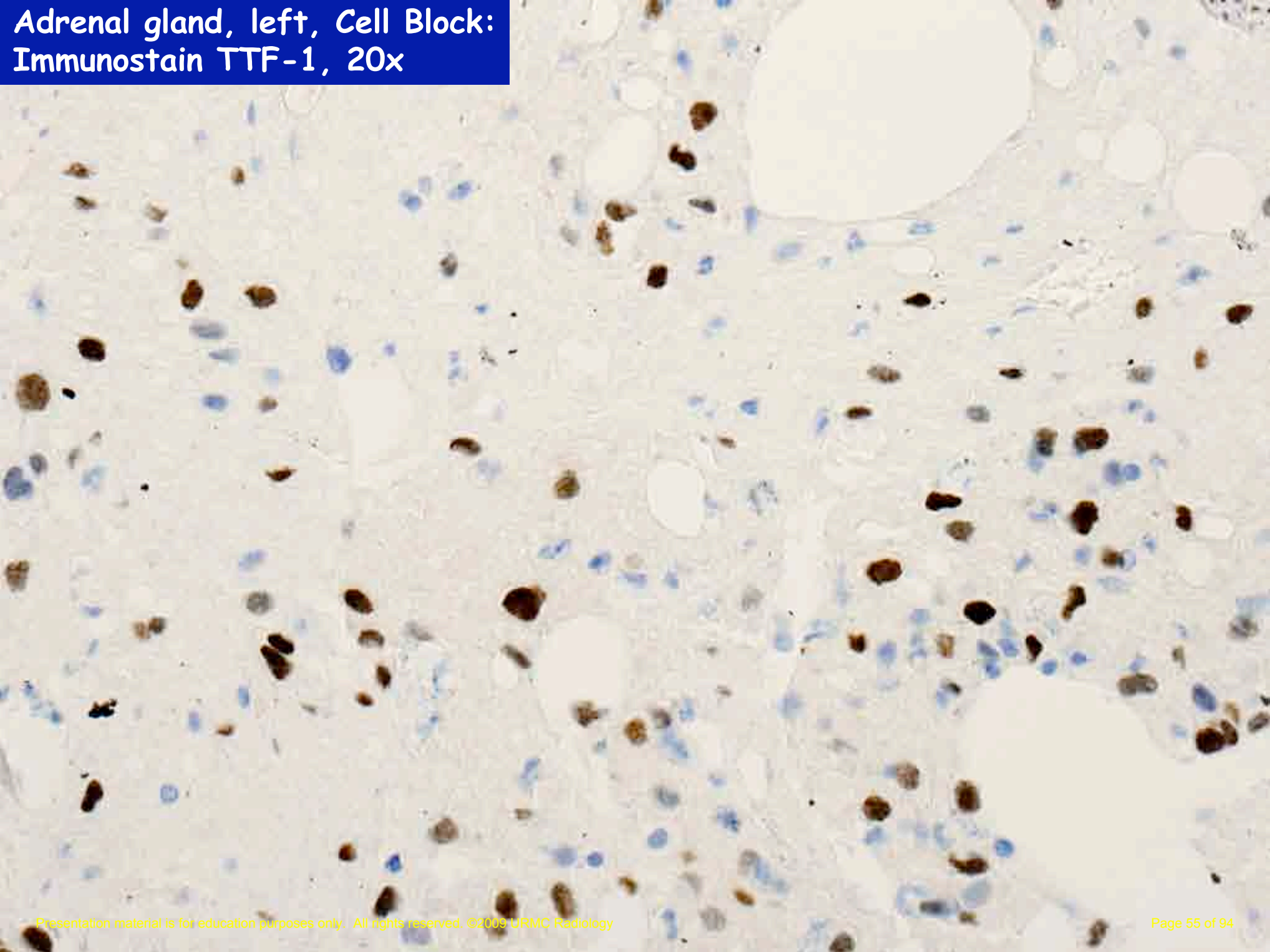
Adrenal gland, left, CT-guided FNA: Papanicolaou stain, 20x

Adrenal gland, left, CT-guided FNA: Papanicolaou stain, 40x

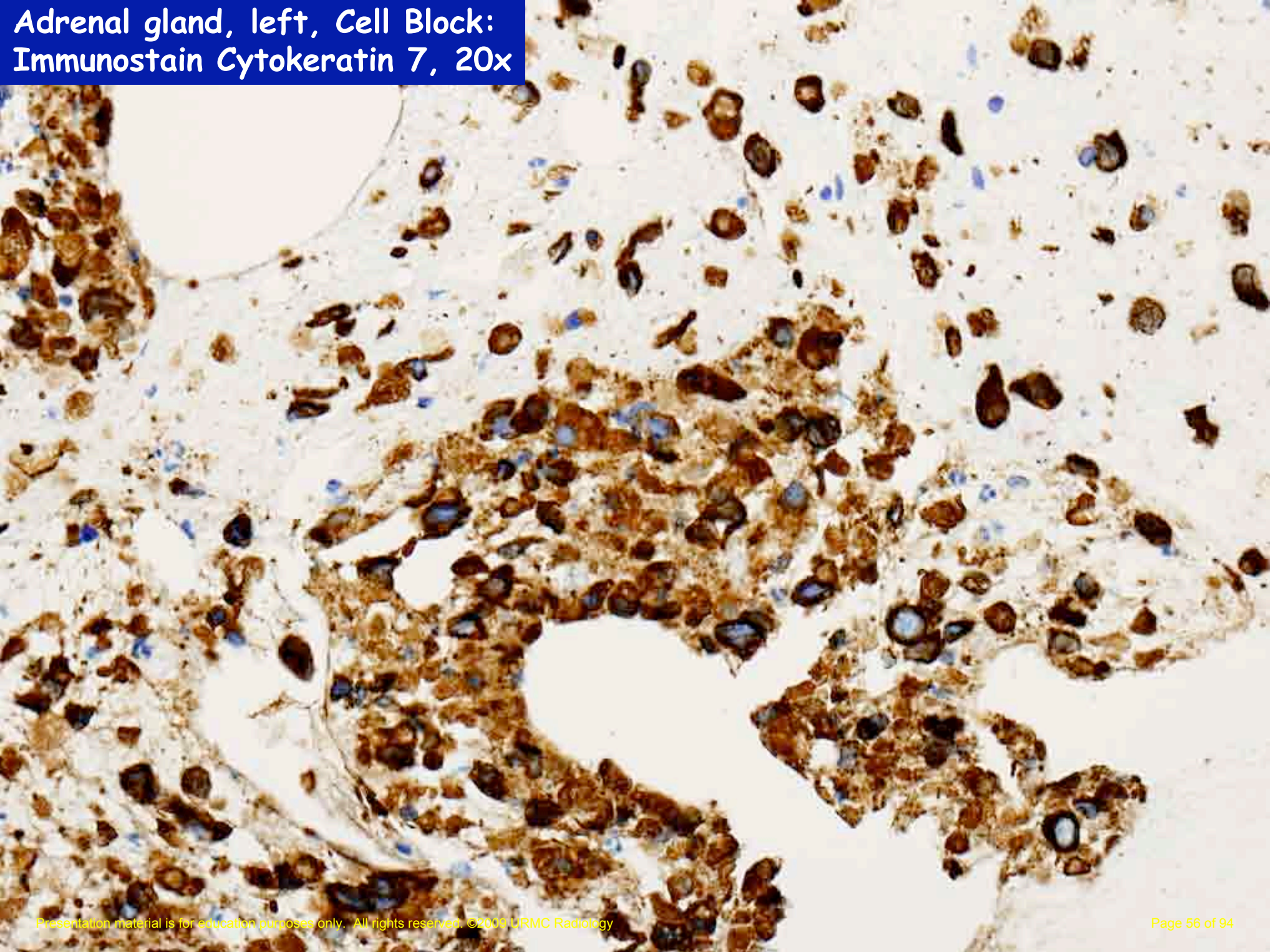




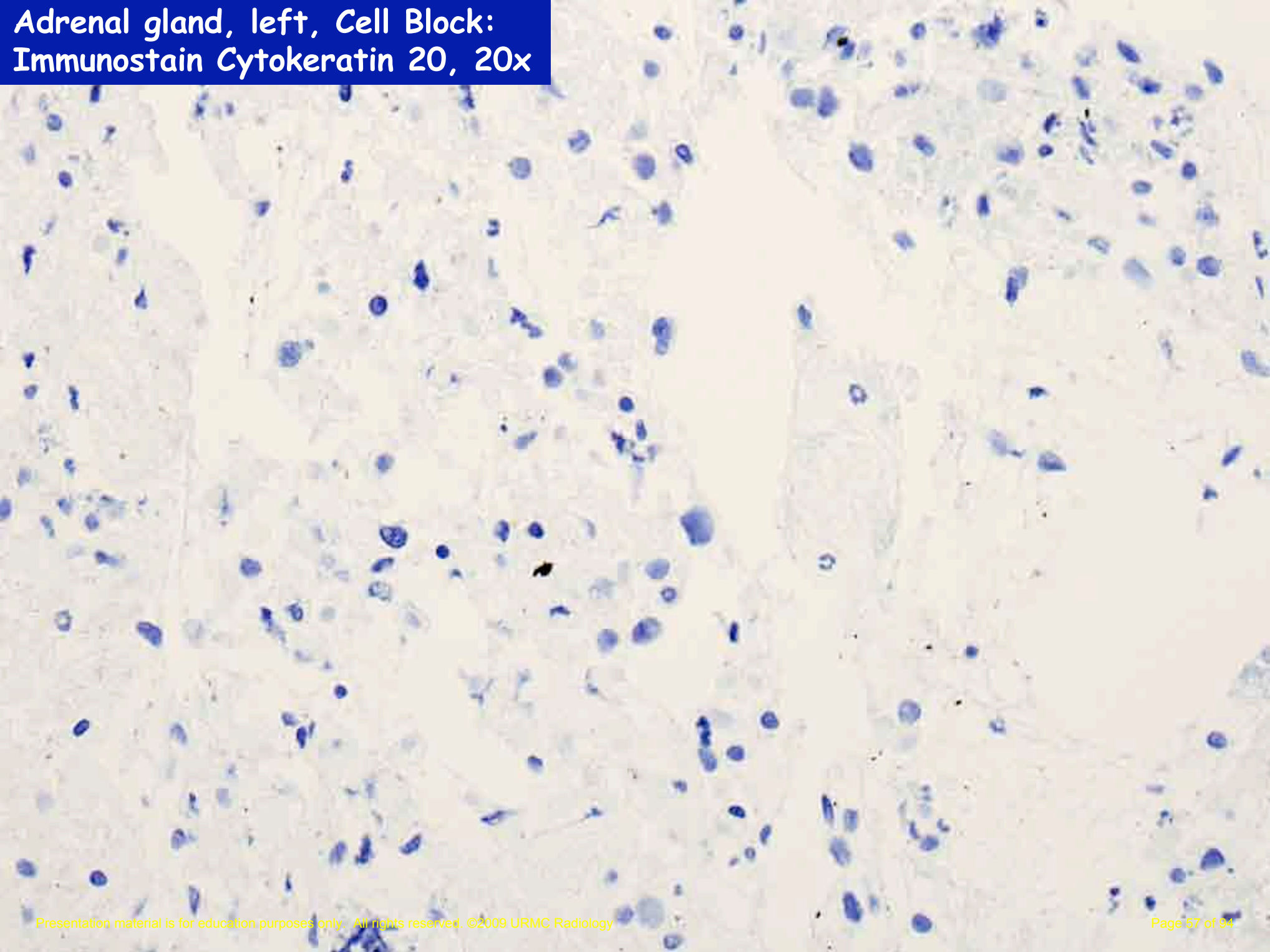
Adrenal gland, left, Cell Block: Immunostain TTF-1, 20x



Adrenal gland, left, Cell Block: Immunostain Cytokeratin 7, 20x



Adrenal gland, left, Cell Block: Immunostain Cytokeratin 20, 20x



Adrenal gland, left, CT-guided fine needle aspiration:

Malignant tumor cells present derived from adenocarcinoma consistent with pulmonary origin.

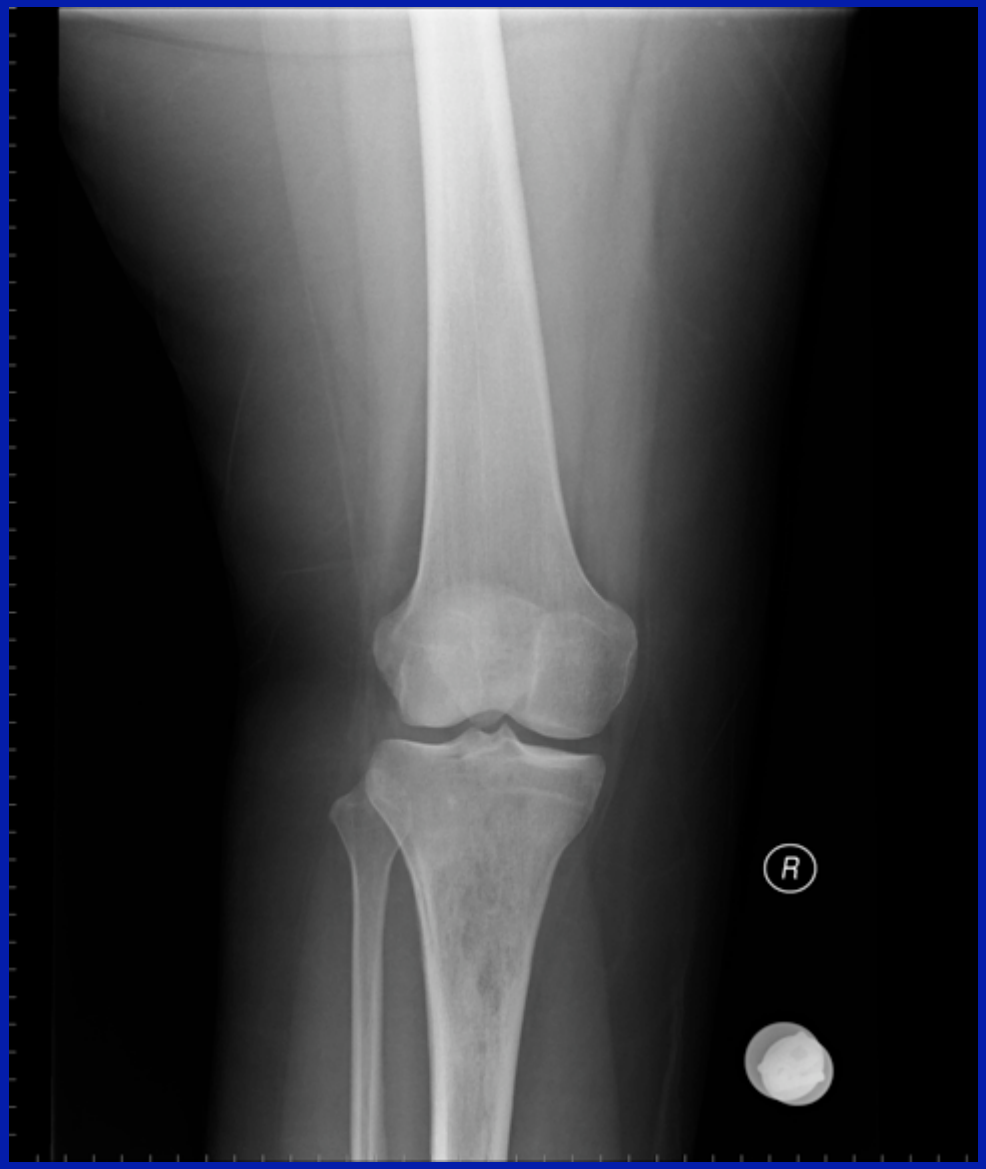
Comment: Immunohistochemical stains are positive for TTF-1 and cytokeratin 7 and negative for cytokeratin 20 and Melan-A. These staining results support a pulmonary origin.

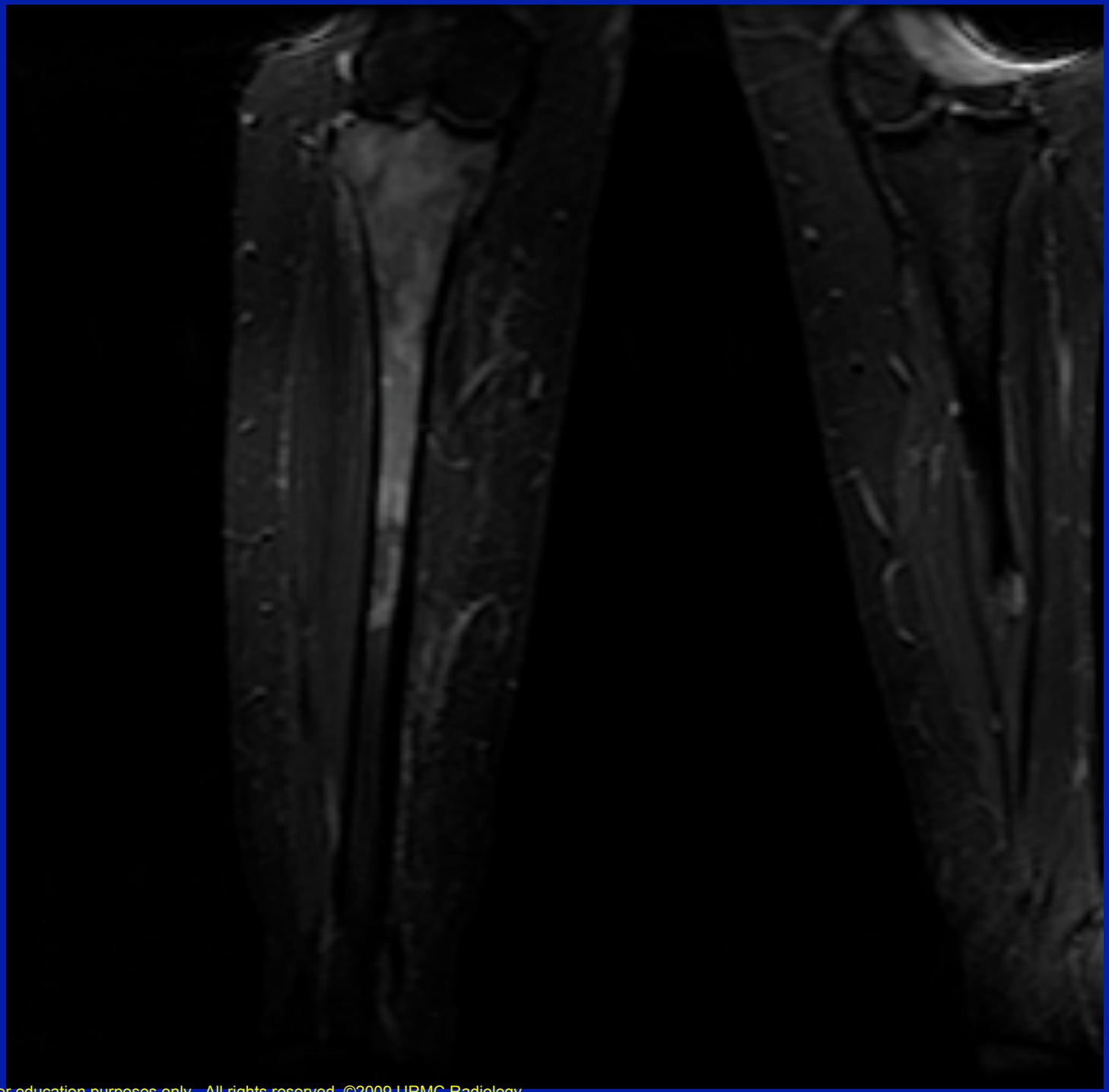
Metastatic Lung Adenocarcinoma to Adrenal Gland

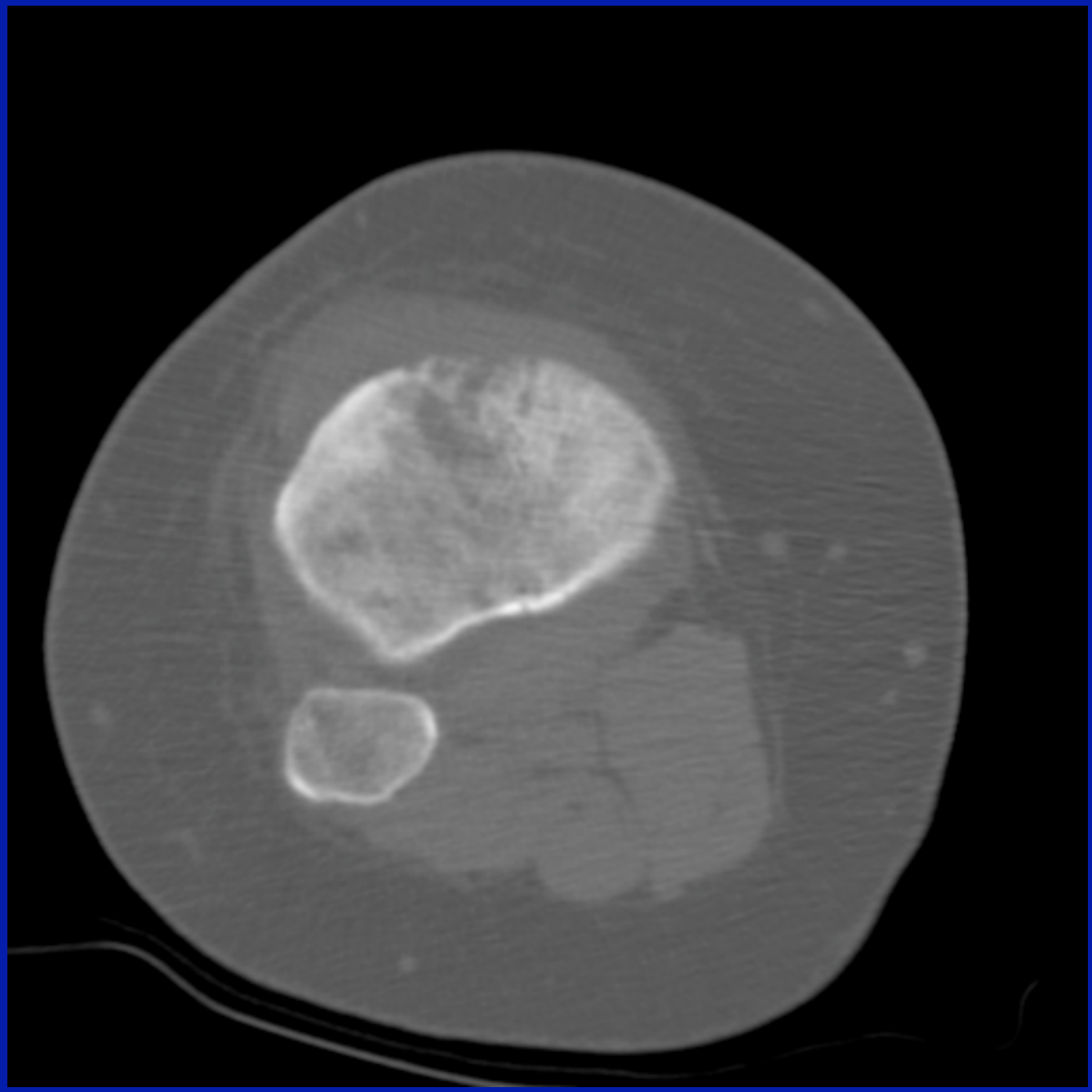
- Adrenal glands per unit weight are the most frequent organ involved by metastatic tumors
- Rank fourth in frequency following lung, liver and bone for mets
- Mets found in autopsy 9-27% pts - breast most common primary
- Immunostains TTF-1 and Napsin A

Case 4

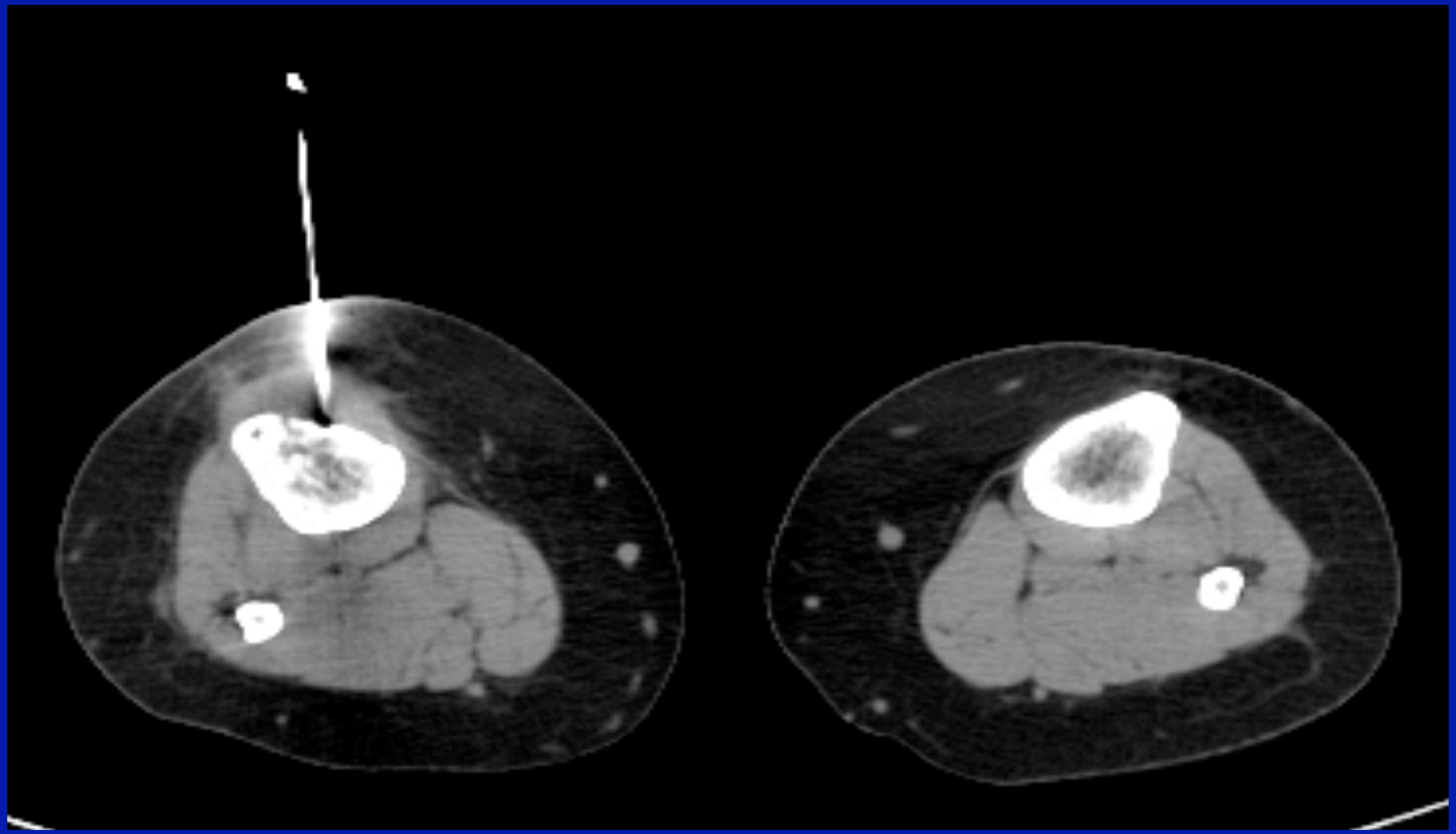
- 24 year old female with knee pain



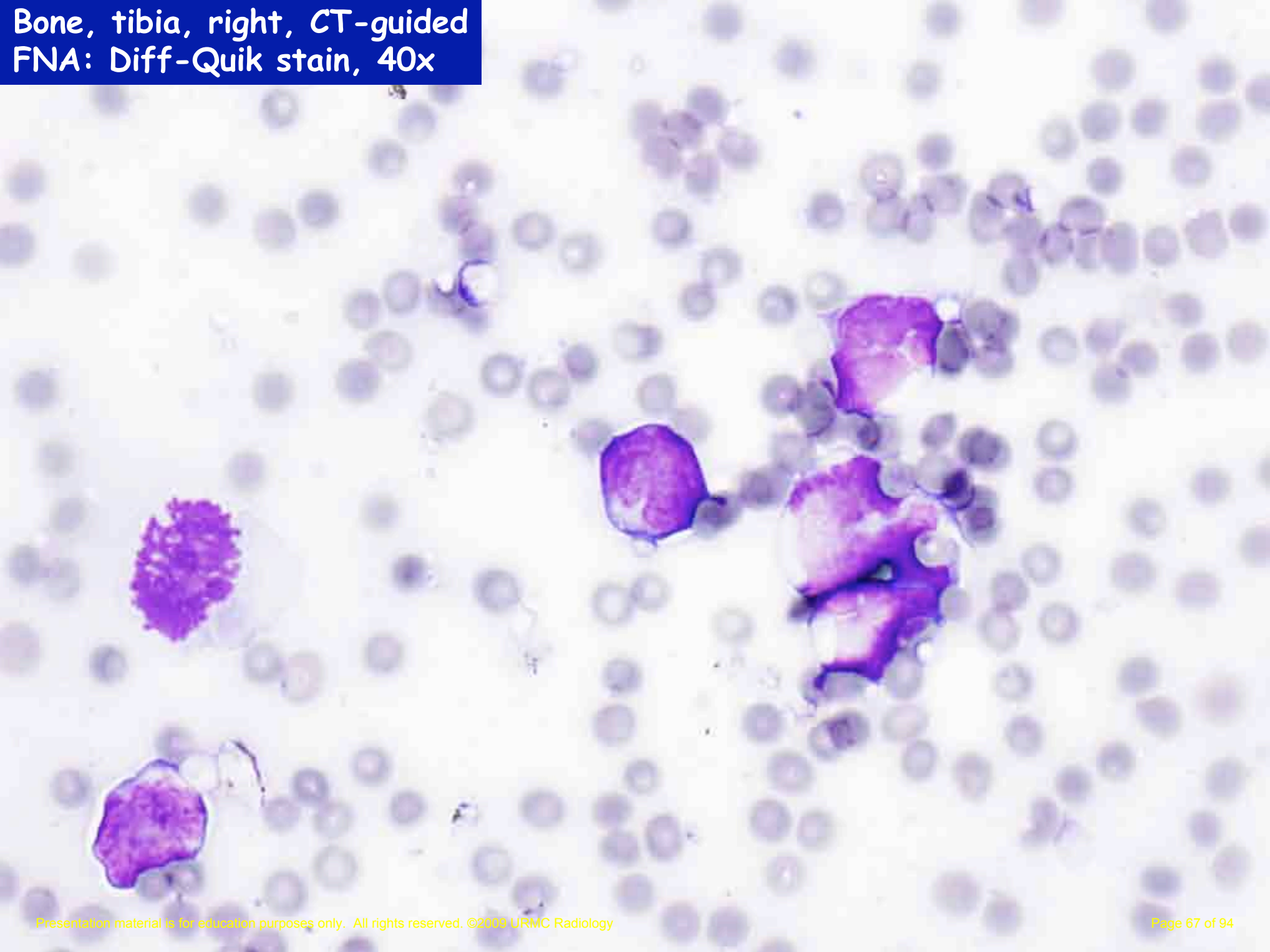




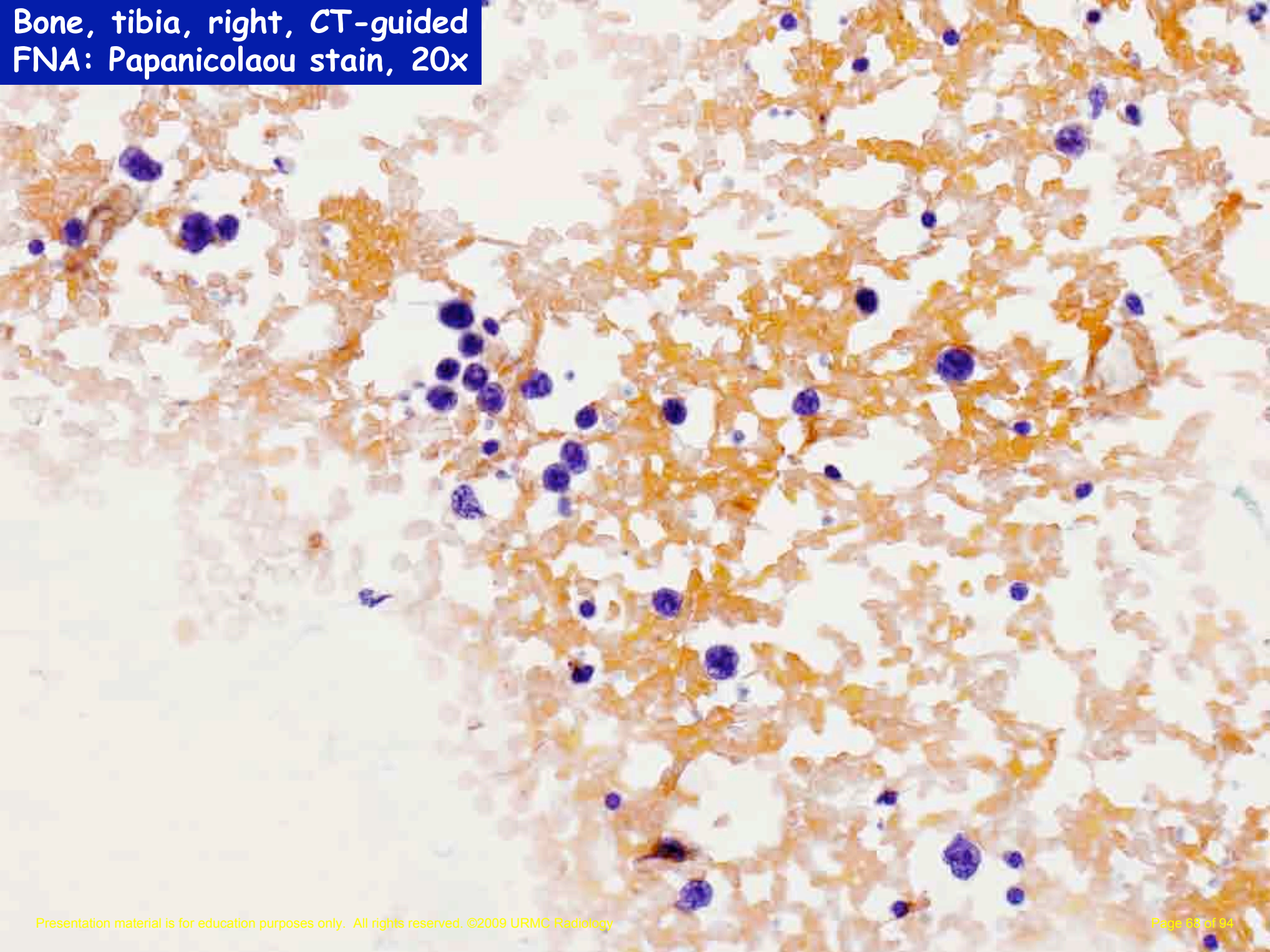
CT guided FNA and needle core biopsy of the right tibia was done.



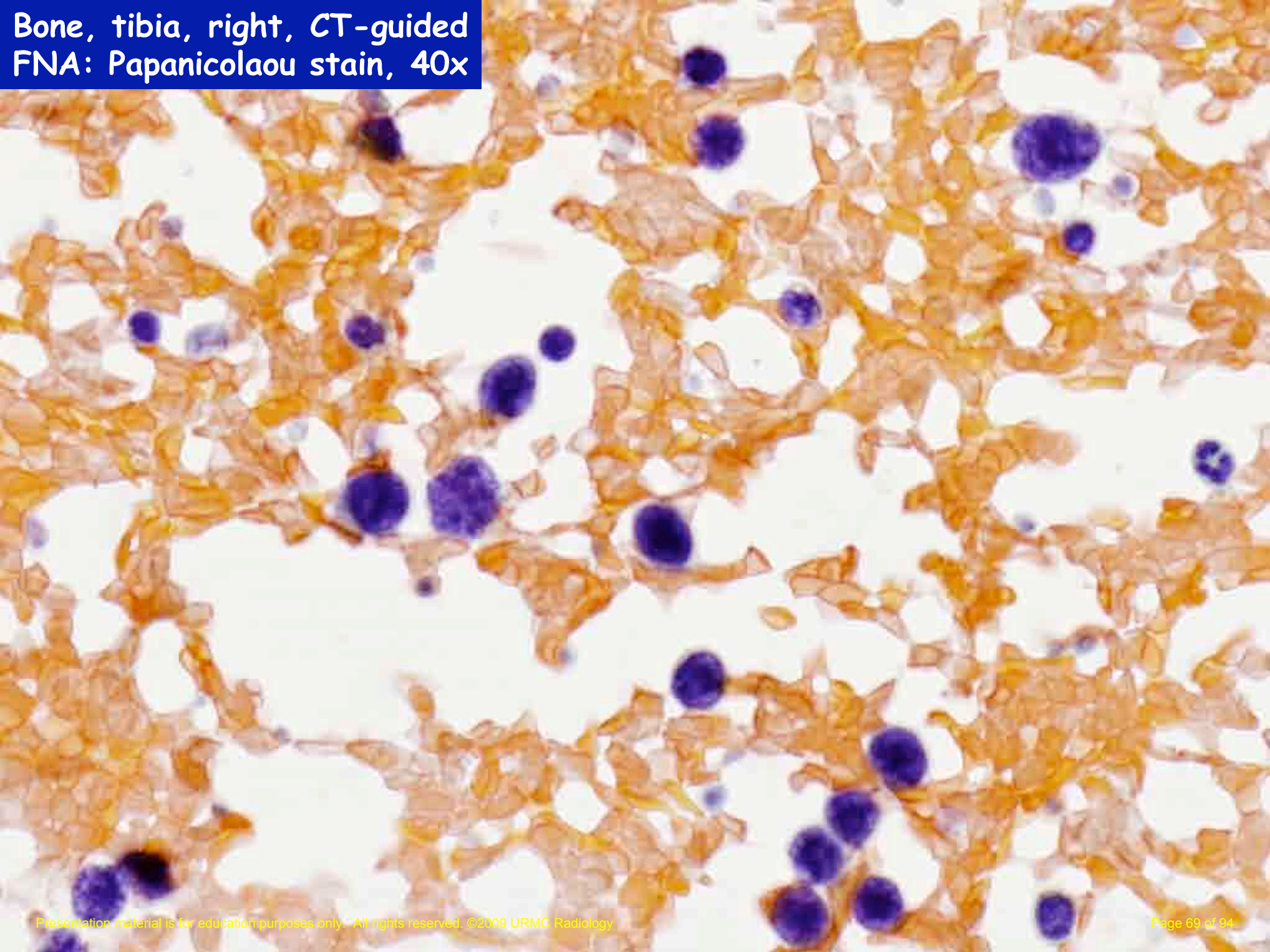
Bone, tibia, right, CT-guided
FNA: Diff-Quik stain, 40x



Bone, tibia, right, CT-guided FNA: Papanicolaou stain, 20x



Bone, tibia, right, CT-guided
FNA: Papanicolaou stain, 40x



Bone, tibia, right, CT-guided fine needle aspiration:

Malignant lymphoma, diffuse large B-cell type

Bone, right tibia, needle core biopsy:

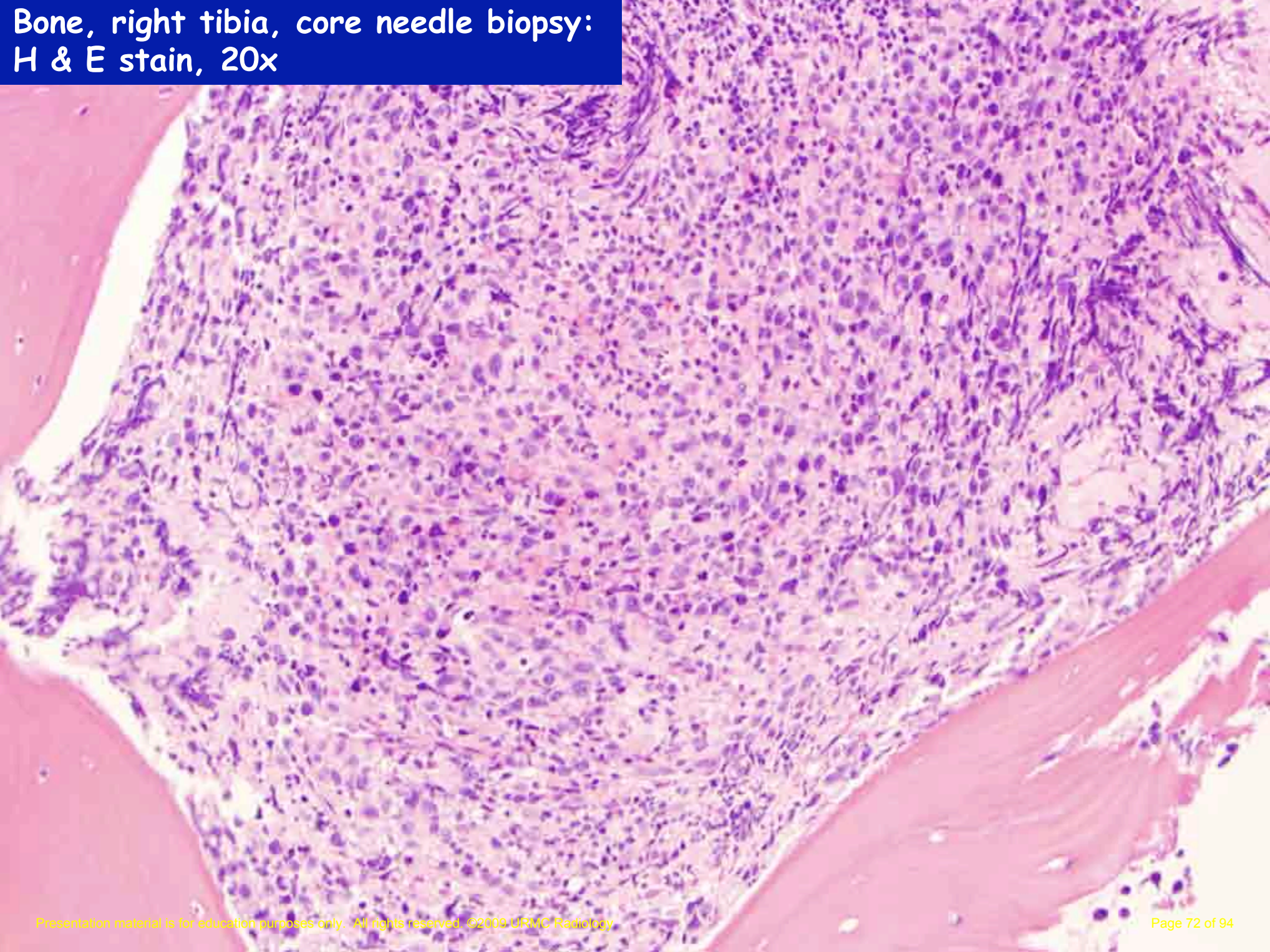
Diffuse large B cell lymphoma

Immunophenotype:

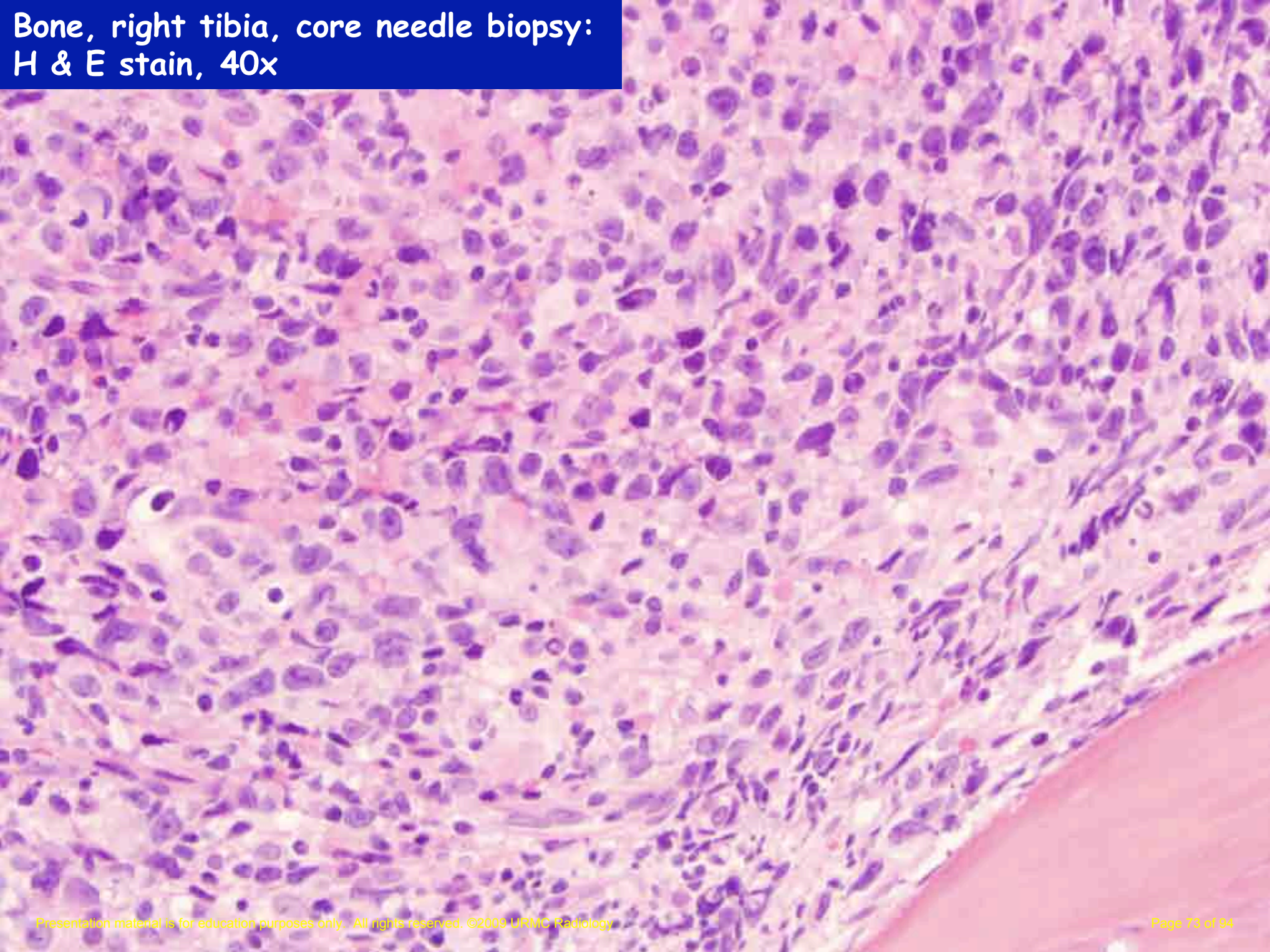
- Positive: CD19, CD20, PAX5, CD10, BCL6, Kappa
- Negative: BCL2, MUM1, CD30

Neoplastic cell Ki-67 proliferation rate ~70%

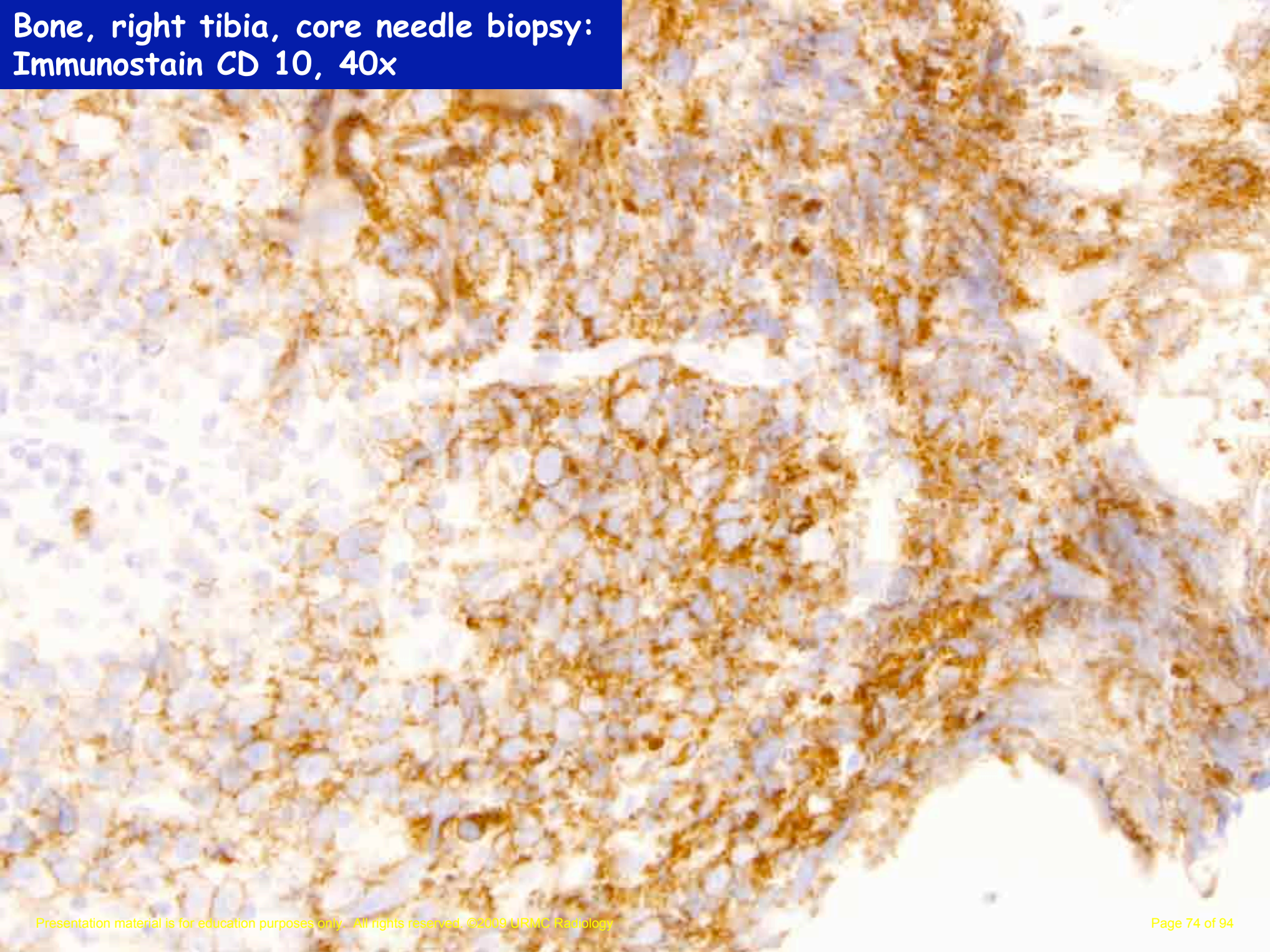
Bone, right tibia, core needle biopsy: H & E stain, 20x



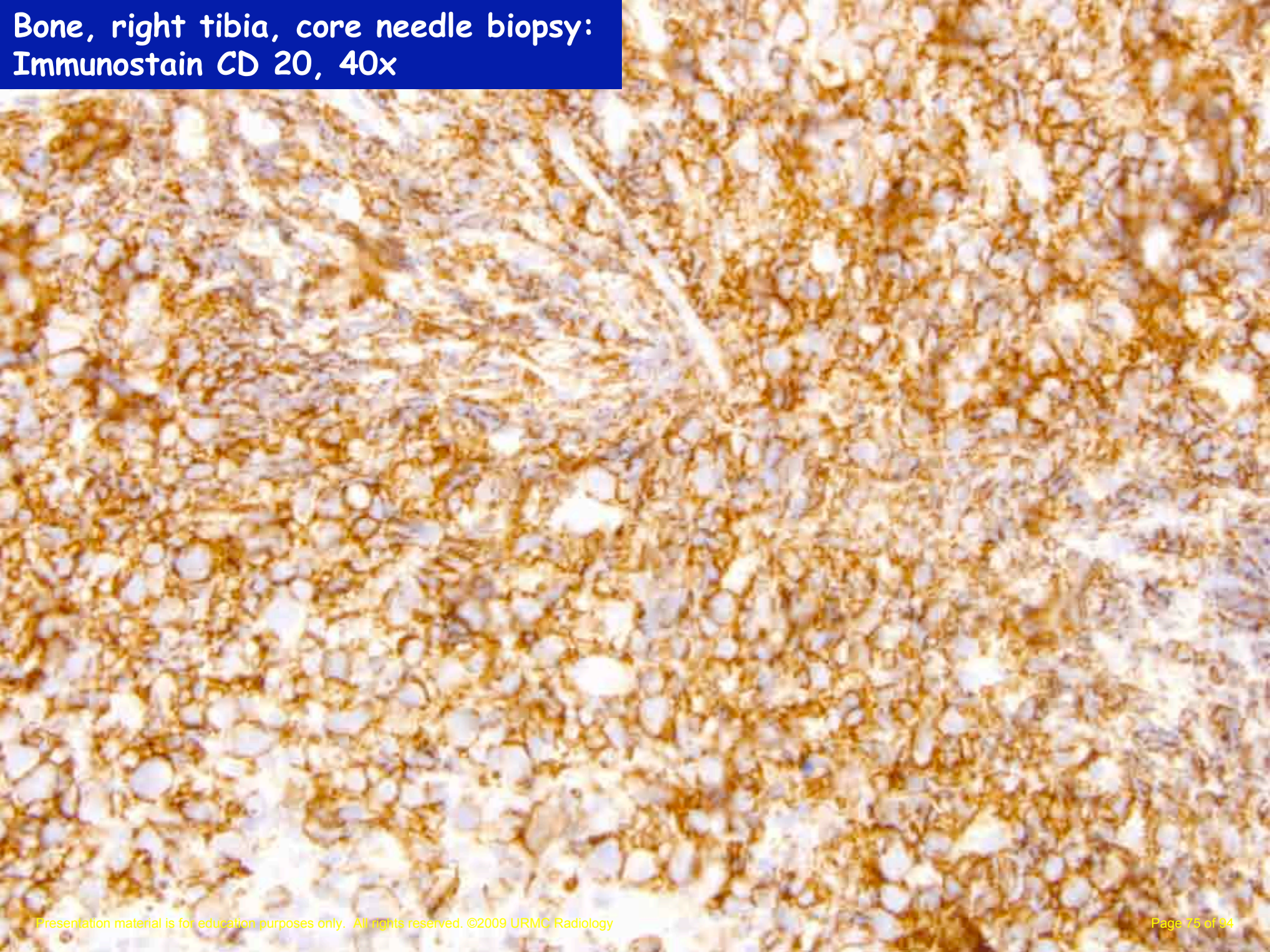
Bone, right tibia, core needle biopsy:
H & E stain, 40x



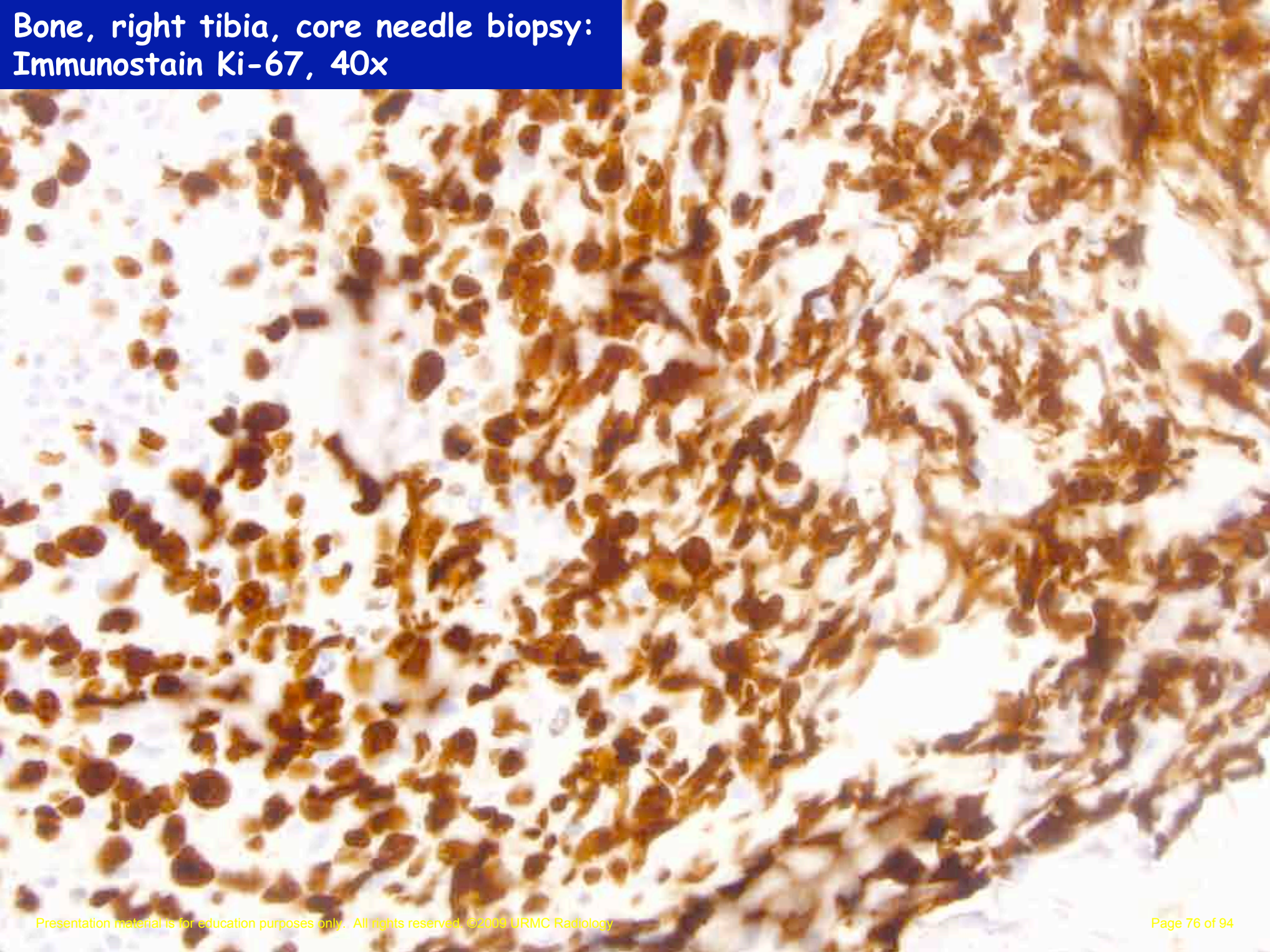
Bone, right tibia, core needle biopsy: Immunostain CD 10, 40x



Bone, right tibia, core needle biopsy: Immunostain CD 20, 40x



Bone, right tibia, core needle biopsy:
Immunostain Ki-67, 40x



Diffuse Large B cell Lymphoma

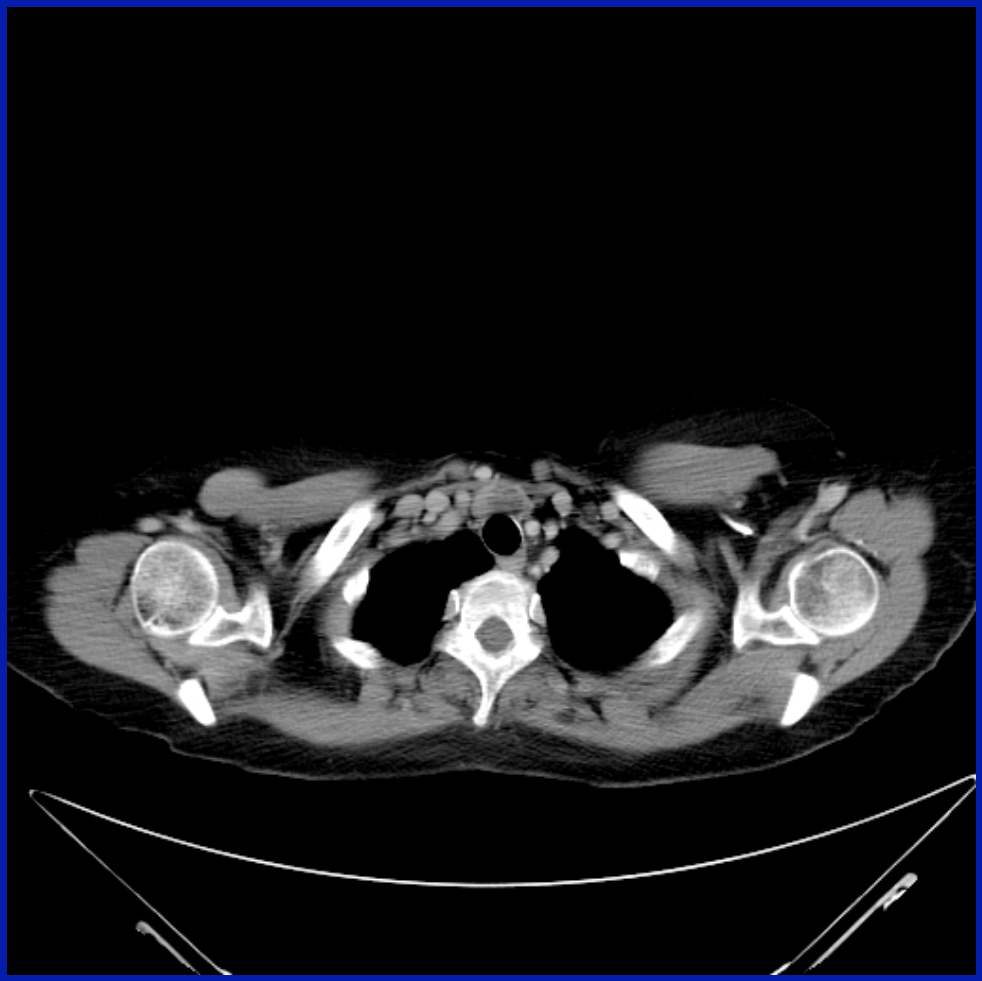
- Comprise 1/3 of all non-Hodgkin's lymphomas
- Occur in all age groups
- Male to female ratio – 1.2:1
- Positive for B-lineage marker CD20

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

Case 5

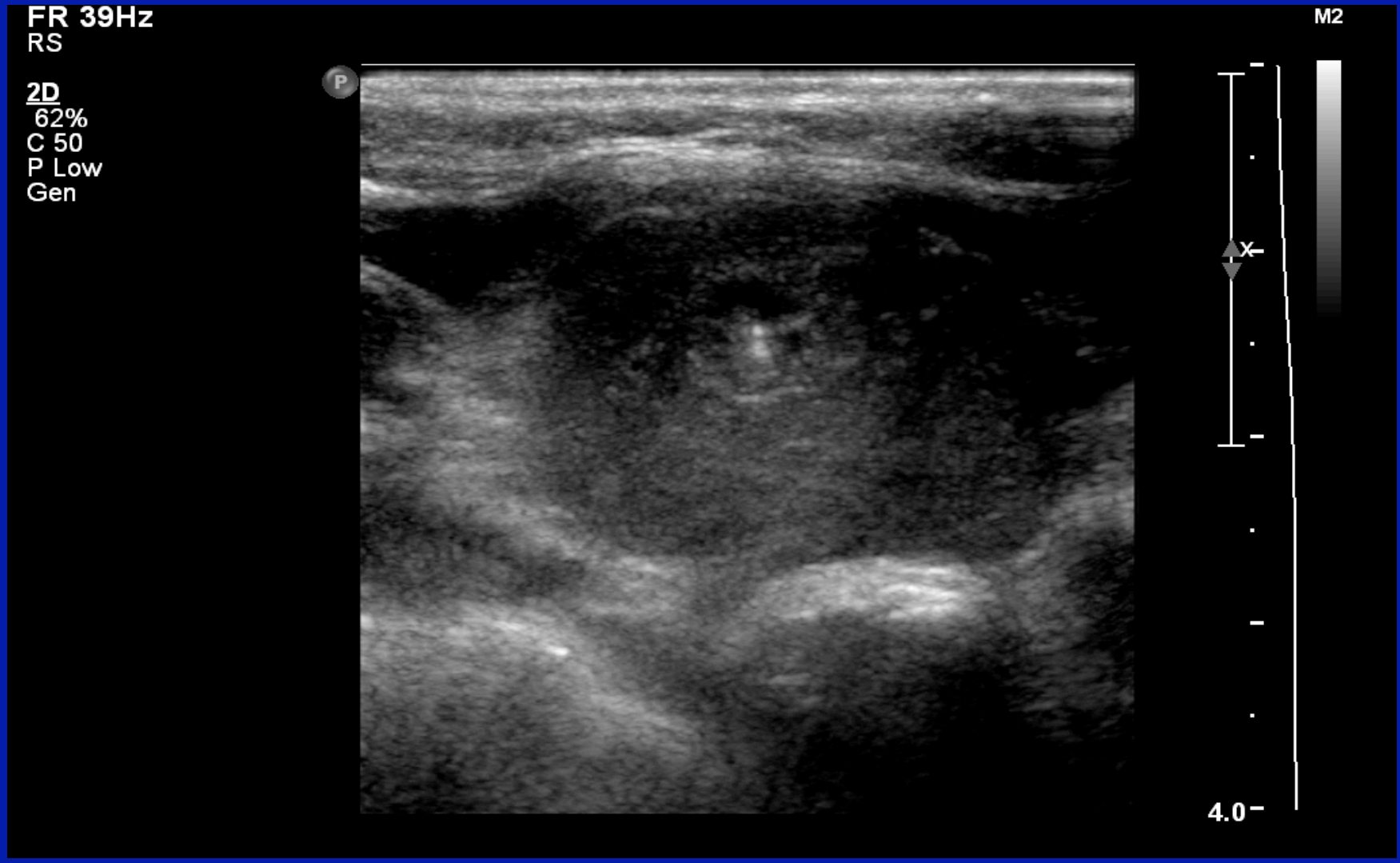
- 64 year old female with abdominal CT findings. PET done.



The Significance of Incidental PET Uptake in the Thyroid Gland

- Incidental FDG-PET uptake in the thyroid gland is associated with a 27.8% risk for well-differentiated thyroid carcinoma; however, there seems to be no correlation between intensity of FDG uptake and the risk for a malignant process.
- Reference: AJNR Am J Neuroradiol. 2009 Aug;30(7):1431-4. Epub 2009 Apr 2.

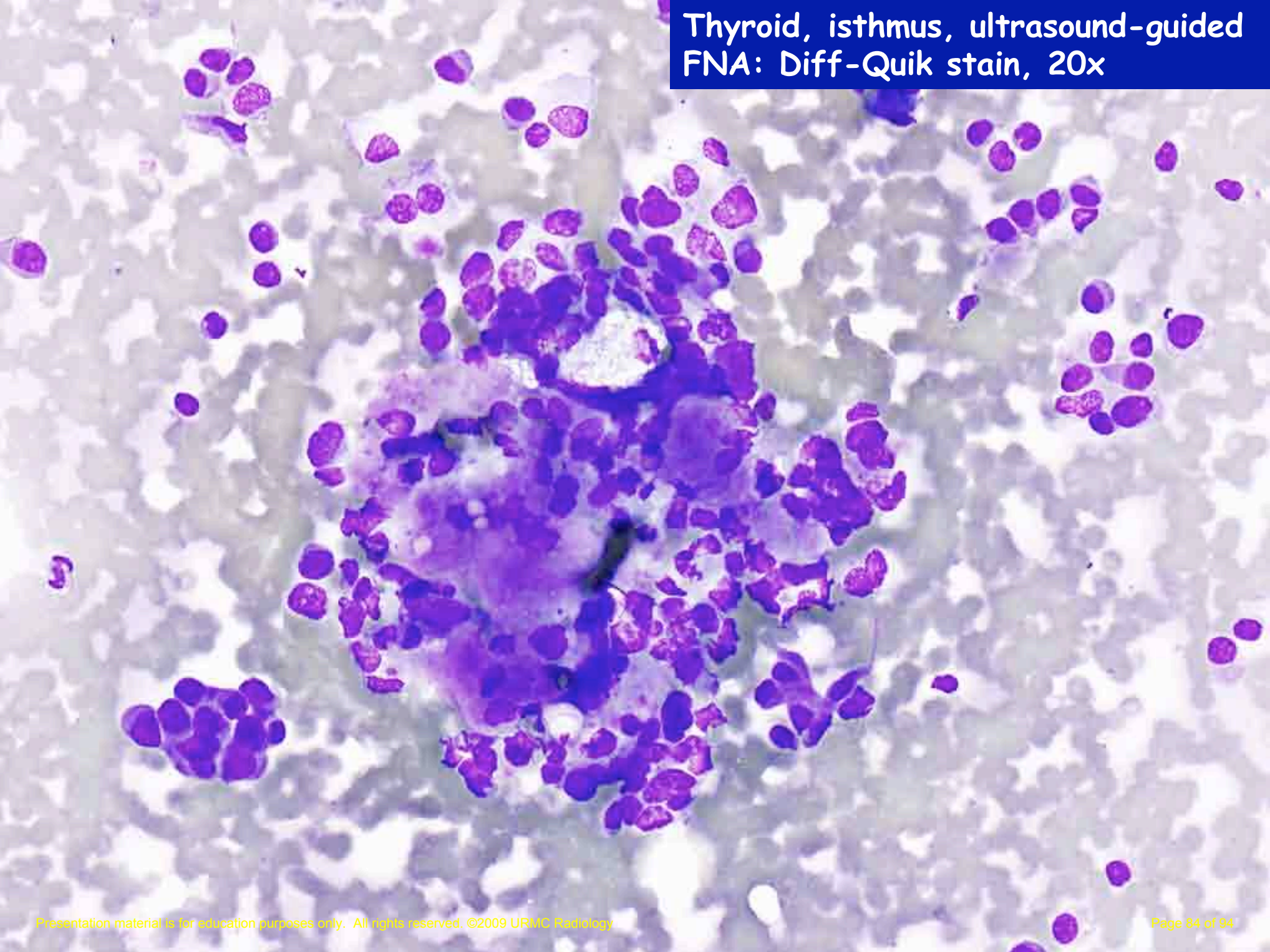
US guided FNA of the thyroid was done.



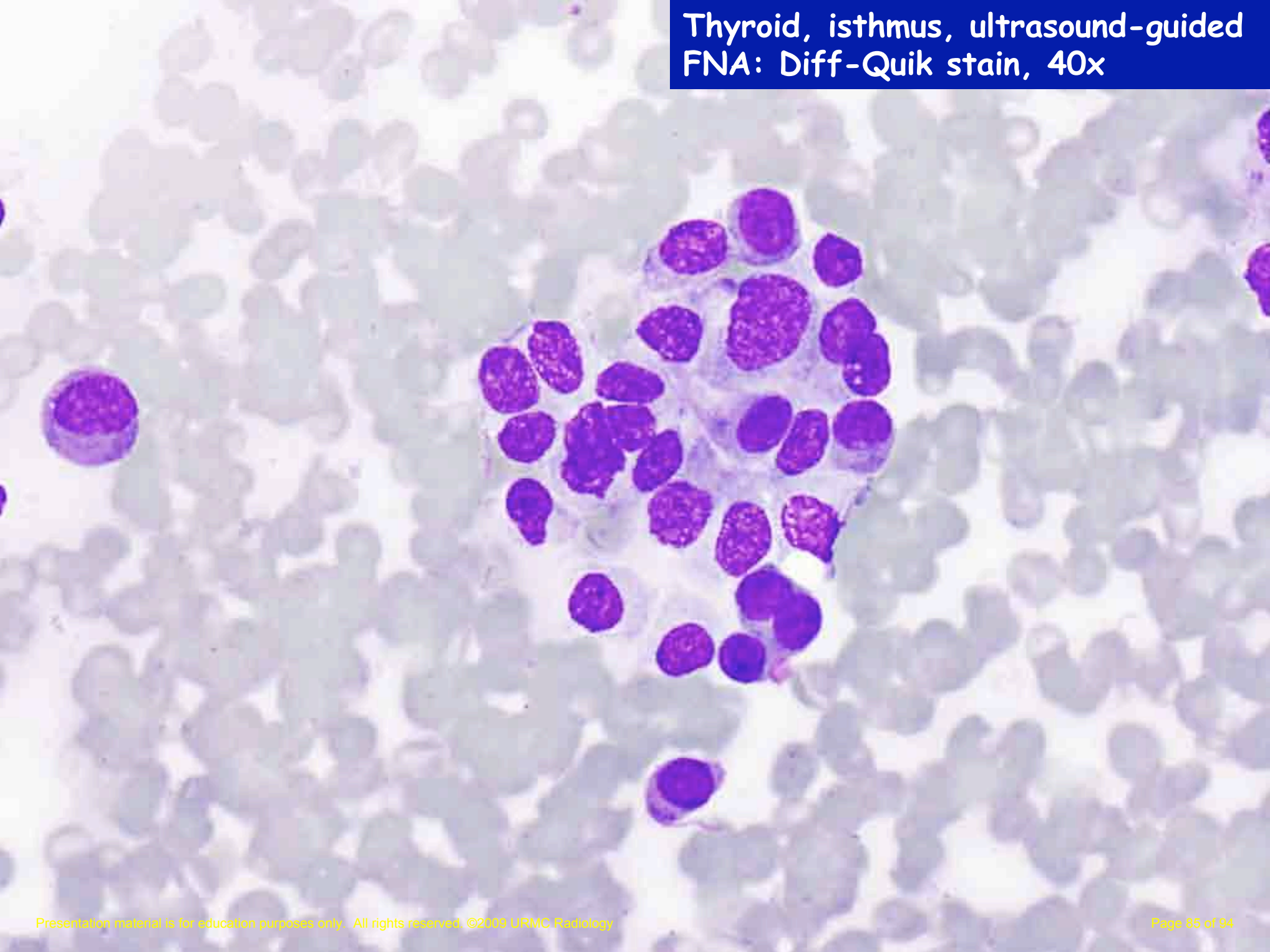
US Feature	Recommendation
Solitary nodule	
Microcalcifications	Strongly consider US-guided FNA if ≥1 cm
Solid (or almost entirely solid) or coarse calcifications	Strongly consider US-guided FNA if ≥1.5 cm
Mixed solid and cystic or almost entirely cystic with solid mural component	Consider US-guided FNA if ≥2 cm
None of the above but substantial growth since prior US examination	Consider US-guided FNA
Almost entirely cystic and none of the above and no substantial growth (or no prior US)	US-guided FNA probably unnecessary
Multiple nodules	Consider US-guided FNA of one or more nodules, with selection prioritized on basis of criteria (in order listed) for solitary nodule*

- **Management of Thyroid Nodules Detected at US: Society of Radiologists in Ultrasound Consensus Conference Statement**
  Radiology December 2005 237:794-800

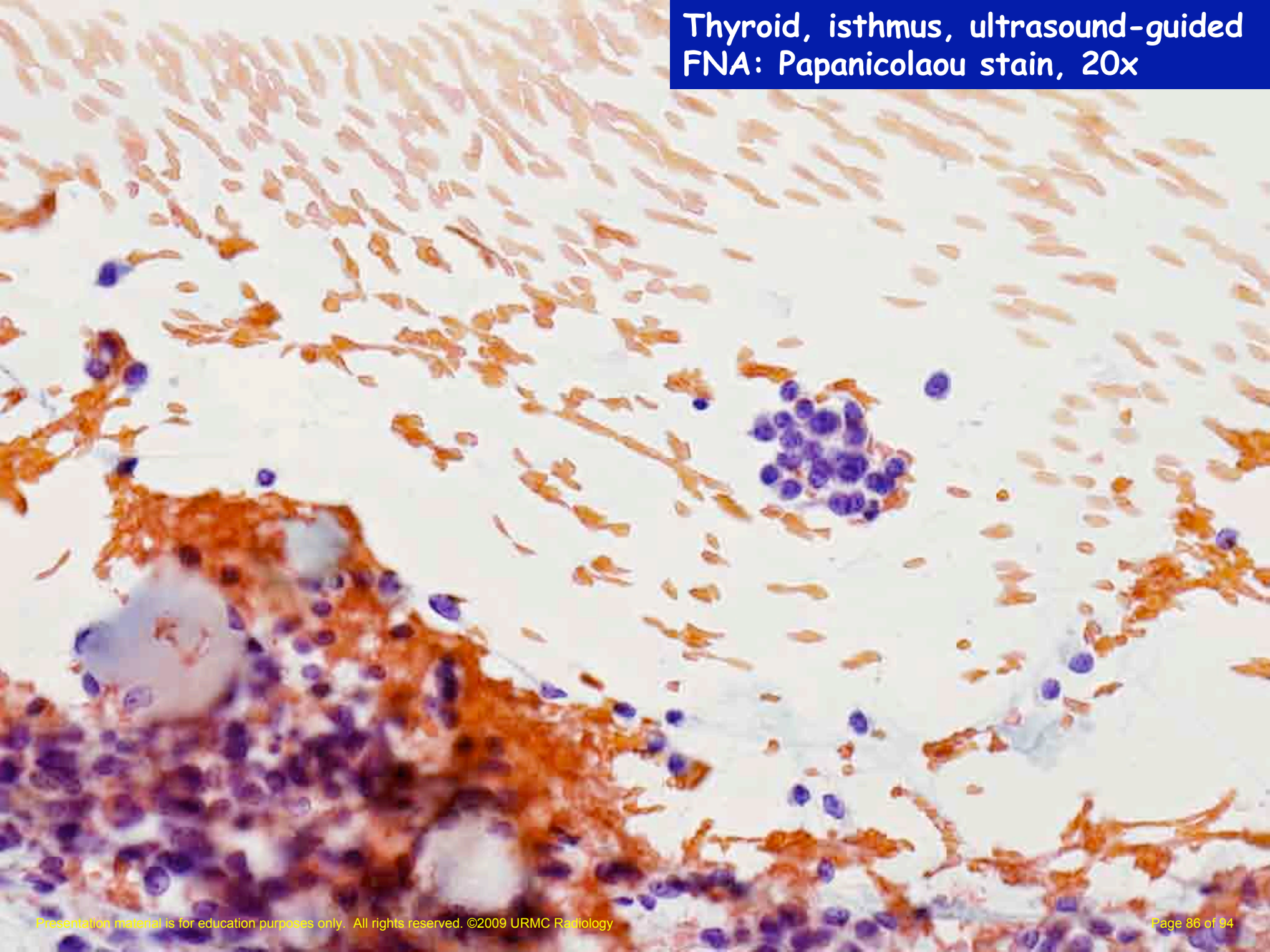
Thyroid, isthmus, ultrasound-guided FNA: Diff-Quik stain, 20x



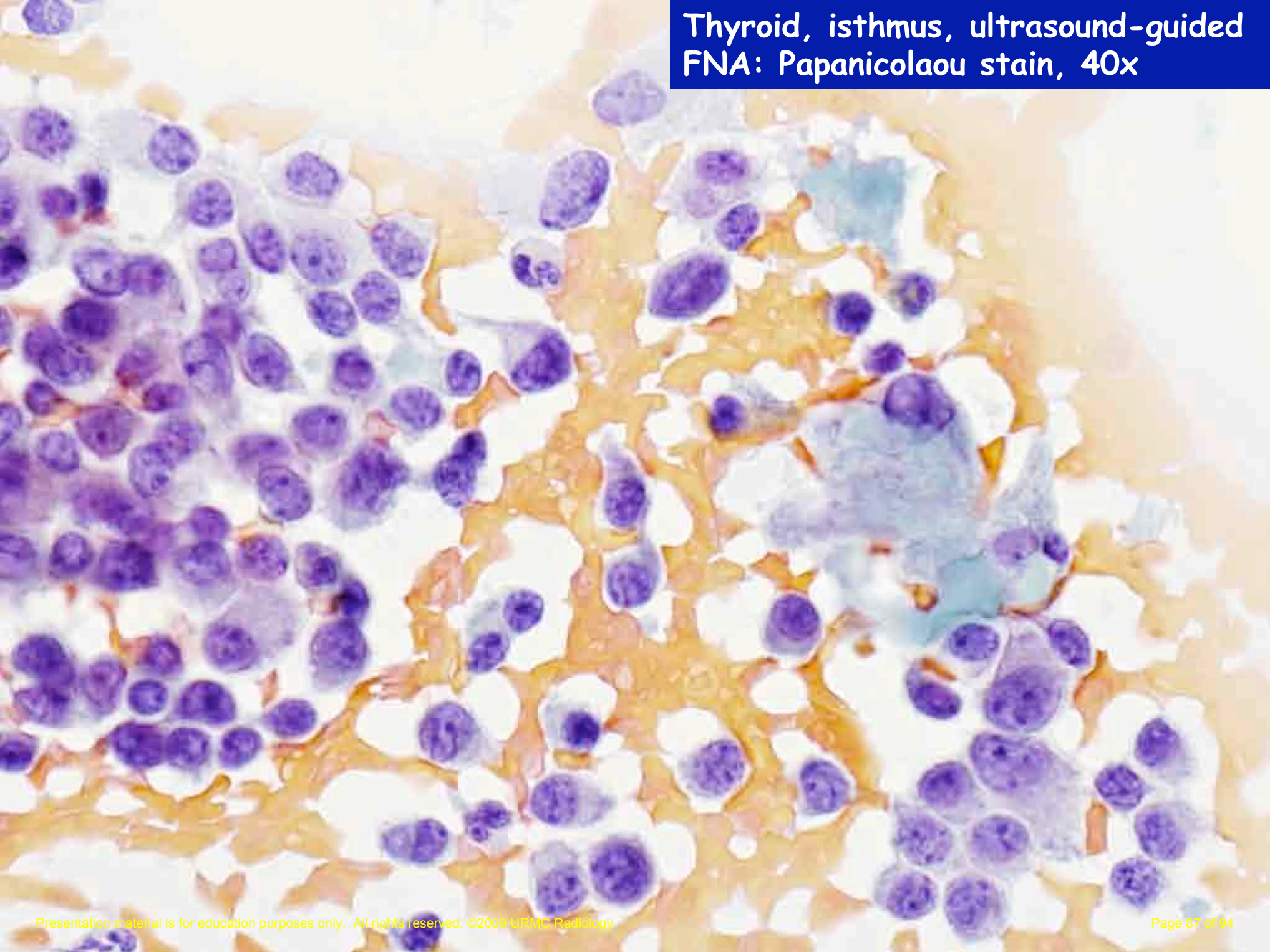
Thyroid, isthmus, ultrasound-guided FNA: Diff-Quik stain, 40x

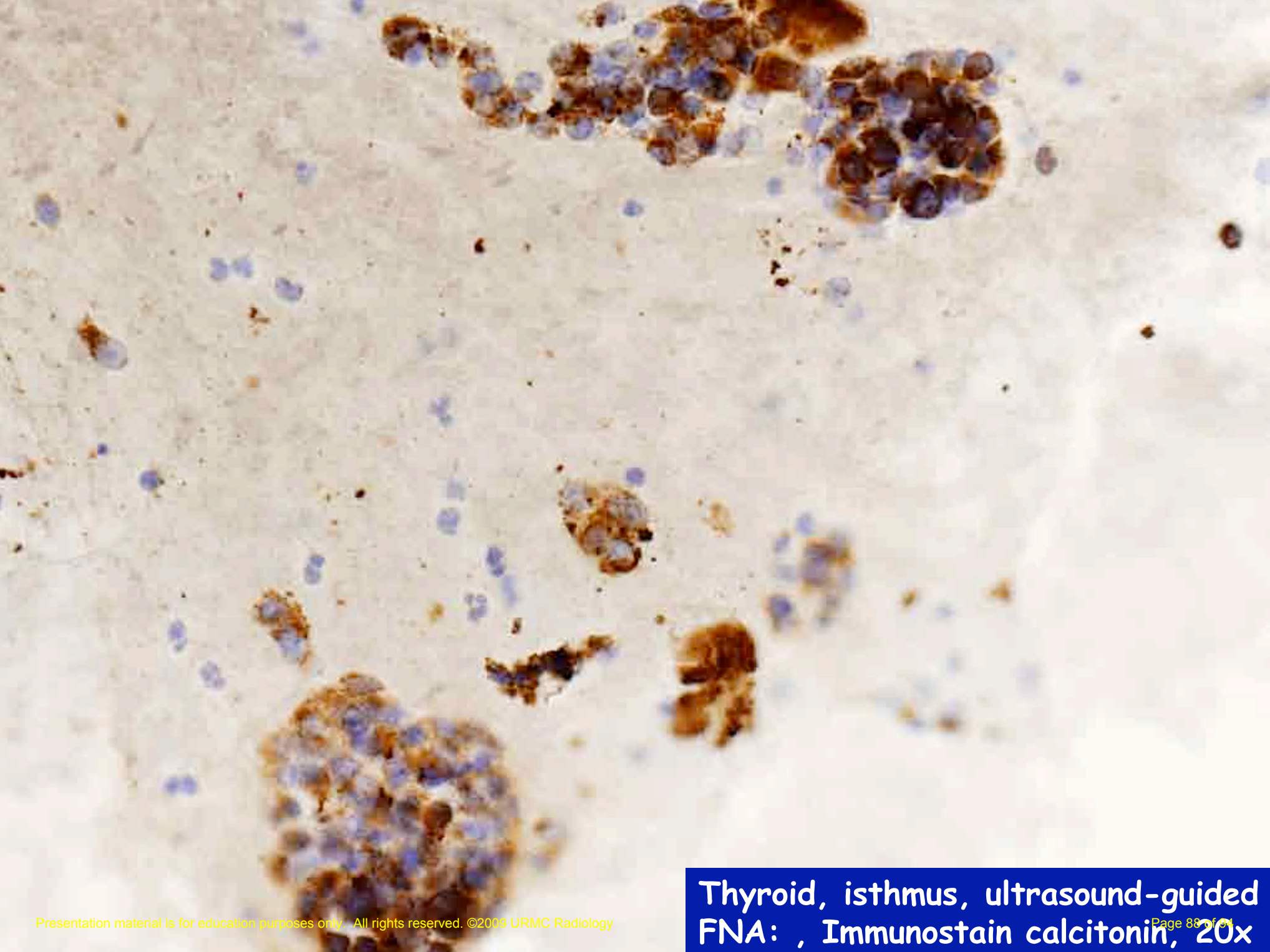


Thyroid, isthmus, ultrasound-guided FNA: Papanicolaou stain, 20x



Thyroid, isthmus, ultrasound-guided FNA: Papanicolaou stain, 40x





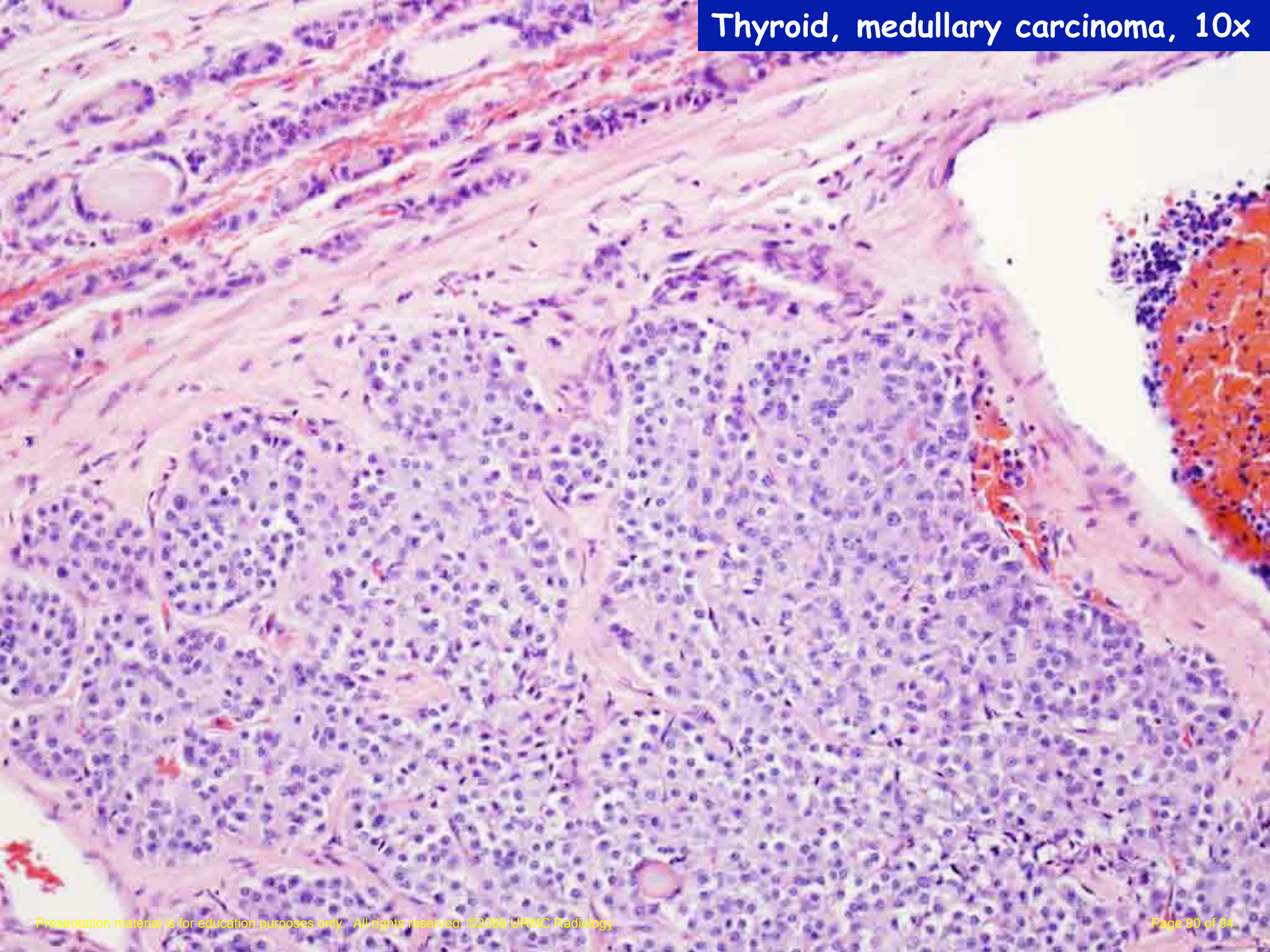
Thyroid, isthmus, ultrasound-guided FNA: , Immunostain calcitonin, 20x

Thyroid, isthmus, ultrasound-guided fine needle aspiration:

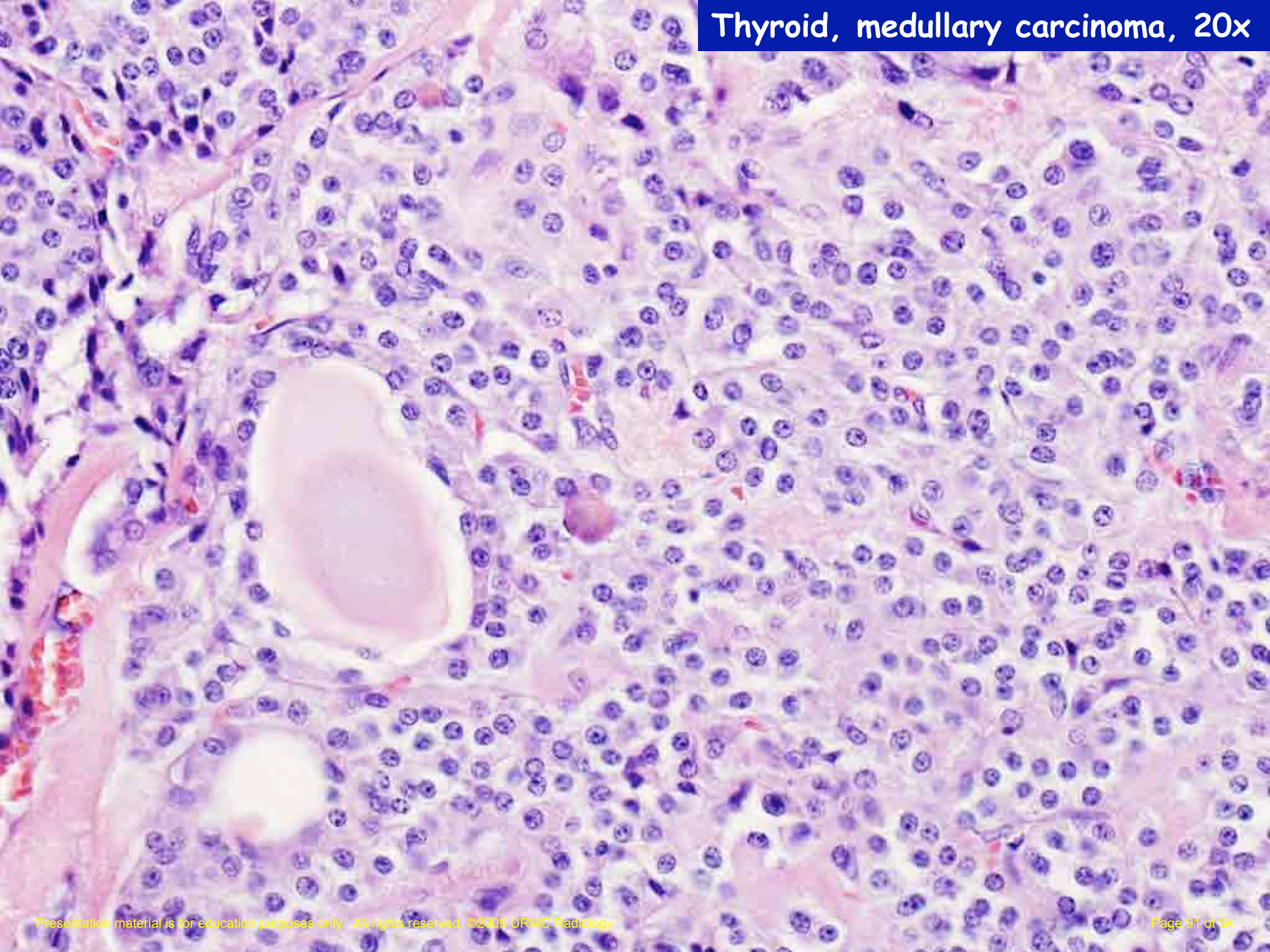
Malignant tumor cells present derived from medullary thyroid carcinoma.

Comment: Immunohistochemical stain performed on alcohol-fixed slide shows the cells of interest mark strongly with calcitonin.

Thyroid, medullary carcinoma, 10x



Thyroid, medullary carcinoma, 20x



Medullary Carcinoma of Thyroid

- Derived from C cells and comprises 5-10% malignant tumors thyroid
- Association with MEN (Multiple endocrine neoplasia) syndromes
- Varied morphologic patterns
- Clinically presents as a firm painless nodule
- Common in females and males
- Age depends on MEN, familial, or sporadic

Medullary Carcinoma of Thyroid

- Amyloid identified in up to 80% tumors – Congo Red
- Common site for mets – cervical lymph nodes and contralateral lobe
- Distant metastasis – lung, bone, liver and adrenals
- Gold standard for diagnosis – Immunostain Calcitonin.
- Prognostic factors – sporadic or familial tumor, age of patient, tumor size and stage

The End