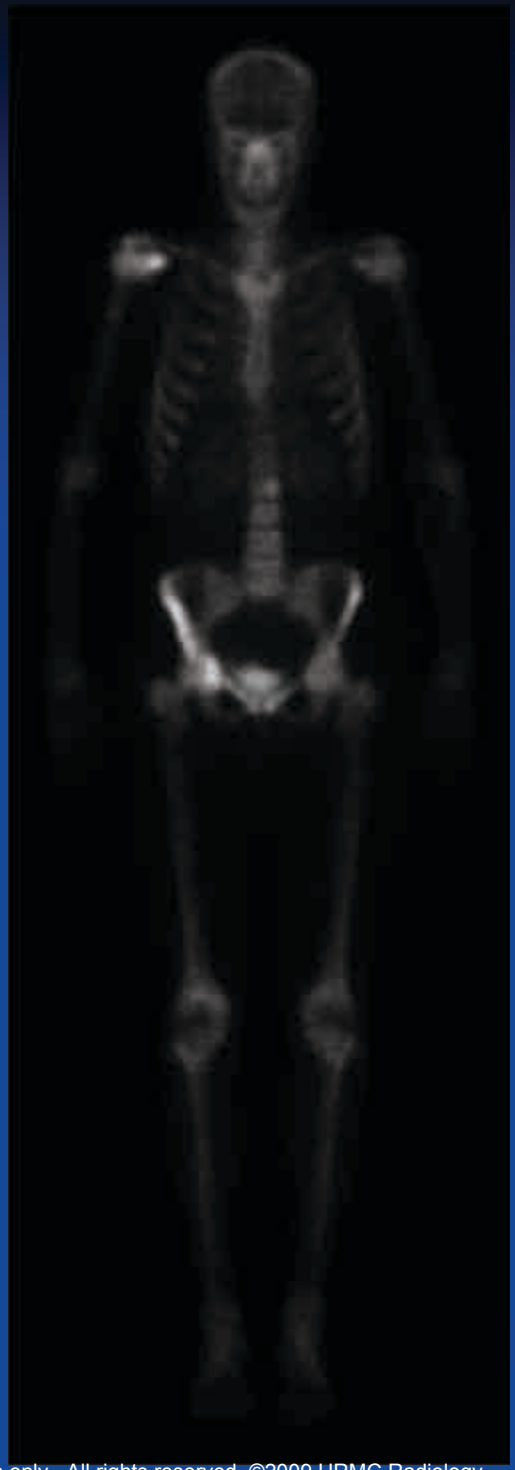
Rad-Path Conference

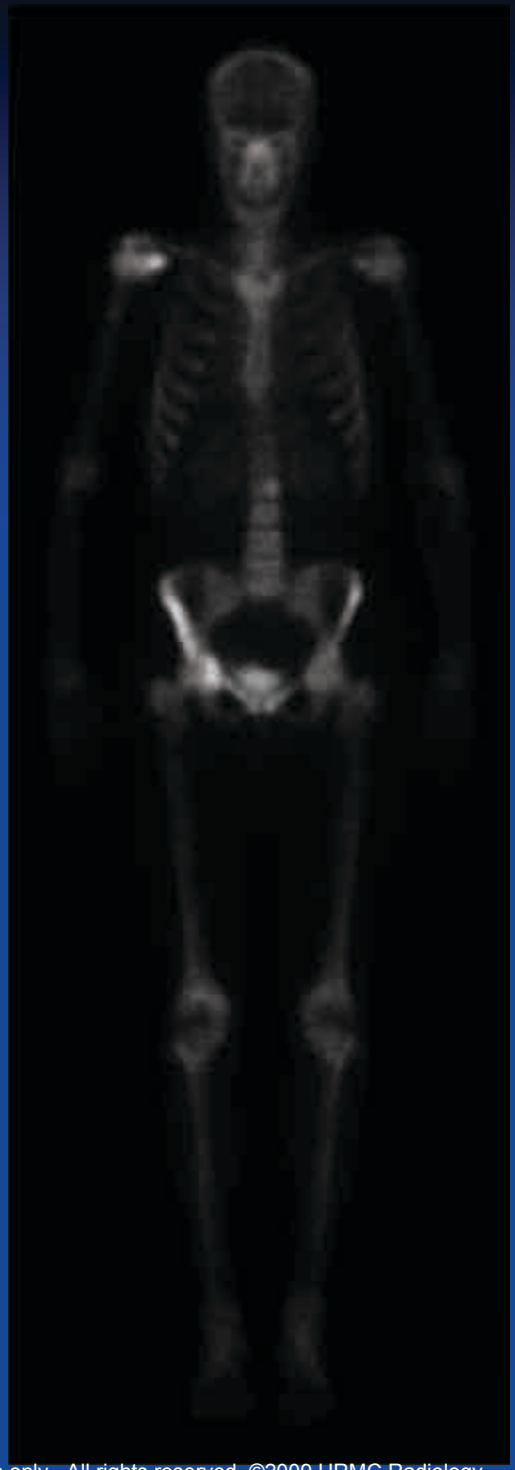
June 26, 2009

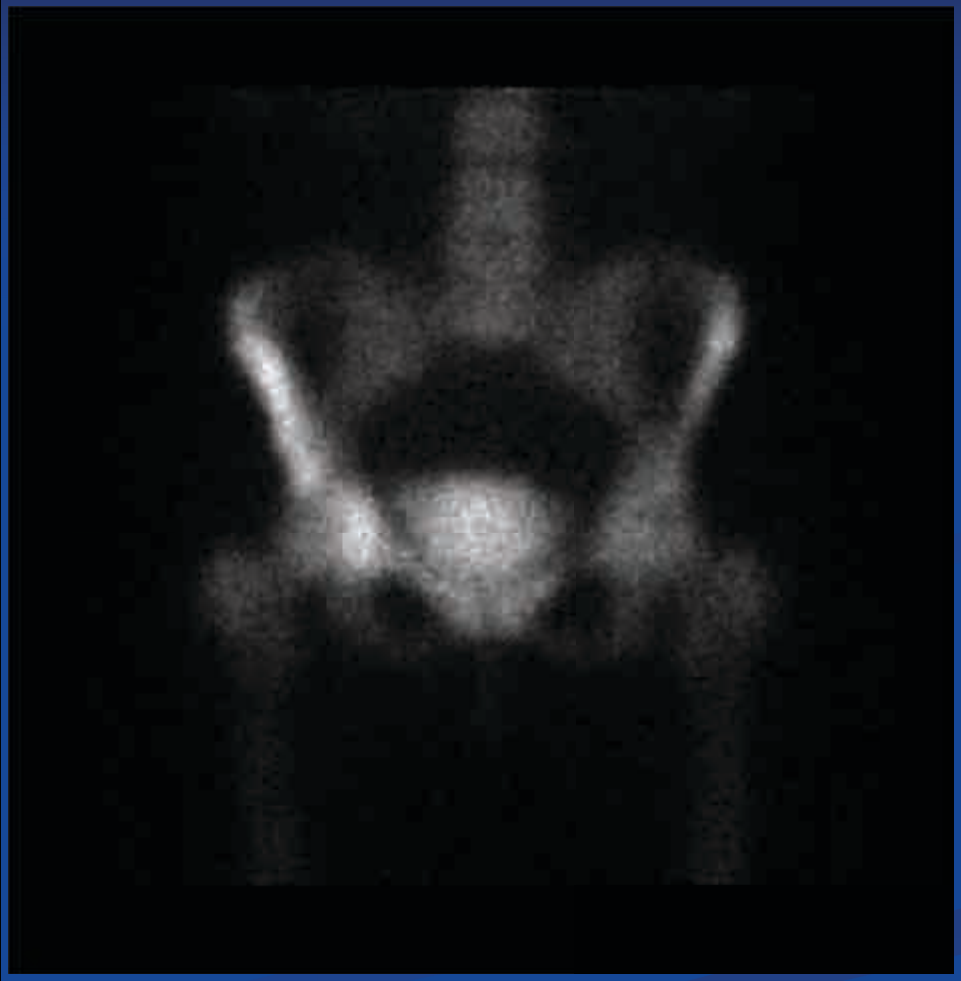
S. Cassar, N. Johnson, and S. Canacci

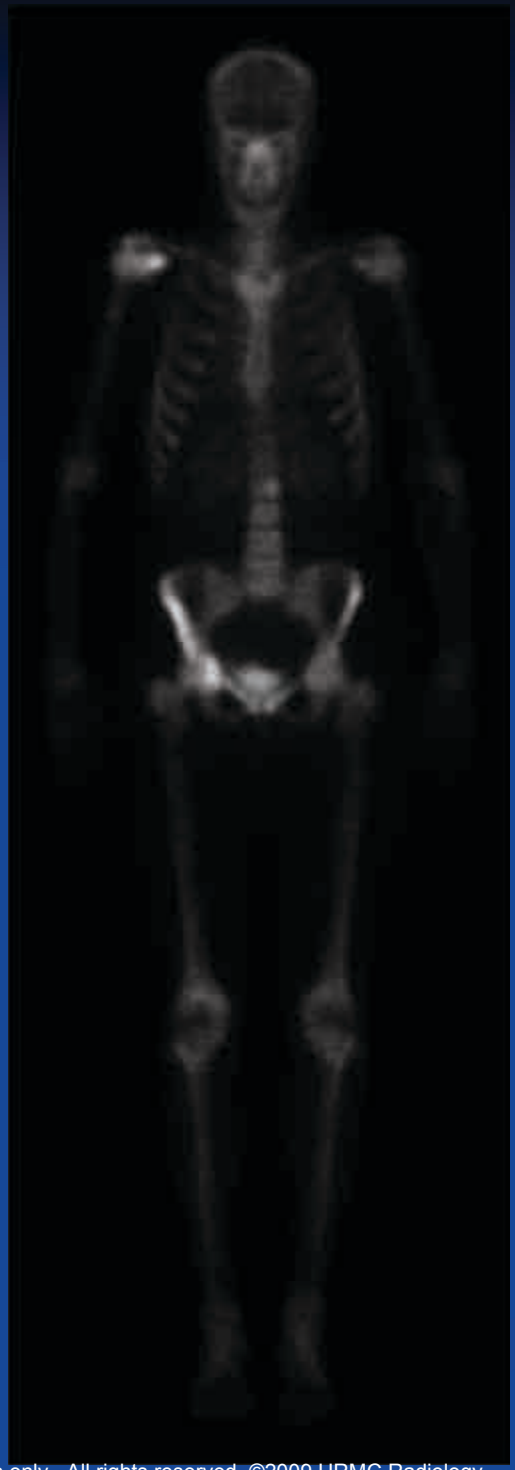
Case 1

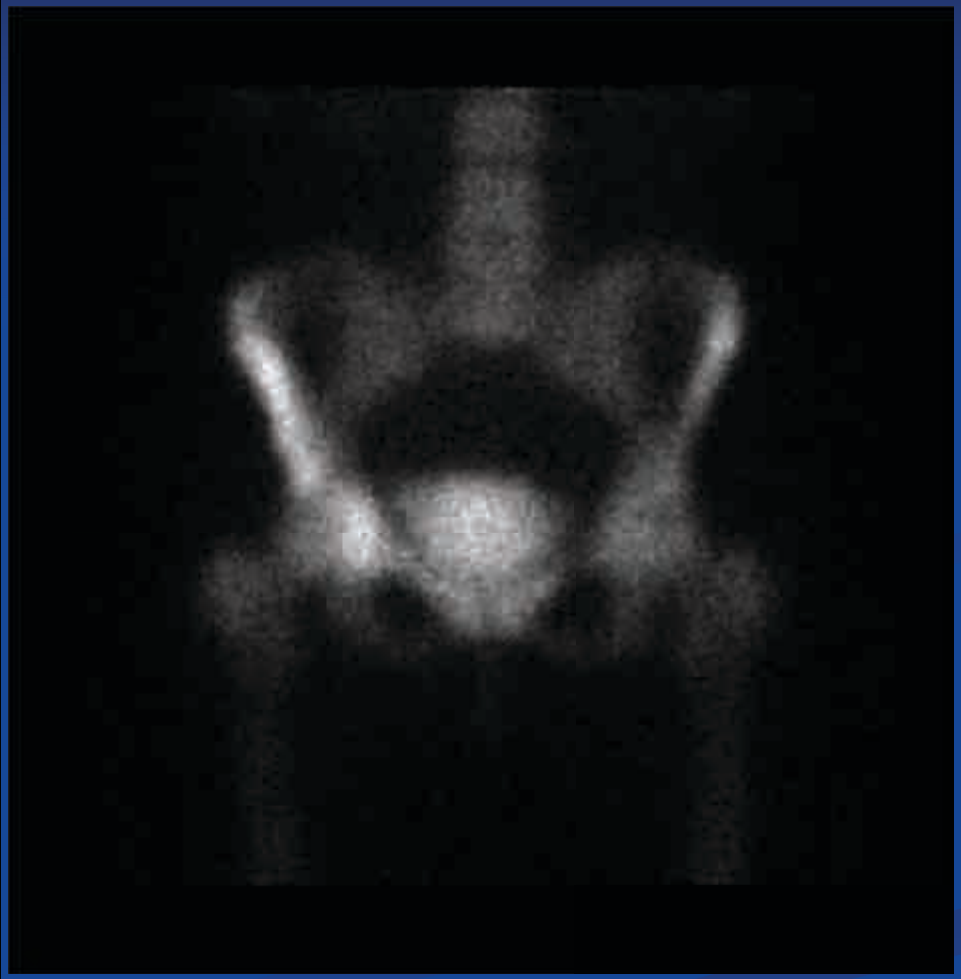
- 44 yo female with a history of breast cancer s/p bilateral mastectomies, chemotherapy, and radiation therapy, now with right groin and upper arm pain for approximately 6 to 8 weeks



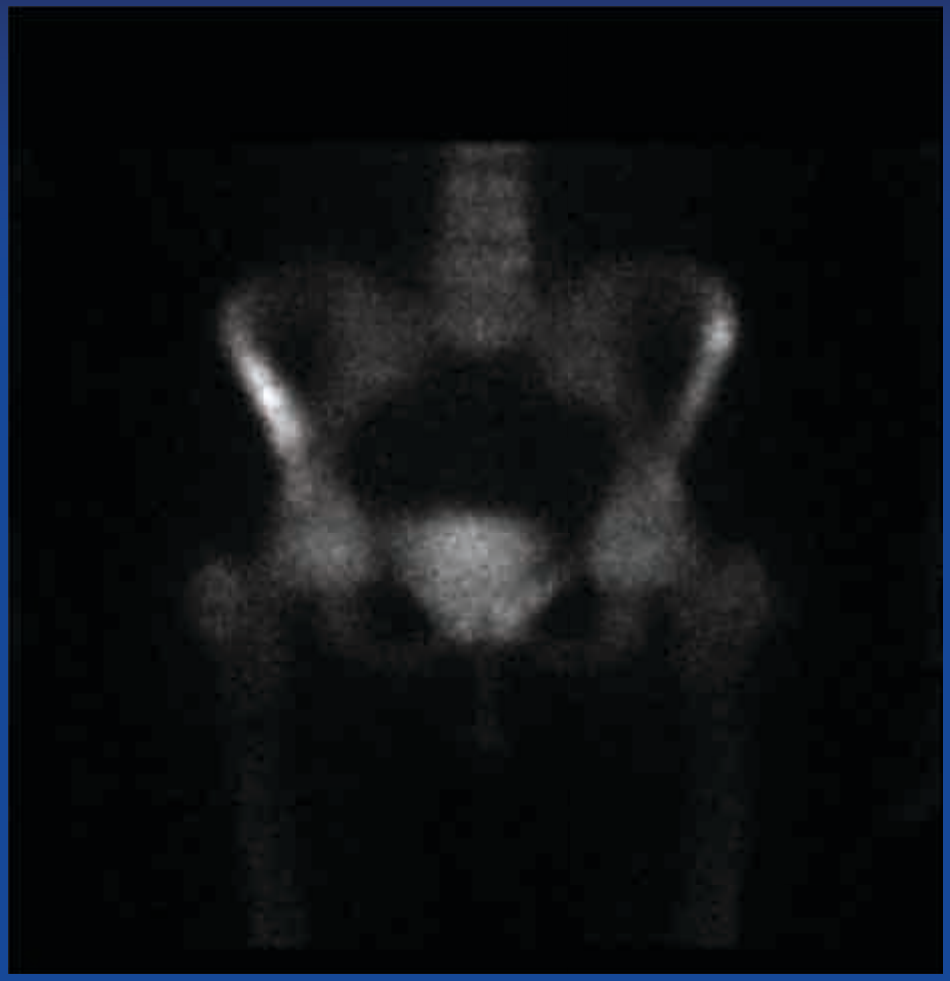


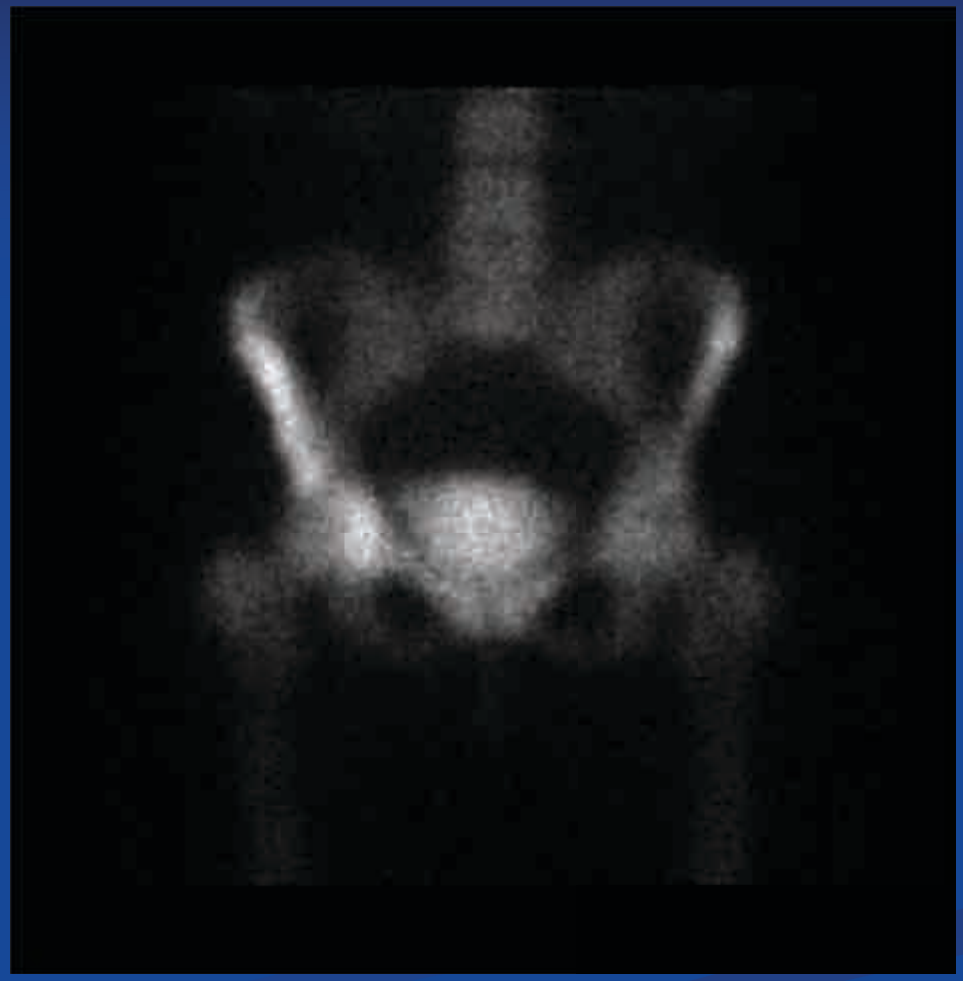






4/09/2009

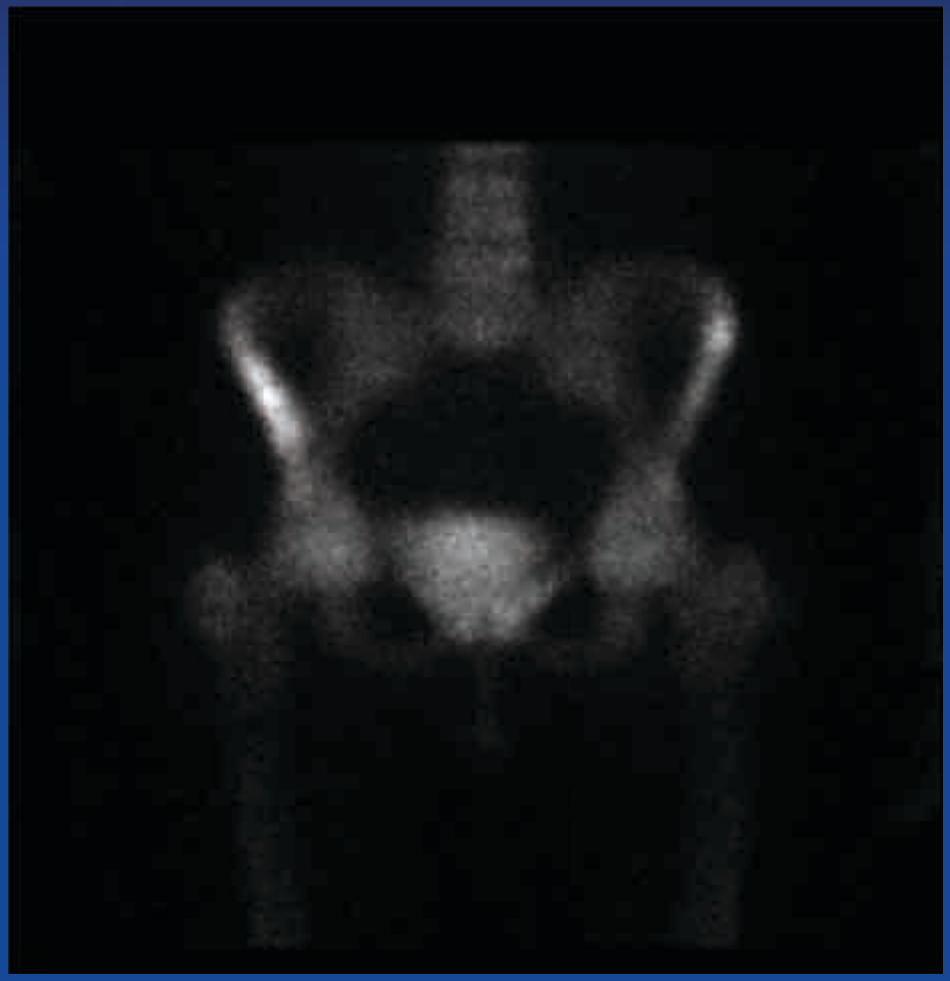




7/21/2008

4/09/2009

Interval increase in intensity in right anterior iliac focus suggestive of worsening of metastatic disease.



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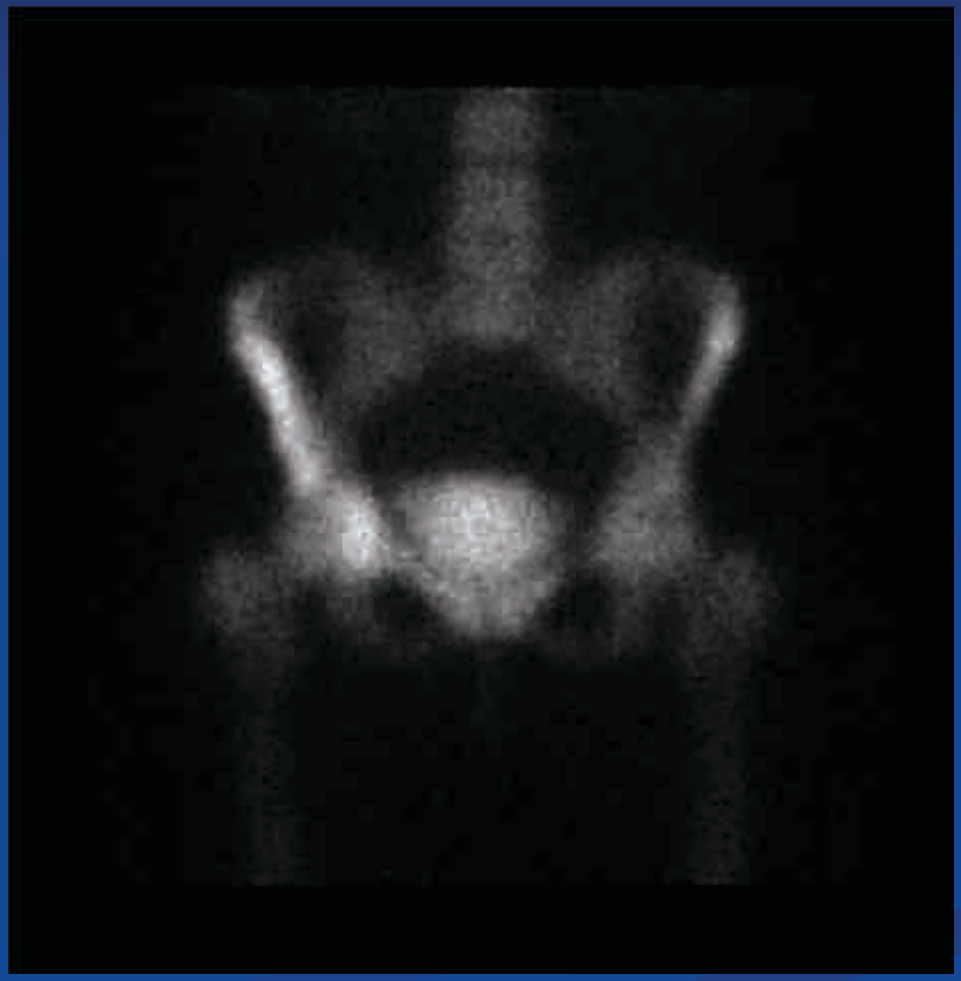
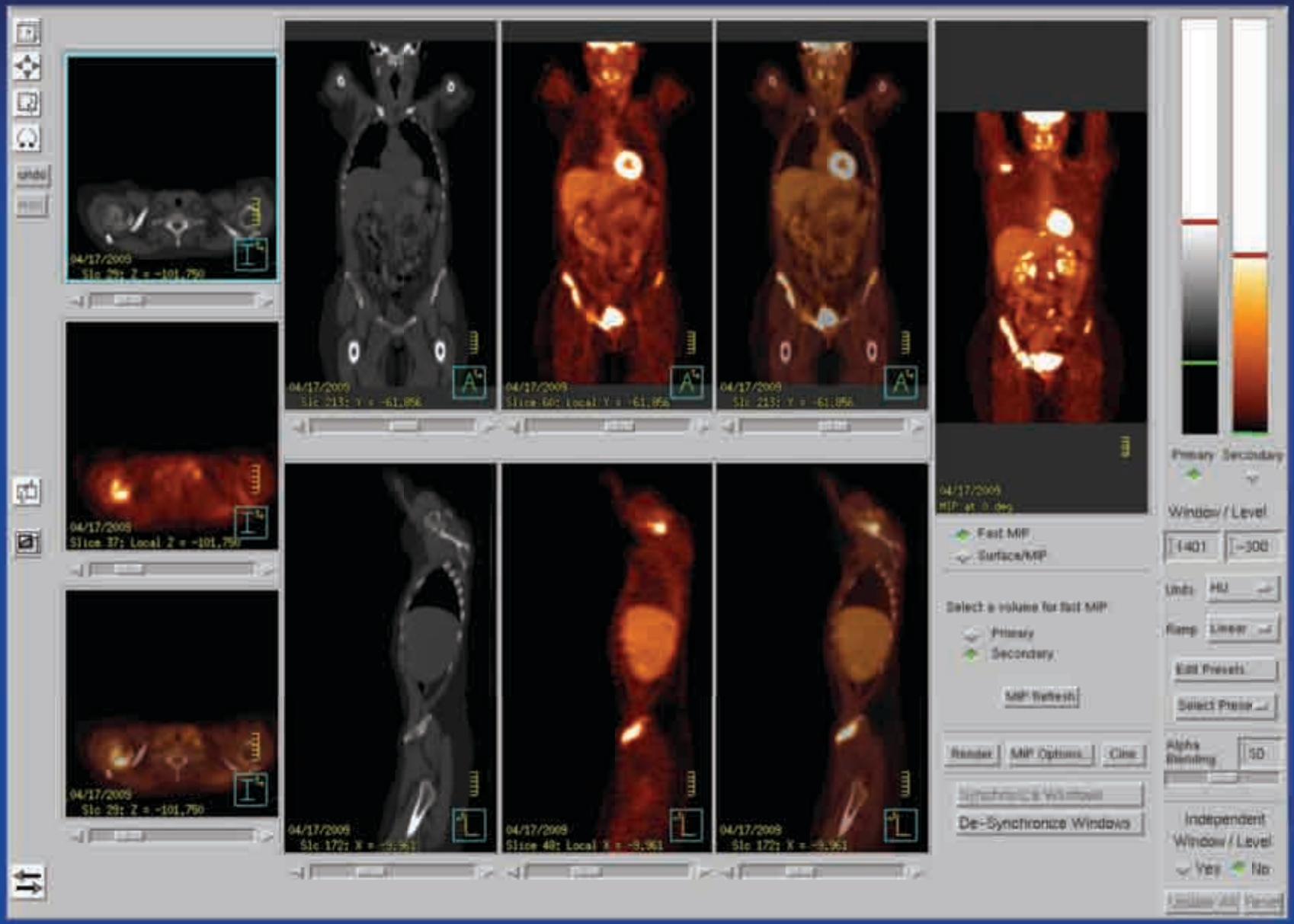


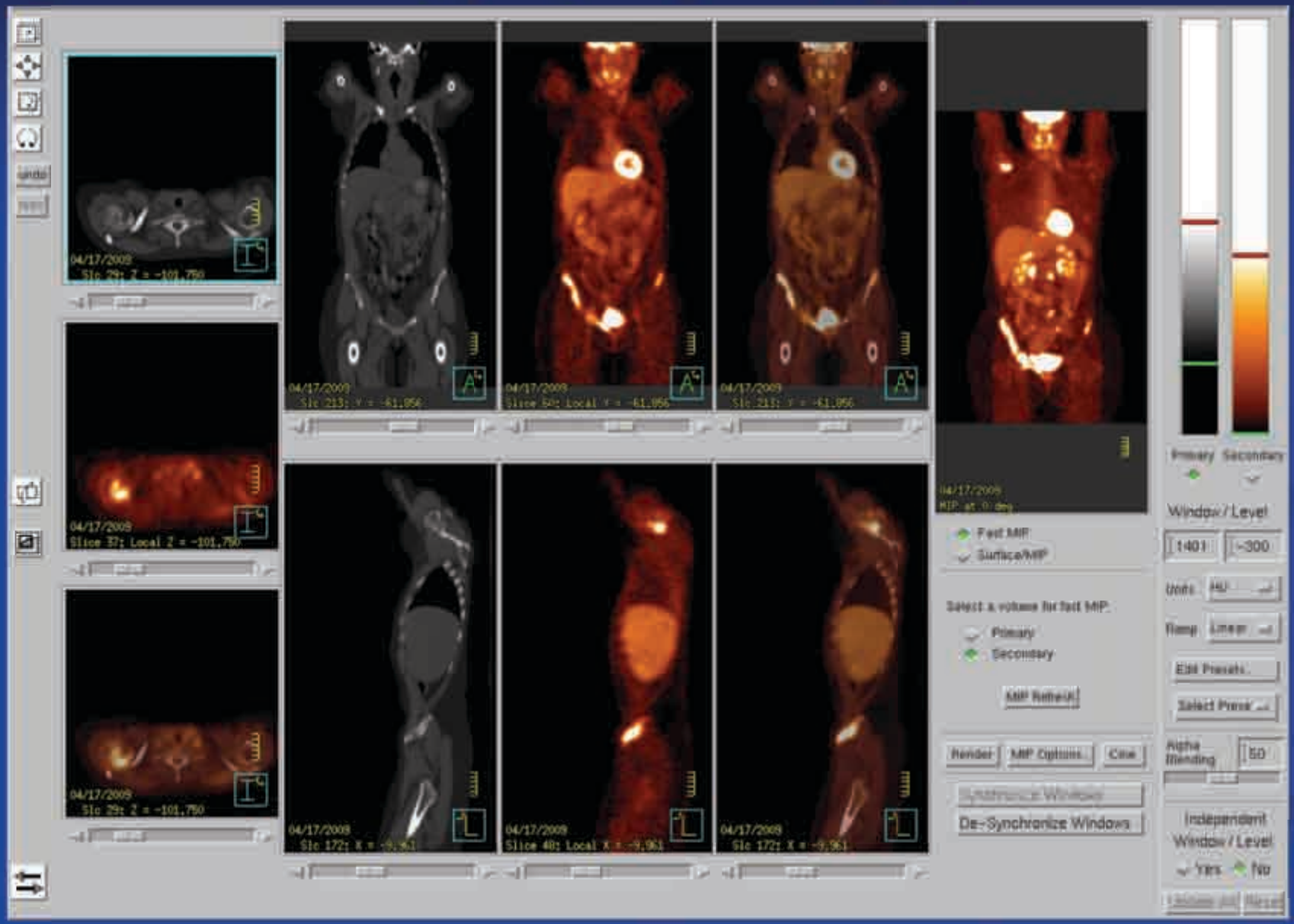
4/09/2009

- She had an MRI of her hips performed at Borg and Ide Imaging, which revealed multiple abnormal signal intensities in the pelvic bones and hips, right greater than left, which was highly concerning for metastatic disease.
- Next step? (Hint: restaging)



4/17/2009

Hypermetabolic foci of metastatic disease in the bilateral shoulders, right humeral head, spine, and pelvis, right greater than left.



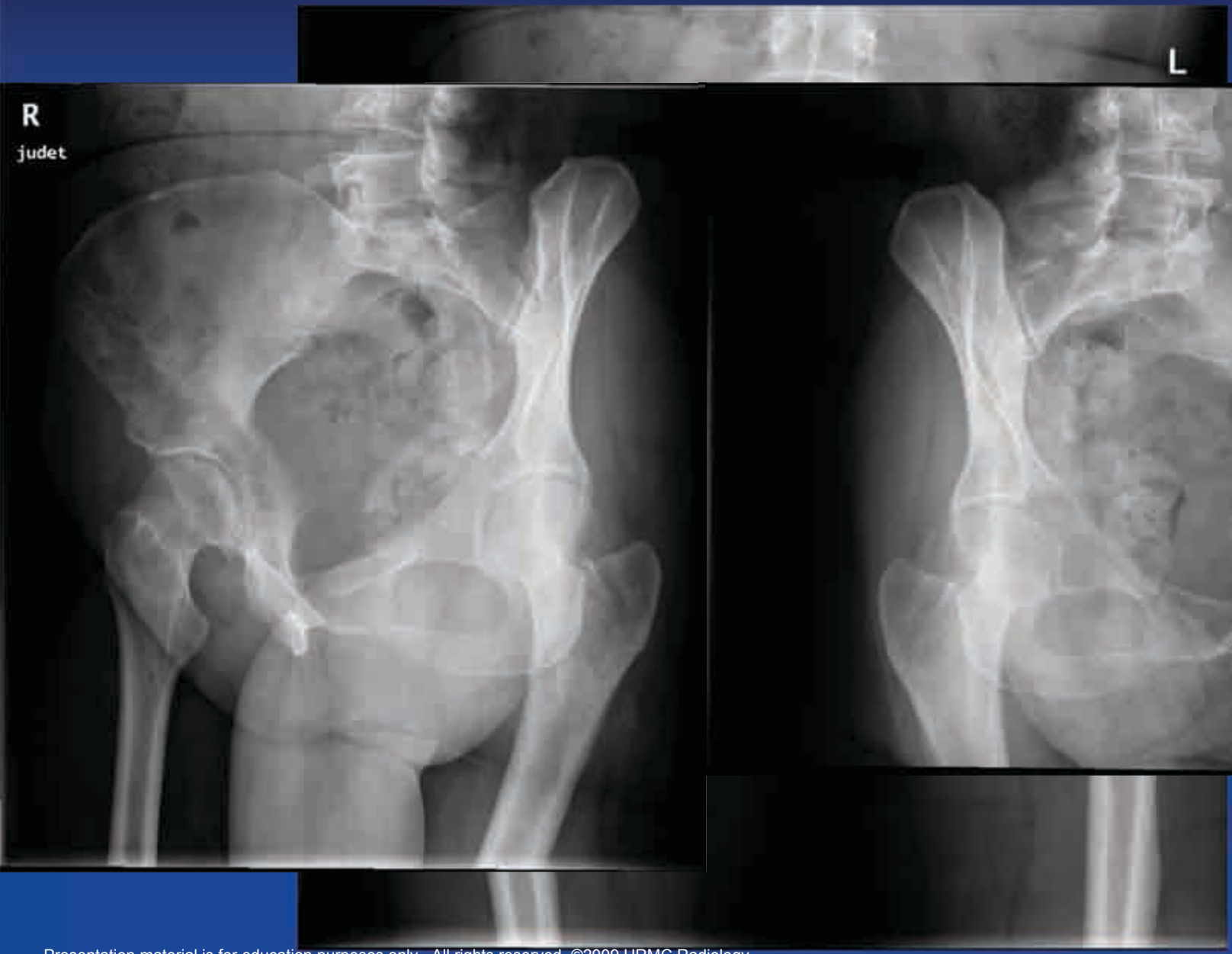
4/17/2009

Differential Diagnosis

- Metastatic breast cancer
- Metastatic breast cancer
- Metastatic breast cancer
- …
- Infection/Inflammation (sarcoid, degenerative)
- Trauma
- Second primary neoplasm (thyroid, lung, colon)

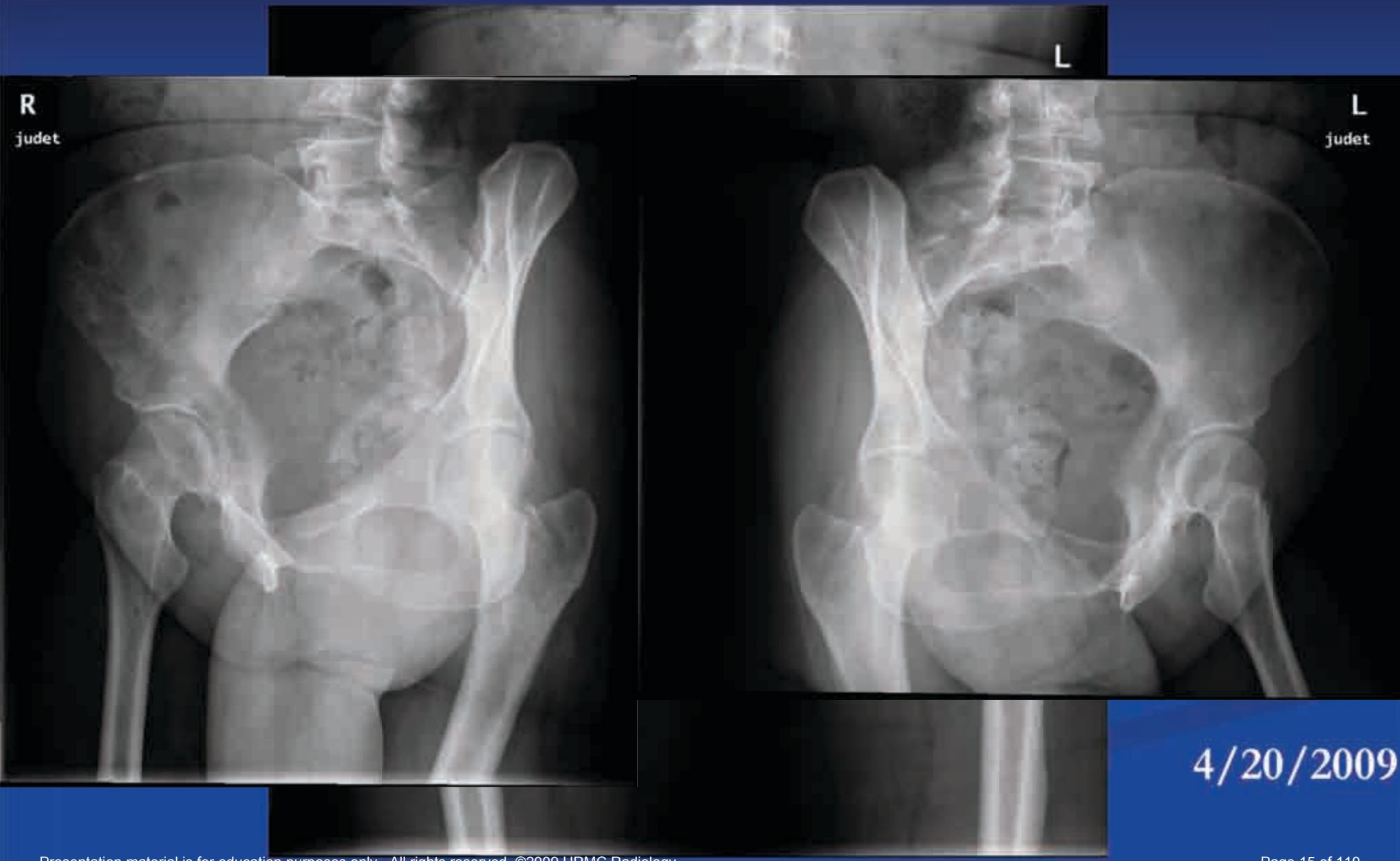
- Orthopedic surgeon consulted for consideration of surgery for stabilization of her pelvis
- He requested plain films and a CT scan of the pelvis (with 3 mm cuts) – note the recent PET-CT was done with 5 mm slices – to look for fracture

4/20/2009



4/20/2009

Increased sclerosis of the right acetabulum and lateral ileum and two sclerotic foci in the proximal right femur consistent with metastases.



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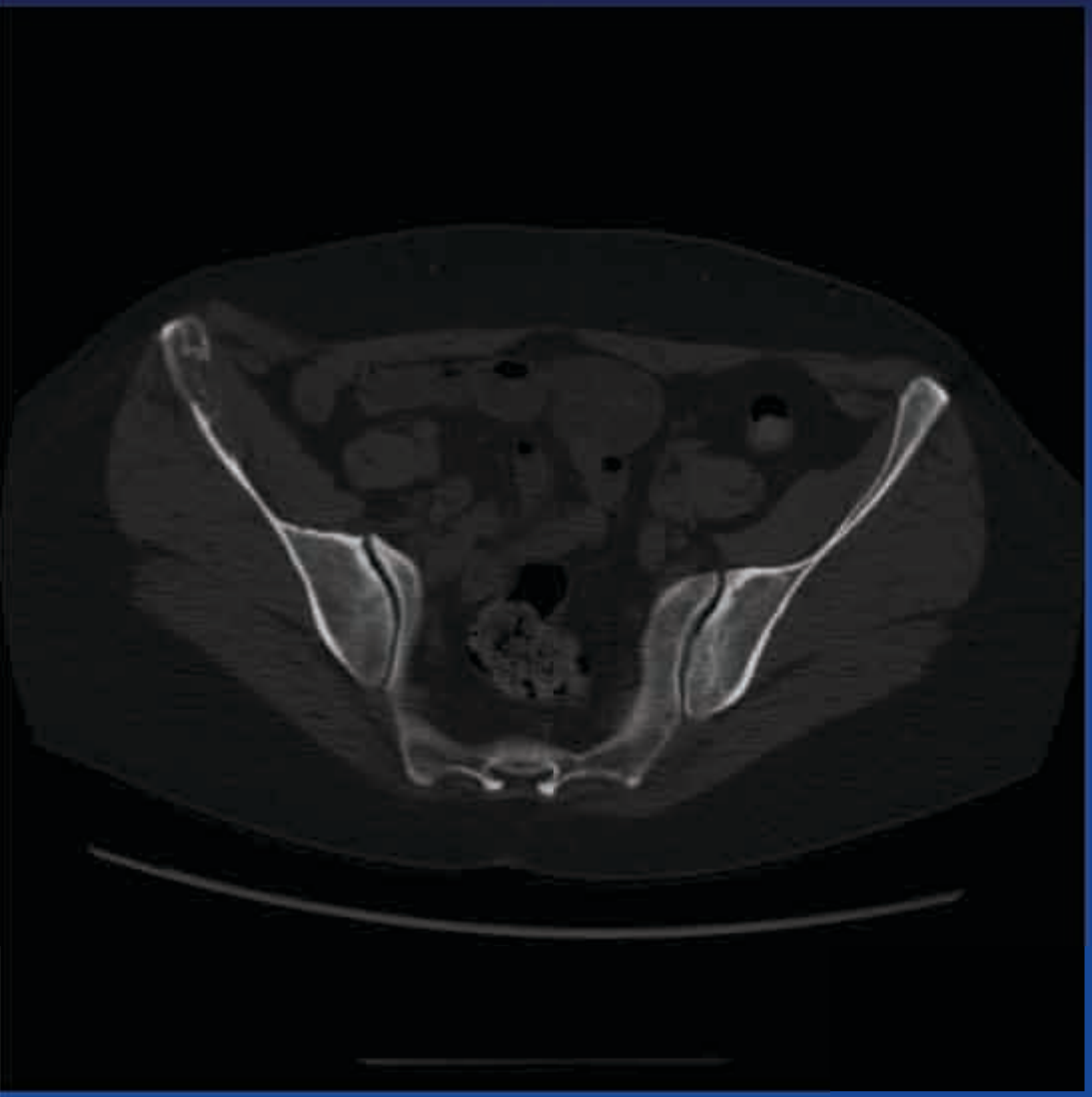

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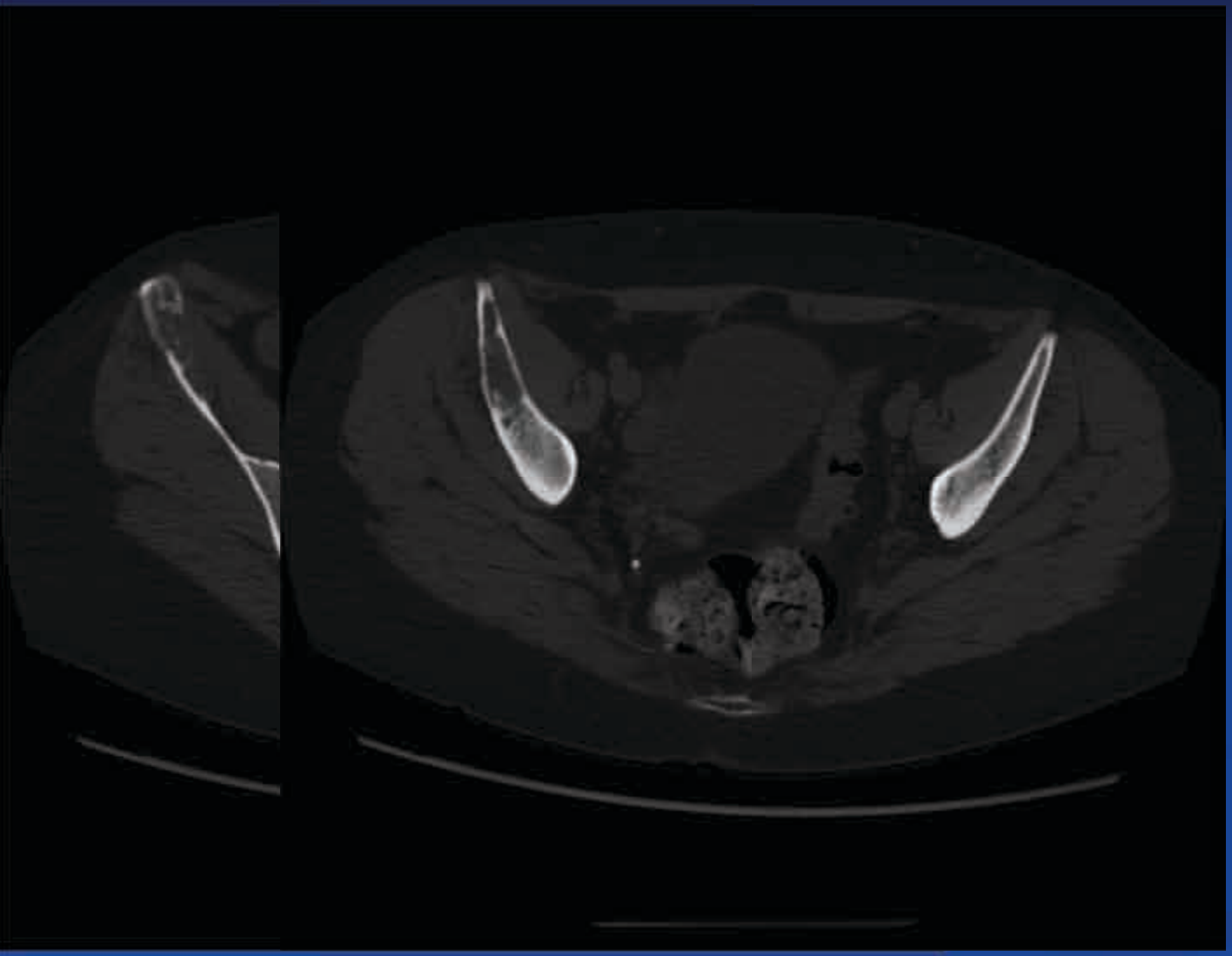

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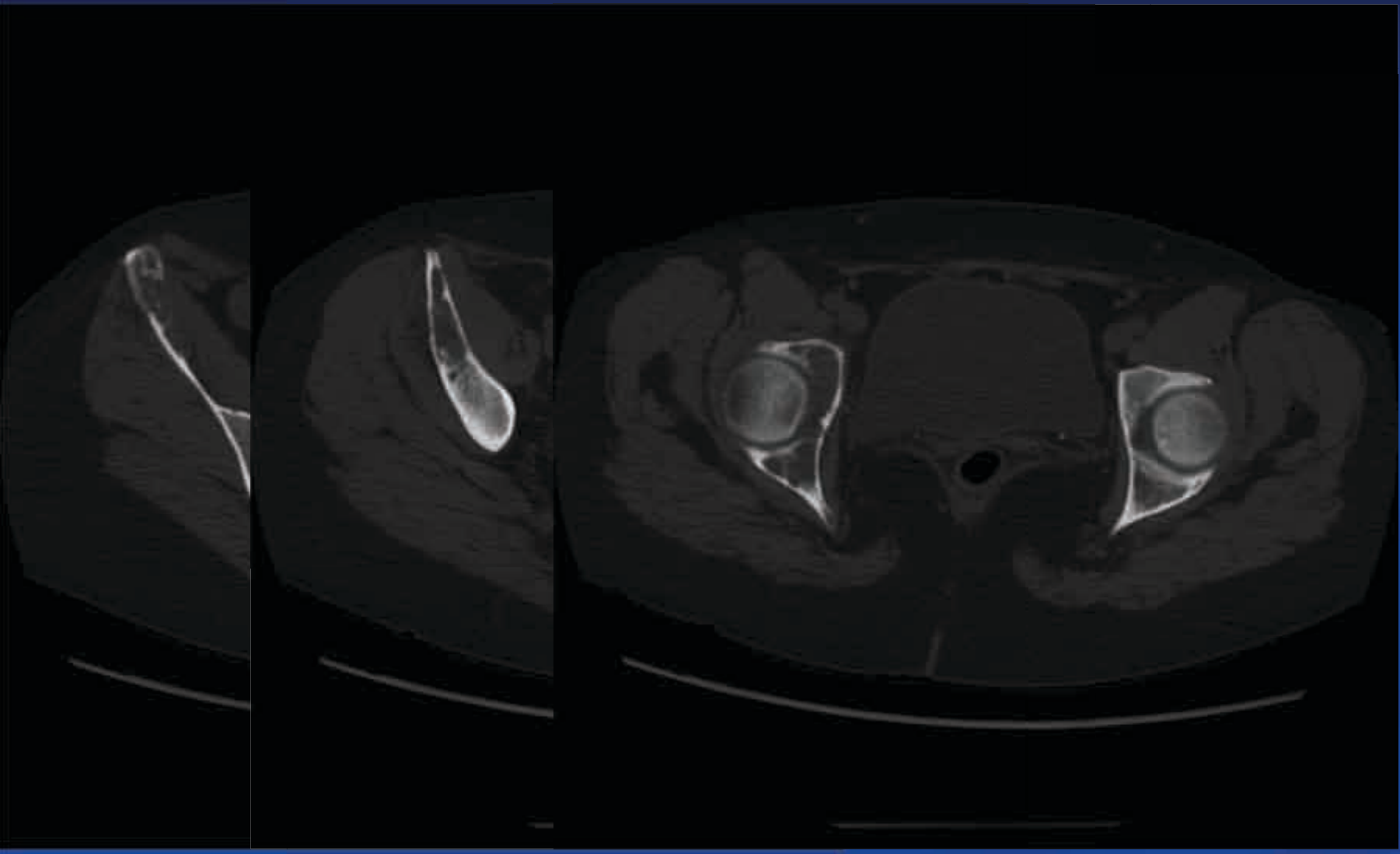

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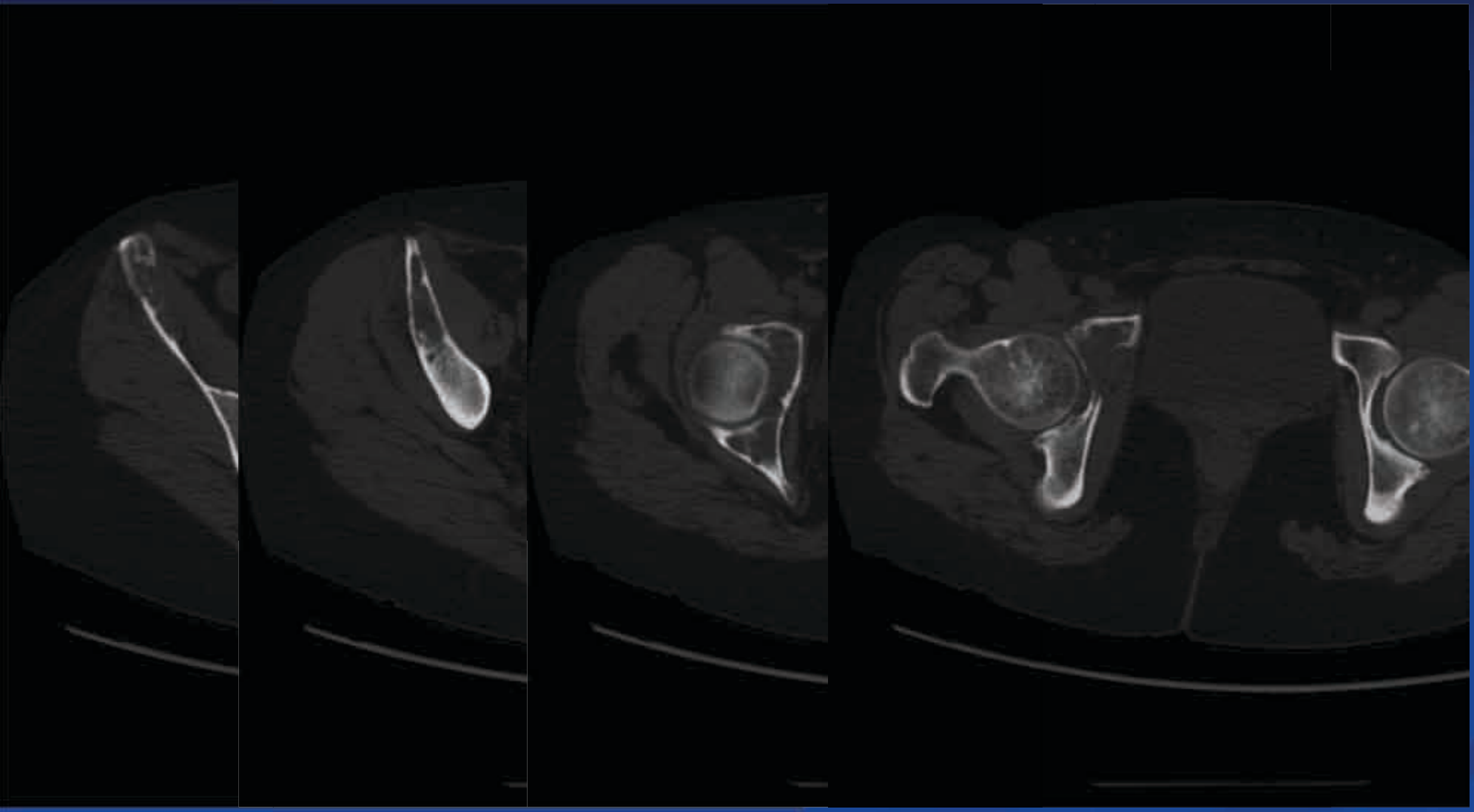
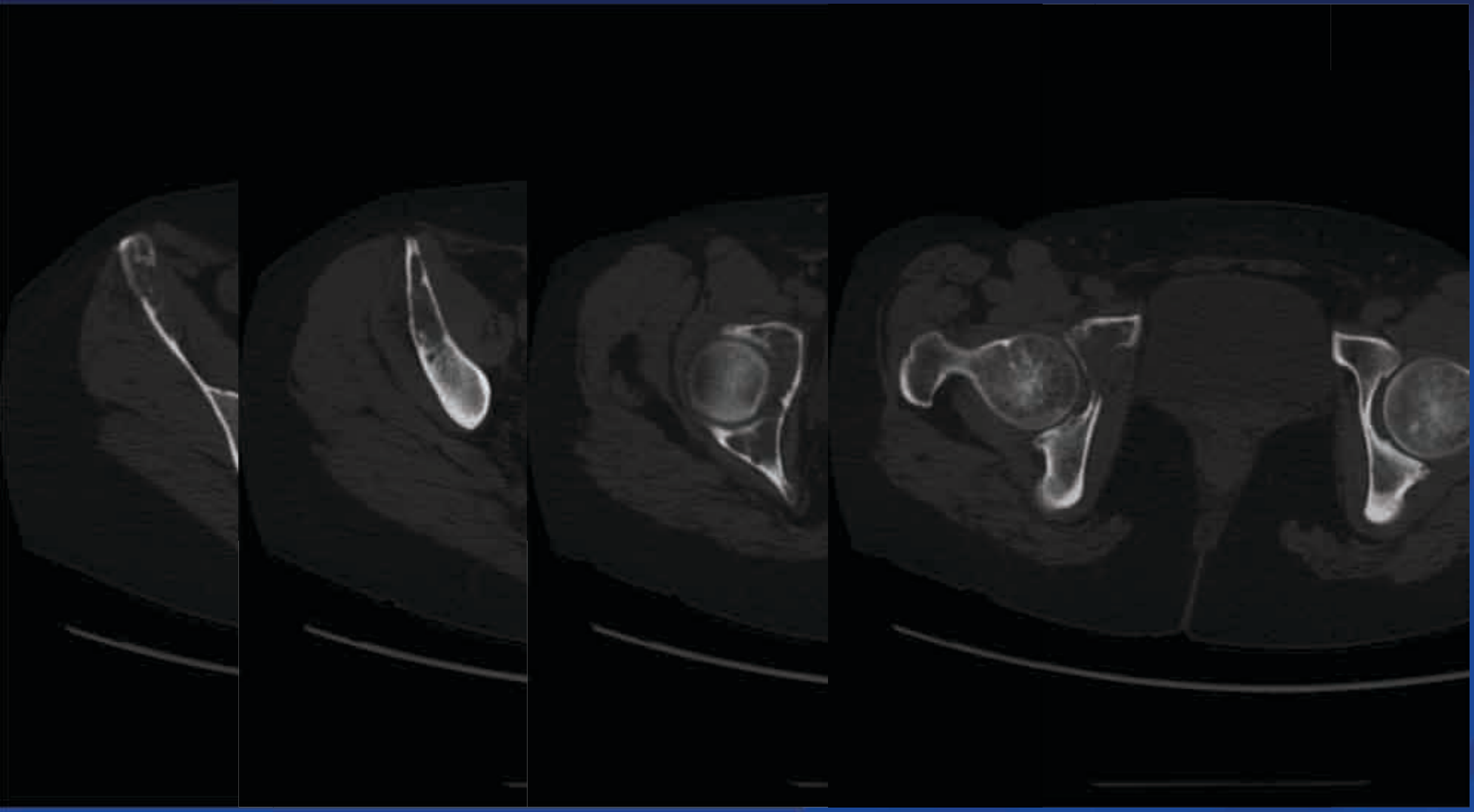


4/21/2009

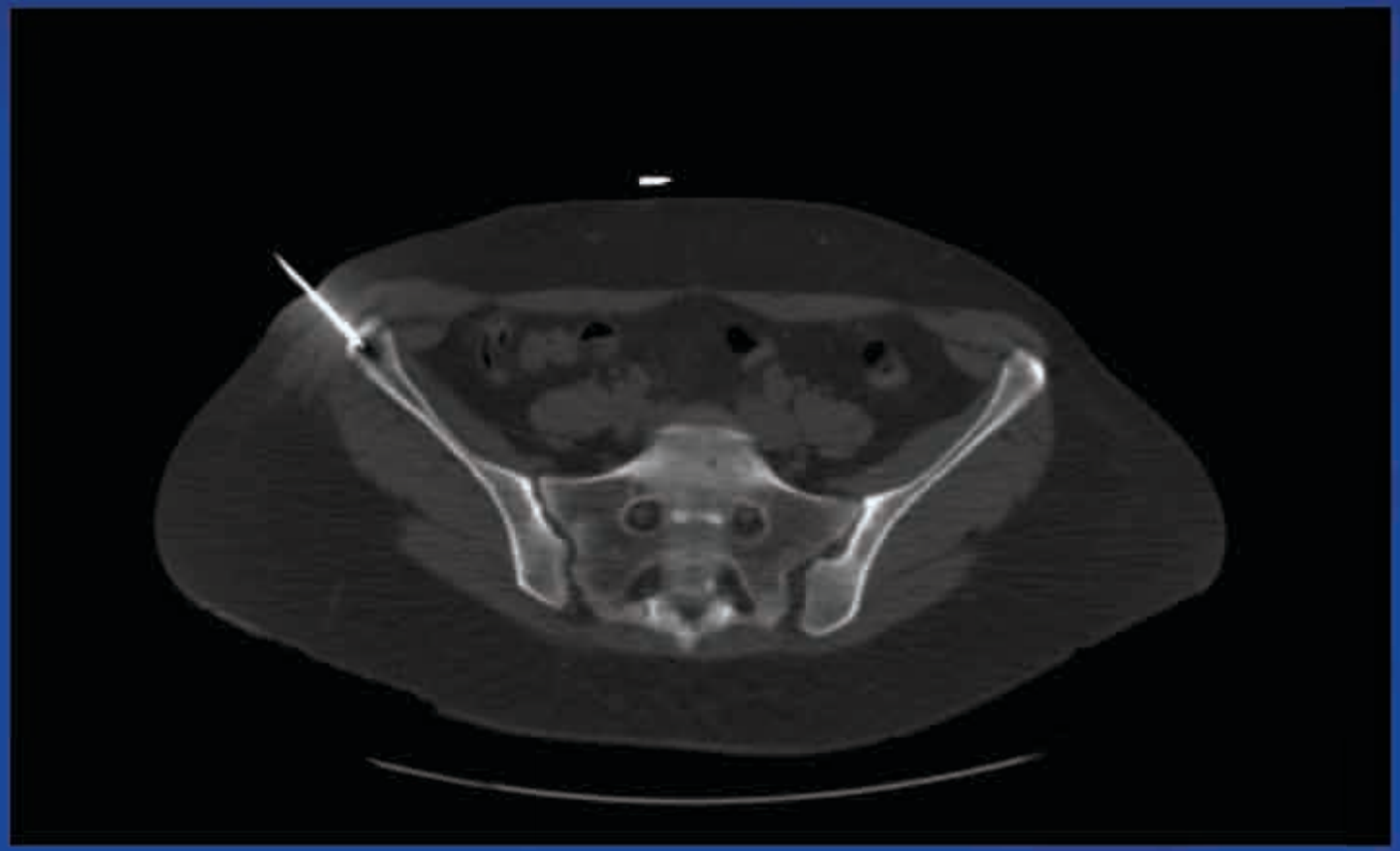
Pelvic bone metastases.



4/21/2009

- Since extensive mets, ortho suggested to first undergo radiation treatment to decrease her pain and for disease control given that there are no imminent fractures.
- Heme/Onc requested a biopsy to confirm not only breast cancer but more so to confirm receptor status and particularly HER2/neu positivity

Fine needle aspiration and core biopsy of right anterior iliac wing lesion submitted to pathology.



4/29/2009

Radiology / Pathology Conference

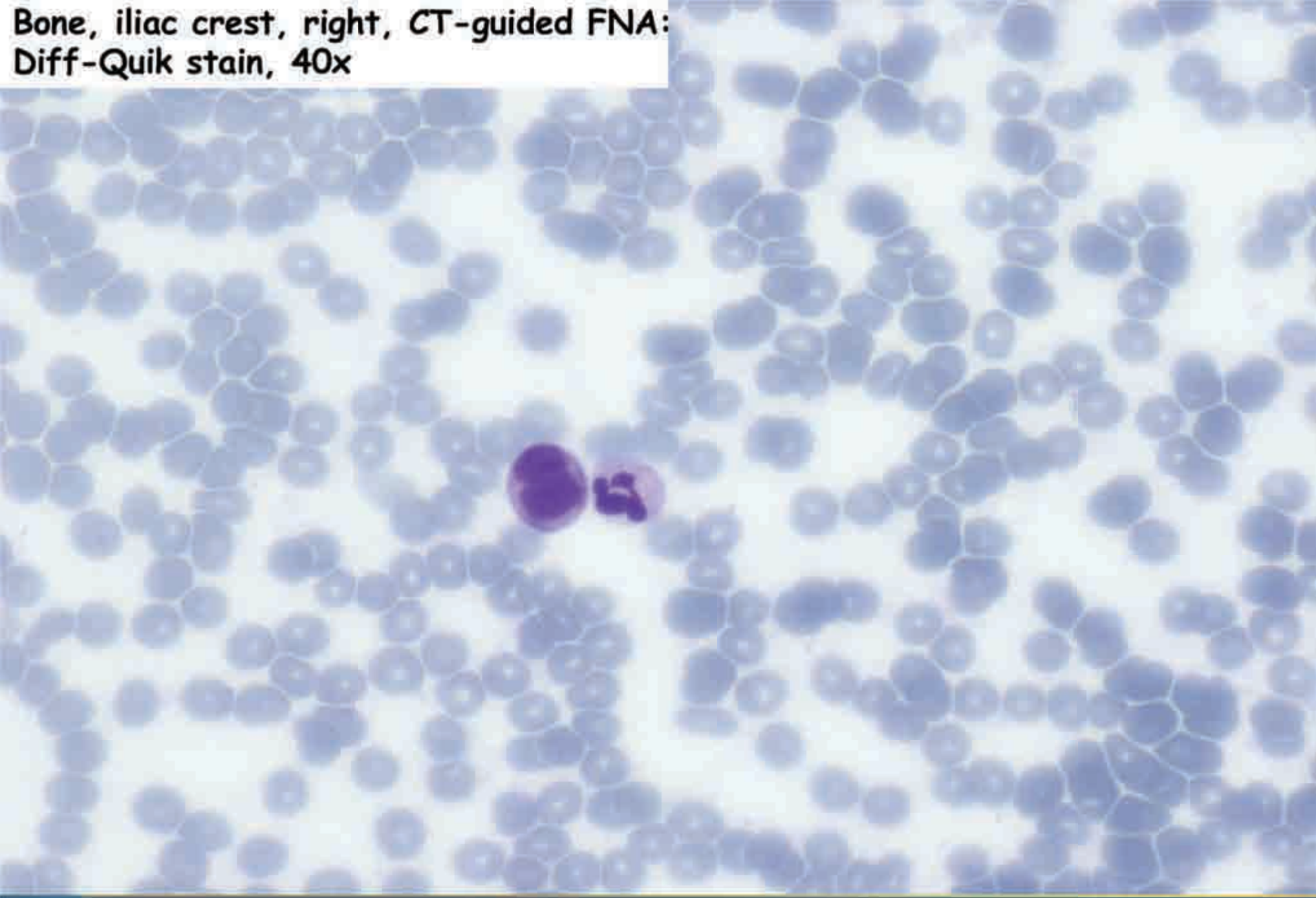
Stacie Canacci, M.D.

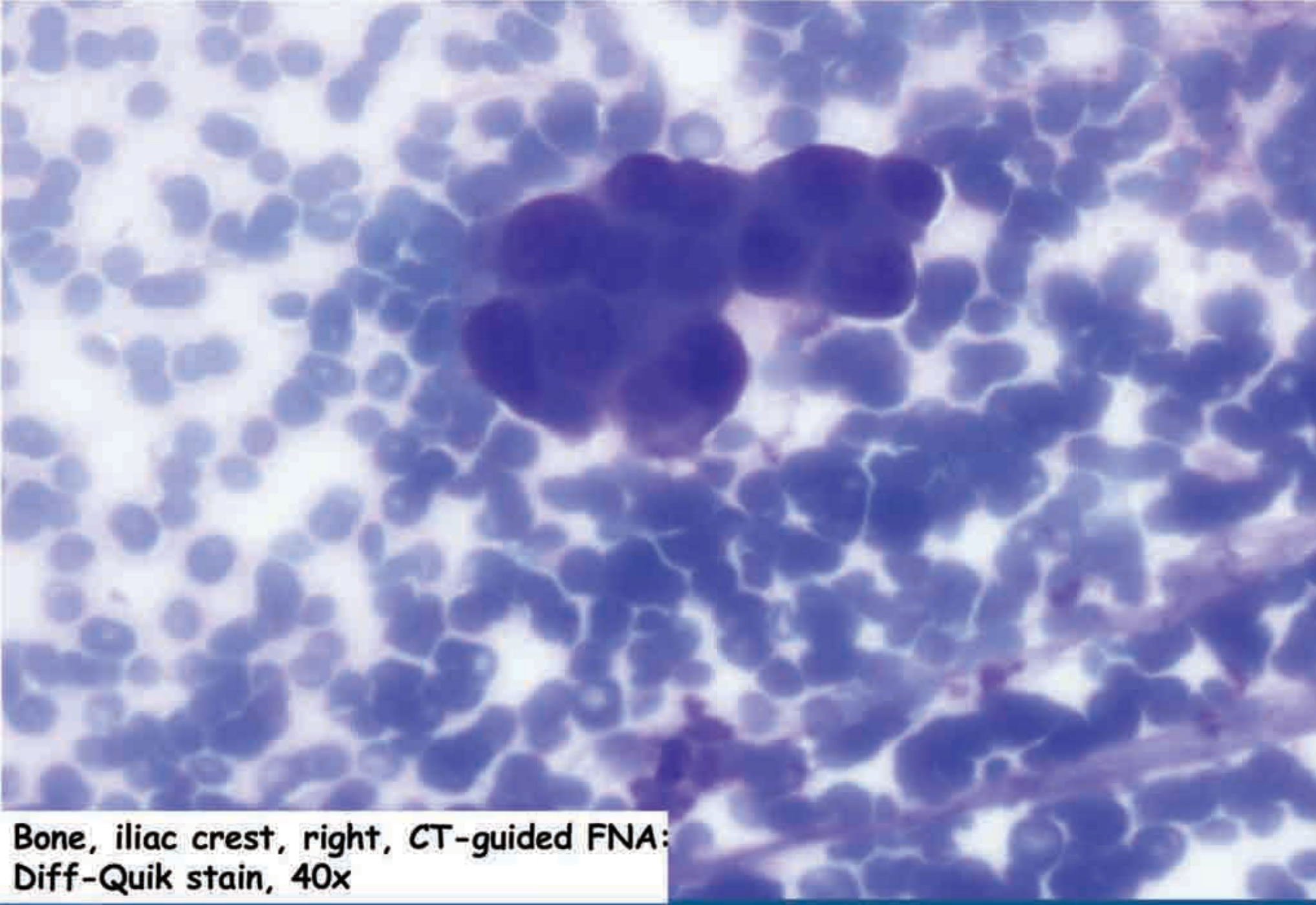
MEDICINE of THE HIGHEST ORDER

UNIVERSITY of ROCHESTER MEDICAL CENTER

Case 1

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

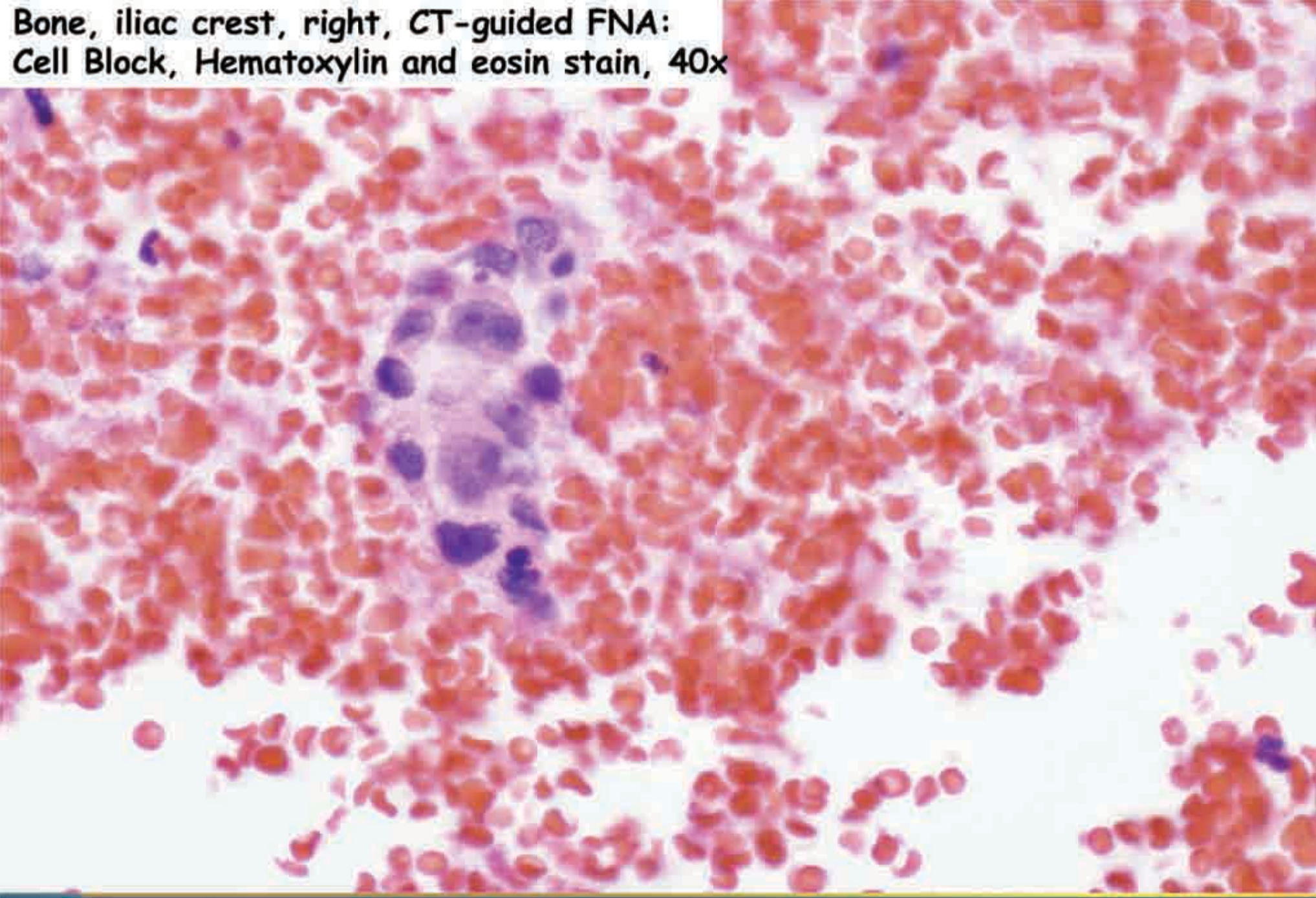




Bone, iliac crest, right, CT-guided FNA:
Diff-Quik stain, 40x

Bone, iliac crest, right, CT-guided FNA:
Cell Block, Hematoxylin and eosin stain, 40x

Bone, iliac crest, right, CT-guided FNA:
Cell Block, Hematoxylin and eosin stain, 40x



Bone, iliac crest, right, CT-guided fine needle aspiration:

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

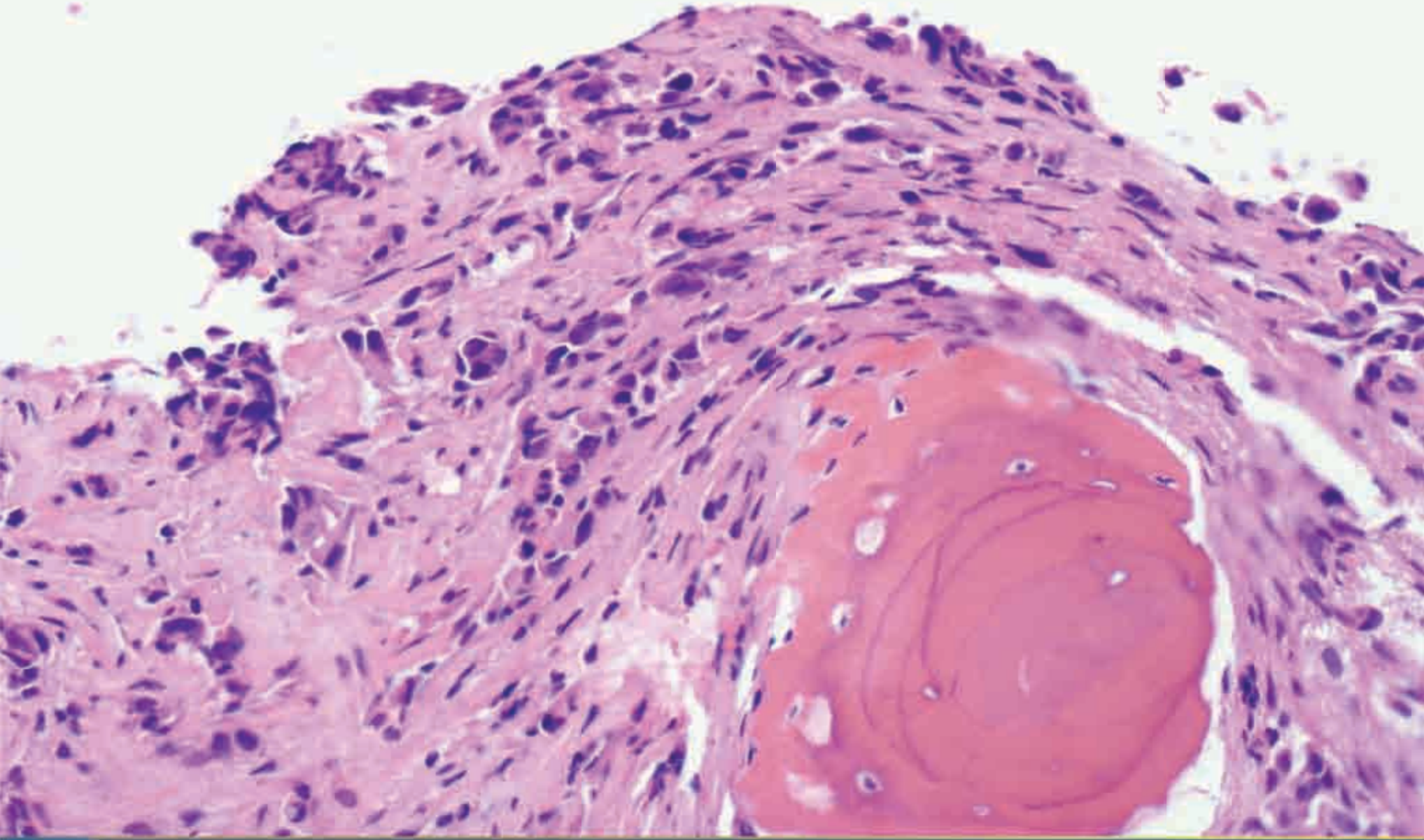
Cell block and cytologic preparations examined.

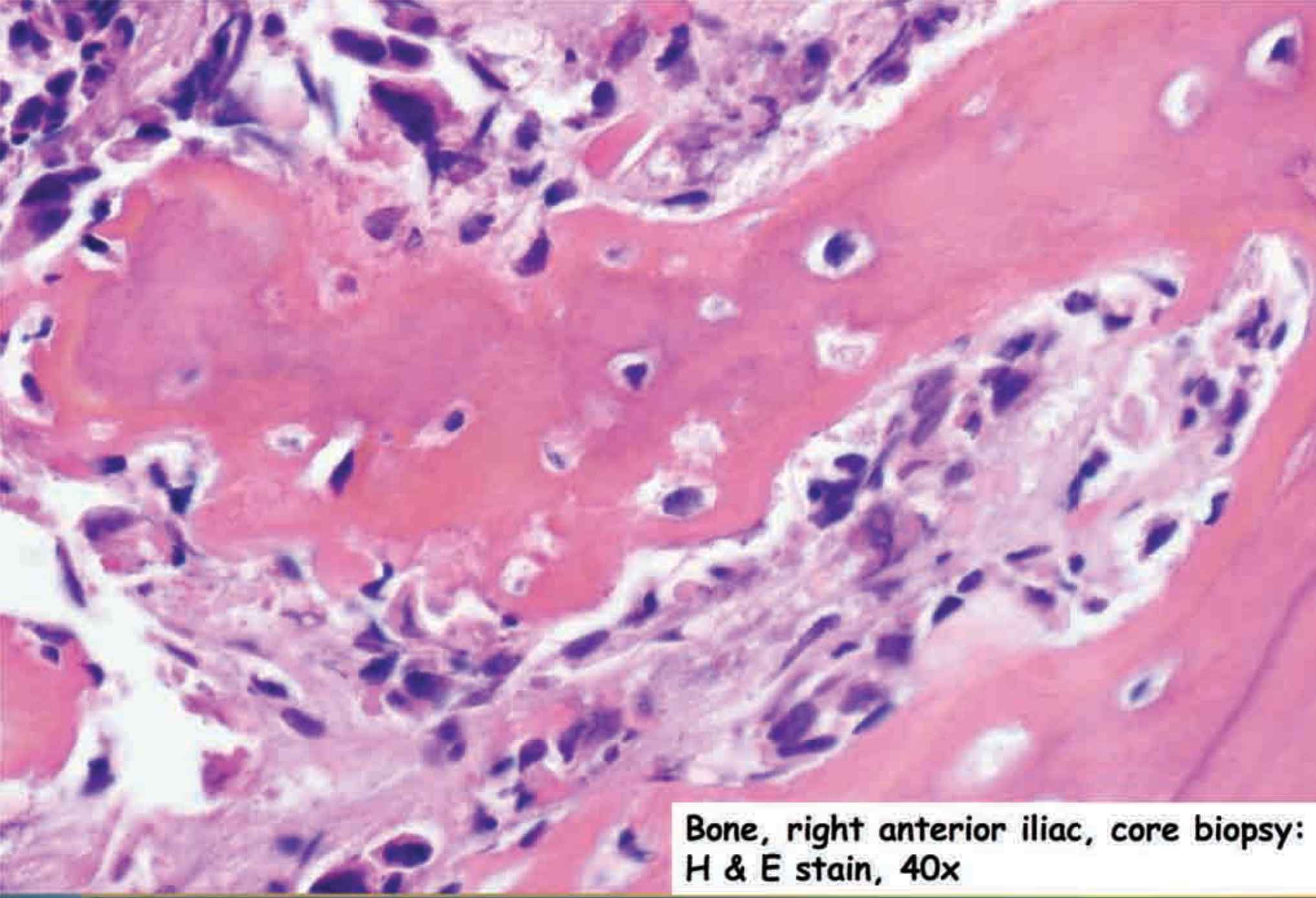
Bone right anterior iliac, core needle biopsy:

Metastatic carcinoma, consistent with breast primary.

Immunohistochemical stain for Estrogen receptor is moderately positive and a few cells are positive for Progesterone receptor. Her2 staining is negative.

Bone, right anterior iliac, core biopsy:
H & E stain, 20x





Bone, right anterior iliac, core biopsy:
H & E stain, 40x

Restaging Breast Cancer

- SUV measurements helpful in determining adequate response to chemotherapy:
  - Greater than 50% SUV reduction at 9 weeks accurately defined good clinical response
  - Greater than 55% response after one cycle also defined good response

Case 2

- 63 yo female with a history of pelvic tumor status post radiation therapy many years ago presents with radiation induced osteogenic sarcoma in the left hemipelvis.

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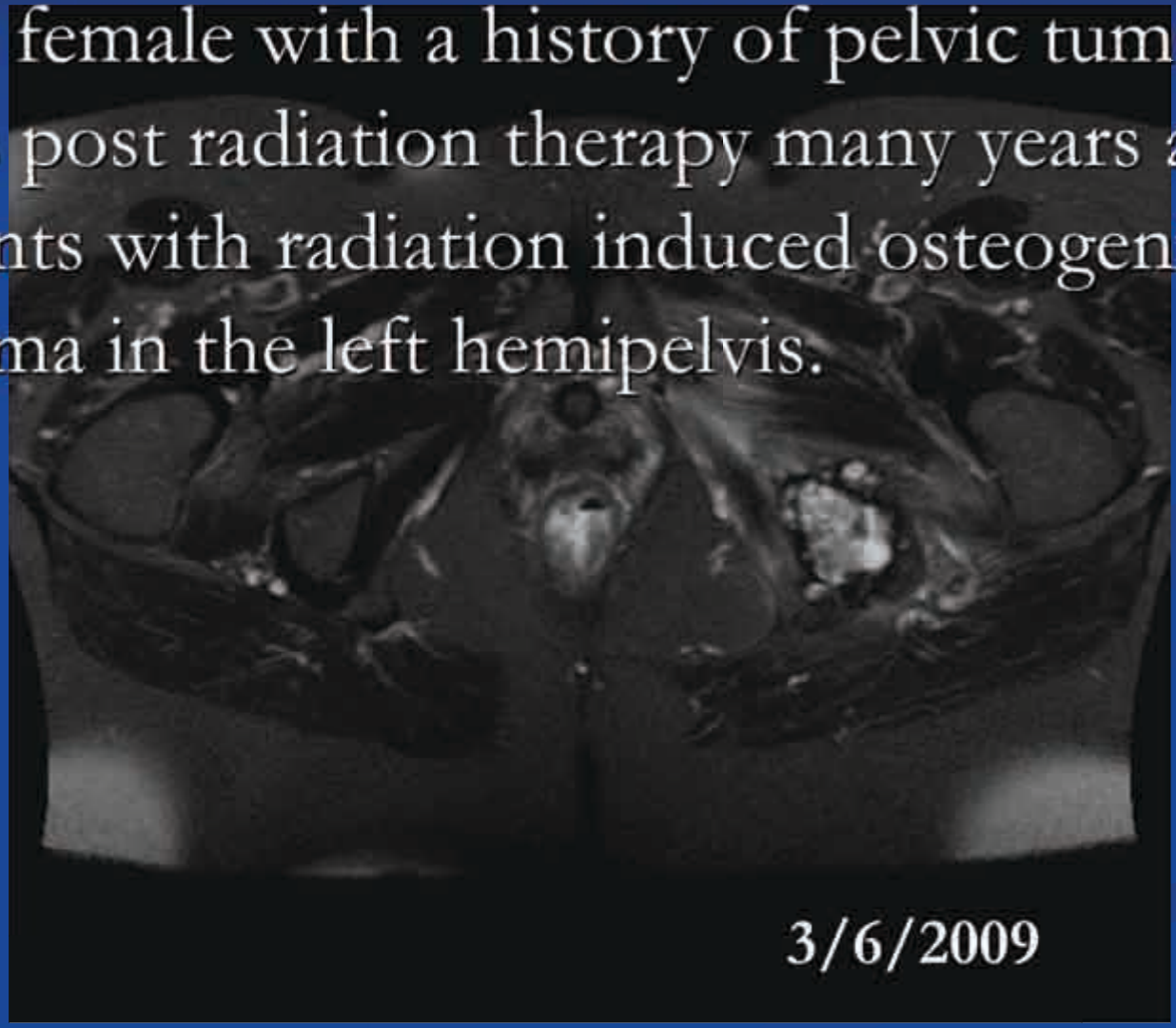
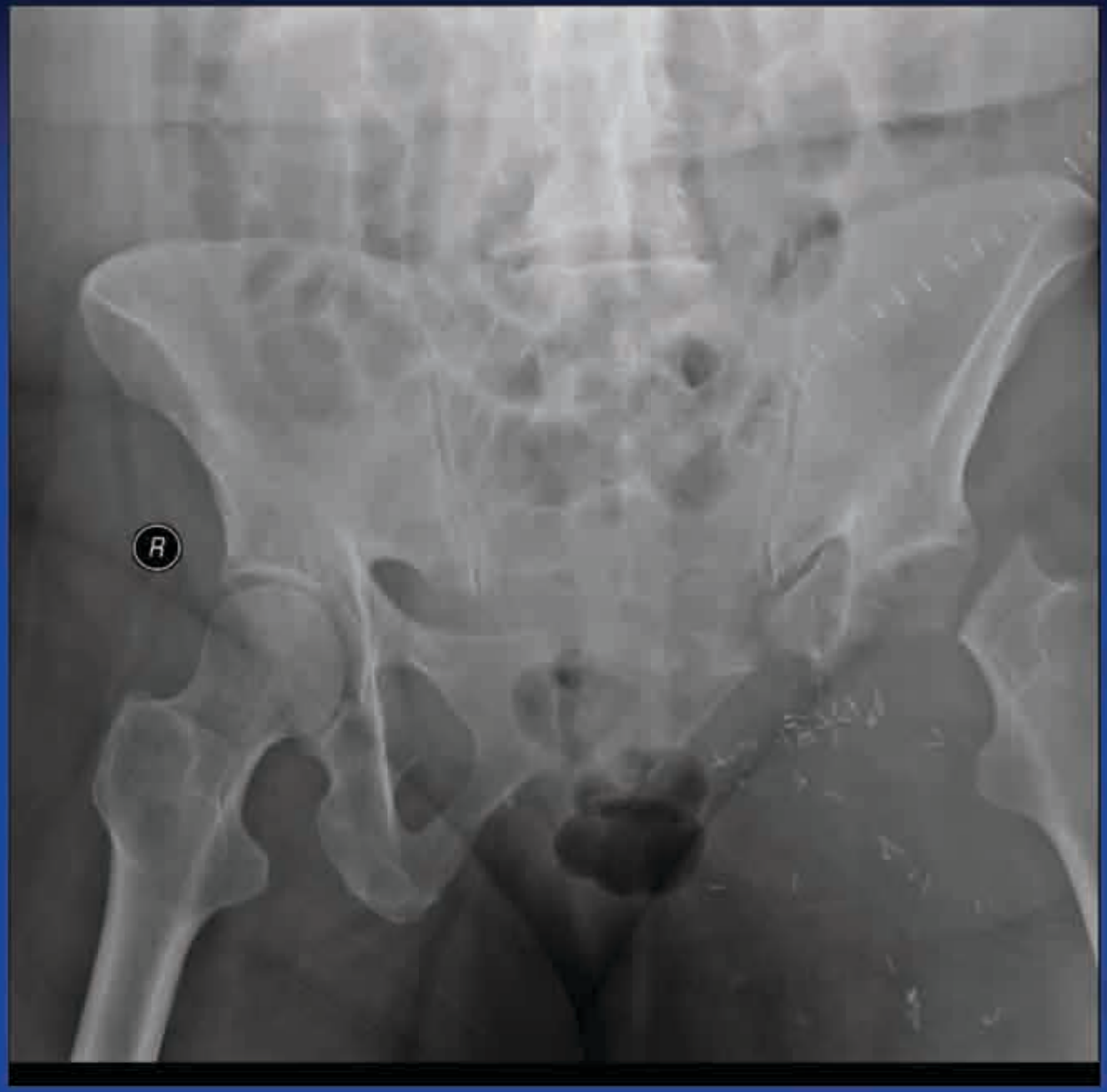
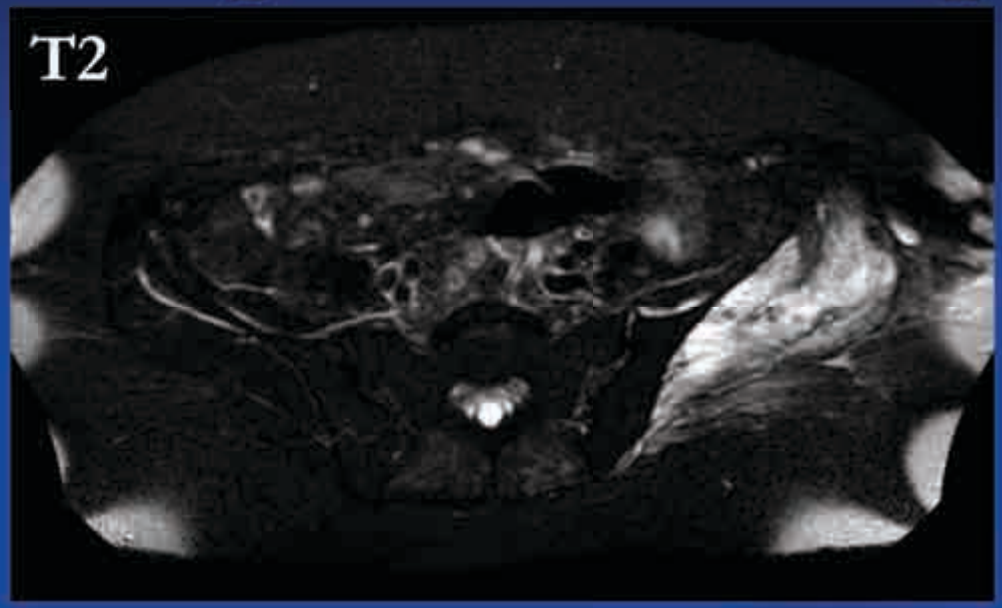


Case 2

- 63 yo female with a history of pelvic tumor status post radiation therapy many years ago presents with radiation induced osteogenic sarcoma in the left hemipelvis.
- Initial treatment performed at RGH consisted of chemotherapy with a poor response. She was transferred to Strong and underwent two surgical resections on 3/17/2009 and 3/27/2009.

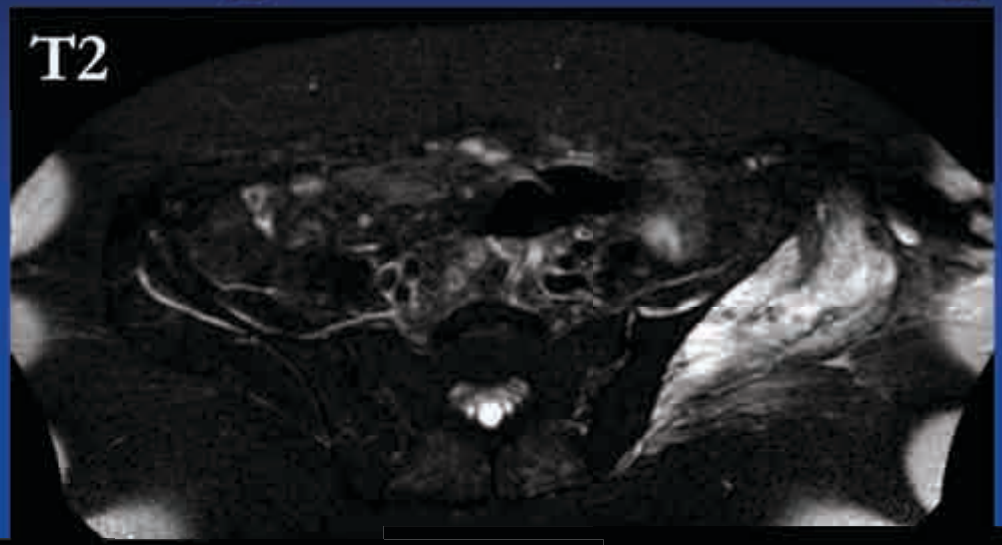


Follow-up MRI of the pelvis



5/1/2009

Follow-up MRI of the pelvis



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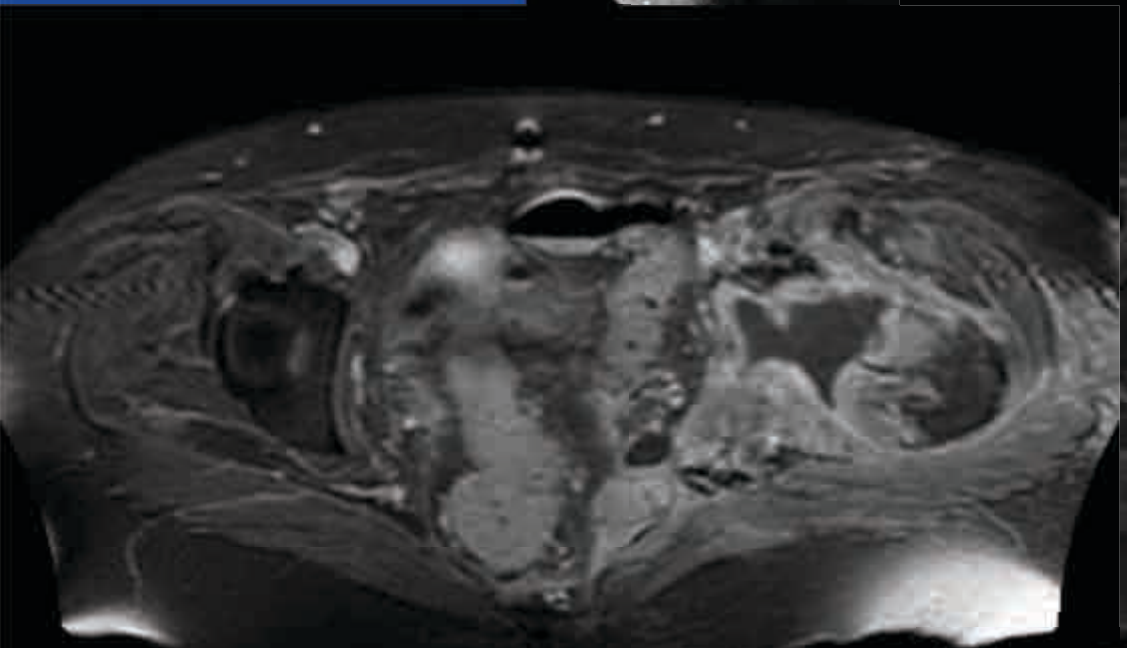
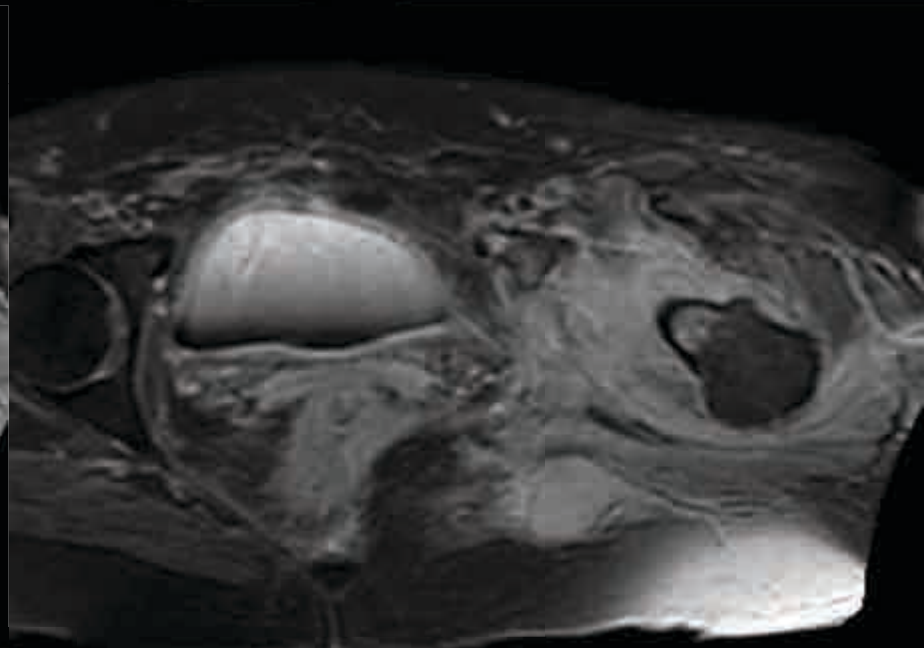
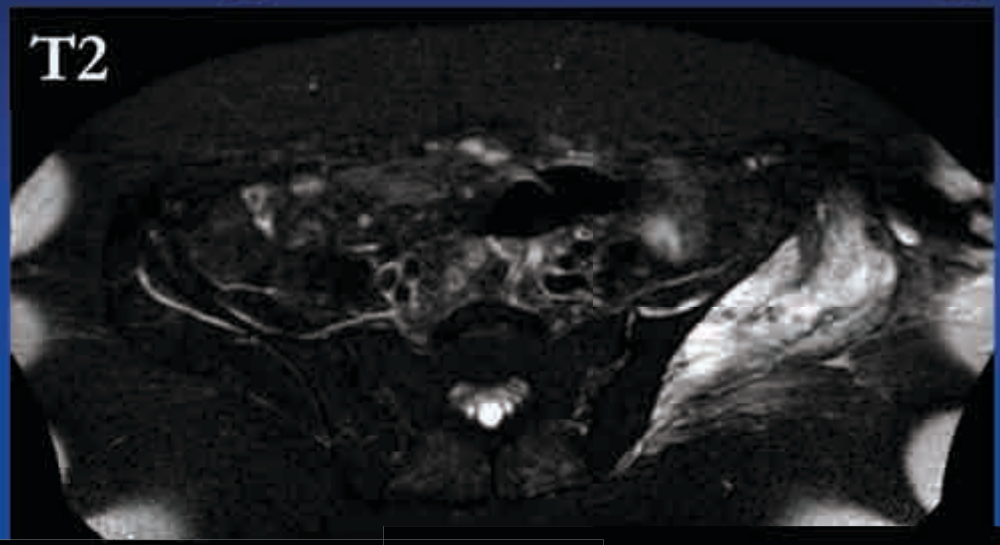




T1 + C

Follow-up MRI of the pelvis



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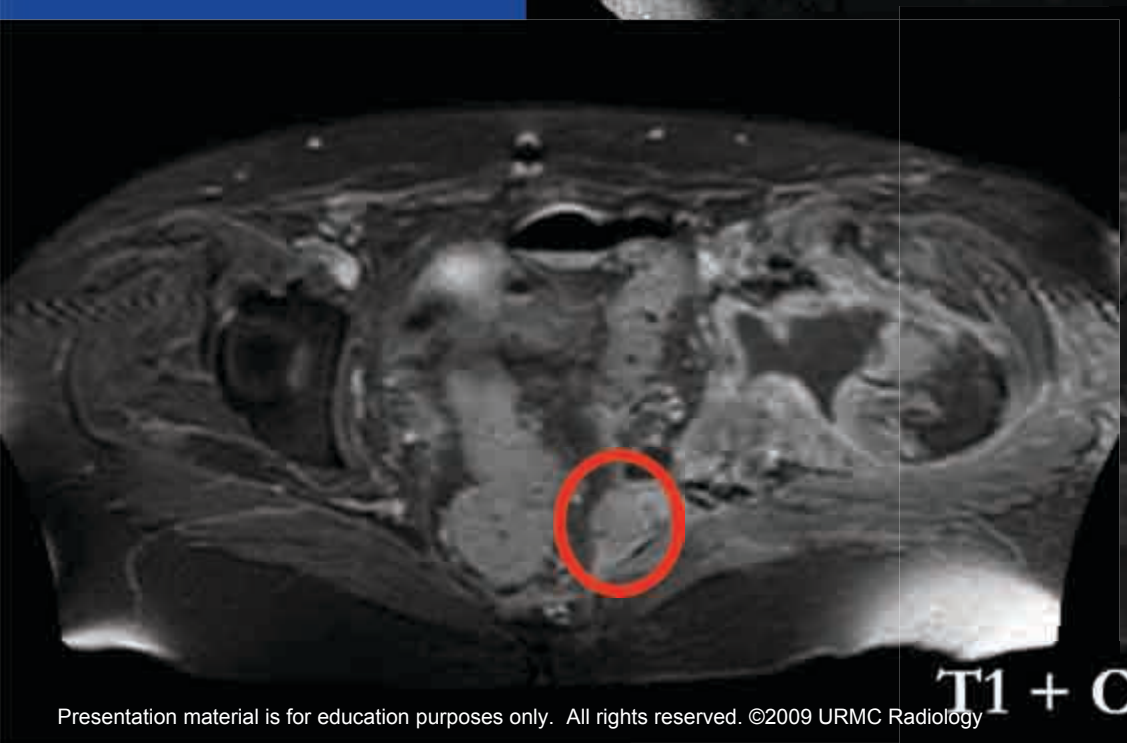
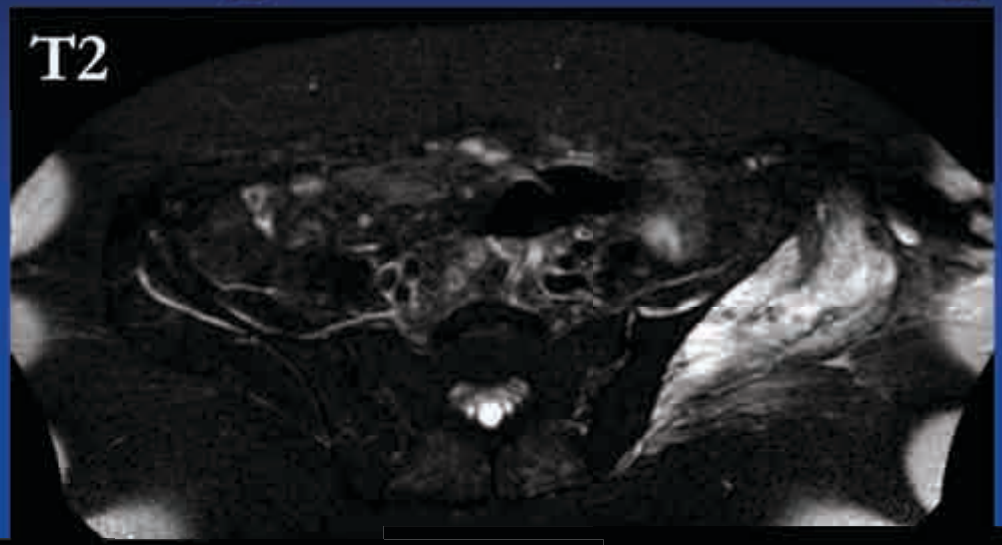


T1 + C

Follow-up MRI of the pelvis



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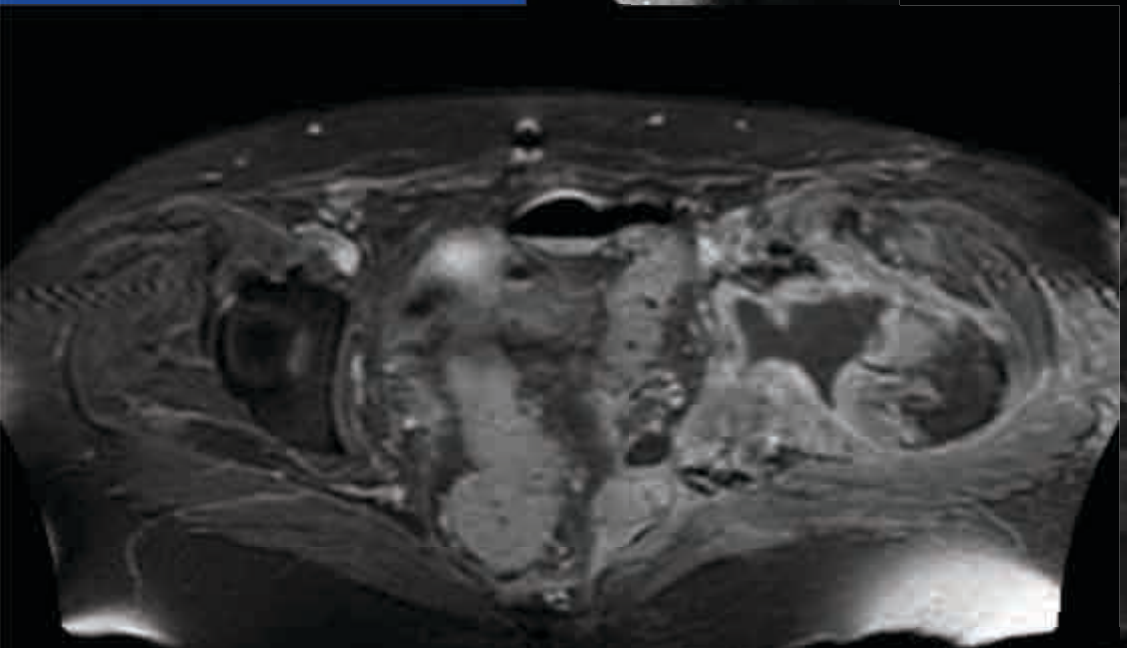
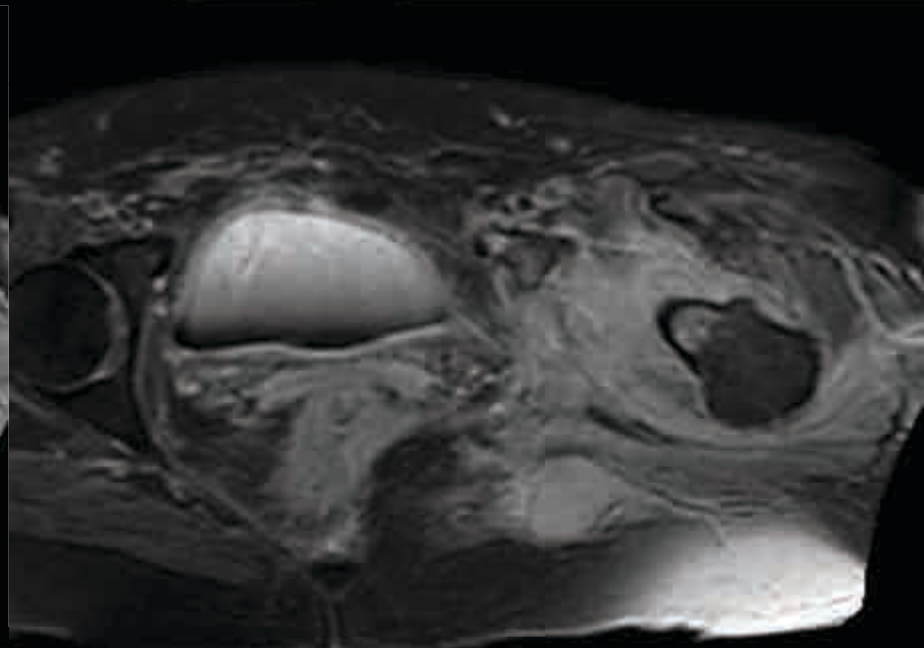
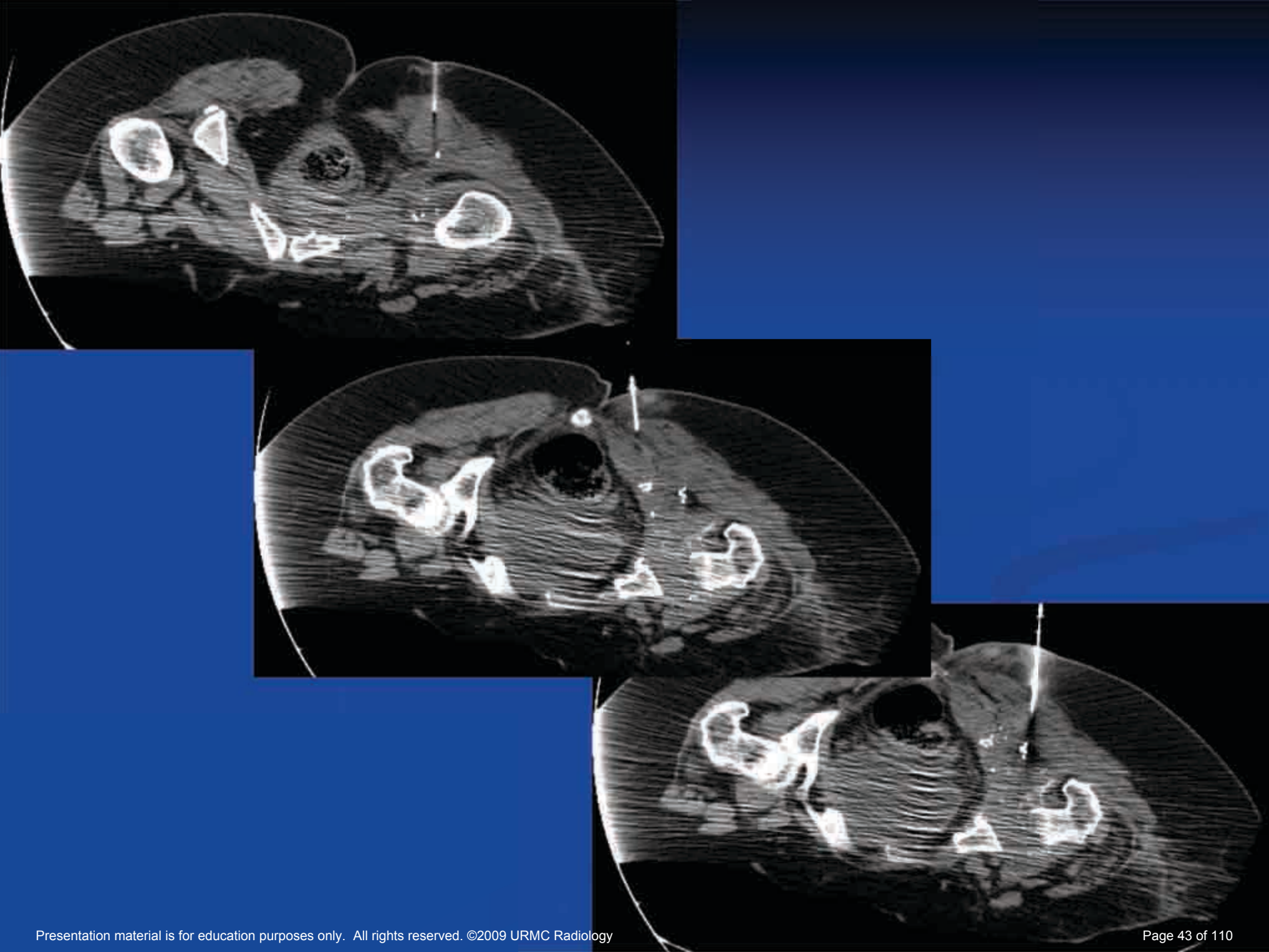




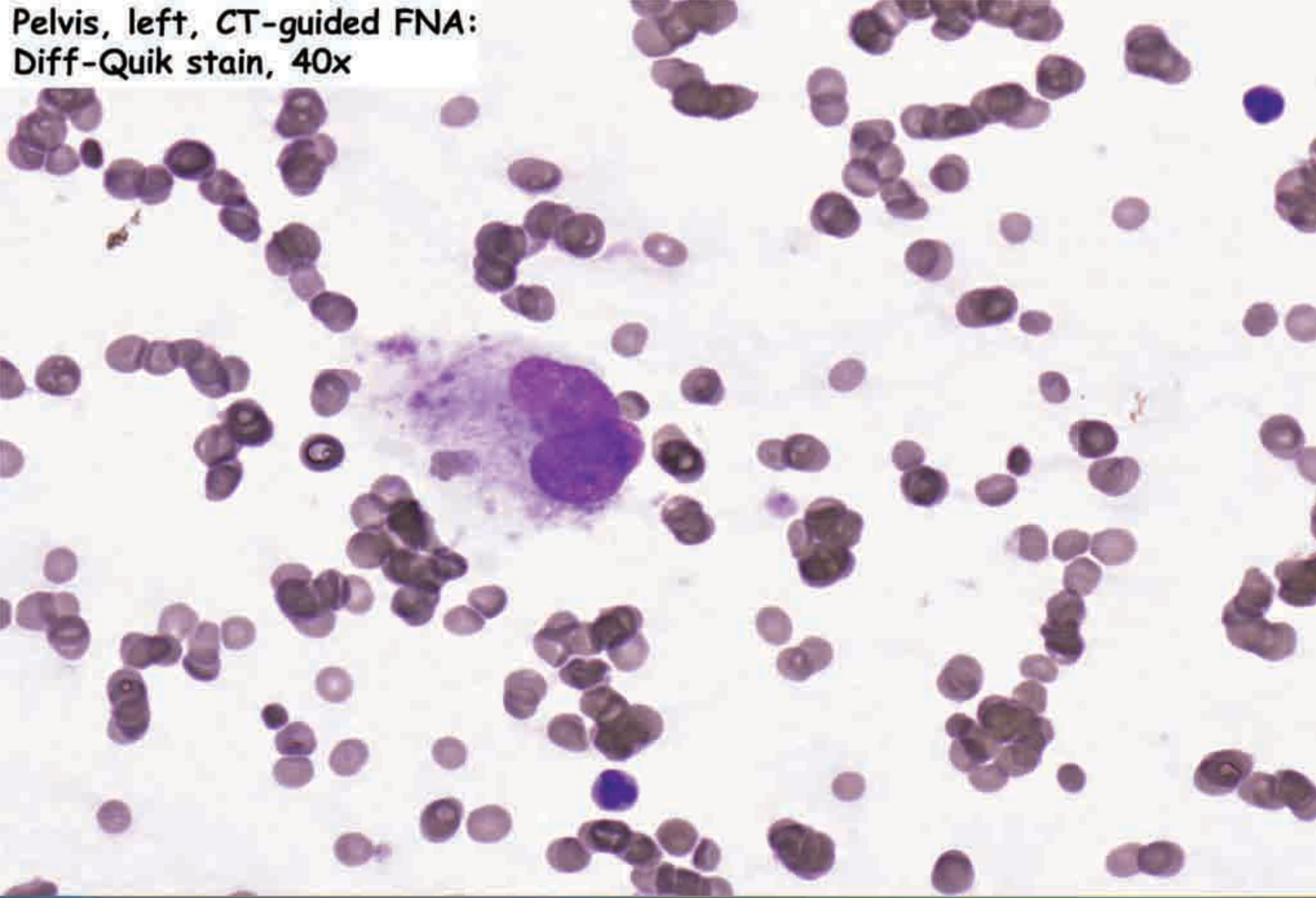
T1 + C

Differential Diagnosis

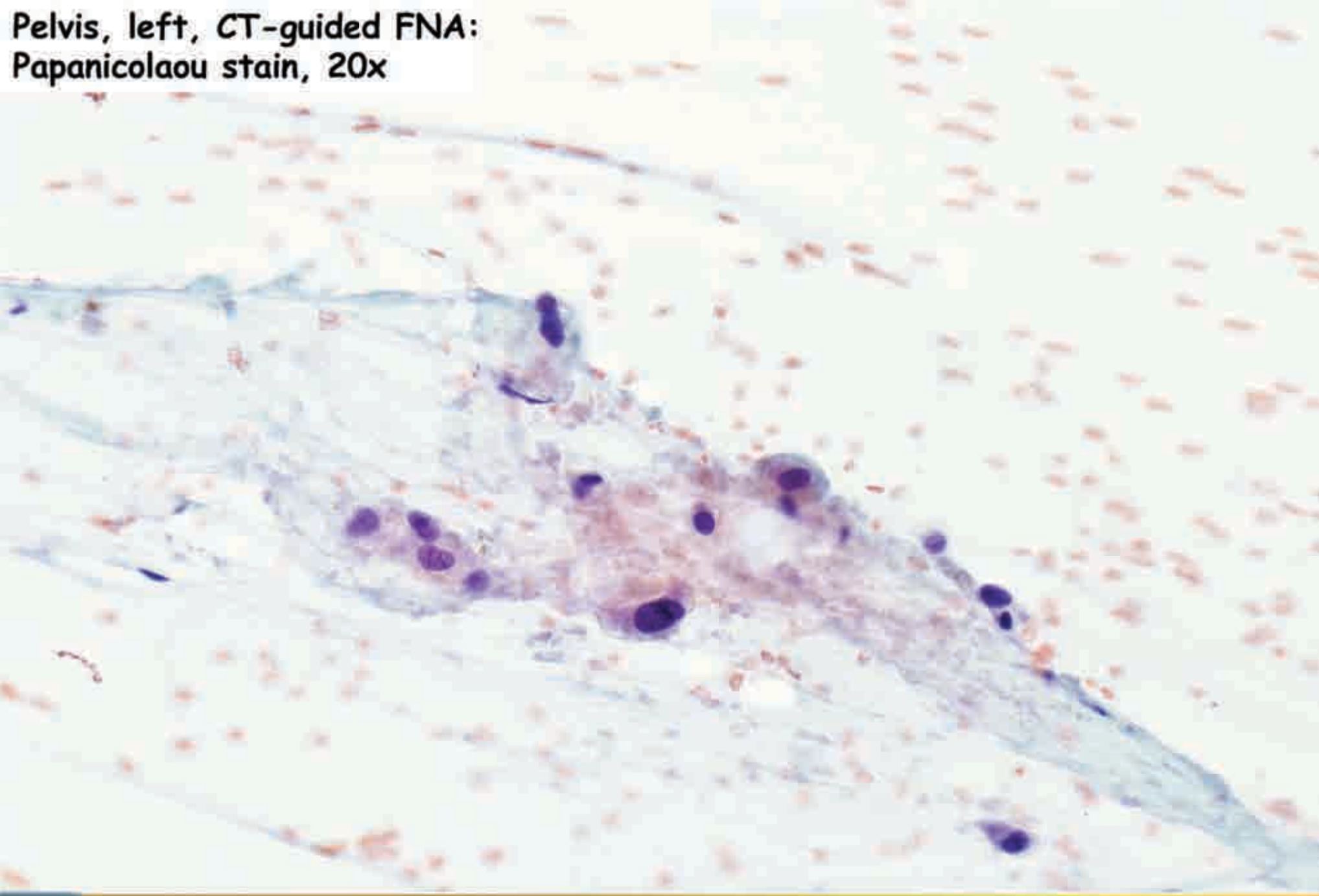
- Metastasis
- Atypical hematoma



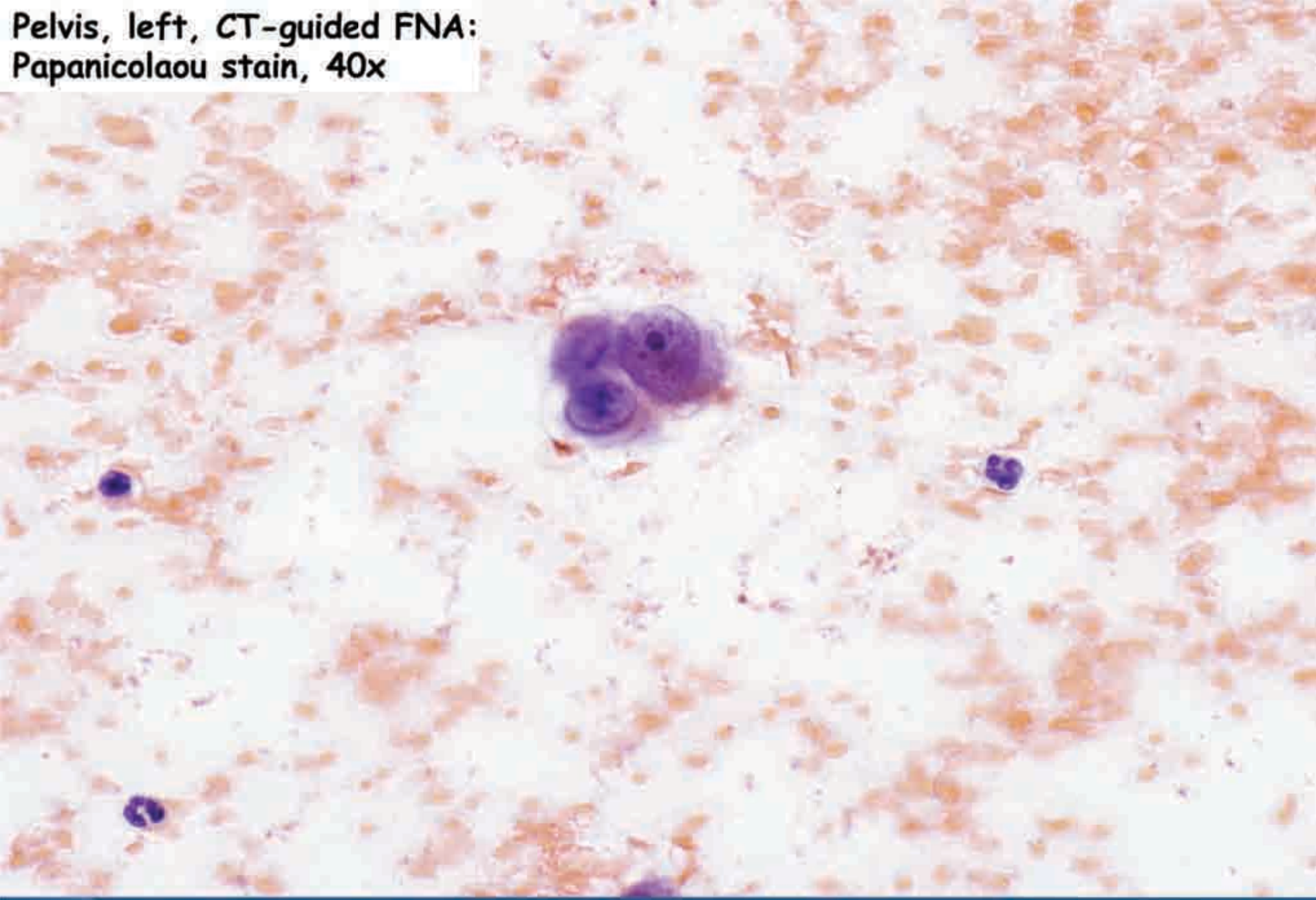
Case 2



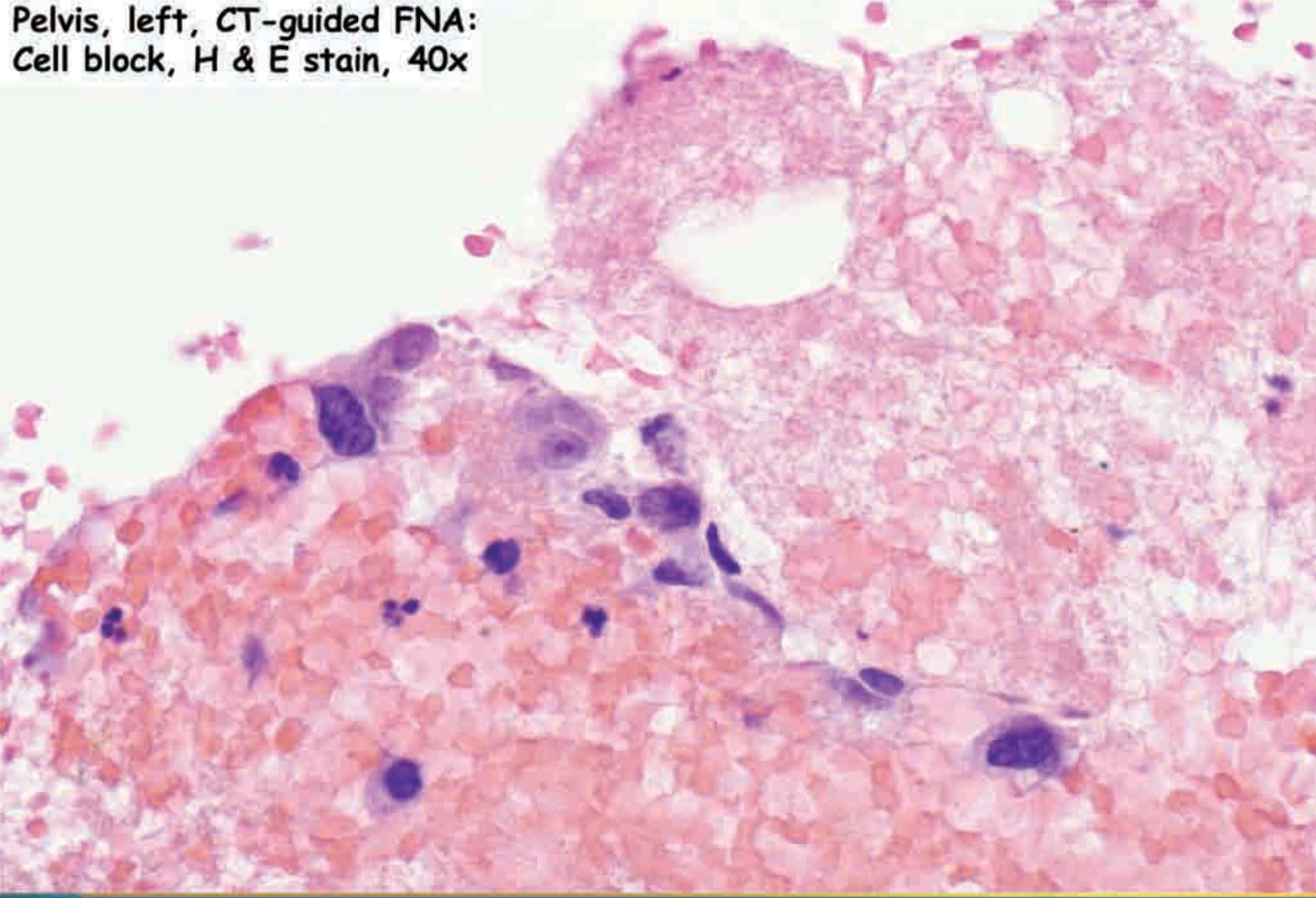
Pelvis, left, CT-guided FNA:
Papanicolaou stain, 20x



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



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



Pelvis, left, CT-guided fine needle aspiration:

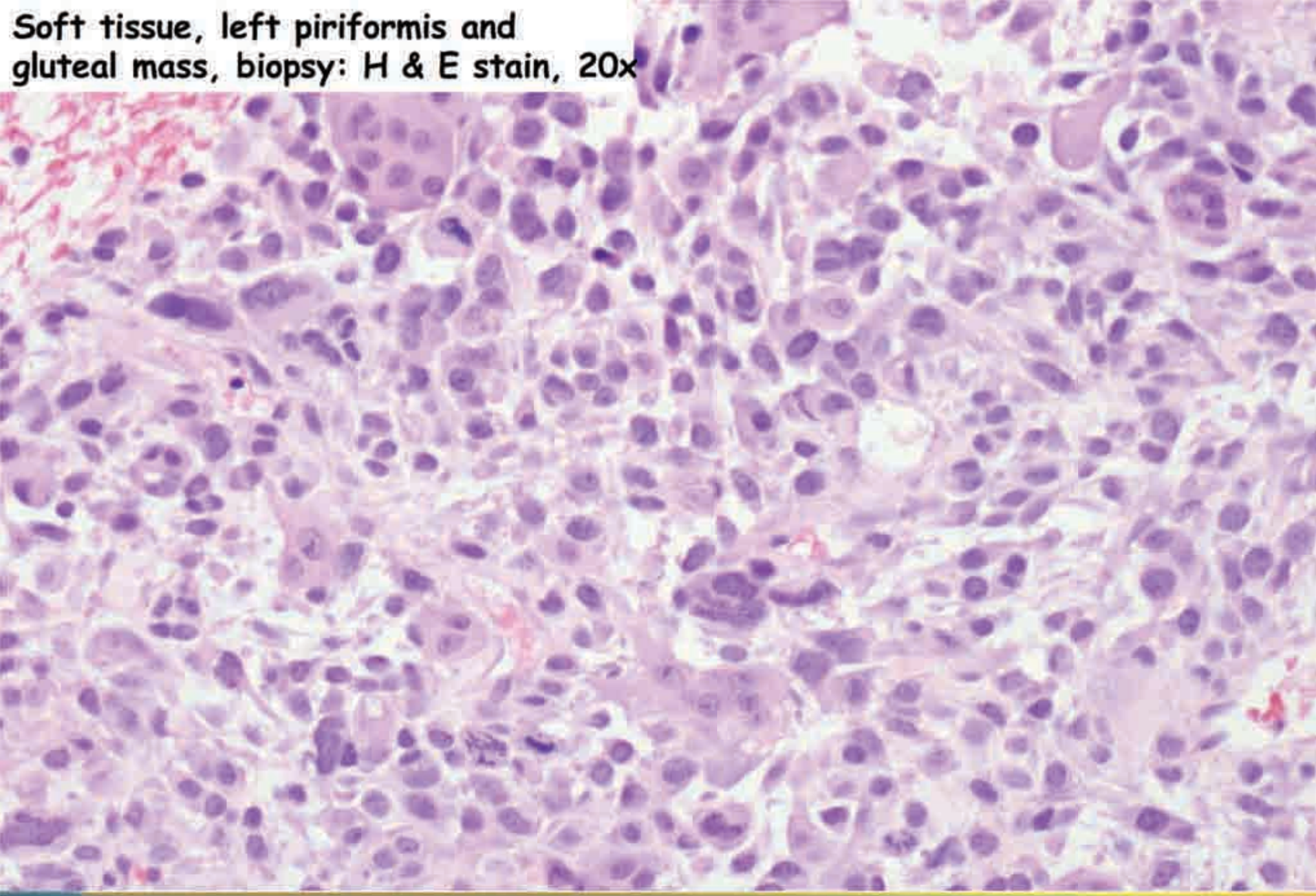
Malignant tumor cells present consistent with osteogenic sarcoma.

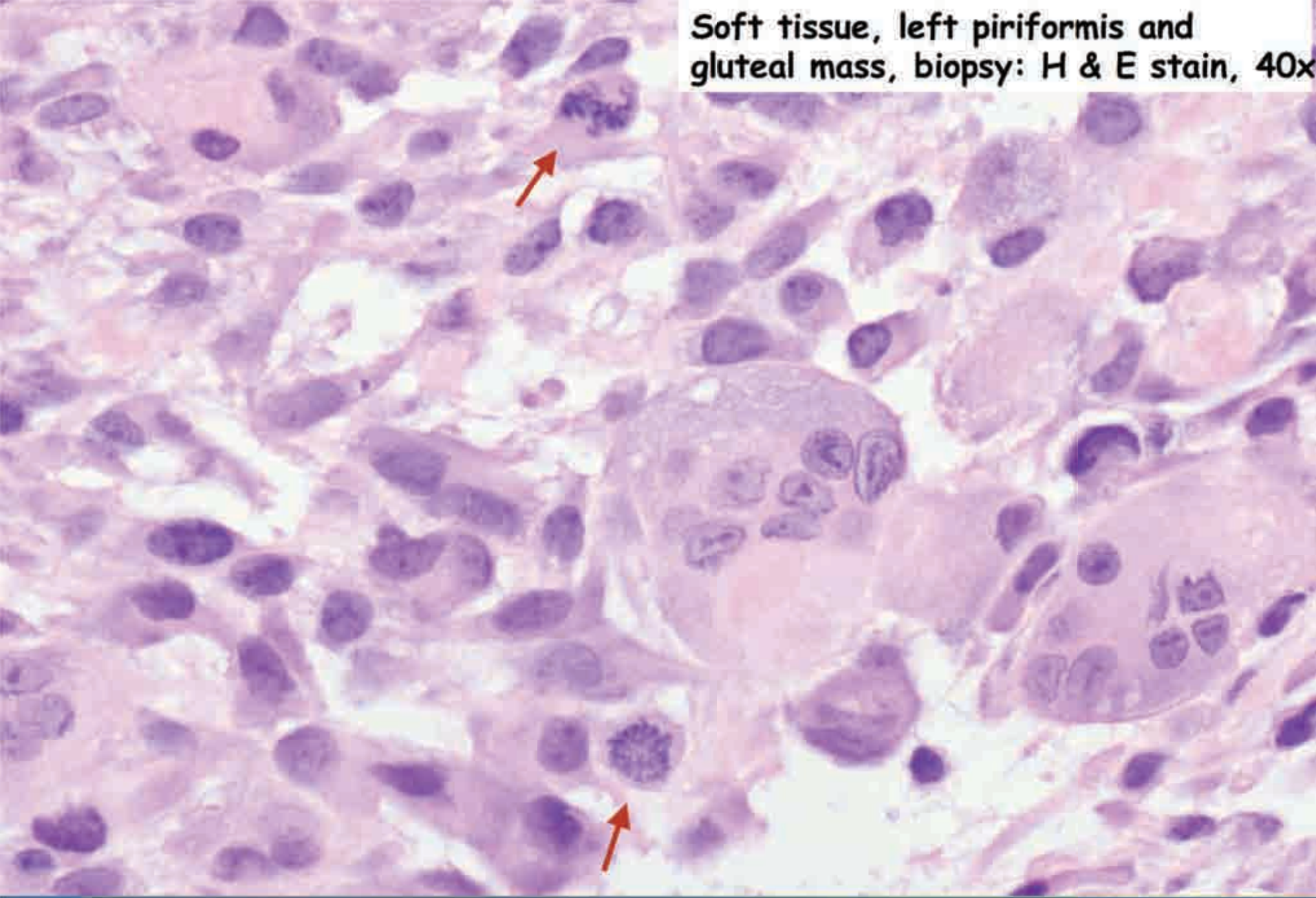
Cell block and cytologic preparations examined.

Soft tissue, left piriformis and gluteal mass, biopsy:

High grade osteogenic sarcoma (clinically recurrent)

Soft tissue, left piriformis and gluteal mass, biopsy: H & E stain, 20x





Osteogenic Sarcoma

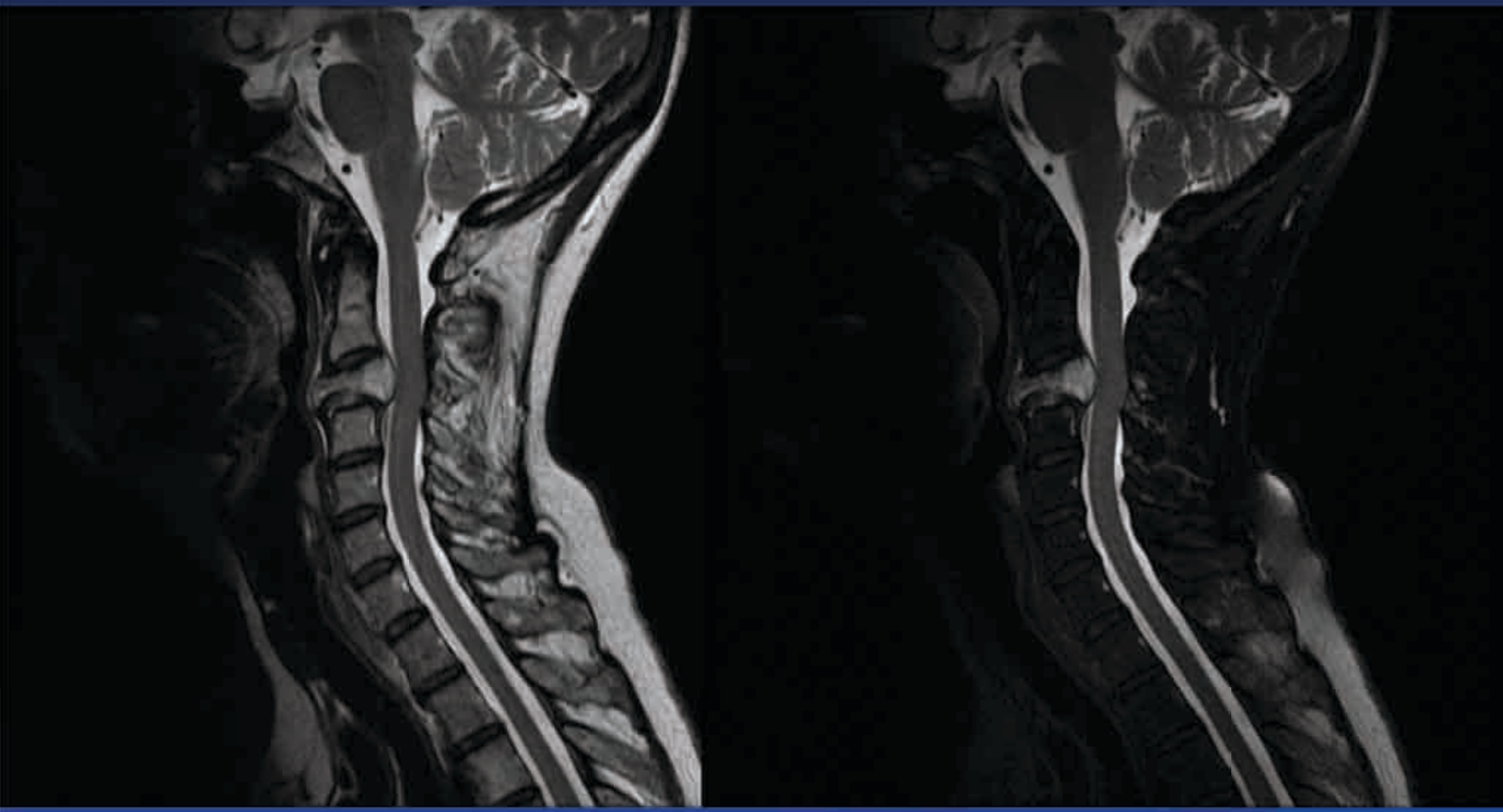
- Malignant tumor with ability to produce osteoid directly from neoplastic cells
- Best diagnostic clue: Bone destruction with associated tumor bone formation and aggressive periosteal reaction.
- Multiple types:
  - Conventional, telangiectatic, multicentric, parosteal, periosteal, and
  - Secondary Osteosarcoma (5%) – in association with preexisting bone lesion such as prior radiation, bone infarct, Pagets

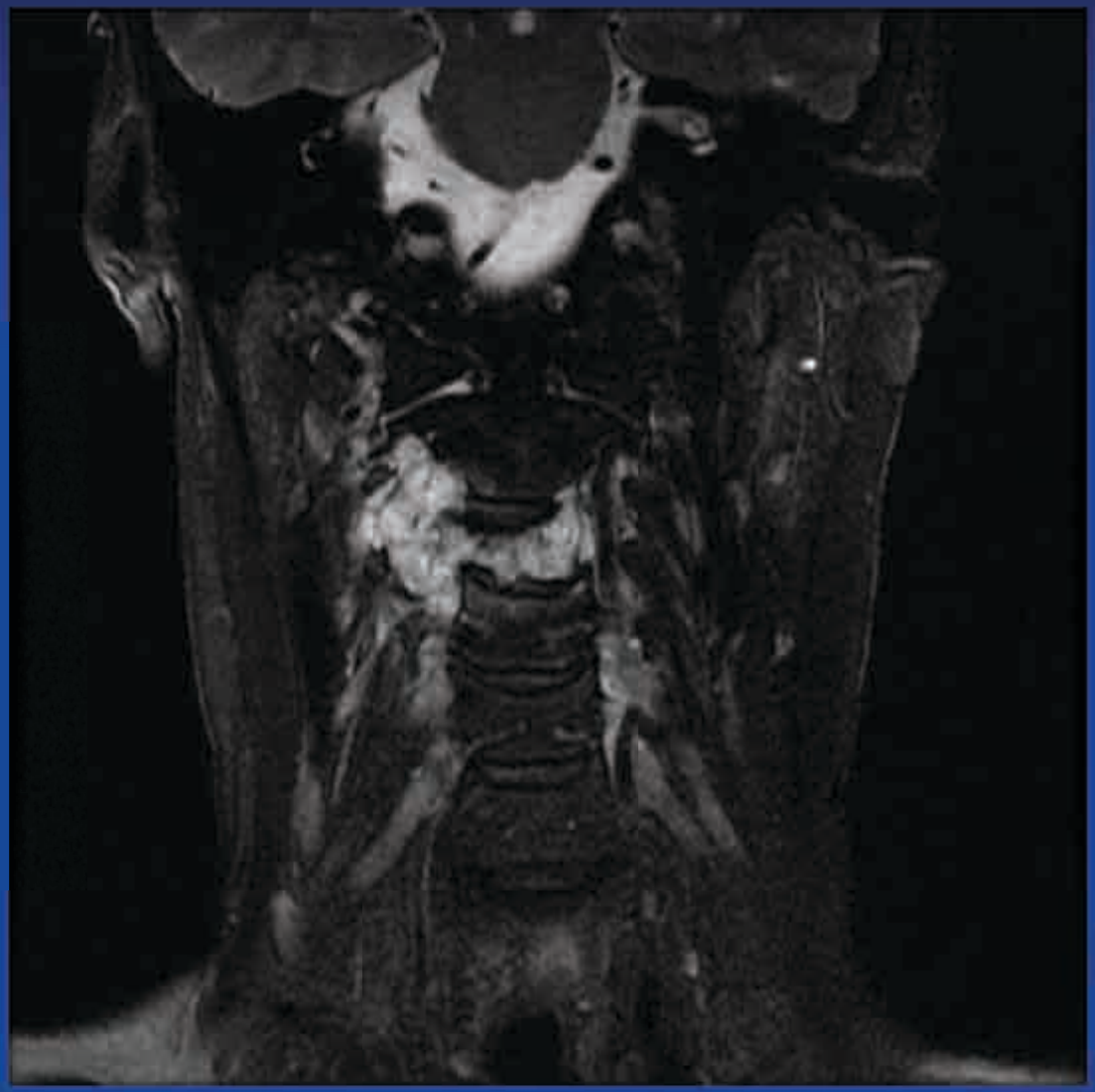
Osteogenic Sarcoma - Clinical Issues

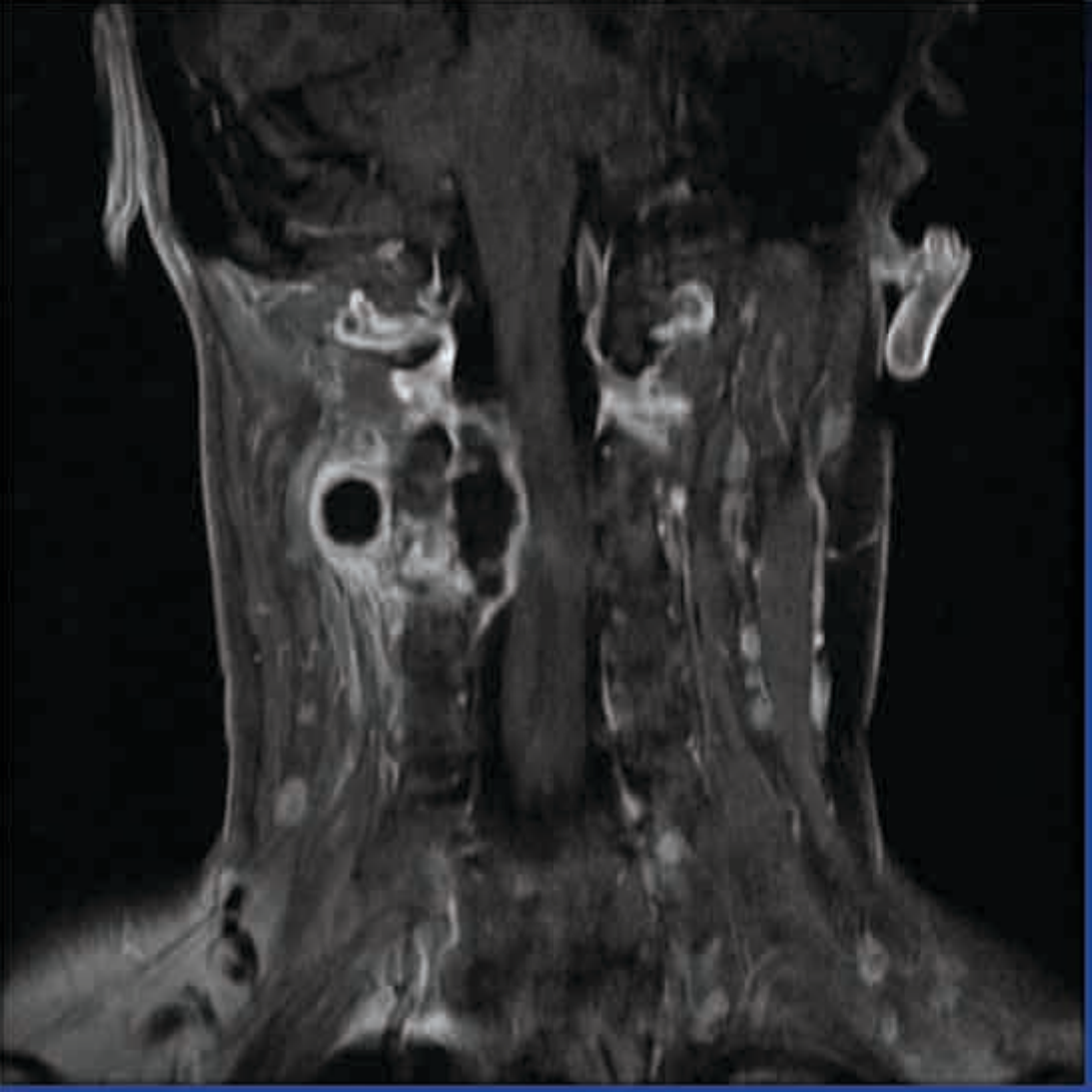
- Progressive pain, soft tissue mass/swelling
- Bimodal age (2^{nd}-3^{rd}, >6^{th} decade)
- Very aggressive tumor
- Surgical resection with wide margins
- Adjuvant and neoadjuvant chemo
- 5 year survival: 41%
- 5 year survival (if resected with no mets): 60-70%

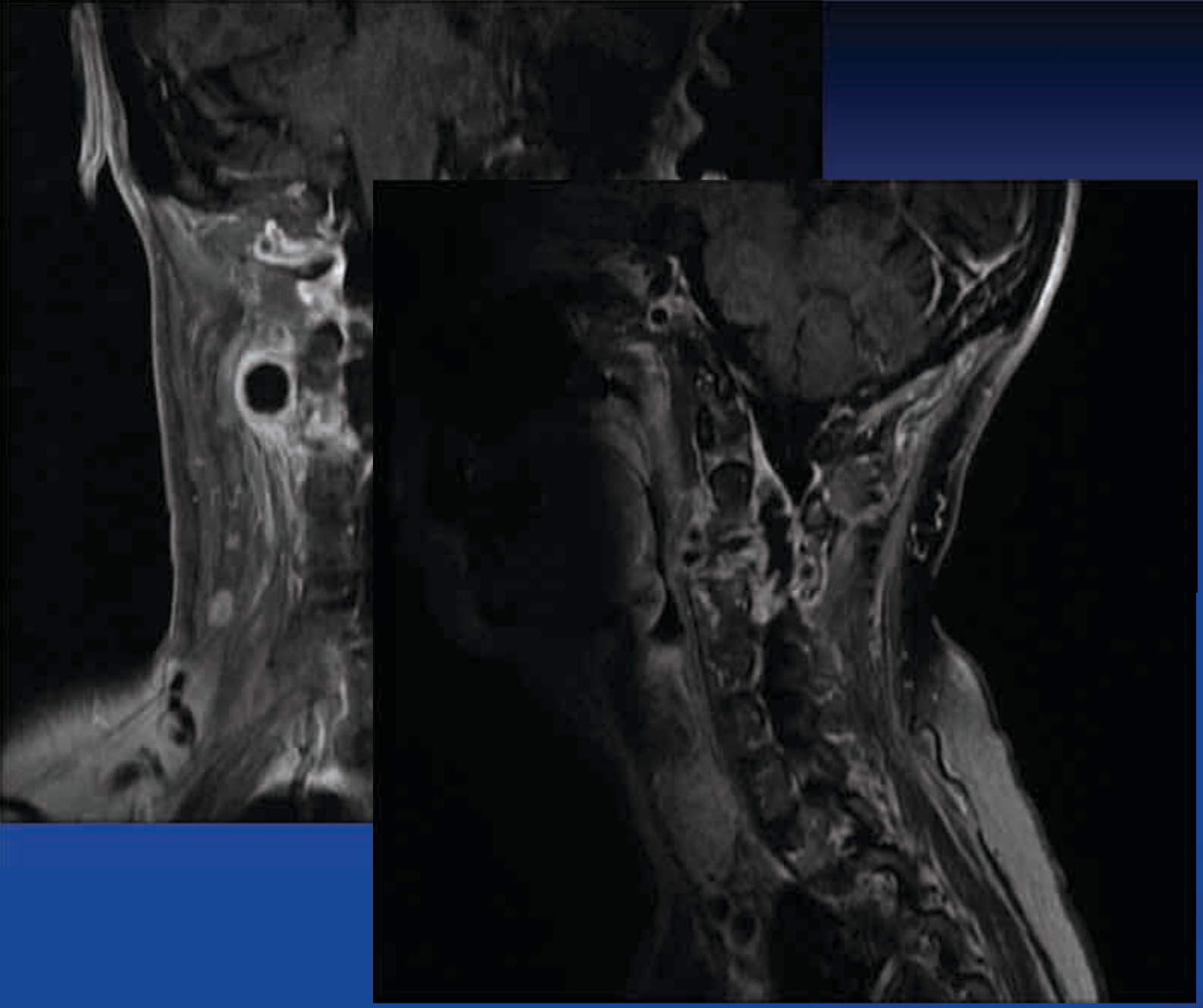
Case 3

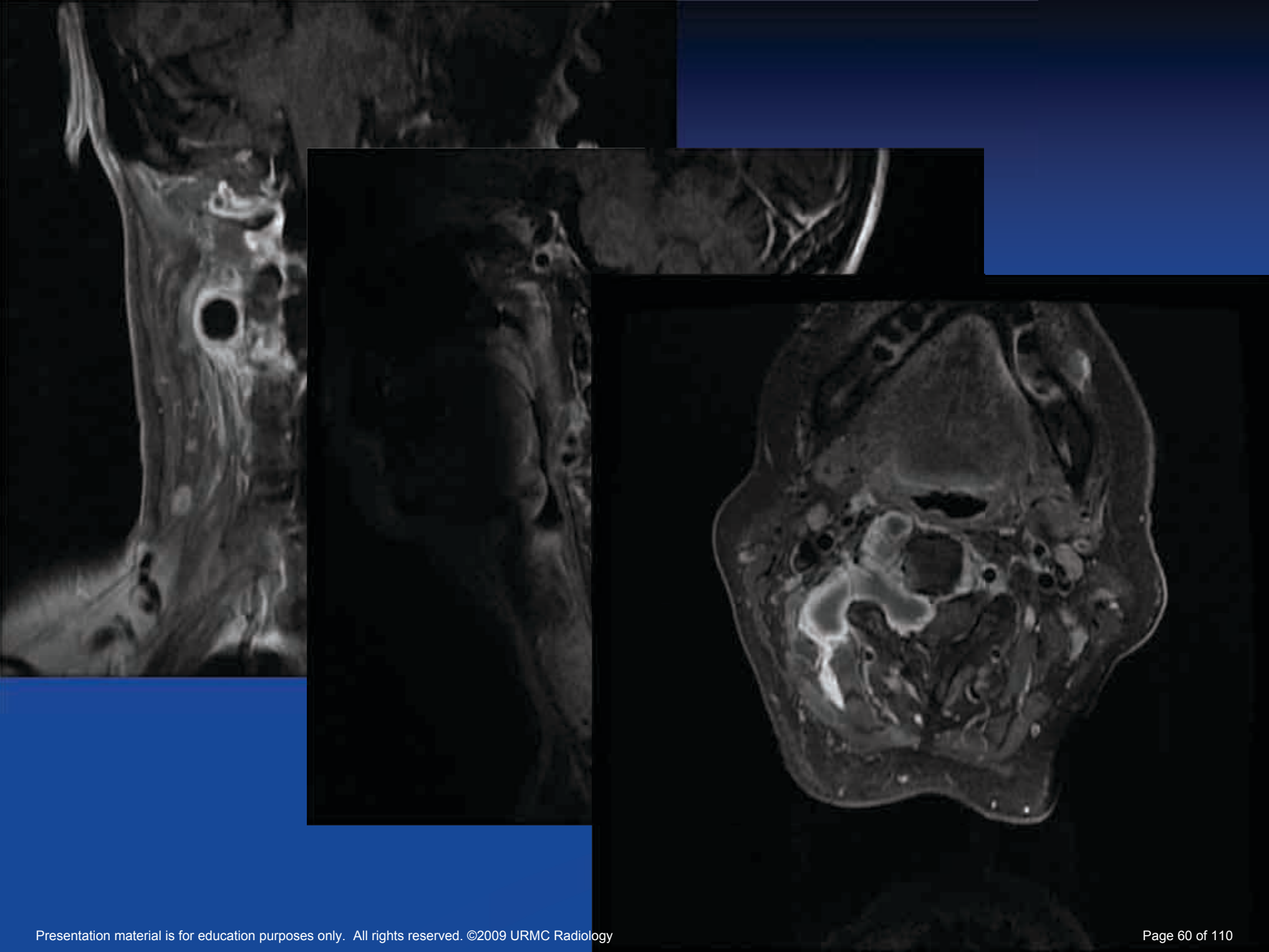
- 60 year-old female with neck pain









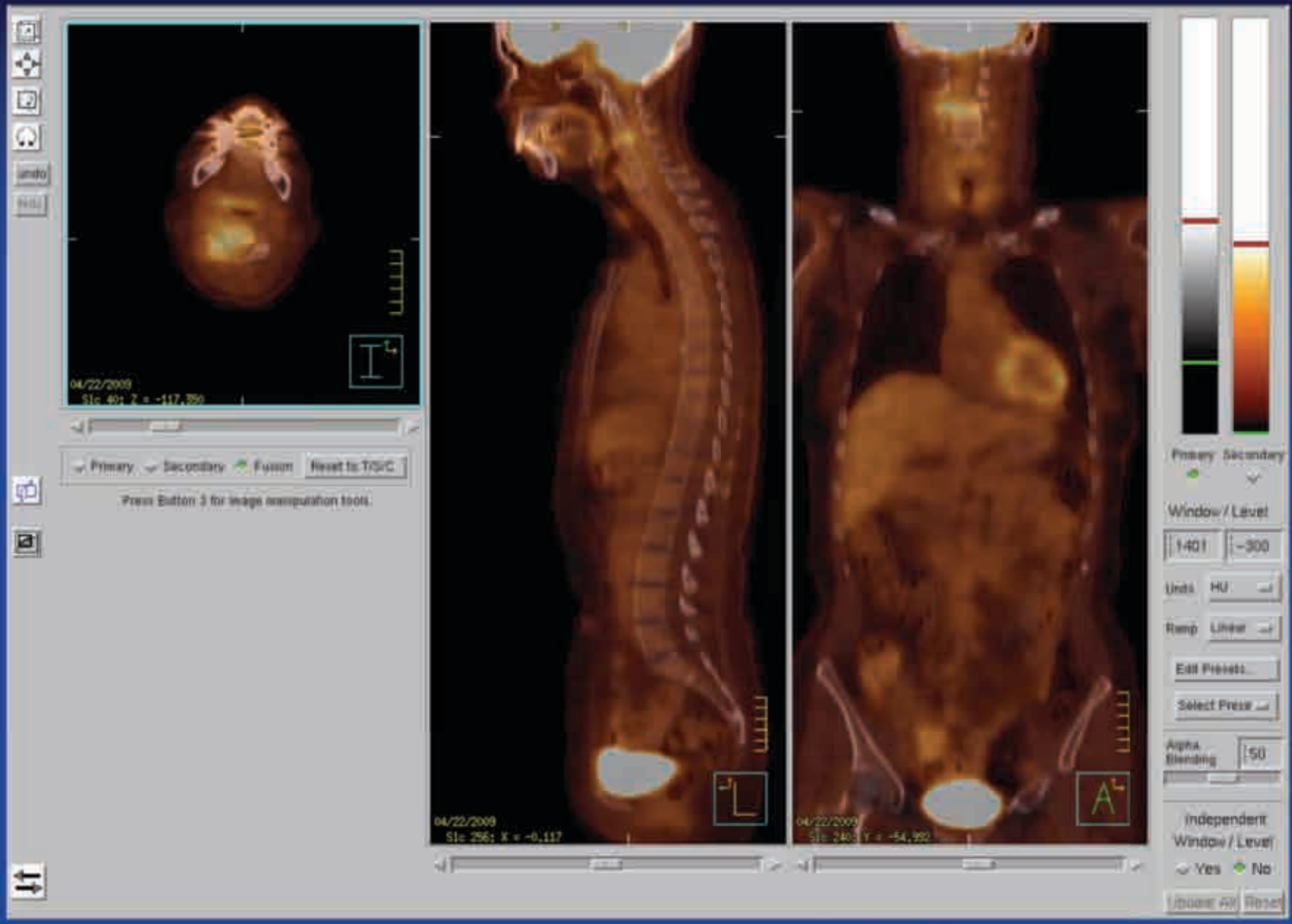


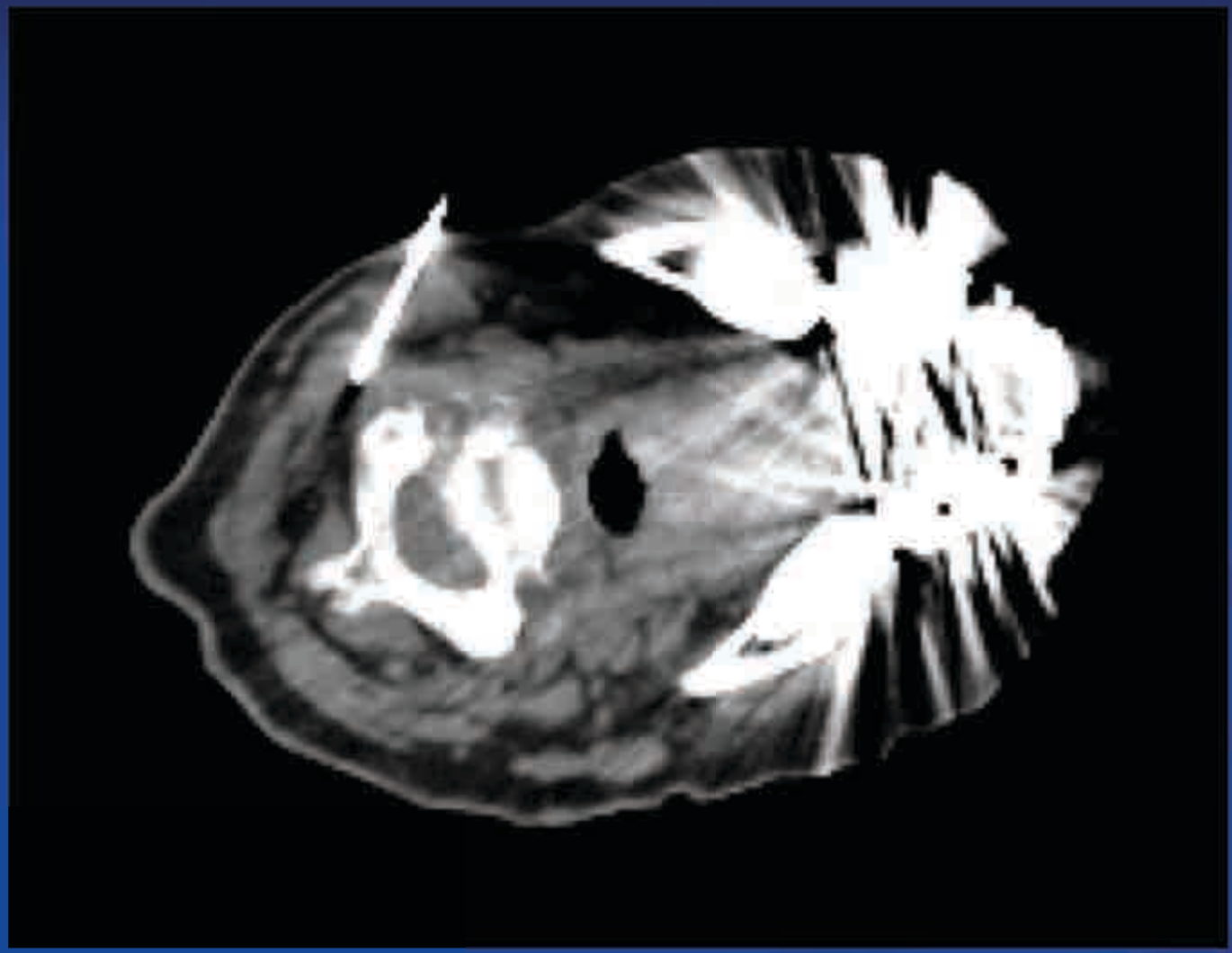
Findings

- Diffuse abnormal high T2 signal and enhancement of C3 with pathologic compression fracture.
- Large peripherally enhancing soft tissue component which extends into and expands the right neural foramen and thecal sac.

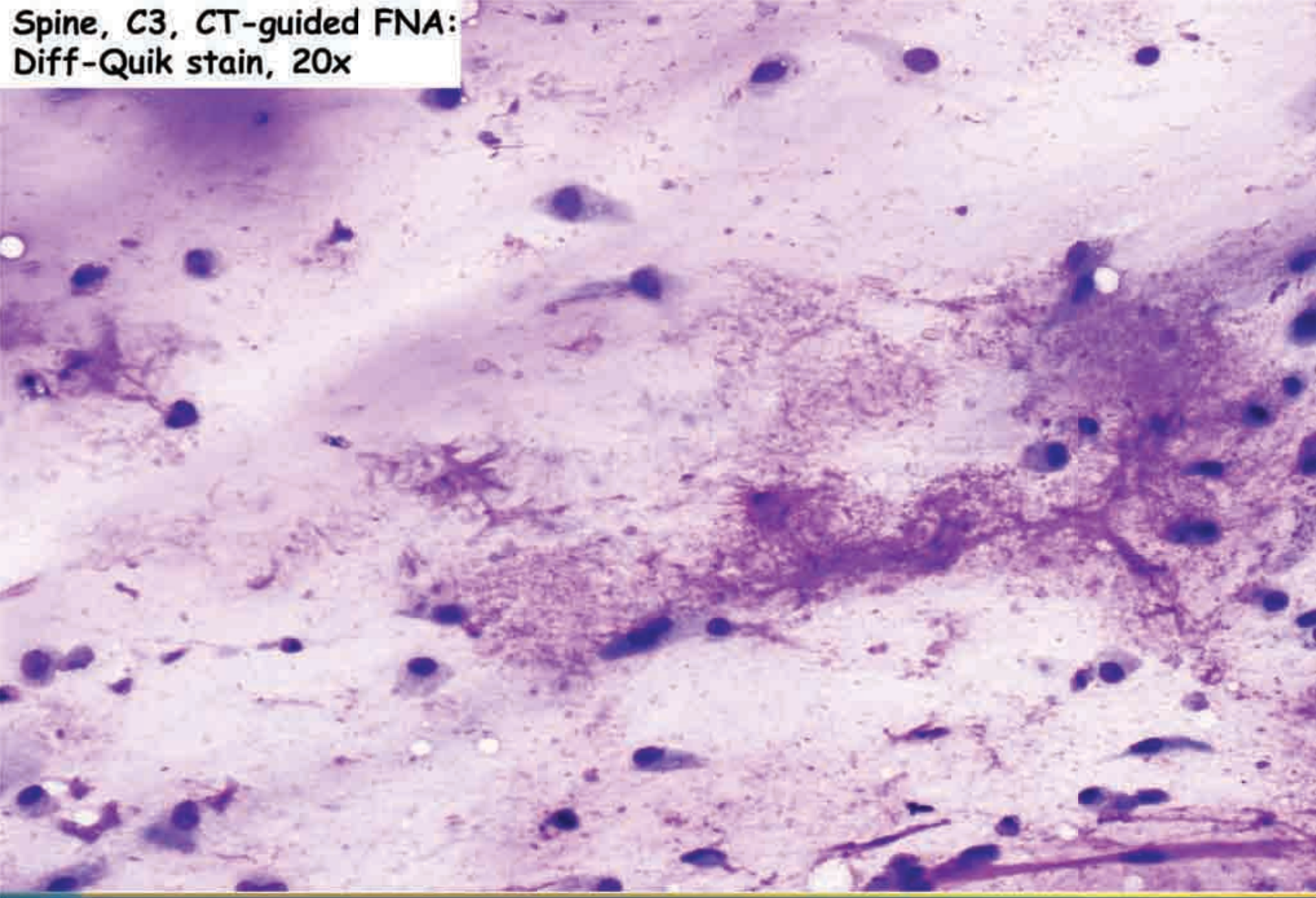
Differential Diagnosis

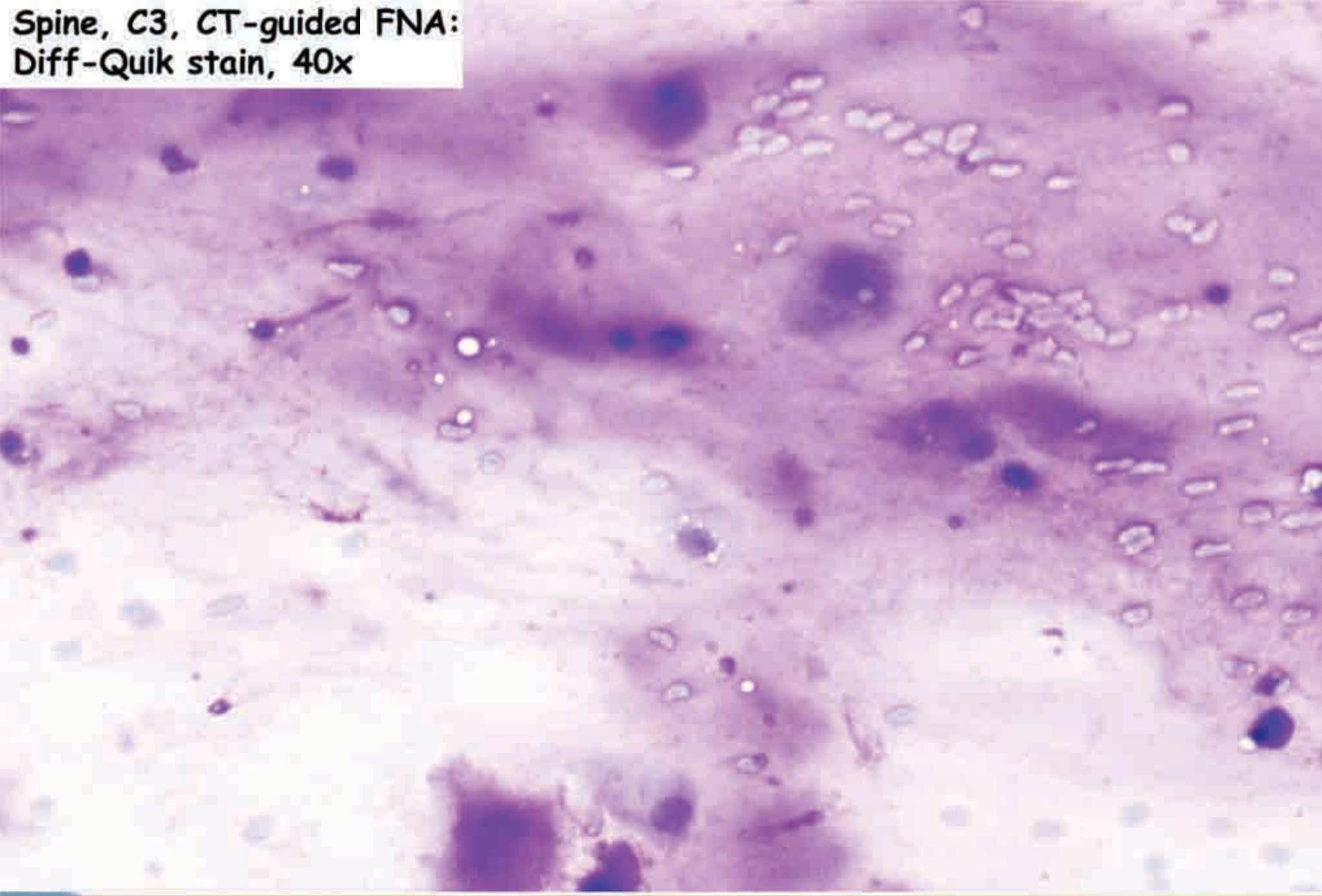
- Chondrosarcoma
- Multiple myeloma
- Lymphoma
- Metastatic disease





Case 3





Spine, C3, CT-guided FNA:
Diff-Quik stain, 40x

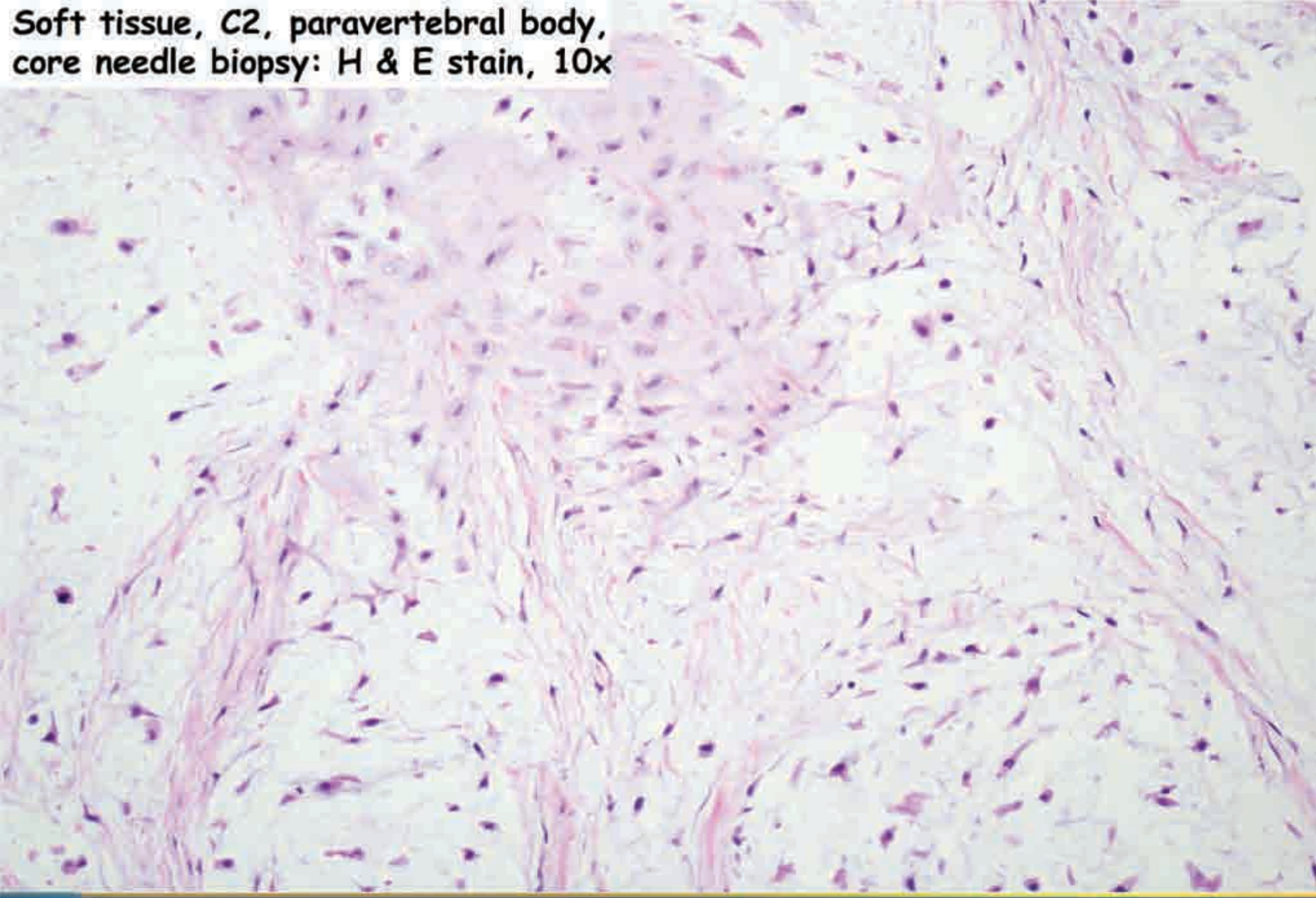
Spine, C3, CT-guided fine needle aspiration:

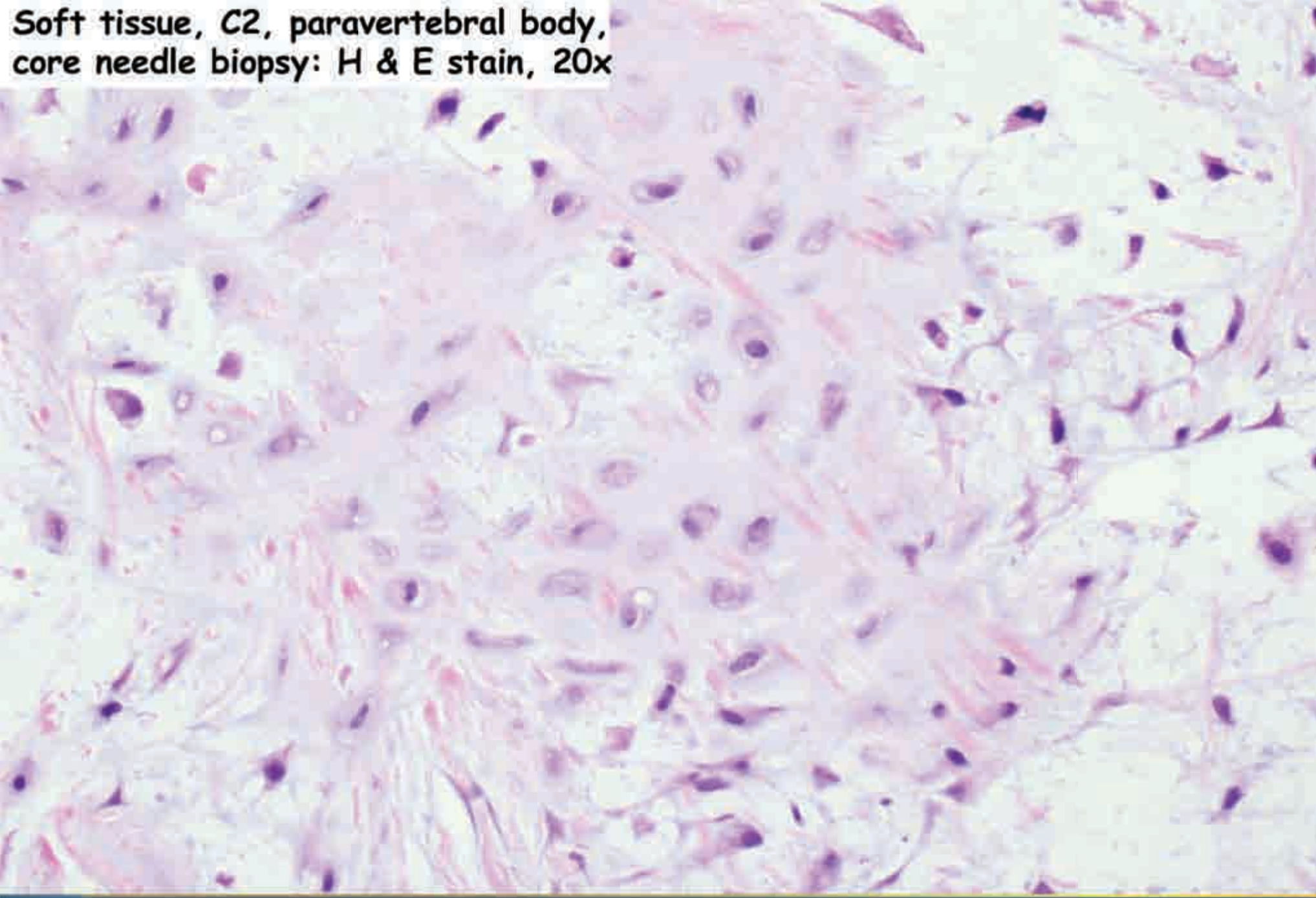
Malignant tumor cells present consistent with chondrosarcoma.

Soft tissue, C3, right paravertebral body, core needle biopsy:

Chondrosarcoma, grade 2.

Soft tissue, C2, paravertebral body, core needle biopsy: H & E stain, 10x





Chondrosarcoma

- Malignant tumor in which neoplastic cells form cartilage
- Best diagnostic clue: Lytic mass with or without chondroid matrix, cortical disruption, and extension into soft tissues
- Chondroid matrix mineralization of "rings and arcs"
- Multiple types:
  - Medullary, exostotic, dedifferentiated, mesenchymal, clear cell, and extraskeletal

Chondrosarcoma - Clinical Issues

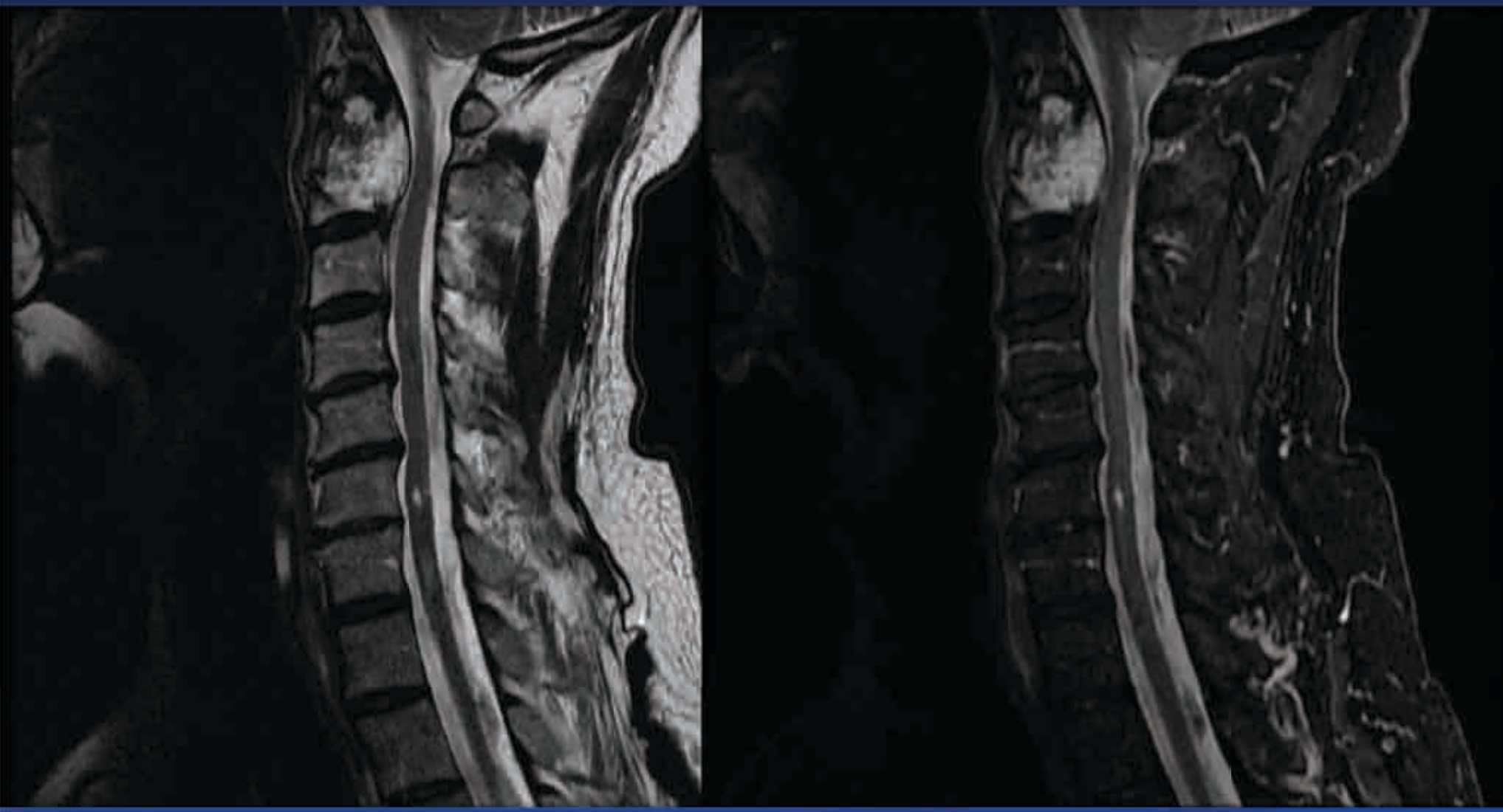
- Dull aching pain at rest, soft tissue mass/swelling
- Age is 20-90 years, peak at 40-60 years
- Surgical resection with wide margins
- Limited role for chemo or radiation therapy
- 5 year survival: 48-60%
- 5 year survival: 90% (Grade 1), 81% (2), 29% (3)

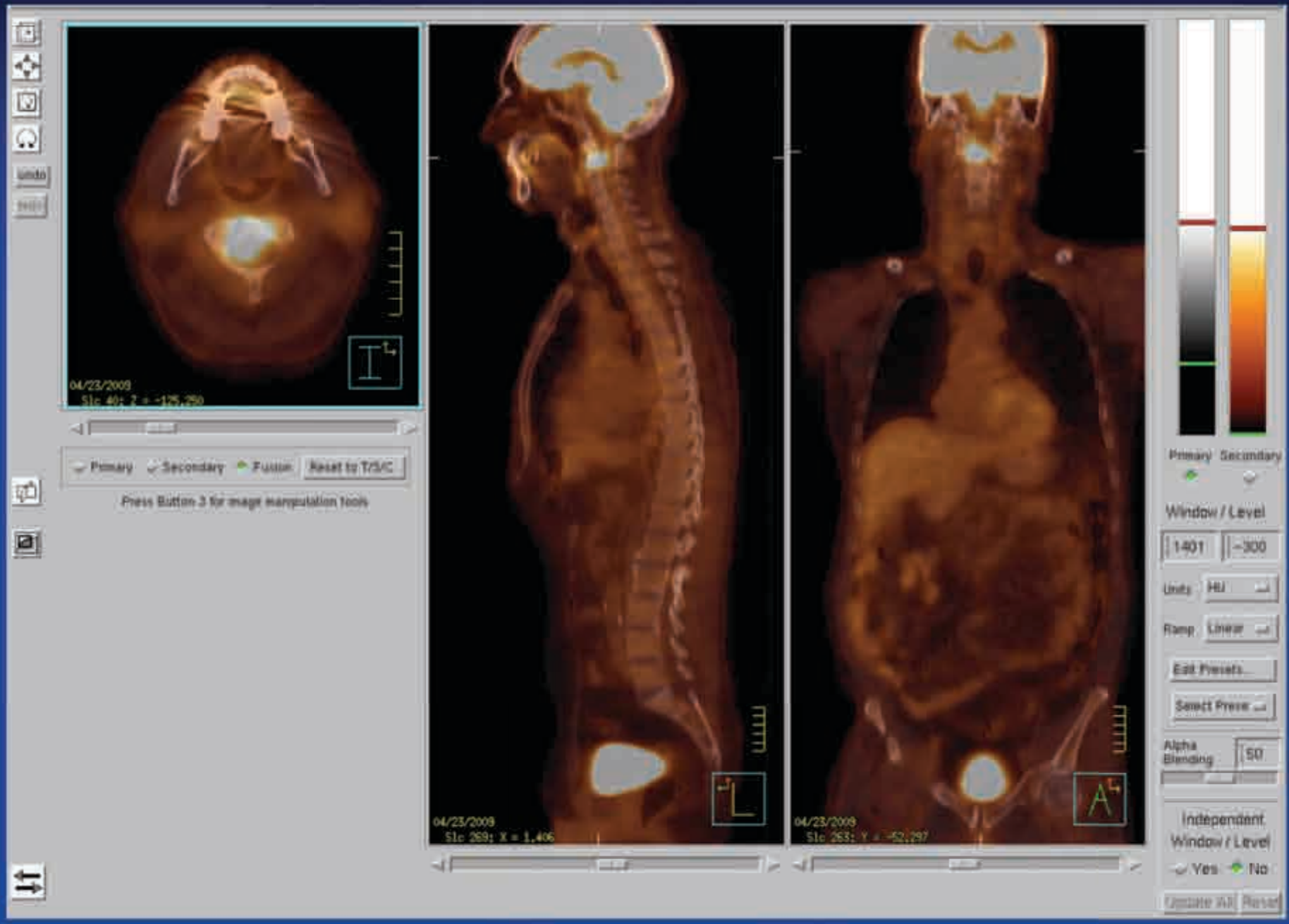
Chondrosarcoma - Grading

- Grade 1: Slowly growing, locally aggressive, indolent course
  - Recurrent growth potential, no metastatic spread
- Grade 2: Locally aggressive tumor with great potential for local recurrence
  - Mets in 10-15%
- Grade 3: Highly aggressive, rapidly growing
  - Mets in over 50%

Case 4

- 66 year old male with neck pain





Findings

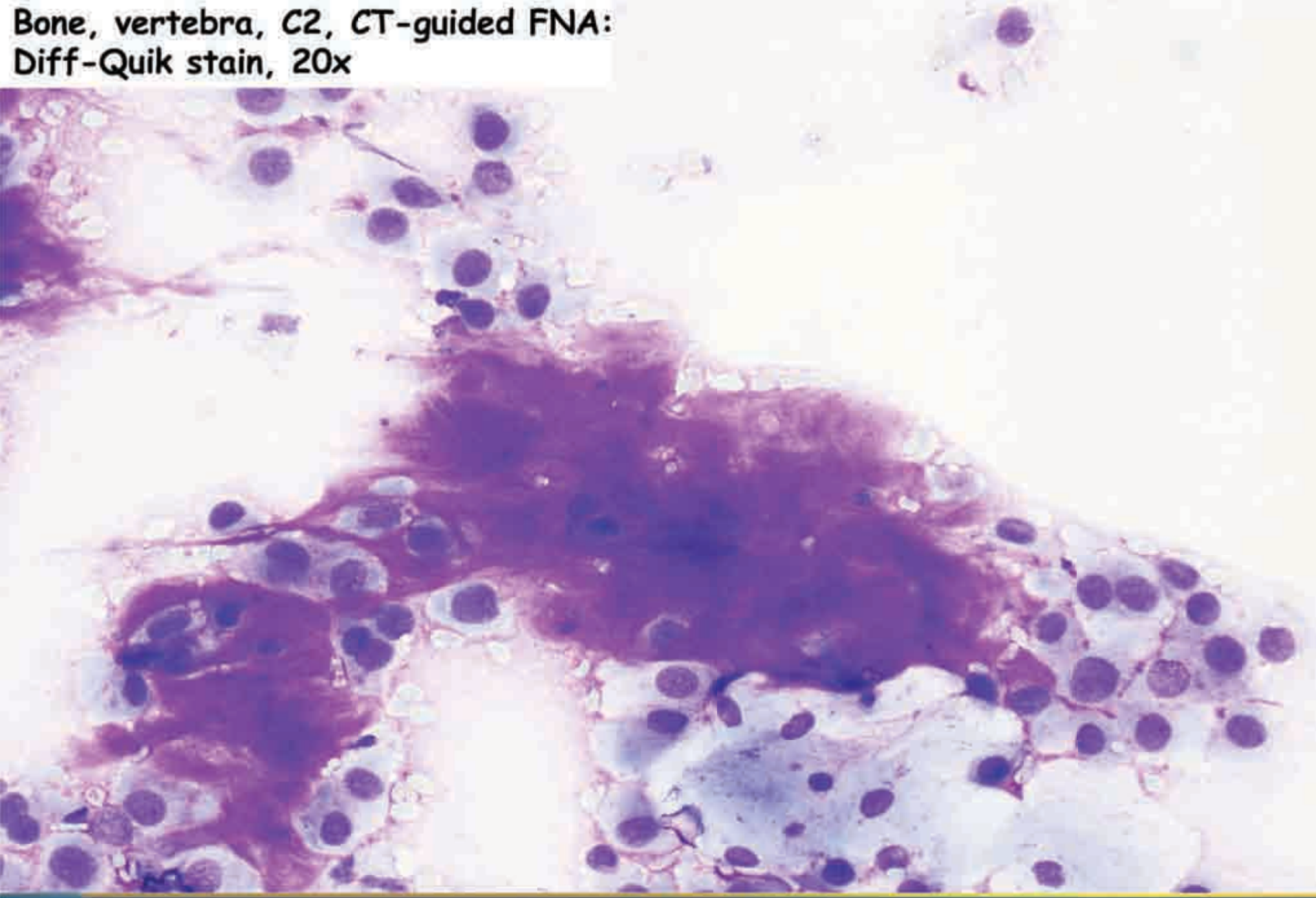
- Hypermetabolic focus corresponding to a destructive lytic lesion at C2. This lesion has markedly increased T2 signal.

Differential Diagnosis

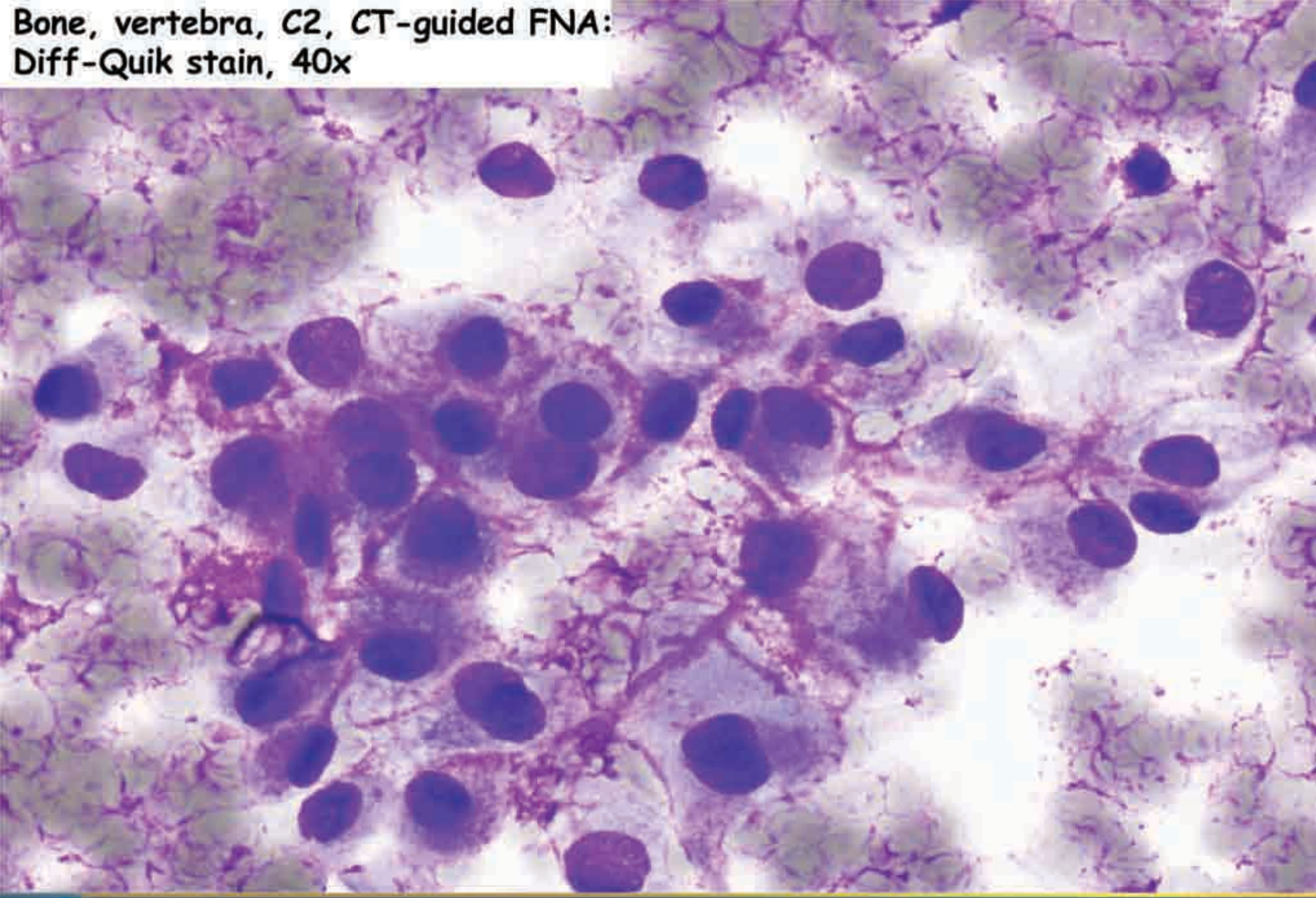
- Chondrosarcoma
- Metastases
- Multiple myeloma
- Lymphoma
- Chordoma

Case 4

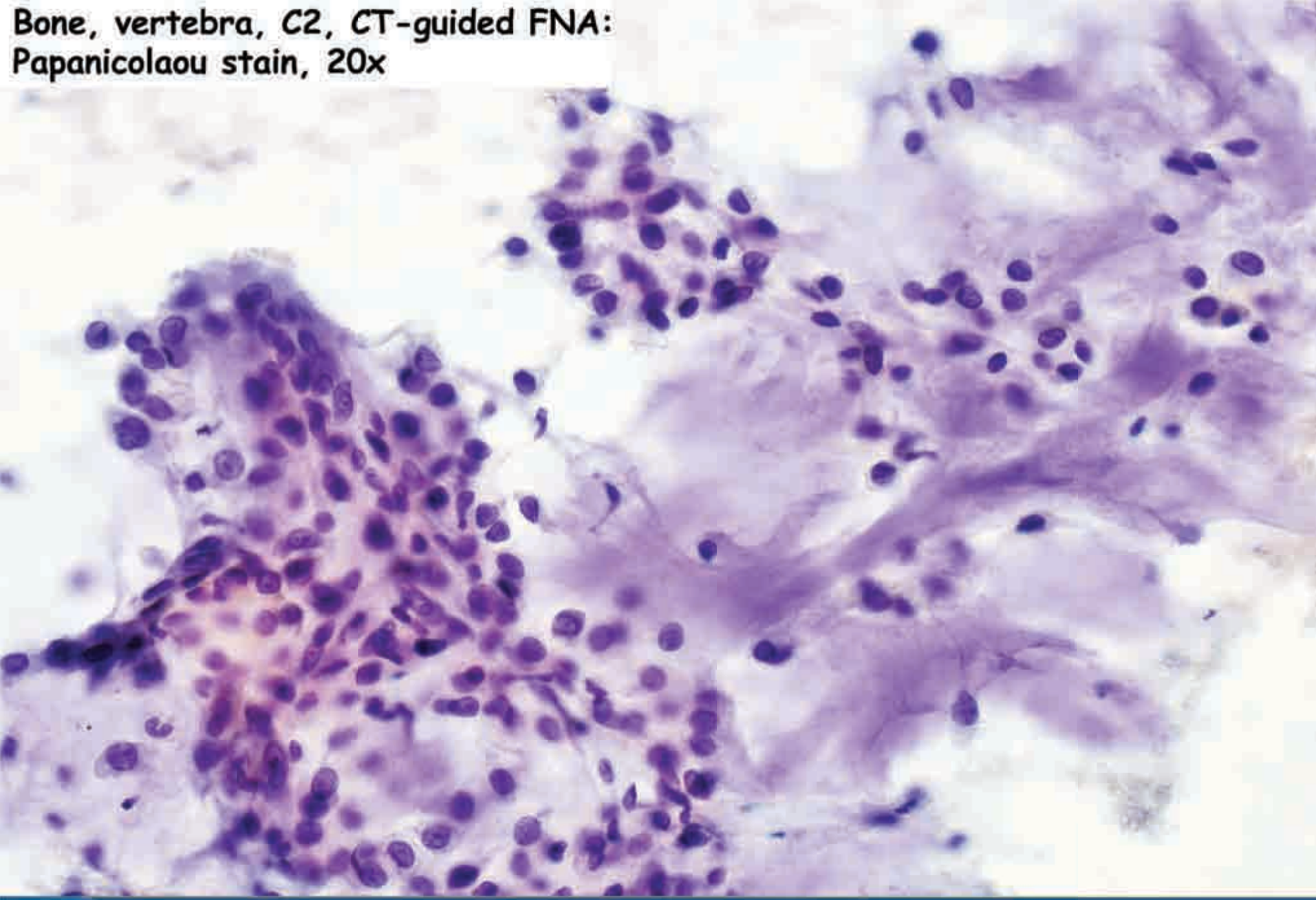
Bone, vertebra, C2, CT-guided FNA:
Diff-Quik stain, 20x



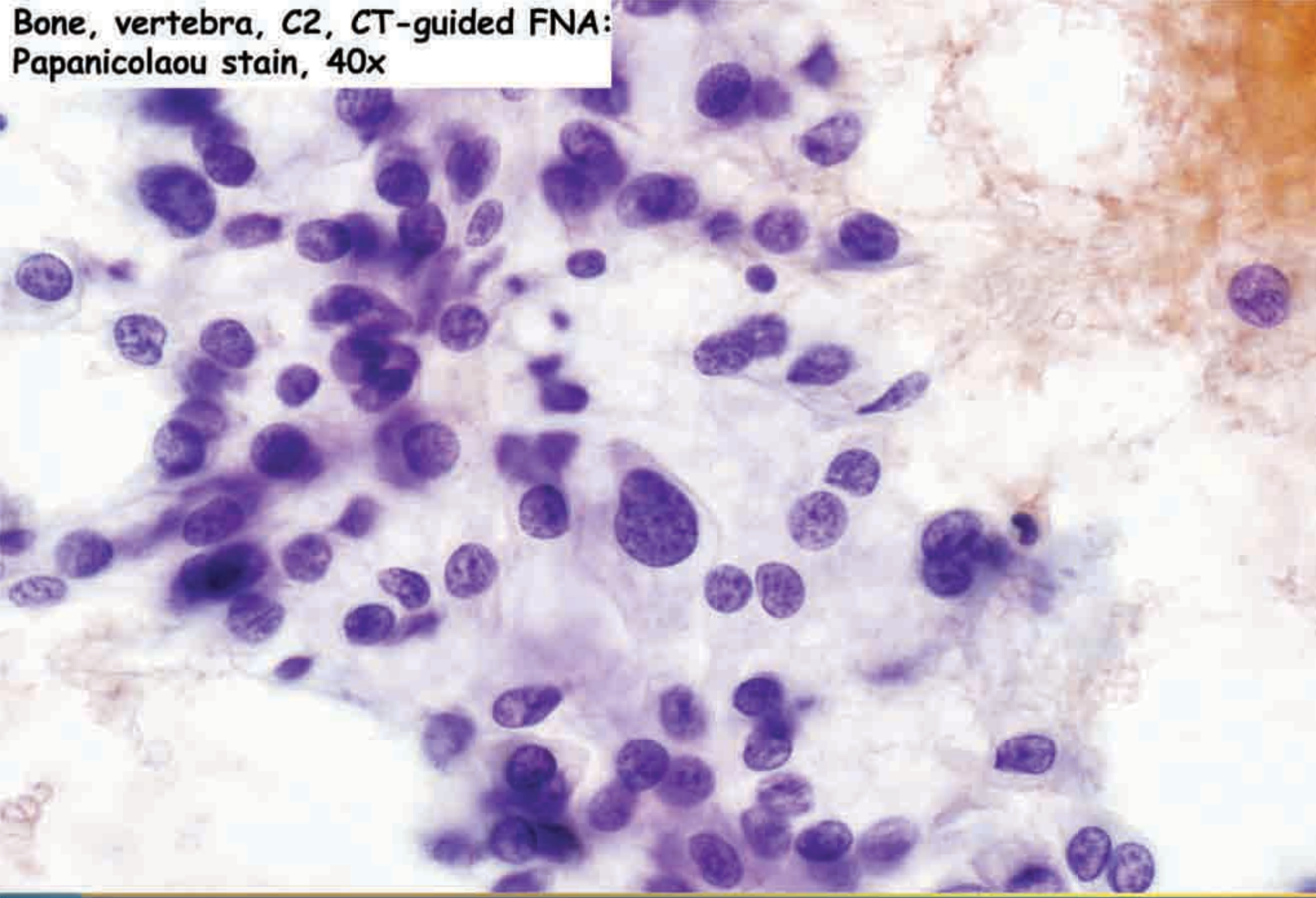
Bone, vertebra, C2, CT-guided FNA:
Diff-Quik stain, 40x



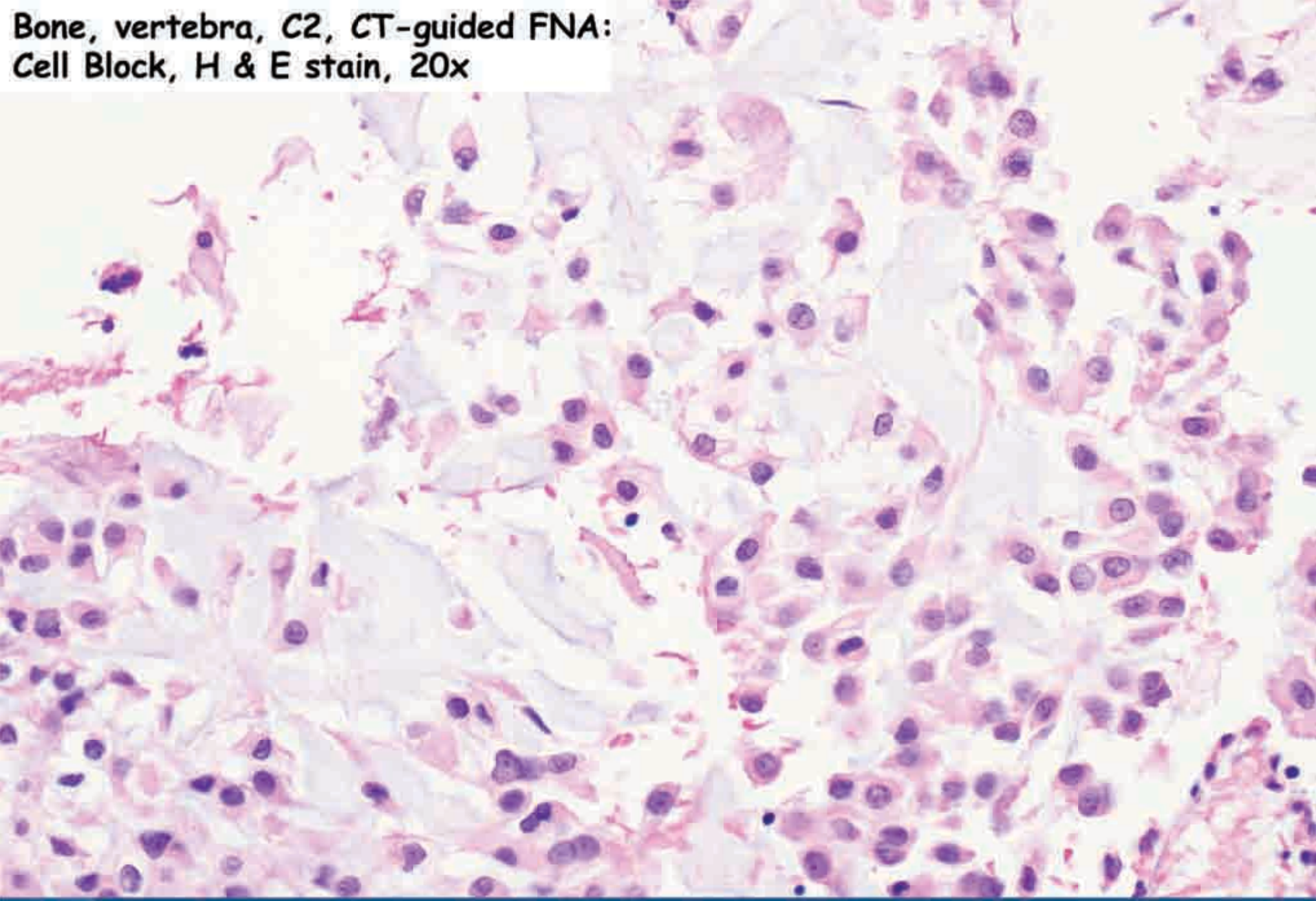
Bone, vertebra, C2, CT-guided FNA:
Papanicolaou stain, 20x



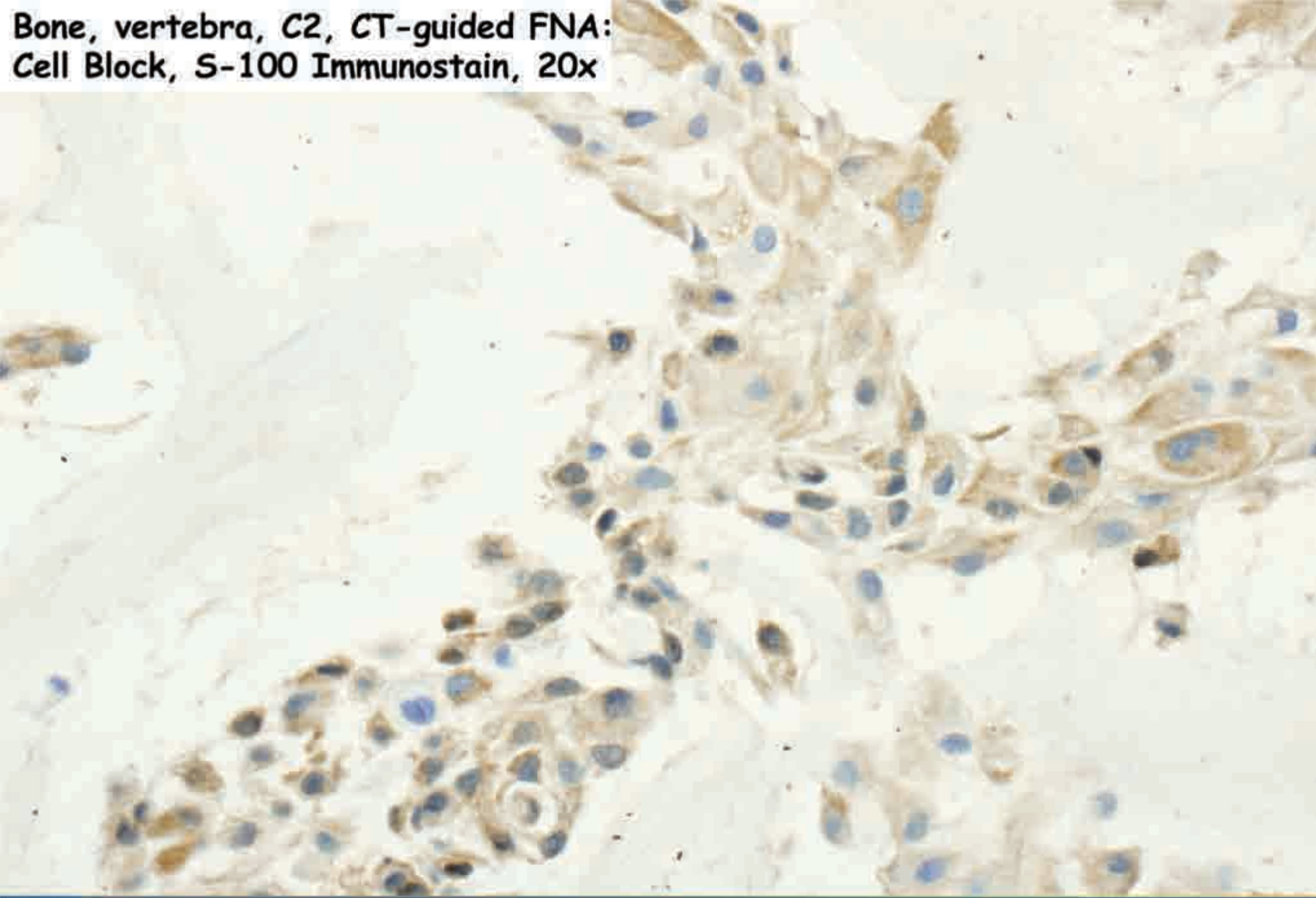
Bone, vertebra, C2, CT-guided FNA:
Papanicolaou stain, 40x

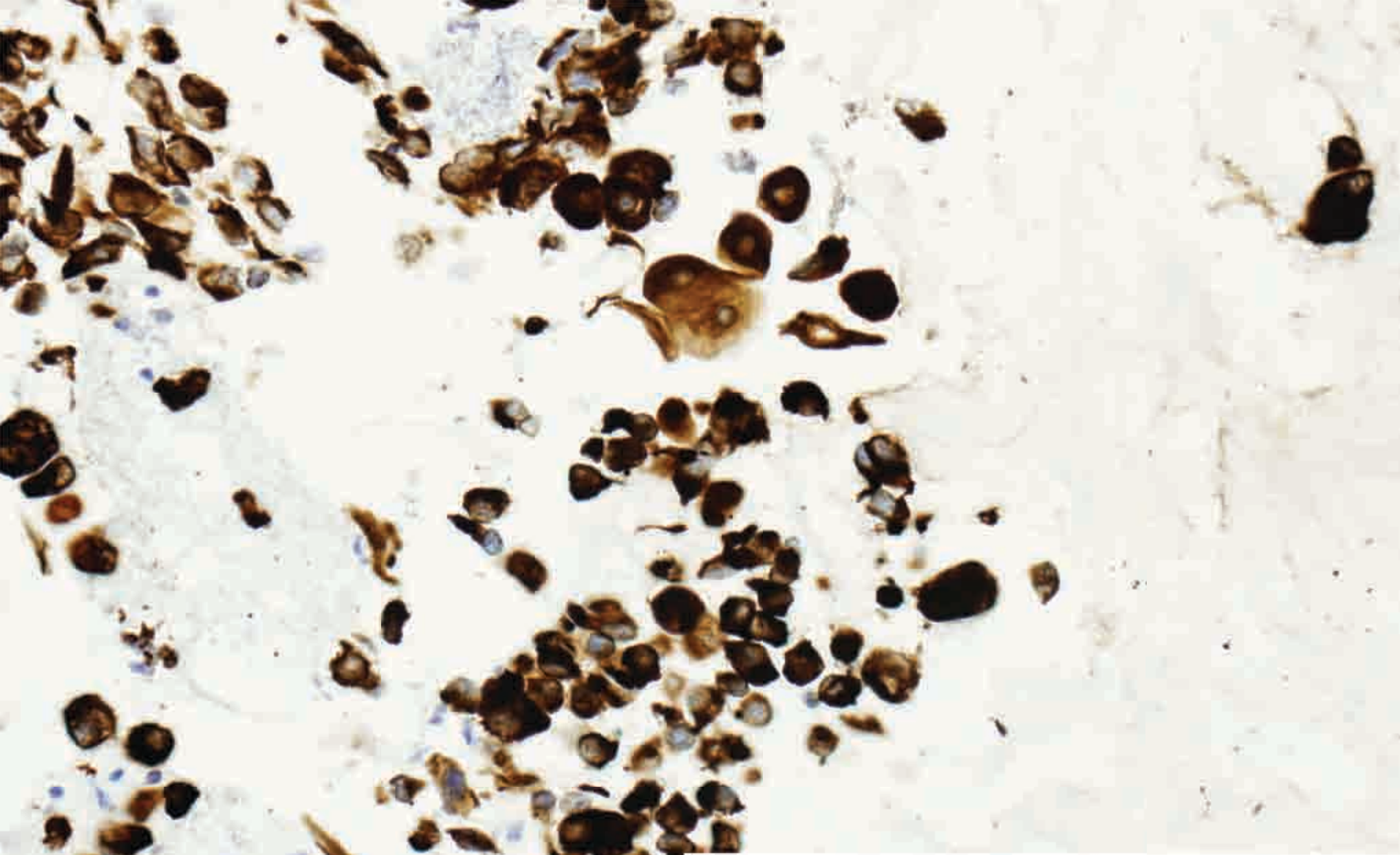


Bone, vertebra, C2, CT-guided FNA:
Cell Block, H & E stain, 20x



Bone, vertebra, C2, CT-guided FNA:
Cell Block, S-100 Immunostain, 20x





Bone, vertebra, C2, CT-guided FNA:
Cell Block, Cytokeratin Immunostain, 20x

Bone, vertebra, C2, CT-guided fine needle aspiration:

Cellular evidence of chordoma.

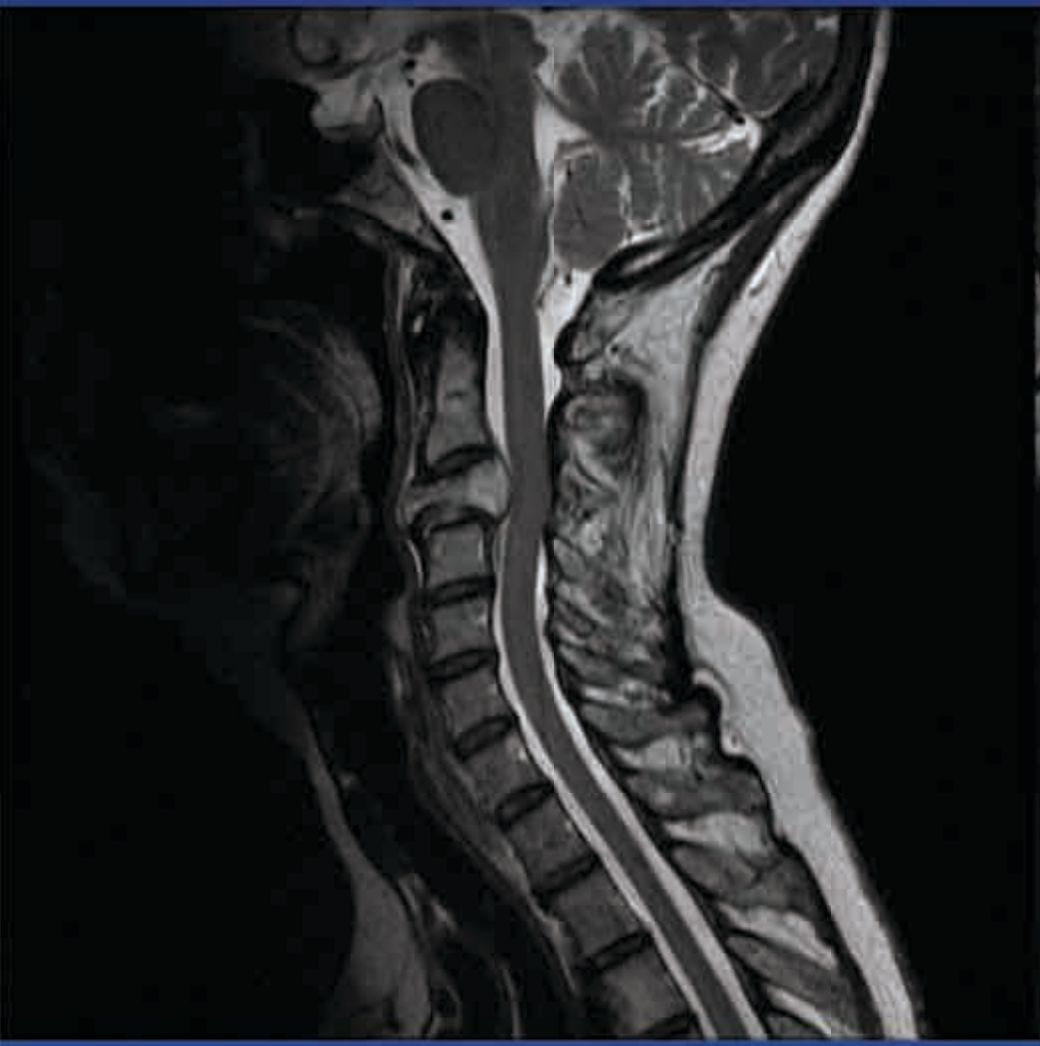
Cell block and cytologic preparations examined.

Immunohistochemical stains were performed to aid in interpretation. Stains for pancytokeratins and S-100 are positive. Stains for chromogranin, synaptophysin and CD56 are negative.

Chordoma

- Malignant tumor arising from notochord remnants
- Midline:
  - sacrococcygeal > spheno-occipital >> vertebral body
- Hyperintense to discs on T2WI, with multiple septa
- Histologic identification of physaliphorous cells confirm diagnosis

Hyperintense to discs on T2WI, with multiple septa



Case 3: Chondrosarcoma

Case 4: Chordoma

Chordoma – Clinical Issues

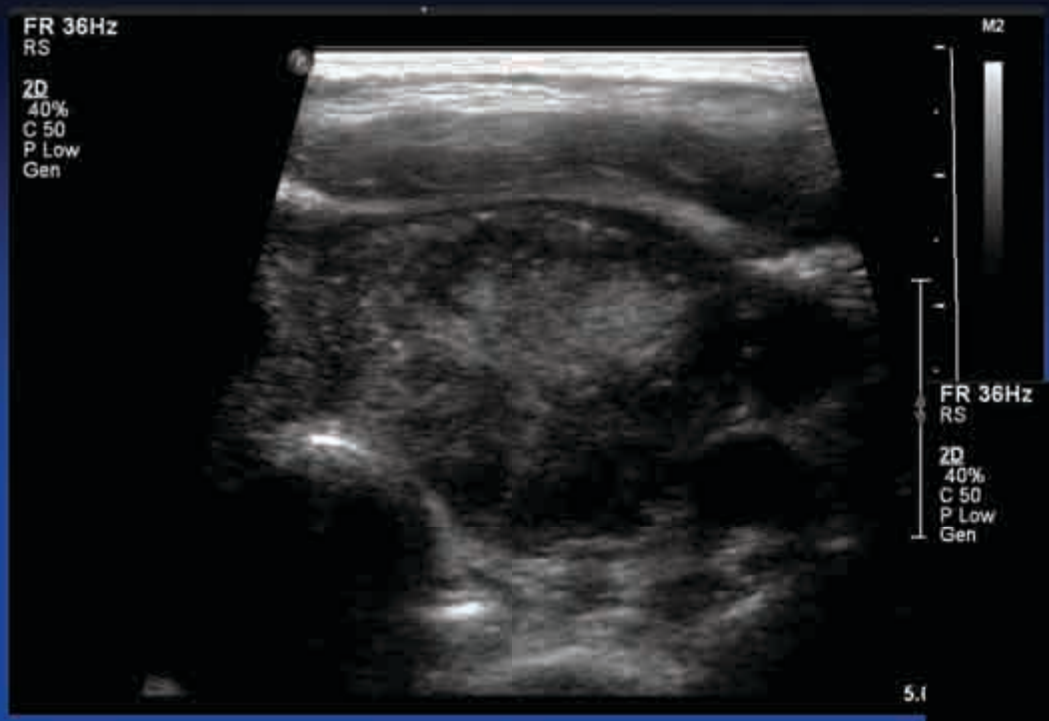
- Location dependent presentation
  - pain, numbness, weakness, incontinence
- Age: 5th-6th decade
- Slow growing
- Surgical resection with adjuvant XRT
- Recurrence is common
- 5 year survival: 67 to 84%
- 10 year survival: 40%

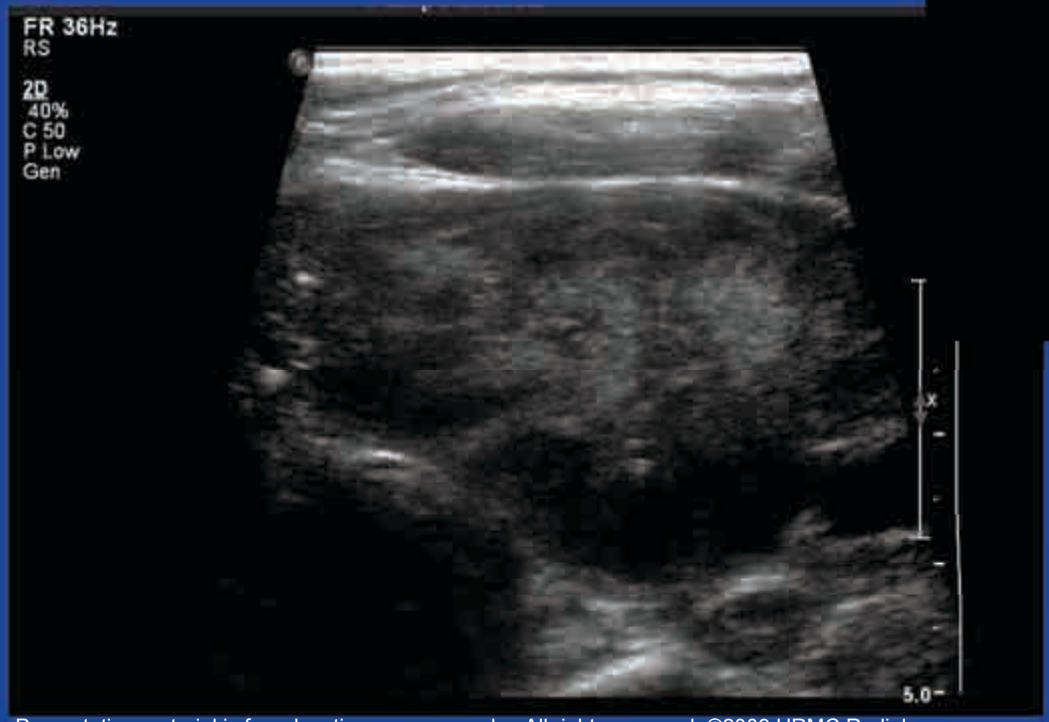
Follow-up

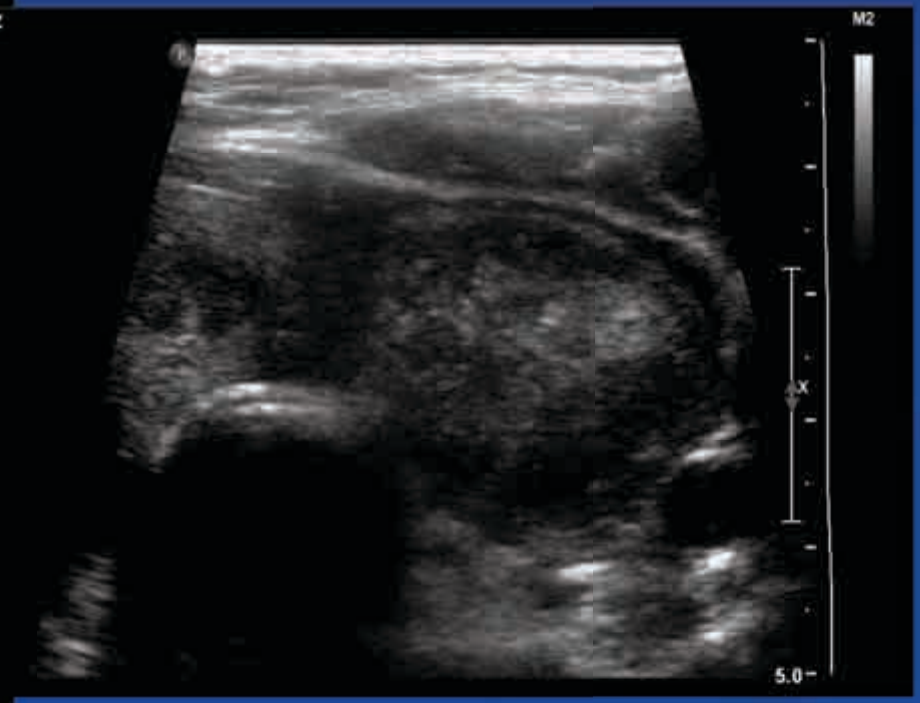
- Complex case requiring highly specialized team:
  - Maxillofacial surgeon
  - ENT surgeon
  - Orthopedic oncologist
  - Neurosurgeon or an orthopedic complex spinal surgeon
- 3 centers in the nation perform this procedure:
  - Johns Hopkins, University of Pittsburgh, MD Anderson
- The referral for initial consultations at these hospitals has been denied by his insurance company

Case 5

- 41 year old female with thyroid nodules. The left lobe is mostly replaced with a nodule.





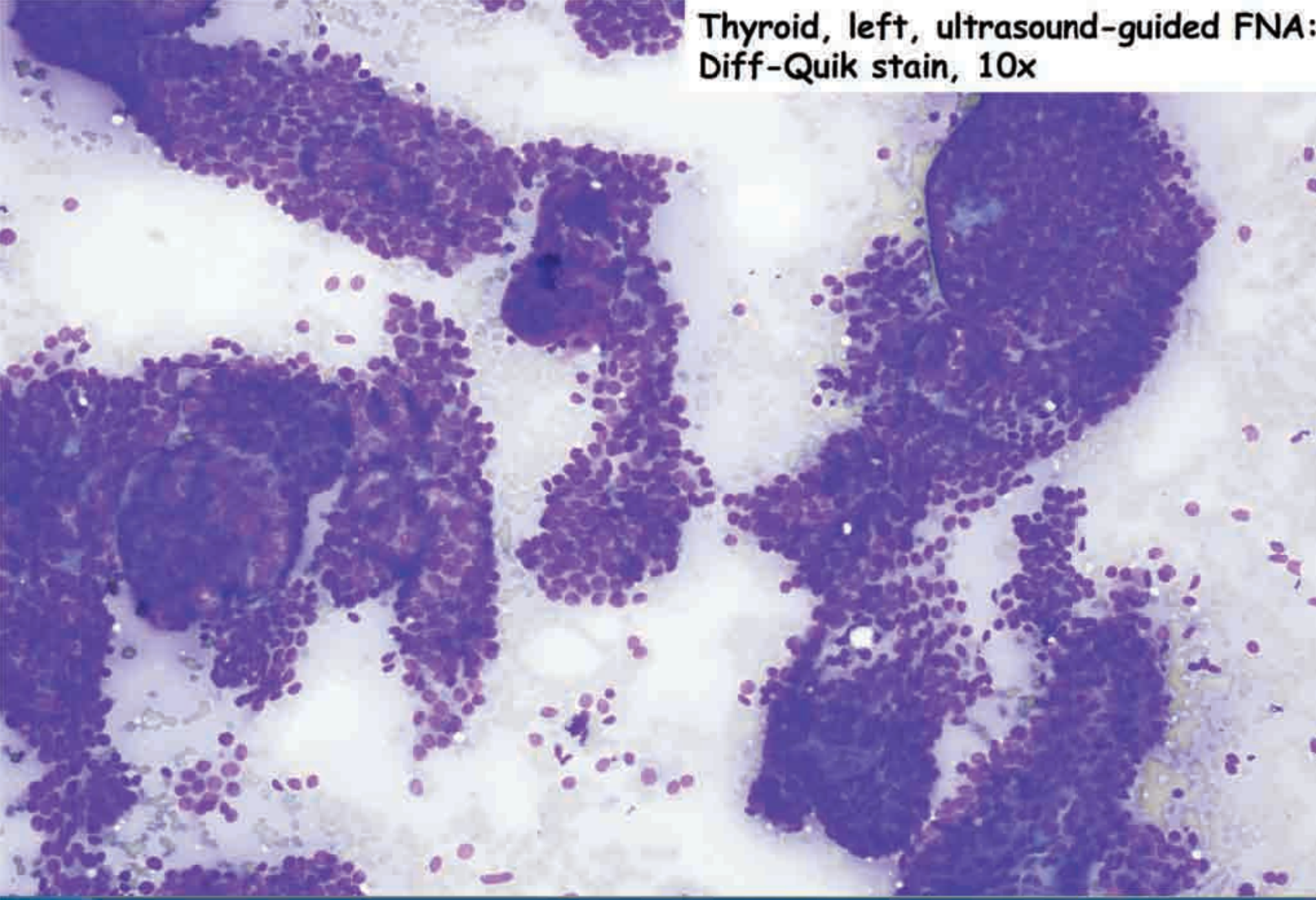


Differential Diagnosis

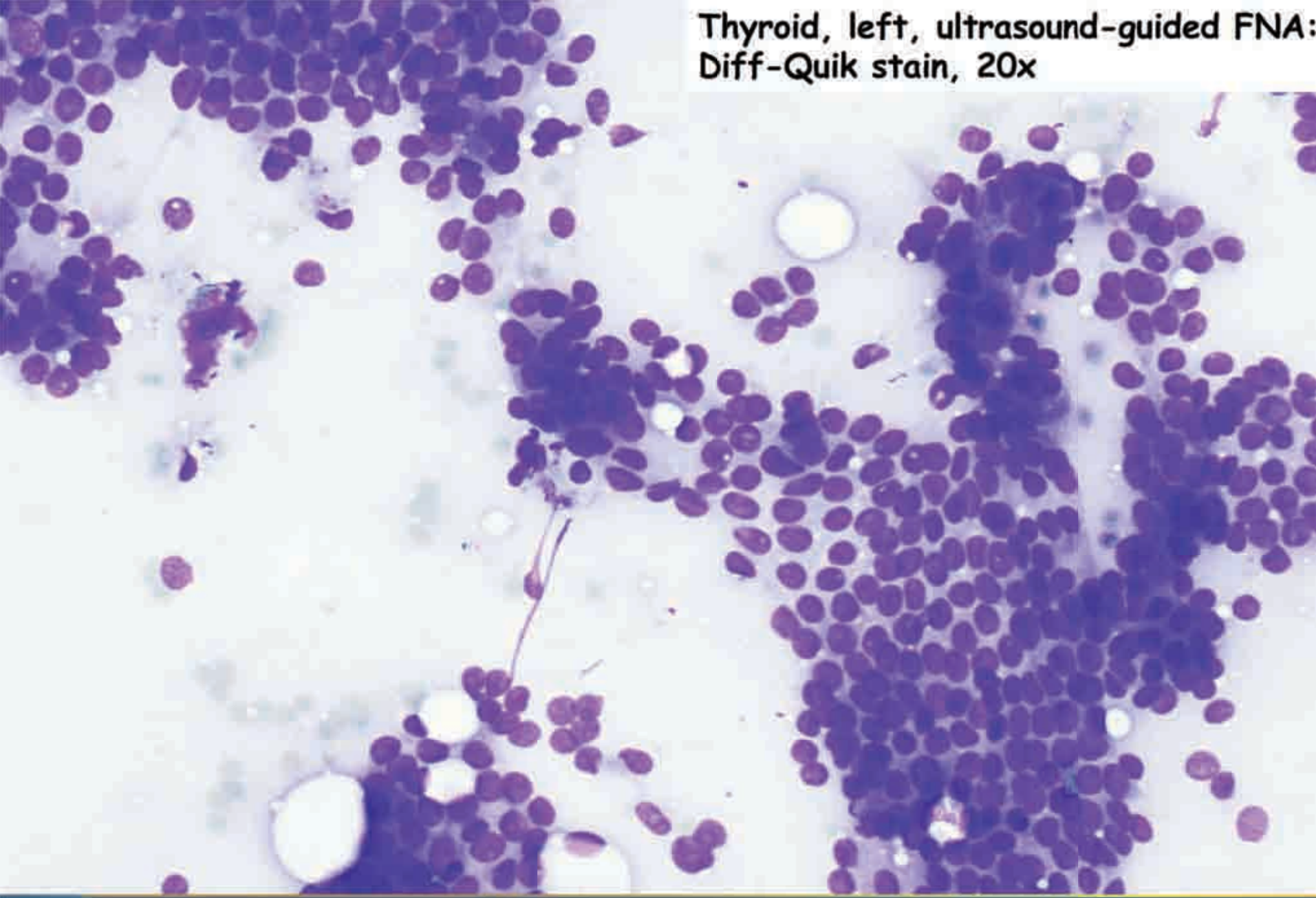
- Thyroid Cancer
  - Differentiated thyroid carcinoma
    - Papillary (80%) and Follicular (10%)
  - Medullary carcinoma (5-10%)
  - Anaplastic carcinoma (1-2%)
- Hemorrhagic colloid cyst
- Multinodular goiter
- Follicular adenoma
- Non-Hodgkin lymphoma

Case 5

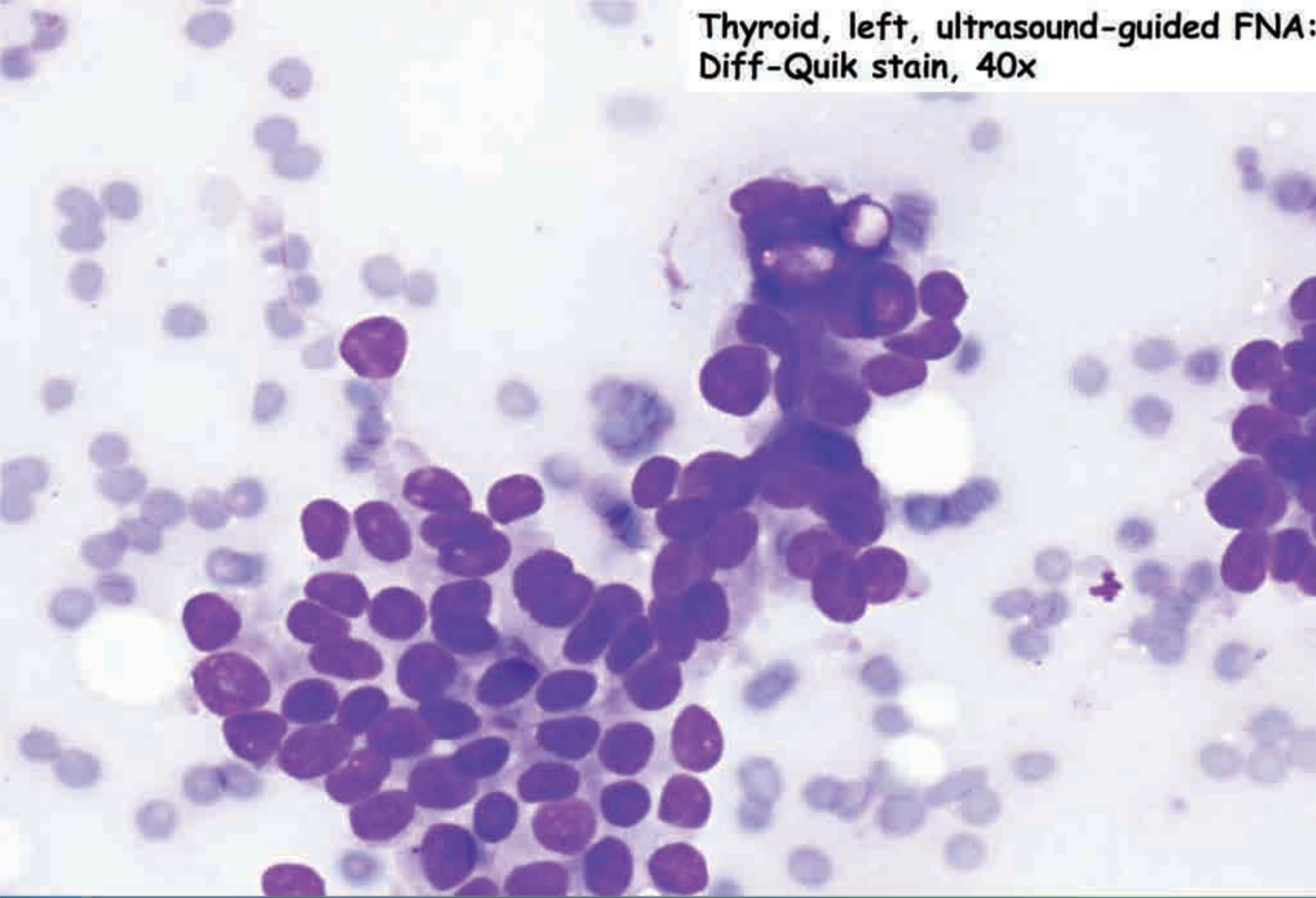
Thyroid, left, ultrasound-guided FNA:
Diff-Quik stain, 10x

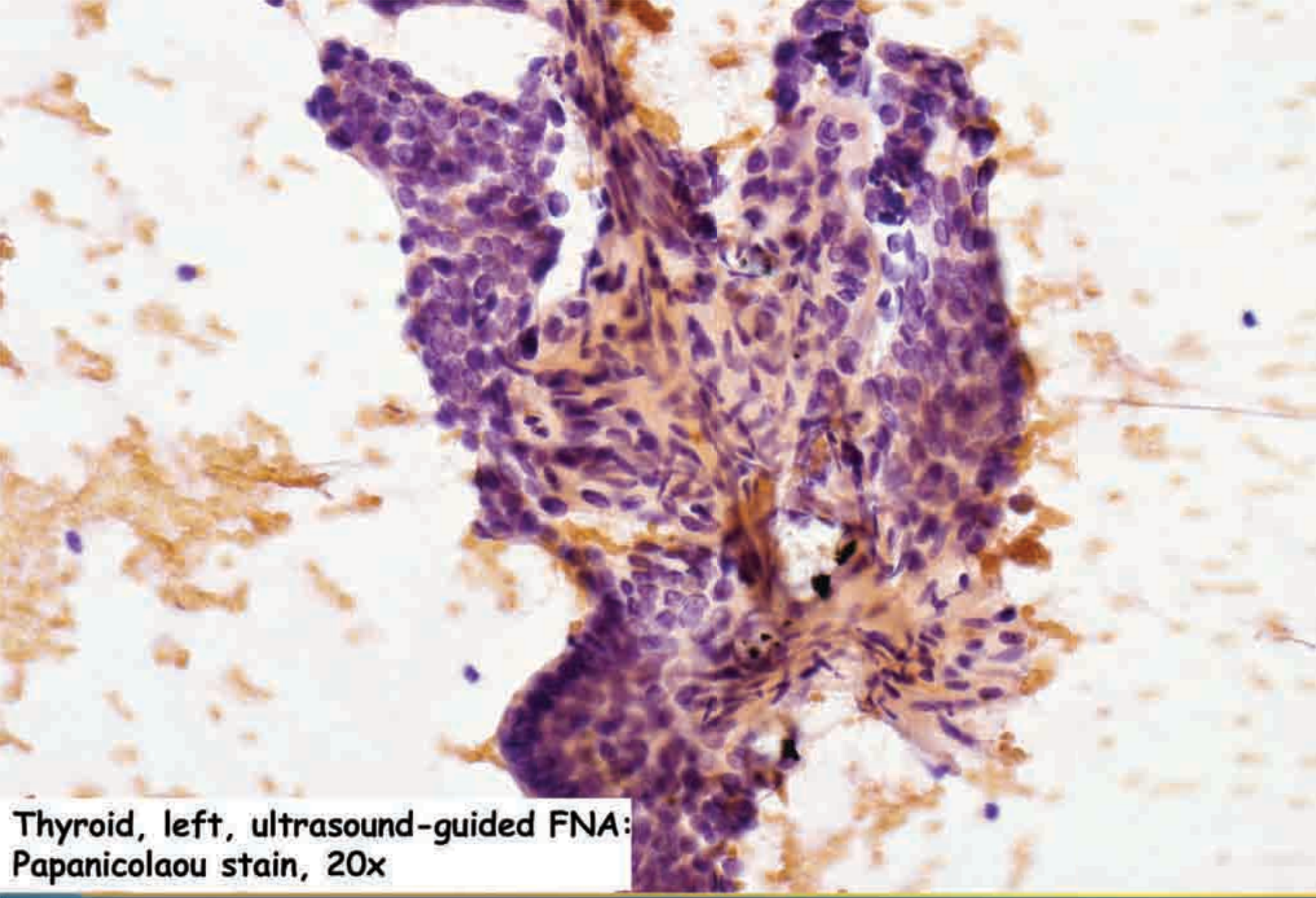


Thyroid, left, ultrasound-guided FNA:
Diff-Quik stain, 20x



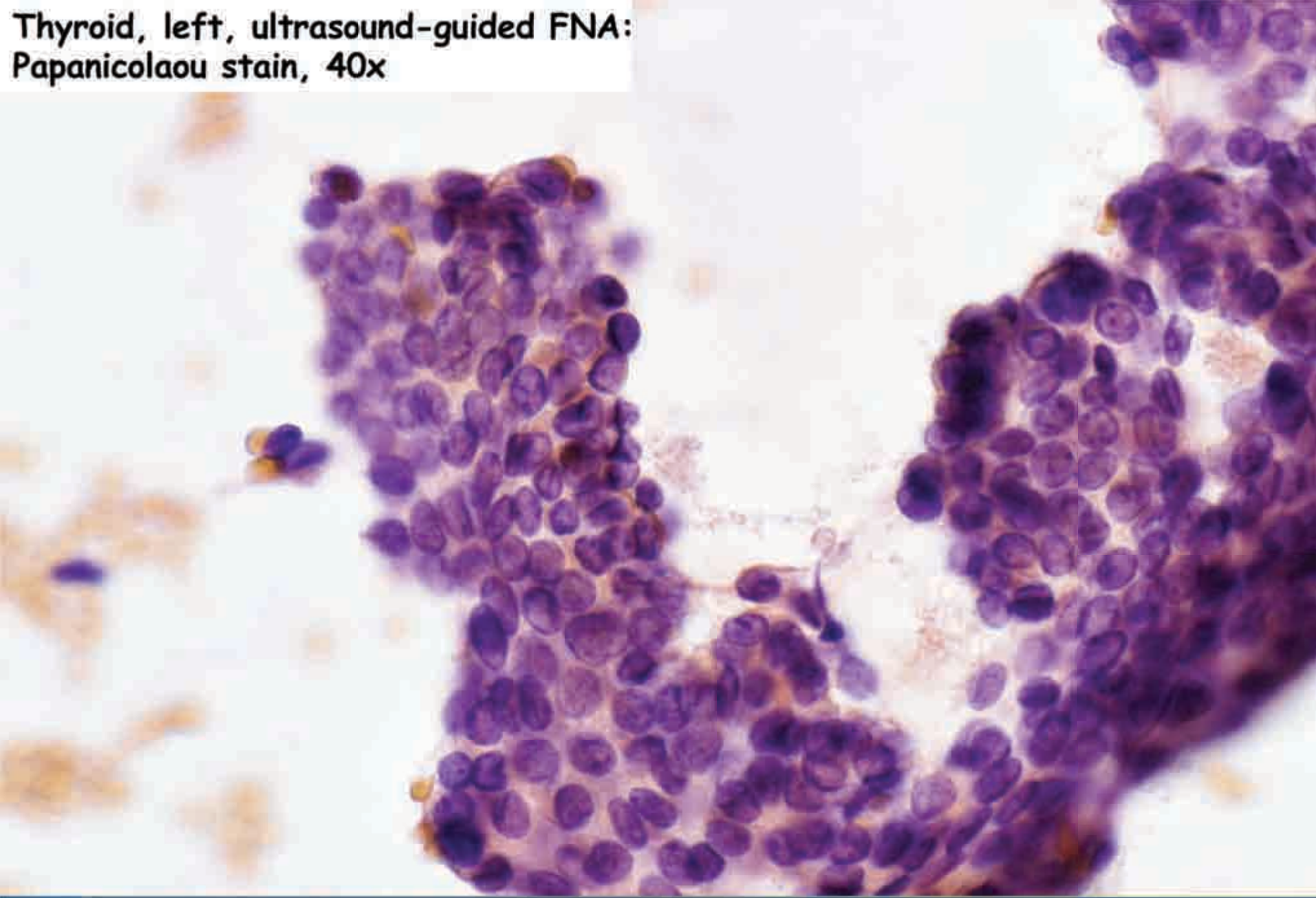
Thyroid, left, ultrasound-guided FNA:
Diff-Quik stain, 40x





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

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



Thyroid, left, ultrasound-guided fine needle aspiration:

Malignant tumor cells present derived from papillary carcinoma.

Thyroid and neck dissection, excision:

Papillary carcinoma, well differentiated.

Tumor necrosis: Not present

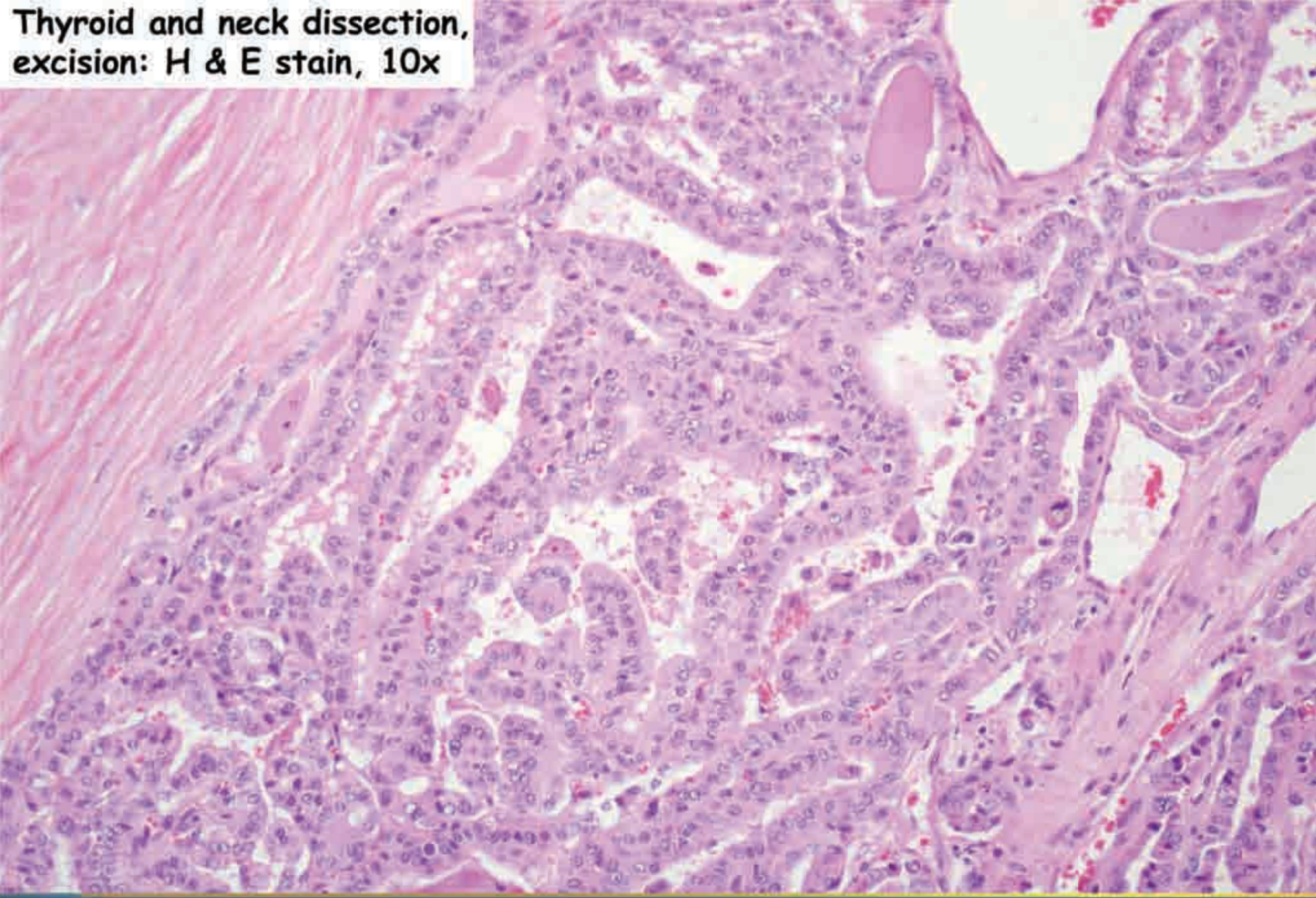
Tumor size:

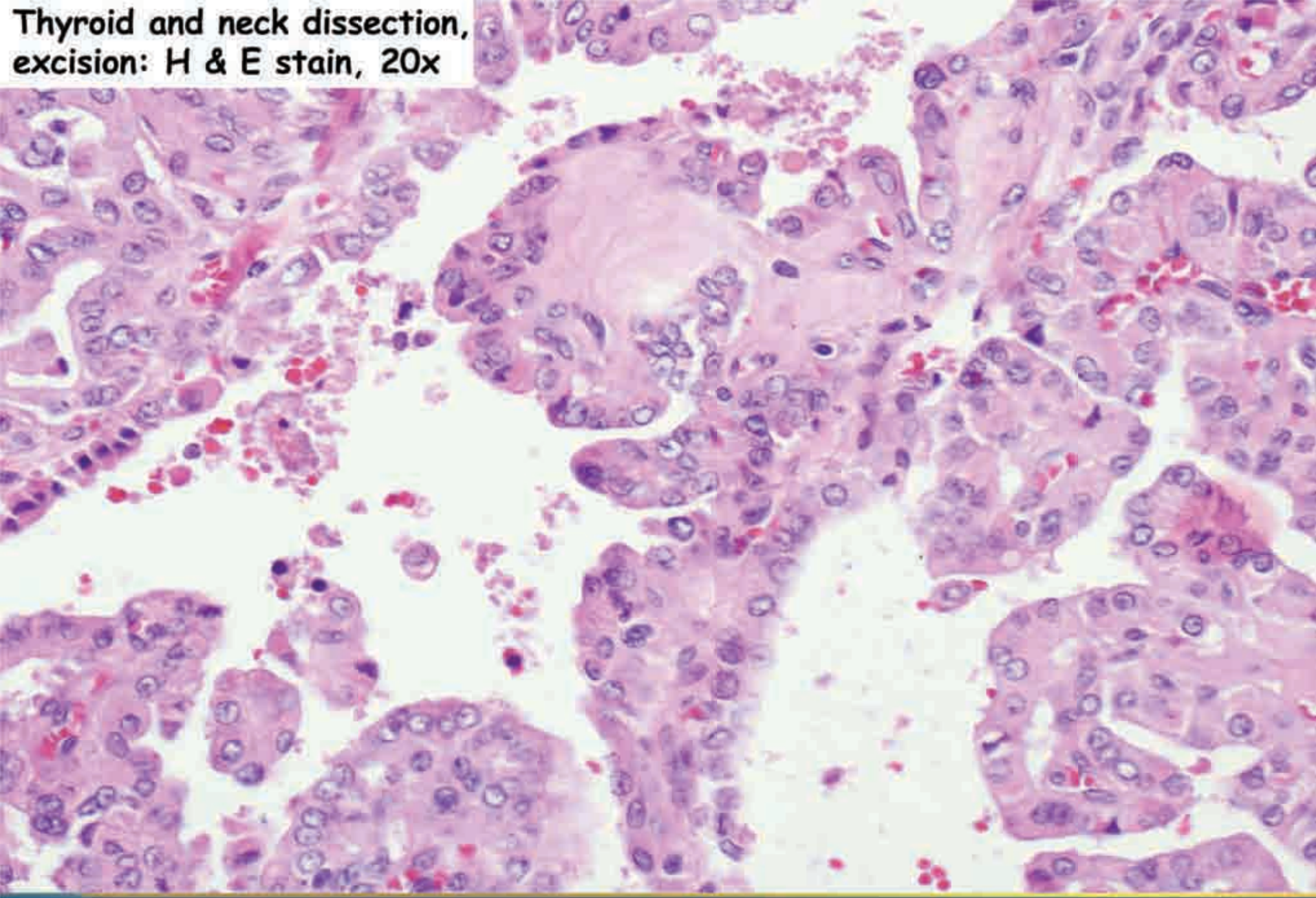
Right lobe	1.7 x 1.5 cm
Isthmus and left lobe	7 x 5 cm

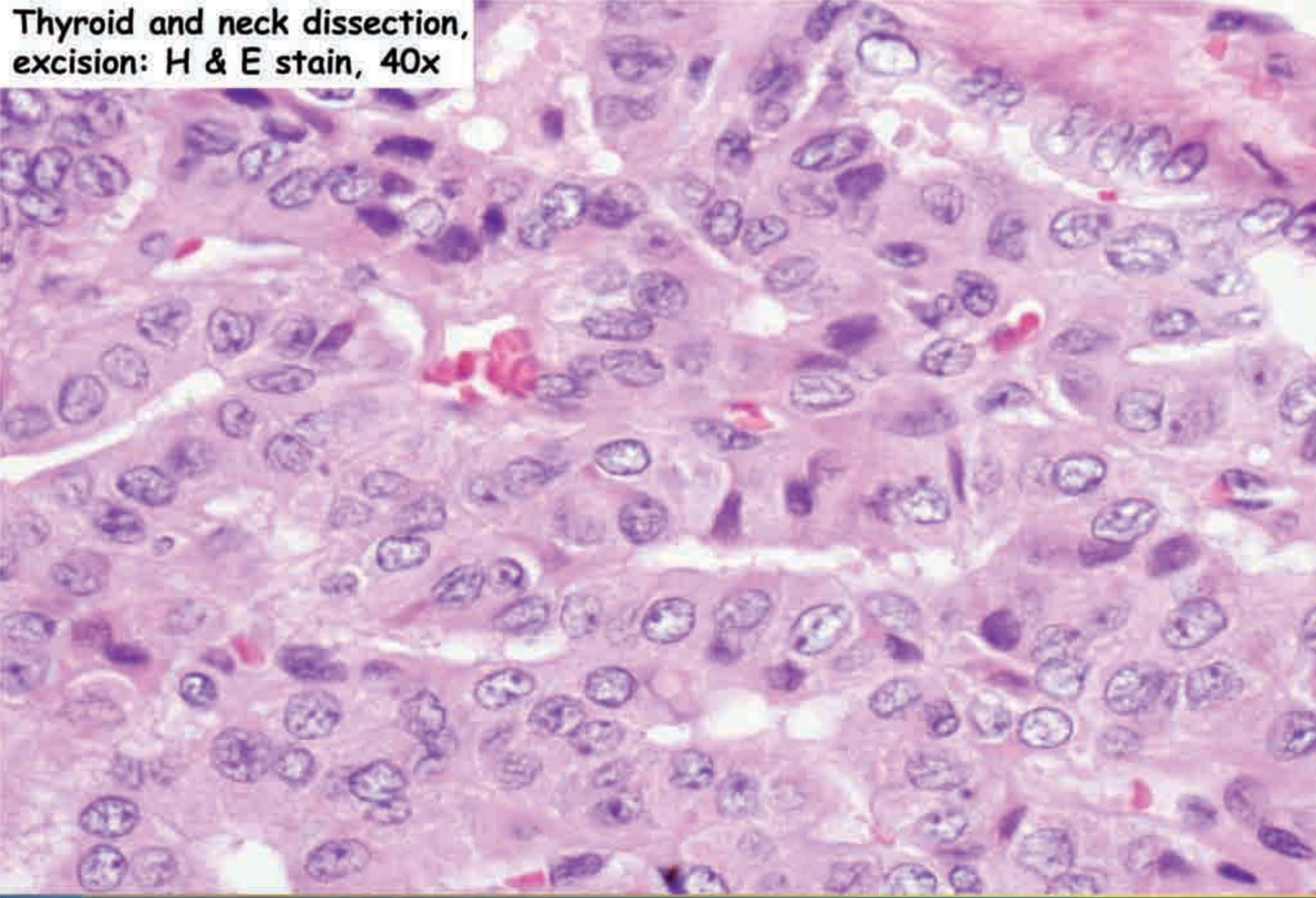
The tumor is partially encapsulated.

Other tumor features Psammomatous calcification.

Lymph node: Nine out of twenty four lymph nodes are + for metastatic disease.







Papillary Thyroid Carcinoma

- Best diagnostic clue: Focal, intrathyroidal mass with associated extracapsular invasion +/- metastatic nodes
- Highly variable ultrasound appearance with no definite features to differentiate benign from malignant
- Most common appearance is a solid hypoechoic or isoechoic mass +/- calcification

Papillary Thyroid Ca – Clinical Issues

- Painless, palpable, solitary thyroid nodule
- Clinical profile: female with firm thyroid nodule
- Age: Peak incidence in 3rd and 4th decades
- 20 year survival rate:
  - 90% (papillary), 75% (follicular)
- Surgical resection: Total thyroidectomy and regional lymphadenectomy
- Followed by I-131 ablative therapy if indicated

Follow-up

- Patient underwent total thyroidectomy and had two avid areas of radiotracer uptake in the neck on subsequent I-131 total body scan.
- She underwent thyrogen protocol and received 148 mCi of I-131.
- There was good radiotracer uptake in the thryoid surgical bed and therapeutic benefit can be expected.