39-year-old Female With Right Gluteal Mass”

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Case Presentation

- 39-year-old female patient who felt a mass in the right gluteal area.
- Slowly growing over the course of 2 - 3 months.
- The mass is associated with pain that is dull in nature.
- No neurological complaints, no fevers, no skin changes, no weight loss.
- Patient admitted for further work-up.

H and P continued

- PMHx: None
- PSurgHx: s/p appendectomy 20 years ago, s/p C-section 10 years ago

- Medications: None
- All: NKDA

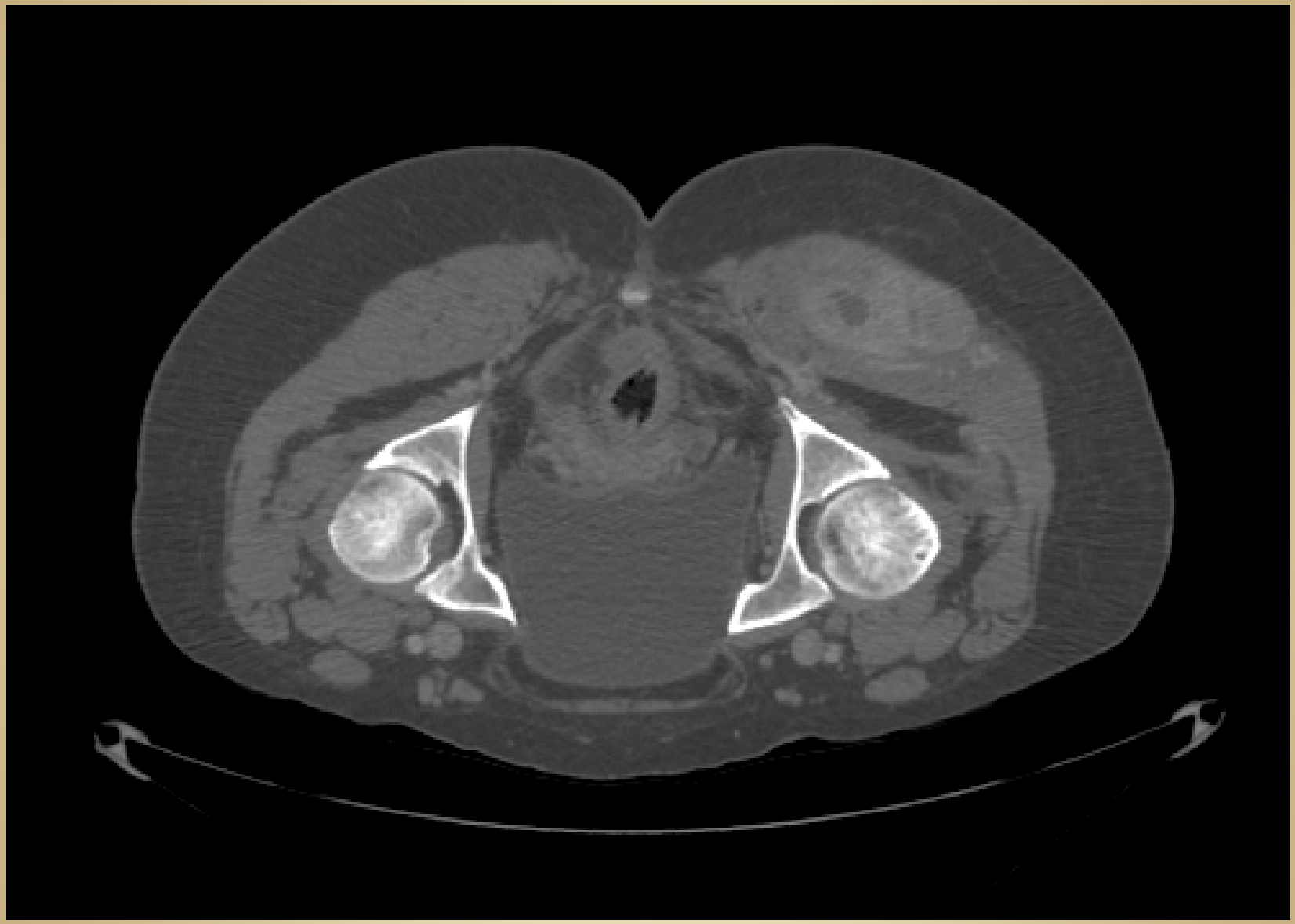
- SHx: No Tob, Occ Etoh, lives with husband and two kids
- FHx: negative for malignancy

Physical Exam

- KPS: 90
- Gen: NAD, patient lying in bed comfortably.
- No palpable cervical, axillary lymph nodes.
- Hard, mobile, roughly 6 x 6 cm nontender mass adjacent to the right intergluteal cleft. Overlying skin normal without evidence of erythema or ulceration.
- Neuro: Patient does not demonstrate any motor or sensory deficits.
- Remainder of exam normal .

CT

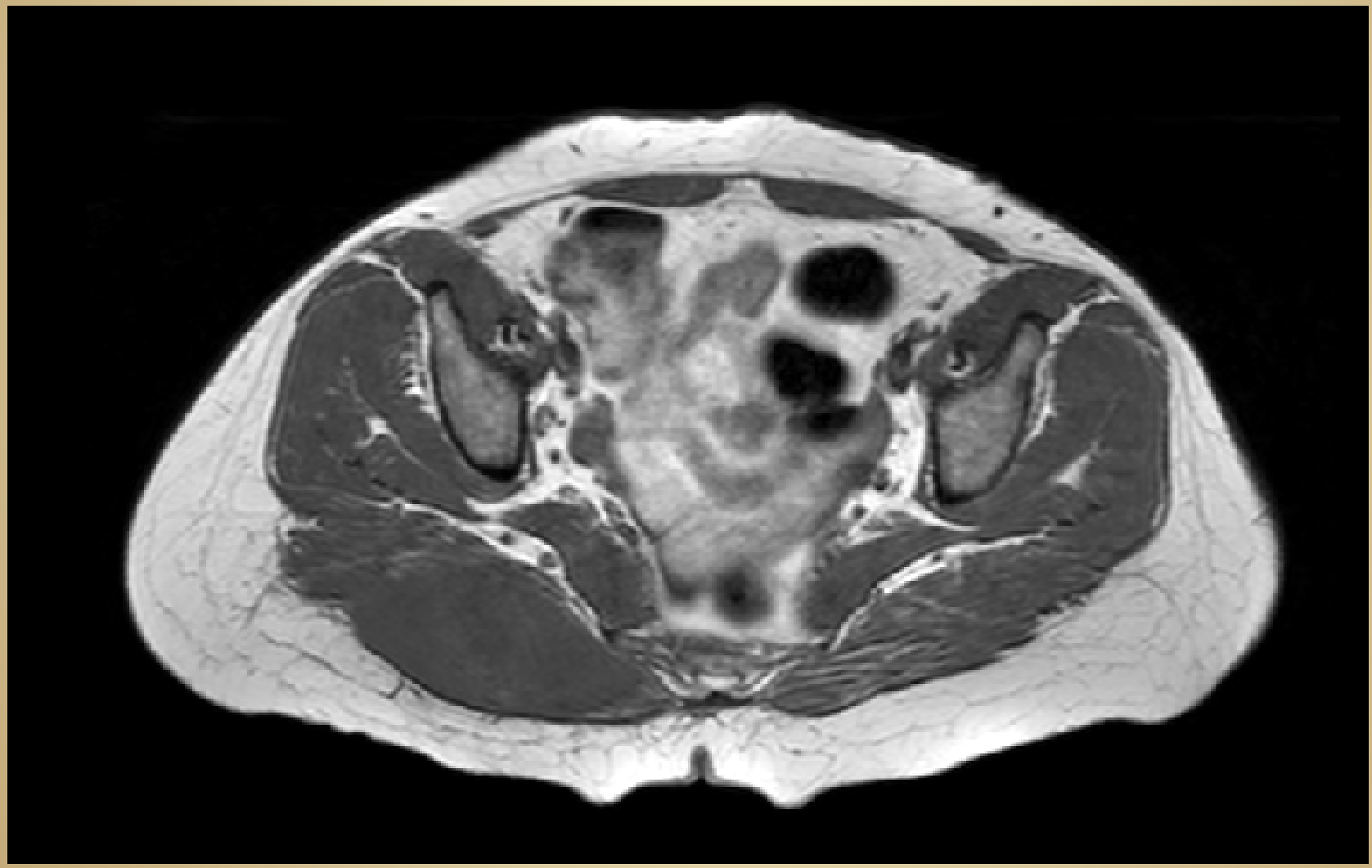
- Right side posterior gluteal 8.9 x 5.7 x 7.3cm heterogeneously enhancing mass with central low density.
- Remainder of the exam demonstrates no acute pathology.



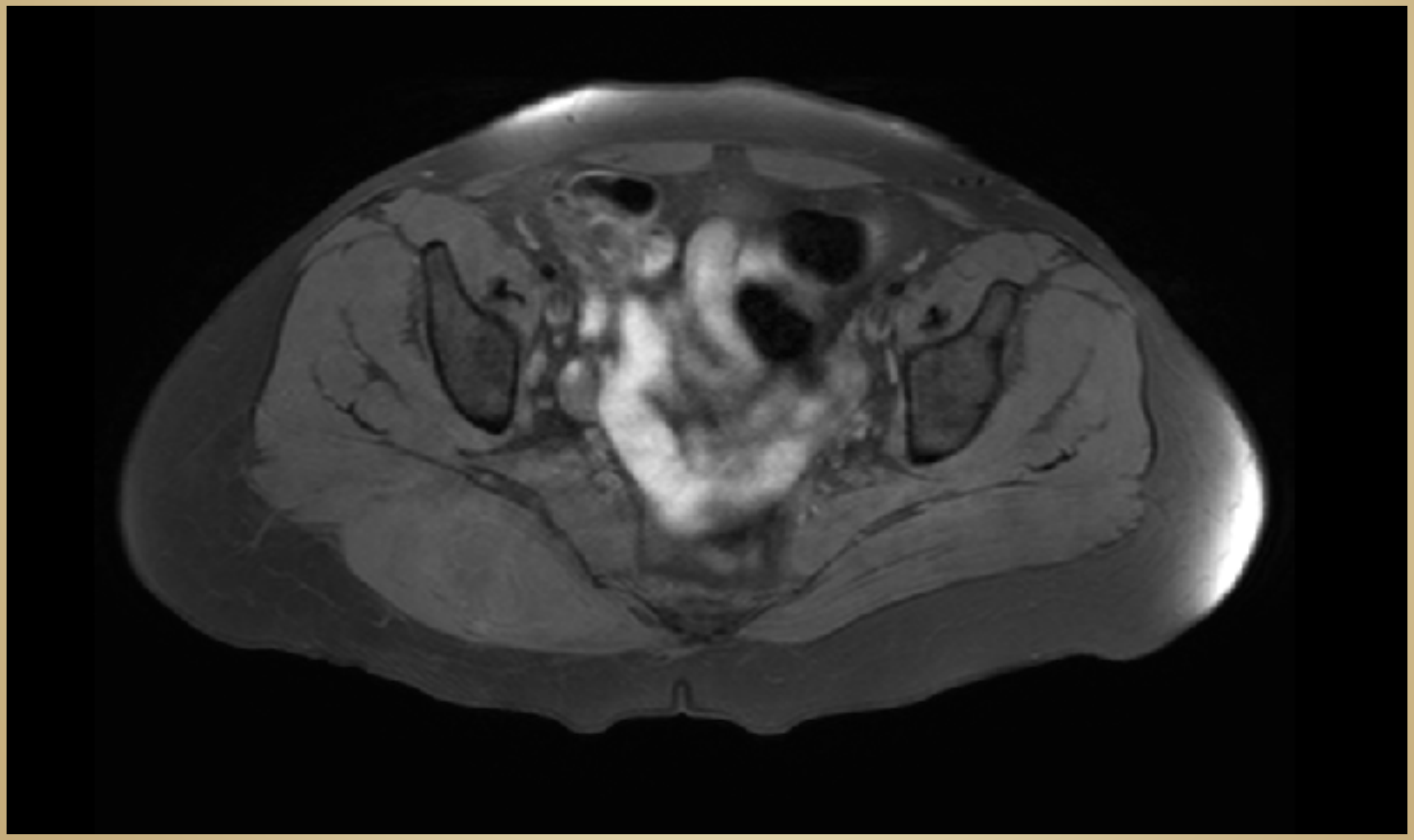
MRI

- 13.0 x 4.5 x 8.0 cm heterogeneous , well-encapsulated mass in the right gluteus maximus.

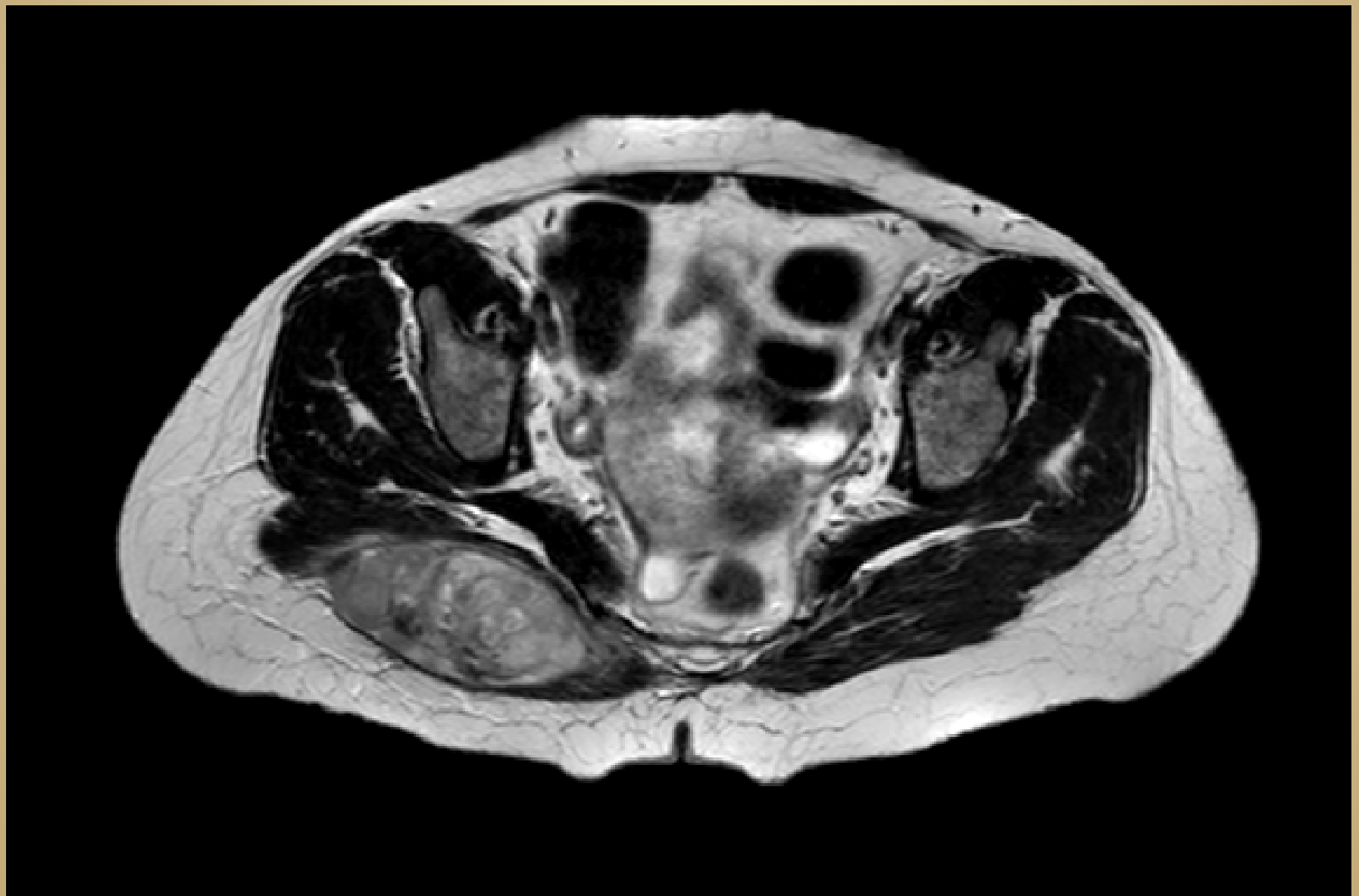
Ax t1

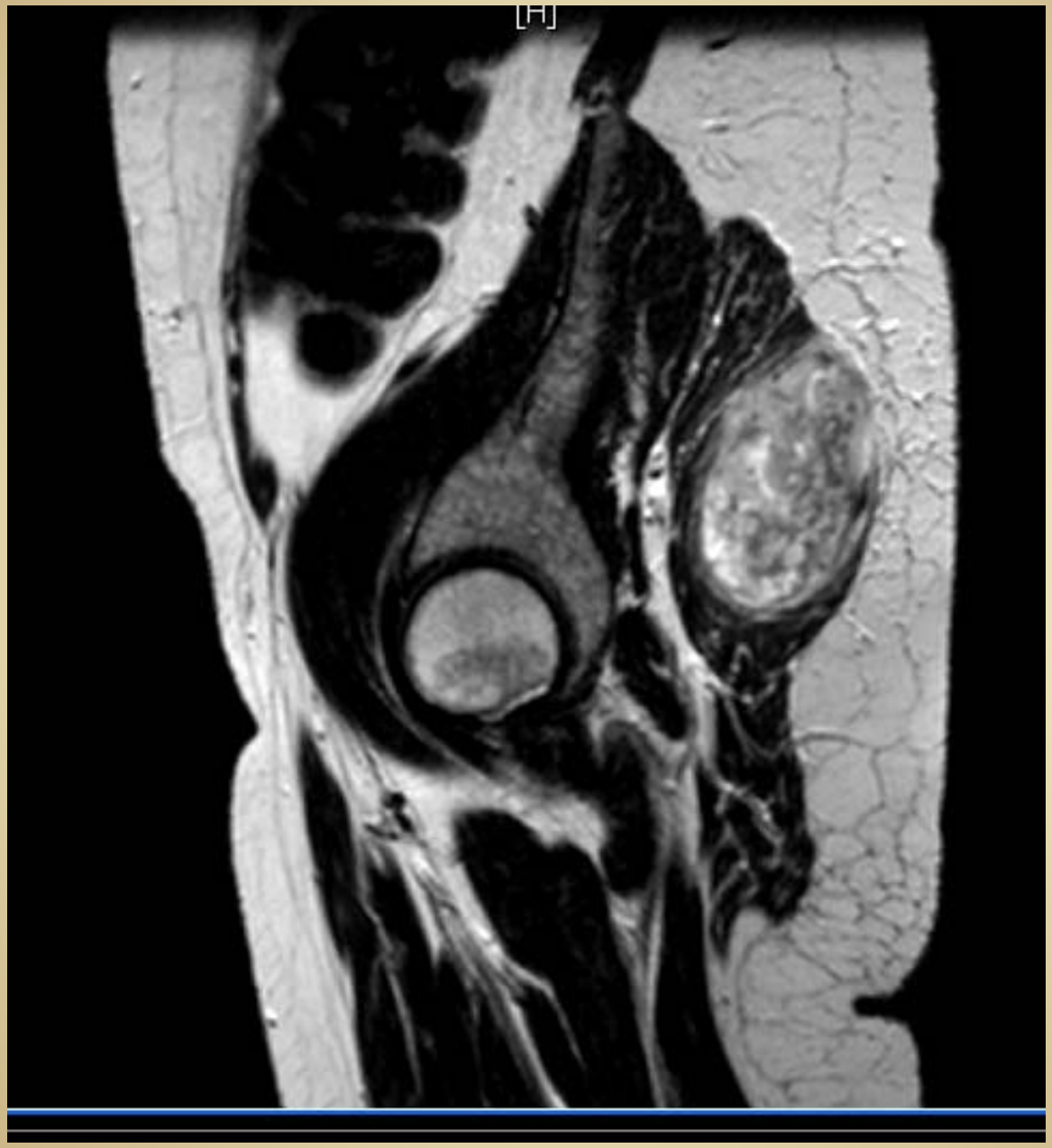


Ax t1 fat supressed



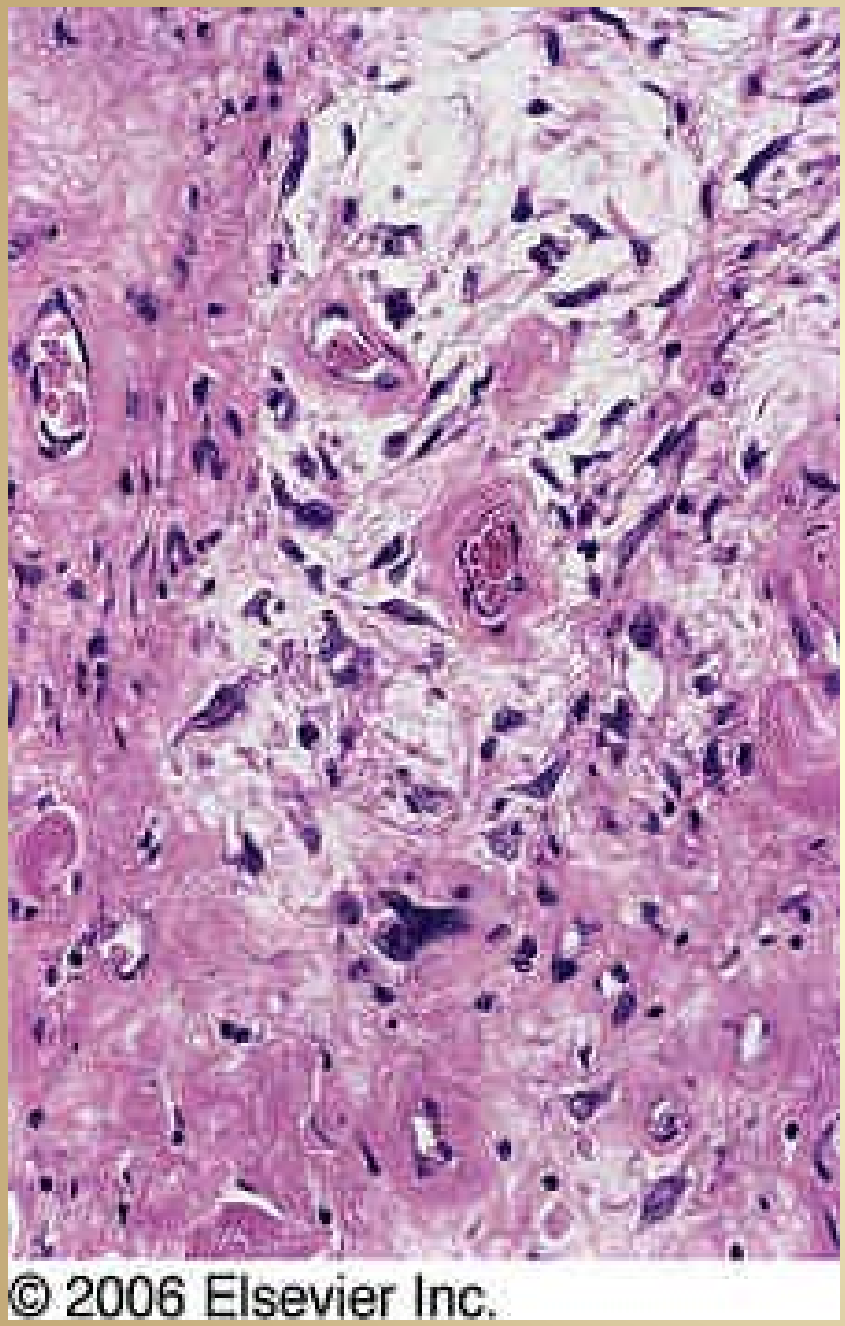
Axial T2




[H]

Incisional Biopsy

- Considered technique of choice, though core needle biopsy is now more commonly done and has excellent sensitivity and specificity (FNA and excision Bx are not recommended).
- Must orient along long axis of extremity (planned future resection axis).
- Don’t violate uninvolved compartment.
- Attempt minimal dissection with careful attention to hemostasis.



- High-grade myxofibrosarcoma
- Immunopathology
  - Positive: CD 117, 34, 68, **desmin**
  - Negative: AE1/AE3, EMA, HMB45, S100, Actin

- Malignant stromal tumor of fibroblastic origin with a spectrum of morphology that includes variable pleomorphism, myxoid appearance and typical vascular pattern.

Treatment Decision Point

- Radiation oncologist consulted prior to further therapy.
- Patient would benefit from adjuvant therapy given location and pathology.
- Possibility of brachytherapy to boost to higher dose.

Comparing Pre-op vs Post-op RT

PRE-OP RT	vs.	POST-OP RT
Advantages		**Advantages**
+ irradiate smaller volume*		+ no surgical delay
+ lower RT dose (less late fibrosis)		+ path staging / margin assessment (improves patient selection for RT)
+ ↓ tumor seeding at surgery*		
+ improves resectability		+ no RT-related healing problems
+ less tissue hypoxia before surgery		
Disadvantages		**Disadvantages**
- delay in surgery		- irradiate larger volume
- ↑ wound complications (reversible)		- higher RT dose required
- IHC pathology complications		- more fibrosis/edema (irreversible)
- Boost in pts with (+) margins +/- effective		- hypoxic environment after surgery

***Notes:**

- Pre-op RT encompasses a smaller volume because you don't need to cover any operative field.
- Pre-op RT decreases tumor seeding during surgery because (1) the tumor may regress or (2) the pseudocapsule may thicken and become acellular, easing resection

- Post-op radiation therapy is preferred in lower extremity sarcomas due to increased risk of wound complications with pre-op radiation therapy in this group. For this reason an adjuvant approach was taken with our patient.

Wide Local Excision

- Right gluteal mass, 12.5 x 11 x 3.6 cm, Intramuscular
- High grade myxofibrosarcoma
- 20-40 mitotic figures per 10 HPF, Necrosis present, LVI negative
- Medial margin was positive on frozen section → fulguration and re-excision performed → no residual tumor seen on pathology
  - **In cases of (+) or unknown margins, re-resection has been shown to improve local control <u>even</u> if patient receives post-op radiation therapy (MDACC, Zagars, 2003).**

Interstitial Implant

- Following resection, 20 hollow afterloading catheters were placed **1 cm apart** in a **single plane** in the **longitudinal** direction.
- All catheters were inserted inferiorly under the gluteal ridge to come superiorly closer to the iliac crest.
- The distance spanned ~12 cm.
- Catheters were secured with absorbable sutures inside the tumor bed and with plastic and metal buttons externally.
- The incision was then closed over the catheters.


B BRAUN

HDR Brachtherapy

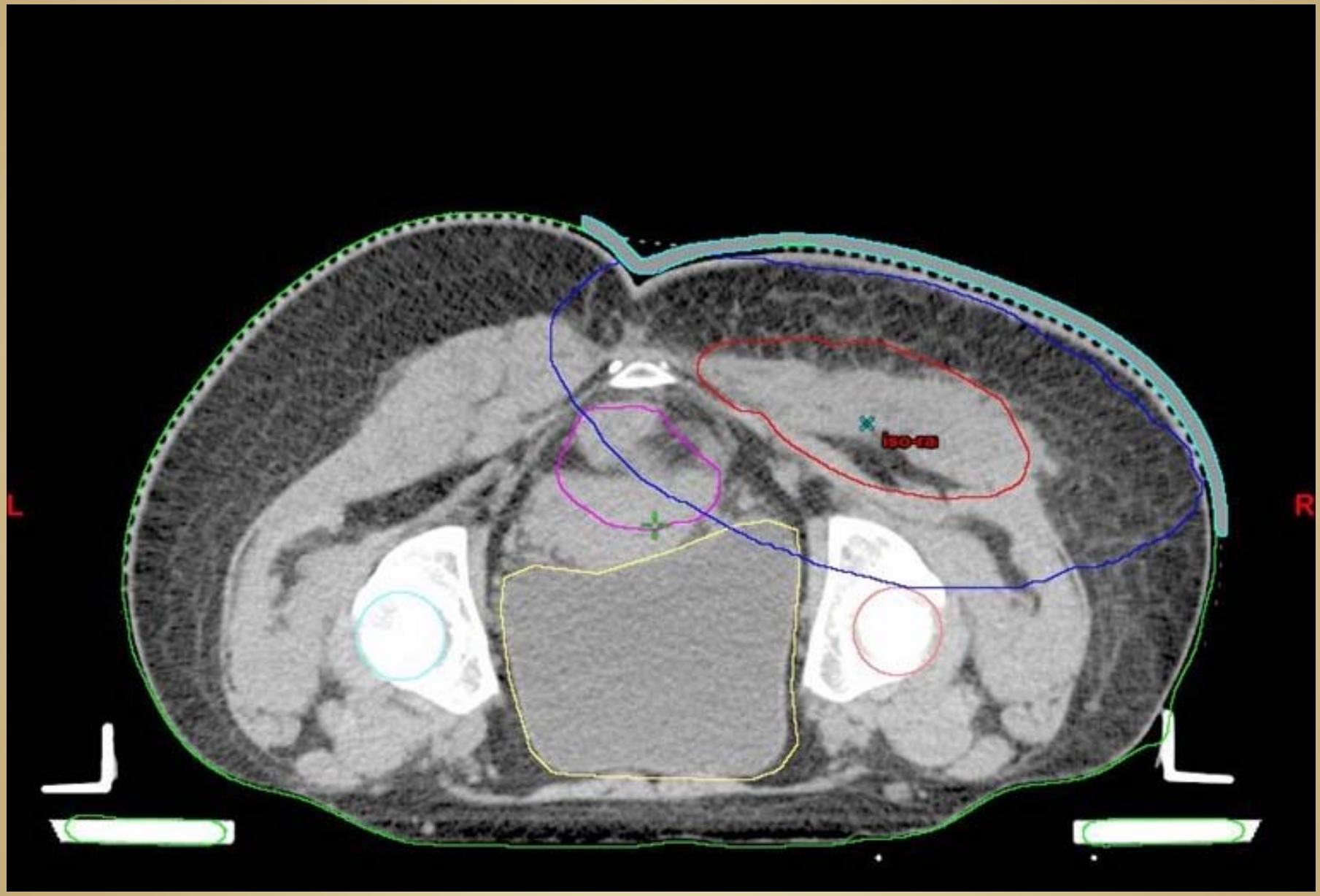
- Patient received a course of fractionated high-dose rate brachytherapy to the right gluteal region.
- Target volume: Tumor bed + 2cm longitudinal & 1.5cm perpendicular margin.
- Prescribed 1800 cGy at 1 cm depth giving 600 cGy for three fractions in three days.
- Treatment was started on post-op day six and was well-tolerated.
  - **Pisters et al (1996) showed that RT increased rate of wound complications if Tx began ≤ 5 days post-op**
- Catheters were removed.
- No side effects encountered and the patient was then referred for external radiation therapy in three weeks time.

External Beam Radiotherapy

- A course of external radiation therapy was given using IMRT to the right gluteal region.
- A dose of 5400 cGy was prescribed.
- Side effects: There was mild fibrosis of the right gluteal skin, but there was no significant wound healing problem.

General Notes on EBRT planning

- Target Volume:
  - Initial Field: Tumor bed, scar, drain sites + margins (**5-7cm longitudinal, 2-3cm perpendicular).**
    - Fuse planning CT with T1 MRI with contrast to delineate GTV, and include suspicious edema on T2 in CTV.
    - Margin can be shortened on anatomic boundaries such as bone, joints, un-violated fascia, and boundaries of compartment (with margin of 1-2cm)
    - Bolus scars & drain sites for first 50Gy unless in tangents (controversial)
    - Typically, don't do elective nodal irradiation (certain histologies excepted)
      - If LNs resected, may consider nodal RT for ECE.
  - Boost Field: Reduce field to surgical bed + 2cm margin
- Positioning Pearls
  - Upper Inner Thigh best treated with frog-leg position
  - Buttock/post thigh best treated in prone position
  - Biceps best treated with shoulder 90 degrees abducted and internally rotated
  - **It is often necessary to assess multiple positions during simulation.**
- Avoidance Structures:
  - Avoid treating the full circumference of an extremity (especially >50Gy)
  - Try to spare ½ of cross-section of weight-bearing bone, > ½ of joint cavities, and major tendons (patellar, Achilles)
  - Always spare 1.5-2cm strip of skin
    - Especially over anterior tibia due to poor vascularity & over commonly traumatized areas (elbow, knee, shin, femoral neck)
  - Avoid treating anus, urogenital tract, perineum, and genitalia
  - Avoid treating lung (use shielding, etc)
  - Avoid dose maximums over surgical scars
  - For the feet, try to spare 2/3 of weight bearing surfaces (heel, ball, lat edge)
- Dose Limitations:
  - >20Gy can prematurely close epiphysis
  - >40Gy ablates bone marrow
  - >50Gy to bone cortex → fracture
  - >40Gy to joint space → fibrotic constriction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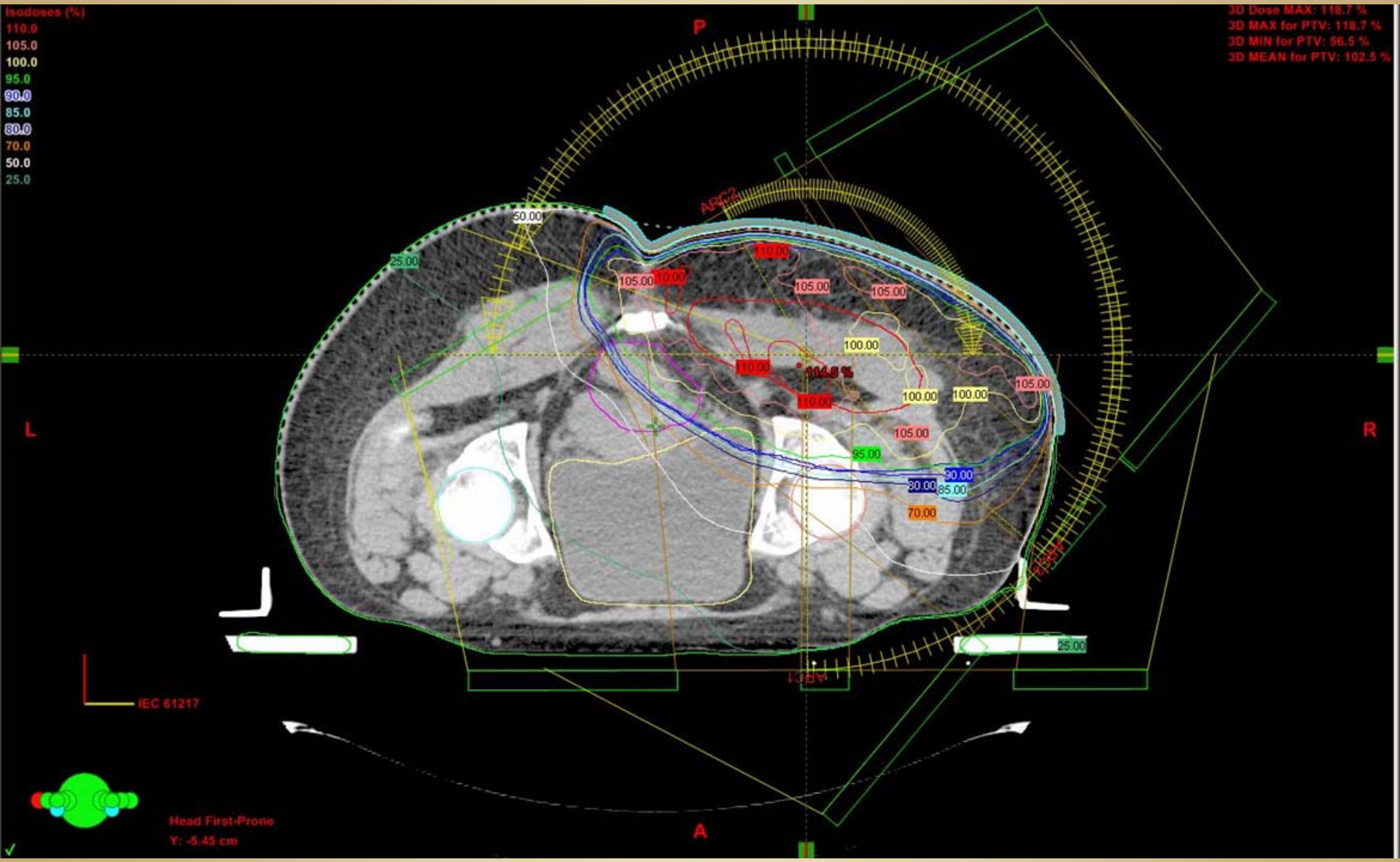
Isodoses (%)
110.0
105.0
100.0
95.0
90.0
85.0
80.0
70.0
50.0
25.0
3D Dose MAX: 118.7 %
3D MAX for PTV: 118.7 %
3D MIN for PTV: 56.5 %
3D MEAN for PTV: 102.5 %
P
L
R
A
ARC2
ARC1
50.00
25.00
110.00
105.00
100.00
95.00
90.00
85.00
80.00
70.00
104.8 %
IEC 61217
Head First-Prone
Y: -5.45 cm

Soft-tissue Sarcoma

A few interesting points…

Patterns of Spread

- Lymph nodes
  - ~5% have positive lymph nodes at presentation.
  - Increased risk in clear cell sarcoma (28%), angiosarcoma (11%), epithelioid sarcoma (20%), rhabdomyosarcoma (15%), synovial sarcoma (2-14%).
    - (Mnemonic: **SCARE** for synovial, clear cell, angio, rhabdo, epithel.)
- Distant metastases
  - ~10% have distant mets at presentation.
  - Extremity sarcomas most commonly spread to lung (70-82% experience lung mets as first metastatic site); ~80% of distant mets appear within two years.

AJCC 7th Edition (2009)

Primary Tumor:
T1 - less than or equal to 5cm
- T1a - superficial
- T1b - deep

T2 - greater than 5cm
- T2a - superficial
- T2b - deep

Regional Lymph Nodes:
N0 - no
N1 - yes

Distant Metastases:
M0 - none
M1 - yes

Grade:
AJCC now recommends a three-tier system. The FNCLCC (French) system is the preferred grading system.

Stage Grouping:
IA - T1a/b N0 G1 - low grade (grade 1), small
IB - T2a/b N0 G1 - low grade (grade 1), large
IIA - T1a/b N0 G2-3 - mod/high grade (grade 2-3), small
IIB - T2a/b N0 G2 - mod grade (grade 2), large
III - T2a/b G3, or N1 - high grade (grade 3), large; or node positive
IV - M1 - metastatic

Prognostic Factors

- Predictors of local recurrence NOT the same as those for distant recurrence
- **Grade** is most important prognostic factor, followed by **margin status**
- Increased Risk of **Local Recurrence** (in order of importance)
  1) **Positive margins**
  2) **Tumor site**: Difficult to clear margins in Retroperitoneal and H&N sarcomas
  3) Prior local recurrence
  4) Age >50
  5) Histology: fibrosarcoma, desmoid, MPNST
  6) Not significant: Grade, tumor size, and depth
- Increased Risk of **Distant Metastasis** (in order of importance)
  1) **Grade**: 50% risk for high grade, 10% for low grade
  2) **Size**

Size	# pts	%DM @ 5yrs
<2.5cm	58	**3**
2.5-5cm	128	**22**
5-10cm	177	**34**
10-15cm	68	**43**
15-20cm	49	**58**
>20cm	21	**57**

  3) **Deep lesion**
  4) High Ki-67
  5) Histology: leiomyosarcoma & MPNST unfavorable, liposarcoma favorable
- Increased Risk of **Nodal Recurrence**
  - Depends on histologic subtype (SCARE pneumonic)

General Management

MANAGEMENT OF EXTREMITY/TRUNK SOFT TISSUE SARCOMAS

******Overview of Practice Guidelines******

Stage I	Surgery Alone (as long as final margins >1cm or intact fascial plane) PORT for close (≤1cm) or (+) margins (after optimal reexccision)
Stage II-III	Surgery + RT (pre-op or post-op) Chemo (pre-op or post-op) for large, deep, high-grade tumors
Stage IV	For controlled 1^0 with ≤ 4 lung lesions and/or extended disease-free interval, consider surgical resection of all lesions. Otherwise, best supportive care.

Post-op RT Treatment Options

- Indications: **high grade**, **> 5cm tumor**, or **close/(+) margins**
- Timing: 10-20 days after surgery, or when healing is complete
- Brachytherapy:
  - (-) margin: 45Gy LDR/4-6d (or HDR 36Gy/10 BID fractions)
  - (+) margin: 16-20Gy LDR/2-3d (or HDR equiv) → 50Gy EBRT
  - Note: Data for HDR is limited for sarcomas, but fractions of 3-4Gy preferred)
- IORT:
  - 10-16Gy IORT → 50Gy EBRT
- EBRT: 4-6MV for extremities
  - (-) margin: 50Gy EBRT → 10-16Gy boost
  - R1 resection: 50Gy EBRT → 16-20Gy boost
  - R2 resection: 50Gy EBRT → 20-26Gy boost
- Target Volume:
  - Initial Field: Tumor bed, scar, drain sites + margins (**5-7cm longitudinal, 2-3cm perpendicular).**
    - Fuse planning CT with T1 MRI with contrast to delineate GTV, and include suspicious edema on T2 in CTV.
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    - Typically, don't do elective nodal irradiation (certain histologies excepted)
      - If LNs resected, may consider nodal RT for ECE.
  - Boost Field: Reduce field to surgical bed + 2cm margin

Brachytherapy

- Indications: definitive post-op Tx, boost dose combined with EBRT, definitive salvage treatment after prior EBRT (LC ~50%)
- Types:
  - LDR 40-200cGy/hour
  - HDR >1200cGy/hour (scarce data)

Advantages	**Disadvantages**
+ smaller target volumes (??)	- technically demanding
+ **decreased wound complications**	- **less** effective in **low-grade** tumors (#3)
+ no delay of chemo	

- Target volume: Tumor Bed + margin (2cm longitudinal, 1.5cm perpendicular)
- Technique of afterloading-catheter placement:
  - Implanted percutaneously (**1cm apart**) in a **single plane** in the **longitudinal direction** along the planes of the muscle at the time of surgery
  - Catheters should extend **1-2cm** beyond the lateral edge of the CTV and **2-5cm** longitudinally beyond the CTV
  - **Secured** with absorbable sutures inside the tumor bed and with non-absorbable sutures and buttons externally
  - Catheters loaded > **day 5**

References/Studies of Interest

- NCI (Rosenberg et al, 1982)
- NCI (Yang et al, 1998)
- MSKCC (Pisters et al, 1996)
- NCIC (O'Sullivan et al. 2002, Davis et al. 2005)
- MSKCC (Alektiar et al, JCO, 2008)