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.
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.
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 even 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.
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.
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 (5-7 cm longitudinal, 2-3 cm 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, unviolated fascia, and boundaries of compartment (with margin of 1-2 cm)
    - Bolus scars & drain sites for first 50 Gy 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 + 2 cm 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 >50 Gy)
  - Try to spare ½ of cross-section of weight-bearing bone, > ½ of joint cavities, and major tendons (patellar, Achilles)
  - Always spare 1.5-2 cm 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:**
  - >20 Gy can prematurely close epiphysis
  - >40 Gy ablates bone marrow
  - >50 Gy to bone cortex → fracture
  - >40 Gy to joint space → fibrotic constriction
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.
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**

<table>
<thead>
<tr>
<th>Size</th>
<th># pts</th>
<th>%DM @ 5yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.5cm</td>
<td>58</td>
<td>3</td>
</tr>
<tr>
<td>2.5-5cm</td>
<td>128</td>
<td>22</td>
</tr>
<tr>
<td>5-10cm</td>
<td>177</td>
<td>34</td>
</tr>
<tr>
<td>10-15cm</td>
<td>68</td>
<td>43</td>
</tr>
<tr>
<td>15-20cm</td>
<td>49</td>
<td>58</td>
</tr>
<tr>
<td>&gt;20cm</td>
<td>21</td>
<td>57</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Stage</th>
<th>Treatment Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>Surgery Alone (as long as final margins $&gt;1$ cm or intact fascial plane) PORT for close ($\leq 1$ cm) or (+) margins (after optimal reexcision)</td>
</tr>
<tr>
<td>Stage II-III</td>
<td>Surgery + RT (pre-op or post-op) Chemo (pre-op or post-op) for large, deep, high-grade tumors</td>
</tr>
<tr>
<td>Stage IV</td>
<td>For controlled $1^0$ with $\leq 4$ lung lesions and/or extended disease-free interval, consider surgical resection of all lesions. Otherwise, best supportive care.</td>
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</tbody>
</table>
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)
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  - 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)

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ smaller target volumes (??)</td>
<td>- technically demanding</td>
</tr>
<tr>
<td>+ decreased wound complications</td>
<td>- less effective in low-grade tumors (#3)</td>
</tr>
<tr>
<td>+ no delay of chemo</td>
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</tbody>
</table>

- 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)