Axumin™ Image Interpretation Training
Blue Earth Diagnostics
September 2016
Disclosures

• David M Schuster, MD (Division of Nuclear Medicine and Molecular Imaging, Department of Radiology and Imaging Sciences, Emory University) provides the narration to the demonstration Axumin case reviews in this training. Dr Schuster receives research funding from Blue Earth Diagnostics Ltd.

• Blue Earth Diagnostics Ltd provides fluciclovine cassettes to Emory University for research.
Axumin Indication

Axumin™ (fluciclovine F 18) injection is indicated for positron emission tomography (PET) imaging in men with suspected prostate cancer recurrence based on elevated blood prostate specific antigen (PSA) levels following prior treatment.
Important Safety Information

• Image interpretation errors can occur with Axumin PET imaging. A negative image does not rule out recurrent prostate cancer and a positive image does not confirm its presence. The performance of Axumin seems to be affected by PSA levels. Axumin uptake may occur with other cancers and benign prostatic hypertrophy in primary prostate cancer. Clinical correlation, which may include histopathological evaluation, is recommended.

• Hypersensitivity reactions, including anaphylaxis, may occur in patients who receive Axumin. Emergency resuscitation equipment and personnel should be immediately available.

• Axumin use contributes to a patient’s overall long-term cumulative radiation exposure, which is associated with an increased risk of cancer. Safe handling practices should be used to minimize radiation exposure to the patient and health care providers.

• Adverse reactions were reported in ≤1% of subjects during clinical studies with Axumin. The most common adverse reactions were injection site pain, injection site erythema and dysgeusia.

• To report suspected adverse reactions to Axumin, call 1-855-AXUMIN1 (1-855-298-6461) or contact FDA at 1-800-FDA-1088 or www.fda.gov/medwatch

• Please see the Axumin full Prescribing Information accompanying this Training and available at www.axumin.com
Axumin™ (fluciclovine F 18) Injection Prescribing Information

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Important Information

• The Axumin™ Image Acquisition and Interpretation Training is provided to you as a background resource to help familiarize you with techniques for the safe and effective usage of Axumin.

• Responsibility for the accurate and timely acquisition and interpretation of images using Axumin PET/CT scanning rests with the nuclear medicine physician or radiologist supervising the PET/CT imaging facility.

• The Axumin Image Acquisition and Interpretation Training is not intended to substitute for the independent medical judgment of the physician(s) responsible for the individual patient’s management, nor is it a guarantee of any specific clinical results.

• Please see the Axumin full Prescribing Information accompanying this Training and available at www.axumin.com.
Fluciclovine F 18: First F 18 Agent for PET Imaging in Recurrent Prostate Cancer

- Fluciclovine F 18 is an artificial amino acid PET imaging agent labelled with $^{18}\text{F}$ (MW 132).
- Recognized and taken up by amino acid transporters$^1$ that are upregulated in many cancer cells, including prostate cancer.
- Fluciclovine F 18 is not metabolized or incorporated into newly synthesized proteins.

Mechanism of Uptake

ASCT2, LAT1

AA-Transporters

Protein Synthesis

Transferase Degradation

Proteins

Tumor Cell
Chemical Structure

Anti-1-amino-3-18F-fluorocyclobutane-1-carboxylic acid (also known as FACBC)

Axumin™ (fluciclovine F 18) Injection; US Prescribing Information; Blue Earth Diagnostics, Ltd; May 2016
Dosimetry

- The radiation absorbed doses estimated for adult patients following intravenous injection of Axumin are shown in the table.
  - The (radiation absorbed) effective dose resulting from the administration of the recommended activity of 370 MBq of Axumin is 8 mSv (McParland et al. 2013).
  - For an administered activity of 370 MBq (10 mCi), the highest-magnitude radiation doses are delivered to the pancreas, cardiac wall, and uterine wall: 38 mGy, 19 mGy, and 17 mGy, respectively.

<table>
<thead>
<tr>
<th>Organ/Tissue</th>
<th>Mean Absorbed Dose per Unit Administered Activity (microGy/MBq)</th>
</tr>
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<tbody>
<tr>
<td>Adrenal glands</td>
<td>16</td>
</tr>
<tr>
<td>Brain</td>
<td>9</td>
</tr>
<tr>
<td>Breasts</td>
<td>14</td>
</tr>
<tr>
<td>Gallbladder wall</td>
<td>17</td>
</tr>
<tr>
<td>Lower large intestine wall</td>
<td>12</td>
</tr>
<tr>
<td>Small intestine wall</td>
<td>13</td>
</tr>
<tr>
<td>Stomach wall</td>
<td>14</td>
</tr>
<tr>
<td>Upper large intestine wall</td>
<td>13</td>
</tr>
<tr>
<td>Heart wall</td>
<td>52</td>
</tr>
<tr>
<td>Kidneys</td>
<td>14</td>
</tr>
<tr>
<td>Liver</td>
<td>33</td>
</tr>
<tr>
<td>Lungs</td>
<td>34</td>
</tr>
<tr>
<td>Muscles</td>
<td>11</td>
</tr>
<tr>
<td>Ovaries</td>
<td>13</td>
</tr>
<tr>
<td>Pancreas</td>
<td>102</td>
</tr>
<tr>
<td>Red bone marrow</td>
<td>25</td>
</tr>
<tr>
<td>Osteogenic cells</td>
<td>23</td>
</tr>
<tr>
<td>Skin</td>
<td>8</td>
</tr>
<tr>
<td>Spleen</td>
<td>24</td>
</tr>
<tr>
<td>Testes</td>
<td>17</td>
</tr>
<tr>
<td>Thymus gland</td>
<td>12</td>
</tr>
<tr>
<td>Thyroid</td>
<td>10</td>
</tr>
<tr>
<td>Urinary bladder wall</td>
<td>25</td>
</tr>
<tr>
<td>Uterus</td>
<td>45</td>
</tr>
<tr>
<td>Total body</td>
<td>13</td>
</tr>
<tr>
<td><strong>Effective dose</strong></td>
<td><strong>22 (microSv/MBq)</strong></td>
</tr>
</tbody>
</table>

Table 1: Estimated Radiation Absorbed Doses in Various Organs/Tissues in Adults who Received Axumin

Table 1 from: Axumin™ (fluciclovine F 18) Injection US
Prescribing Information, Blue Earth Diagnostics, Ltd; May 2016
Reading Assignment

Anti-1-Amino-3-\(^{18}\)F-Fluorocyclobutane-1-Carboxylic Acid: Physiologic Uptake Patterns, Incidental Findings, and Variants That May Simulate Disease

David M. Schuster\(^1\), Cristina Nast\(^1\), Stefano Fan\(^1\), Shunzhuo Oka\(^1\), Hiroaki Okuda\(^1\), Yasuhiko Iwase\(^1\), Jens Sillem\(^2\), Rikard Owren\(^2\), Peter Chevke\(^2\), Mats Tarsha\(^2\), Trond V. Boppart\(^2\), Torbjörn G. Hansson\(^2\), Bahram Rezaei H. Hakemi\(^2\), Jonathan A. Nye\(^3\), Olha Vasnev\(^3\), A. Odion\(^3\), Rinal Savin-Barber\(^4\), and Mark M. Goodman\(^5\)

\(^1\)Department of Radiology and Imaging Sciences, Emory University, Atlanta, Georgia, \(^2\)Department of Nuclear Medicine, Policlinico S. Orsola, University of Bologna, Bologna, Italy, \(^3\)Research Center, Nilanu Medical Physics Co. Ltd., Chiba, Japan, \(^4\)Department of Radiology, Oncology and Radiation Sciences, Uppsala University, Uppsala, Sweden, \(^5\)GE Healthcare, Life Sciences, Imaging R&D, Uppsala, Sweden.

Key Words: \(^{18}\)F-FACBC, physiologic uptake, positive emission tomography

Amino acids are involved in a variety of biological processes, including protein synthesis, and amino acid transport is upregulated in many neoplasms (1, 6). Consequently, radiolabeled amino acids, both natural and synthetic, have been used for oncologic molecular imaging.

Anti-1-Amino-3-\(^{18}\)F-Fluorocyclobutane-1-carboxylic acid (\(^{18}\)F-FACBC) is an investigational synthetic nonmetabolized amino acid analog PET radiotracer (5, 6). This agent is primarily mediated by sodium-dependent amino acid transporters, specifically system ASC, with contributions by sodium-independent system L (5, 6). This PET radiotracer has been most actively studied in patients with prostate cancer, other trials have been completed or are underway, including those for cerebral gliomas and breast, lung, and head and neck cancers, among others.

For well-established radiotracers such as \(^{18}\)F-FDG, nonmetabolic uptake and storage have been reported (17-19). However, for \(^{18}\)F-FACBC, biodistribution and radiation dose limits have not been obtained only in small sets of healthy volunteers (9, 20). At our institutions, we have also obtained \(^{18}\)F-FACBC scans in clinical trials involving prostate cancer and other neoplasms. The purpose of this study was to report our collective experience with \(^{18}\)F-FACBC imaging in patients enrolled in clinical trials, correlating uptake patterns to those of healthy volunteers in the description of common physiologic uptake, incidental findings, and variants that may simulate disease.

MATERIALS AND METHODS

Study Protocol and Demographics

The \(^{18}\)F-FACBC studies of 298 subjects include 12 healthy volunteers (25 scans and 575 scans) and 618 total scans, 15 patients with repeated studies, spanning from October 16, 1994, to February 20, 2000.
Case 1

- Post robotic-assisted laparoscopic radical prostatectomy and bilateral staging pelvic lymphadenectomy
- Now rising PSA to 0.41 ng/mL
Case 1: Summary

- Post robotic-assisted laparoscopic radical prostatectomy and bilateral staging pelvic lymphadenectomy.
- Now rising PSA to 0.41 ng/ml.
- Normal physiology
- Findings:
  - Single intense right internal iliac/pelvic side wall node (1 cm), consistent with metastasis
  - No uptake in prostate bed
  - Symmetric mild uptake in negative inguinal nodes
  - Bilateral benign lymphoceles
  - Otherwise negative
Incidental Uptake and Variants

- In order to interpret images the physician should be aware of potential for Axumin uptake in areas of benign pathology and other incidental cancers.
- The following slides describe physiological variants and incidental findings noted following use of Axumin in patients with various conditions.
- The slides provide examples resulting from non-specific uptake of this amino acid tracer in areas of inflammation and in other benign and malignant pathologies.
- These examples represent potential incidental findings with Axumin outside of its indicated use for positron emission tomography (PET) imaging in men with suspected prostate cancer recurrence based on elevated blood prostate specific antigen (PSA) levels following prior treatment.
- Please see the Axumin full Prescribing Information accompanying this Training, on slide 4, and available at www.axumin.com.
Bio-distribution

- Amino acid (AA) transporters ubiquitous throughout body; upregulated in prostate cancer\(^1\)
- Distribution after IV dosing\(^2\):
  - Liver: 14%*
  - Red bone marrow: 12%*
  - Lung: 7%*
  - Myocardium: 4%*
  - Pancreas: 3%*
- First 4 hrs. post-injection\(^2\):
  - 3% excreted in urine*

* % of administered radioactivity

2. Axumin™ (fluciclovine F 18) Injection US Prescribing Information, Blue Earth Diagnostics, Ltd; May 2016
Uptake Over Time

Time Activity Curves (SUV\textsubscript{Mean})

- Prostate Tumours
- Lymph Node Lesions
- Muscles
- Marrow
- Bladder
- Vesicle lesion


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Inflammation

- Research has been undertaken in a series of in-vitro and small animal models.
- Amino acid imaging is believed to be less prone to false positive inflammatory uptake.
- However, amino acid transporters are also overexpressed in benign inflammation.
- Graph (right) demonstrates the uptake of fluciclovine F 18 in normal popliteal lymph node (LN, intact), popliteal lymphadenitis (LN, inflammation), and subcutaneous prostate cancer in DPCI (rat) model.

*P < 0.01; Each bar represents mean ± SD.

Incidental Uptake and Variants

- Axumin uptake in areas of benign prostate pathology may be indistinguishable from uptake in areas of prostate cancer
Incidental Uptake and Variants:

Bone, Brain and Lymph Node

Osteoid Osteoma

Mild symmetric inguinal nodal uptake is commonly present, but typically fades on subsequent images. It may be more intense with inflammation, as in this example.

Meningioma

Ringworm

*J Nucl Med 2014; 55:1*
Incidental Uptake and Variants

- Incidental non-physiologic uptake can occur

Tubulovillous Adenoma with Atypia

*J Nucl Med 2014; 55:1*
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• Responsibility for the accurate and timely acquisition and interpretation of images using Axumin PET/CT scanning rests with the nuclear medicine physician or radiologist supervising the PET/CT imaging facility.

• The Axumin Image Acquisition and Interpretation Training, including the Suggested Interpretation Criteria described in the following slides, is not intended to substitute for the independent medical judgment of the physician(s) responsible for the individual patient’s management, nor is it a guarantee of any specific clinical results.

• Image interpretation errors can occur with Axumin PET imaging. A negative image does not rule out recurrent prostate cancer and a positive image does not confirm its presence. The performance of Axumin seems to be affected by PSA levels. Axumin uptake may occur with other cancers and benign prostatic hypertrophy in primary prostate cancer. Clinical correlation, which may include histopathological evaluation, is recommended.

• Physicians should be aware of potential for Axumin uptake in areas of benign pathology and other incidental cancers. These potential incidental findings with Axumin are outside of its indicated use for positron emission tomography (PET) imaging in men with suspected prostate cancer recurrence based on elevated blood prostate specific antigen (PSA) levels following prior treatment.

• Please see the Axumin full Prescribing Information accompanying this Training, on slide 4, and available at www.axumin.com.
Suggested Interpretation Criteria

- Image interpretation is predominantly qualitative
  - General guidance is to report ‘Inside - Out’
    - i.e. assess central areas of focal uptake before assessing the periphery.
  - Err on the side of specificity...
    - ...but with increasing experience, and allowing for partial volume effects, call additional areas of uptake suspicious for cancer according to the image interpretation criteria, and taking into consideration confidence level and make/model of PET-CT scanner

- Location of prostate cancer recurrence in typical sites is based on fluciclovine F 18 uptake in comparison to tissue background
  - For larger lesions, uptake equal to or greater than bone marrow is considered suspicious for prostate cancer recurrence
  - For small lesions (<1 cm diameter), focal uptake greater than blood pool should be considered suspicious for prostate cancer recurrence
Suggested Interpretation Criteria:

Prostatectomy

- Focal uptake which, visually equal to or greater than bone marrow, in sites typical for prostate cancer recurrence is suspicious for cancer.
  - But if a focus is small (<1cm), it may be considered suspicious if the uptake visually greater than blood pool.
Suggested Interpretation Criteria: Post-Prostatectomy

- Subject presented with elevated PSA of 43.5 ng/ml
- Prostate bed recurrence detected (blue arrow).
Suggested Interpretation Criteria:

Post-Prostatectomy

- Subject presented with elevated PSA of 0.29 ng/ml
- Recurrent prostate cancer detected in anastomotic area of bladder and urethra (blue arrow).
Suggested Interpretation Criteria:

Post-Prostatectomy

- Image interpretation: Negative Prostate Bed
- Cranial to caudal review demonstrated mild symmetric uptake in bladder wall.
- No uptake at anastomotic region on sagittal view (red arrow).
Suggested Interpretation Criteria:

Non-prostatectomy

- Moderate focal asymmetric uptake, visually equal to or greater than bone marrow, is suspicious for cancer.
  - But if a focus of uptake is small (<1cm in diameter) and in a site typical for recurrence, it should be considered suspicious if the uptake is visually greater than blood pool.
    - If the uptake is diffuse and **heterogenous**, consider it suspicious for disease if the uptake is greater than blood pool.
    - If the uptake is diffuse and **homogenous**, apply a threshold of equal to or greater than bone marrow.
    - Note: Anecdotally, median prostate lobe uptake (central base invaginating into bladder) has a higher false positivity.

**Recommendation:** Review PET-only coronal images to aid reporting
Suggested Interpretation Criteria:

Non-prostatectomy

- Subject presented with rising PSA (10.6 ng/mL; nadir 6.6ng/ml), post-cryotherapy
- Image interpretation: positive prostate (blue arrows); negative extra-prostatic.
- PSA decreased to 0.49 ng/ml post-salvage cryotherapy.
Suggested Interpretation Criteria:
Non-prostatectomy


- Image interpretation (bottom row): diffuse homogeneous activity not significantly greater than marrow visually (borderline). Biopsy proven benign.
Suggested Interpretation Criteria: Lymph Nodes

Typical locations for recurrence

- Uptake visually equal to or greater than bone marrow, is considered suspicious for cancer.
  - If borderline visually, quantitation may help with a node ($SUV_{\text{max}}$) to marrow ($SUV_{\text{mean}}$) ratio of $\geq 1.2$ as a threshold.
  - But if a node is small ($<1\text{cm}$) and in a site typical for recurrence, should be considered suspicious if uptake greater than blood pool.
  - Also combine with anatomical appearance of node
    - e.g. Round versus curvilinear on CT
  - Necrotic node may not have much uptake
Suggested Interpretation Criteria:

**Lymph Nodes**

- Subject presented with rising PSA (2.31 ng/mL), post-EBRT and Brachytherapy.
- MR negative for extra-prostatic disease.
- Image interpretation: positive sub-cm right common iliac and obturator nodes (blue arrows). Malignant on laparoscopic dissection.
Subject presented with elevated PSA (4.1ng/mL), post-Brachytherapy
- Negative for extra-prostatic on ProstaScint; outside CT negative
- Image interpretation: positive 1cm right internal iliac node (blue arrow). Malignant on laparoscopic biopsy
Suggested Interpretation Criteria: Lymph Nodes

- Patient presented with rising PSA post-therapy
- 1 cm node identified (blue arrows) with uptake not equal to or greater than marrow (red arrow). Thus, image interpretation: negative. Biopsy confirmed benign.
- If a node is <1cm and in a site typical for recurrence, it may still be considered suspicious if visually greater than blood pool

\[ \text{SUV}_{\text{mean}} \text{ at L3} = 3.3 \]
- Threshold = 4 (1.2 x 3.3)
- \( \text{SUV}_{\text{max}} \) of node is 3.0
Suggested Interpretation Criteria:

**Lymph Nodes**

- Note these tiny 3-5 mm retroperitoneal nodes (blue arrows), significantly greater than blood pool visually. If such tiny nodes have this degree of uptake, would consider suspicious for prostate cancer, especially if in suspicious groupings. Compare to sagittal midline spine; since appear similar to marrow even at this size, consider malignant. Quantitation (text box, bottom right) added confidence.

\[
\text{SUV}_{\text{mean}} \text{ at L3} = 2.1 \\
\text{Threshold} = 2.5 \times (1.2 \times 2.1) \\
\text{SUV}_{\text{max}} \text{ of node is 2.7}
\]
Suggested Interpretation Criteria: 

**Lymph Nodes**

- **Inguinal, distal external iliac, hilar, and axillary nodes**

  - Mild, symmetric uptake is typically considered physiologic uptake, but if such nodal uptake is present within the context of other clear malignant disease, it may be considered suspicious for cancer.
    - *Note that the presence of nearby vascular grafts or orthopaedic hardware could cause false positive uptake in these nodal groups.*
    - *Distal external iliac nodes may also be suspicious in isolation, if causes of false positivity excluded such as recent procedures, and the uptake is greater than bone marrow (nodes ≥ 1 cm).*
Suggested Interpretation Criteria: Lymph Nodes

- 1.5 x 1.2 cm right iliac bifurcation node, expected hot for size (blue). But do not call positive mild uptake in left ext iliac, left obturator, or symmetric inguinal nodes (red). Nodal dissection was malignant only where fluciclovine F18 was hotter than marrow.
Suggested Interpretation Criteria:

Bone

- Focal uptake clearly visualised on Maximum Intensity Projection (MIP) or PET-only images is considered suspicious for cancer.

- A bone abnormality visualised on CT (e.g. dense sclerosis without uptake) does not exclude the presence of malignant metastasis. Alternative imaging, for example, MR, NaF PET-CT or SPECT-CT bone scan should be considered
  - Degenerative uptake in bone is not as common as seen with $^{18}\text{F}$-FDG.
  - Skeletal metastases which resemble Schmorl’s nodes, but with uptake within them, have been described
Suggested Interpretation Criteria:

**Bone**

- Patient presented with rising PSA (9.5 ng/mL), post-Prostatectomy and salvage Radiotherapy
- Image interpretation: multiple foci positive (including sub-cm retroperitoneal nodes and sternum) (blue arrows). Sternum biopsy positive prostate cancer.
Suggested Interpretation Criteria:

Bone

- Dense sclerotic lesion, without uptake; cannot exclude metastases (red arrow). Recommend follow-up imaging such as MR or bone scan.

- Mildly sclerotic lesion, without fluciclovine F18 (green arrow); would expect greater fluciclovine F18 uptake so did not call despite positive MR. Biopsy negative.
Suggested Interpretation Criteria:
Bone

Bottom Line: Axumin uptake:

- Intense in lytic lesions
- Moderate in mixed lesions
- May be absent in indolent sclerotic lesions
- Needs further study
- Recommend skeletal specific imaging, including bone scan, NaF PET, MRI
Potential Interpretation Workflow (One Suggestion)

As with any imaging review, best to have a routine

- MIP
- PET all 3 planes
- Concentrate on CT (keeping eye on PET)
  - Brain windows
  - Bone windows cranial to caudal
  - Soft tissue abdomen and liver windows
  - Wide PET window for liver
  - Soft tissue and lung windows chest
- Slice by slice cranial to caudal, synthesize data
Case 2:

- Post-radiotherapy (remote) for prostate cancer
- Now rising PSA
Case 2 (Video): Click to Play

Errata (video narration): Node referred to as “hot and benign” but should be “hot and malignant”

Also, tool keyboard shortcuts may change over time depending on software version, but may be customized.
Case 2: Summary

• Post-radiotherapy (remote) for prostate cancer
• Now rising PSA
• Normal physiology
• Workstation tools
• Suggested workflow
• Findings:
  o Extensive retroperitoneal malignant nodes extending into thorax
  o Probable benign mild diffuse midline prostate activity
  o Incidental left adrenal hyperplasia/adenoma, right arm vein focal activity, benign appearing right iliac sclerosis
Case 3:

- Post-radiotherapy (remote) and ADT
- Now rising PSA
- Negative MR
- Early time point whole body fluciclovine
Case 3 (Video): **Click to Play**
Case 3: Summary

- Post-radiotherapy (remote) and ADT
- Now rising PSA
- Negative MR
- Early time point whole body fluciclovine

Workflow

Findings:
- Right apex hot focus in mild diffuse background
- Negative nodes, bone
- Physiologic muscle, bladder tracer jets (percolation)

Biopsy positive right apex
- Salvage brachytherapy; PSA nadir <0.2 ng/ml
Case 4:

• Post radical prostatectomy, pT3, Gleason 9
• PSA post-op 1.1 ng/ml
• Whole body early acquisition 5 months later
Case 4 (Video):  Click to Play
Case 4: Summary

- Post radical prostatectomy, pT3, Gleason 9
- PSA post-op 1.1 ng/ml
- Whole body early acquisition 5 months later
- Workflow, importance of bone windows
- Findings:
  - L3 sclerotic hot focus
  - Post-op bladder tracer activity
  - Incidental mucocele left maxillary sinus, right renal cysts
- Follow-up: MR initially negative, then became positive at L3 and T12
  - probably microscopic at T12 or spread later
Case 5:

- Post radical prostatectomy, negative lymphadenectomy
- Now rising PSA to 0.73 ng/ml
- Negative MR for malignancy
- Earlier negative skeletal screening
Errata (video narration): In sacrum review, schwannoma referred to as “mucocele”
Case 5: Summary

- Post radical prostatectomy, negative lymphadenectomy
- Now rising PSA to 0.73 ng/ml
- Negative MR
- Workflow
- Findings:
  - Intense small left presacral node 3 x 4 mm, measure SUV
  - Fluciclovine negative sclerotic lesions (T8, L1, L4, L5, left acetabulum, right ilium) needing evaluation. Review prior skeletal screening. Further imaging?
  - Schwannoma right sacrum (confirmed on MR)
  - Goiter
  - Post-prostatectomy bladder
  - Benign left lymphocele
  - Mild symmetric inguinal nodal activity
  - Sinus disease
Case 6:

• Remote radiation therapy for Gleason 7 prostate cancer; short course ADT
• Now rising PSA to 29.7 ng/ml
• Delayed acquisition (22 min) whole body
Case 6 (Video):  Click to Play
Case 6: Summary

- Remote radiation therapy for Gleason 7 prostate cancer; short course ADT
- Now rising PSA to 29.7 ng/ml
- Delayed acquisition (22 min) whole body
- Findings:
  - Left lobe positive. Mild elsewhere, nonspecific.
  - Bones suspicious at T9, L2, L3, right ilium with negative CT. Possible R femur. Further investigation especially since focal activity on delayed imaging.
  - Nodes negative.
- Follow-up: biopsy positive left lobe; suspicious findings on MR at L2 and L3.
Case 7:

- Remote radiation therapy Gleason 8 cancer.
- Negative subsequent pelvic node dissection.
- Local relapse with Gleason 9. LHRH.
- Rising PSA despite ADT. PSA now 62 ng/ml.
Case 7 (Video):  Click to Play
Case 7: Summary

• Remote radiation therapy Gleason 8 cancer.
• Negative subsequent pelvic node dissection.
• Local relapse with Gleason 9. LHRH.
• Rising PSA despite ADT. PSA now 62 ng/ml.
• Findings:
  o Some urinary excretion with dependent activity in bladder.
  o Mild-moderate heterogenous prostate right > left.
  o Call positive since significantly greater than blood pool.
  o Definitively positive precarinal and right paratracheal nodes.
• Follow-up: Nodes enlarged on subsequent CT. Explanation for very elevated PSA. Prostate was not biopsied; may be seeing partially treated disease with known earlier recurrence.
Case 8:

- Prostate cancer T3b, N0M0 Gleason 9. IMRT and Zoladex then Bicalutamide.
- Response on MR with tumor shrinkage, then tumor grew.
Errata (video narration): Activity at “base of prostate” at one point referred to as “base of bladder”.
Case 8: Summary

• Prostate cancer T3b, N0M0 Gleason 9. IMRT and Zoladex then Bicalutamide.
• Response on MR with tumor shrinkage, then tumor grew.
• Findings:
  o Urinary activity in ureters and bladder.
  o But also intense activity left prostate but activity at prostate base too; be suspicious, window and see it is separate, no TURP history.
  o Benign inguinal nodes. No extraprostatic suspicious foci.
  o Incidental activity left superficial neck, correlates with vessel: reflux into a collateral and holdup at valve
  o Gallstones with milk of calcium.
• Follow-up: Salvage brachytherapy left lobe only. But tumor at base grew and invaded bladder wall.
Case 9:

- Radical prostatectomy Gleason 7, T3b, also affected right seminal vesicle.
- Salvage radiation therapy. Now PSA rise to 3.2.
Case 9 (Video):  Click to Play
Case 9: Summary

• Radical prostatectomy Gleason 7, T3b, also affected right seminal vesicle.

• Salvage radiation therapy. Now PSA rise to 3.2.

• Findings:
  o No suspicious activity in bed.
  o Left sacral bone metastasis.
  o 5-6 mm left common iliac near bifurcation node. Activity similar to marrow but intense for size.
  o Also, tiny 2-3 mm left obturator/external iliac mild uptake. May also be suspect in light of other disease but would not call positive in isolation.

• Follow-up: MR confirmed sacral metastasis. Suspicious left iliac nodes (though not a proof).
Case 11:

• Negative lymphadenectomy. Now PSA 1.1.
Errata (video narration): During L3 measurement, “representative vertebral body” was referred to as a “representative node” in error.
Case 11: Summary

- Negative lymphadenectomy. Now PSA 1.1.
- Findings:
  - Axillary vein uptake on left; Benign liver cyst/hemangioma
  - Indeterminate bed. Bulbous equal to marrow at anastomosis, though not focal.
  - Abnormal nodes:
    - Right paracaval at bifurcation. Left obturator/external iliac
    - Subtle right external iliac node. Not call alone, but suspect in this case.
- Follow-up: No definitive level of proof. Radiation therapy to right paracaval and left obturator nodes, PSA dropped a bit then rose with unchanged appearance on CT of nodes. No bone disease on MR. On hormonal therapy. Explanation may be right external iliac node, other microscopic disease or anastomotic recurrence.
Thank You!

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