BREAST SEED LOCALIZATION

AN RSO PERSPECTIVE

PRESENTED BY JON ARO

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OUTLINE

- What is seed localization?
- Program Overview
- Licensing
- Training
- Staff Exposures
- Patient Exposures
- Challenges
WHAT IS SEED LOCALIZATION?

- A technique to locate breast tumours in the OR.
- Used for Non-Palpable tumors.
- A radioactive seed is placed in the patient and a dedicated scintillation probe is used to locate it.
WHAT WERE WE DOING BEFORE?

Disadvantages

- Must be inserted on the day of the surgery.
- Difficult to coordinate Radiology, Nuclear Medicine and the OR.
- Issues with wire migration.
- Surgeon must follow the wire to the tumour site.
WHAT ARE WE DOING NOW?

Advantages

▶ Allows for patients to be scheduled in the 1\textsuperscript{st} OR time slot.
▶ Gives the surgeon freedom to choose entry point.
▶ Significant reduction in vasovagal response (0.5\% vs 5\%).
▶ Less stressful day of surgery for patient.
I-125 SEEDS

- Prostate therapy seeds.
- 1-2 seeds per patient.
- Maximum apparent activity of 9 MBq (0.5 mCi) per seed.
- Actual activity is approximately 2 times the apparent activity.
- Seeds can range from unsterilized seeds to sterilized and pre-loaded in needles.
PROGRAM OVERVIEW

1. Radiology
2. Patient
3. Surgery
4. Pathology
5. Nuclear Medicine
1. **RADIOLOGY**

- Order information is entered into the database.
- The seeds are transferred from the cartridge into individual vials in the GMP room.
- On the treatment day the required seeds are loaded into needles.
- Bone wax is placed in the tip of the needle to prevent the seeds from dislodging.

### Breast Seed Localization Inventory Management

<table>
<thead>
<tr>
<th>PO #</th>
<th>Activity Reference Date</th>
<th># of Seeds</th>
<th>Apparent Activity/Seed (mCi)</th>
<th>Current Activity/Seed (mCi)</th>
<th>Loose Seeds</th>
<th>Seeds Remaining</th>
<th>Storage Container</th>
<th>Cartridge Rotor Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAD1476</td>
<td>10-Apr-15</td>
<td>45</td>
<td>0.299</td>
<td>0.37</td>
<td>4</td>
<td>35</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>20608790</td>
<td>14-Apr-15</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. PATIENT

- Seeds are inserted using a spinal needle under x-ray or ultrasound guidance.
- A radiograph is taking showing the seed in the breast. The images are uploaded into PACs.
- Patient is giving a bracelet indicating the number of seeds implanted.
- Inventory records are updated.
3. **SURGERY**

- Patient’s chart indicates the number of seeds and PACs images are loaded onto the OR computer.
- Seed is located using the surgical radiation detectors.
- The excised tumour is placed in a labeled Dubin container and radiographed.
- After the seed is confirmed to be in the specimen the bracelet is removed.
- The specimen is transported to the Pathology Dept. by a porter.
SPECIMEN IN CONTAINER
OR / PATHOLOGY INSTRUMENTATION

- Small thin-window collimated scintillation detector.
- Can discriminate between Tc-99m sentinel node injection and I-125 seeds.
- Allows the seeds to be easily located to < 1cm precision.
- Auditory response tone is proportional to count rate.
OR LABELLING

Dubin Container
Activity Label
# of Seeds Label

Pathology Requisition
# of Seeds Label
Additional Patient Label

$^{125}$ Seeds
Max. Activity: 37 MBq
SEED MIGRATION

- Seeds do not migrate within the patient.
- In rare cases (<1%) the seed will migrate out of a hematoma caused by a previous biopsy.
- When possible the surgery date is delayed to allow for the hematoma to subside.
- When delaying surgery is not an option the radiologist will place the seed away from the hematoma and communicate this in the report.
4. PATHOLOGY

- The PA places a pin at the seed location.
- The specimen is then sliced without creating distinct pieces.
- The slice containing the seed is then determined and the seed is retrieved.
- Once found the seed is placed in a vial and the patient label is attached.
- **Ensure a drain cover is in place adjacent to the work station.**
RUPTURED SEED

- The seeds are encapsulated in titanium and are quite durable.
- A knife can’t pierce the seeds.
A request to amend our Diagnostic Nuclear Medicine license was submitted to the CNSC.

The request contained an SOP that outlined the procedures for each of the departments involved.

Asked for a maximum I-125 source activity of 25 MBq.
## TRAINING

<table>
<thead>
<tr>
<th>Staff Member</th>
<th>Basic Radiation Safety</th>
<th>Hands-On Training</th>
<th>Labelling (Bracelet / Container)</th>
<th>Missing Seed Training</th>
<th>Awareness Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiologists</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Radiology Technologists</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Radiology Support Staff</td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Surgeons</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR Nurses</td>
<td>X</td>
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<td></td>
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<td>X</td>
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<tr>
<td>Admitting Staff</td>
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</tr>
<tr>
<td>Pathologists</td>
<td>X</td>
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<td>X</td>
<td></td>
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<tr>
<td>Pathology Assistants</td>
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<td>X</td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>Porters</td>
<td></td>
<td></td>
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<td>X</td>
</tr>
</tbody>
</table>
HANDS-ON TRAINING

- Hands on training was done with unused I-125 seeds from The Ottawa Hospital Cancer Centre.
- The radiologists practiced inserting the seeds into chicken breasts and the pathology assistants practiced retrieving them.
- A useful exercise to develop familiarity with the instruments and search techniques.
- However, chicken breast tissue is vastly different than breast tumour tissue.
<table>
<thead>
<tr>
<th>Staff Member</th>
<th>Estimated Annual Dose (mSv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiologist*</td>
<td>0.020</td>
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<tr>
<td>Radiology Technologist*</td>
<td>0.055</td>
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<tr>
<td>Pathology Assistant*</td>
<td>0.52</td>
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<tr>
<td>Surgeon</td>
<td>0.11</td>
</tr>
<tr>
<td>Porter</td>
<td>0.011</td>
</tr>
</tbody>
</table>

*Designated as NEWs
PATIENT EXPOSURE

▶ If the seed is inserted for 4 days the dose to the patient is approximately equivalent to a mammogram.

▶ Assuming a seed activity of 18.5 MBq

▶ The average absorbed dose to the breast is about 4-7 mGy, depending on the size of the lesion.
CHALLENGES

- Ensuring the necessary instrumentation is available.
- Patient scheduling issues.
- Expansion to other surgical areas.
- Lost/missing seeds.
EVENT # 1

LOST SEED

Summary

“Old” seeds were handed off for a training session in the Sim Centre. Seeds were presumed to be non-radioactive so necessary precautions weren’t taken.

Lessons Learned

Always assume seeds are radioactive. If unsure, confirm with radiation detector.

Follow-Up

Procedure for Training required. Staff informed that all I-125 seeds are to be considered radioactive.
ACKNOWLEDGEMENTS

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- Mary Cox – Pathology
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Questions?