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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

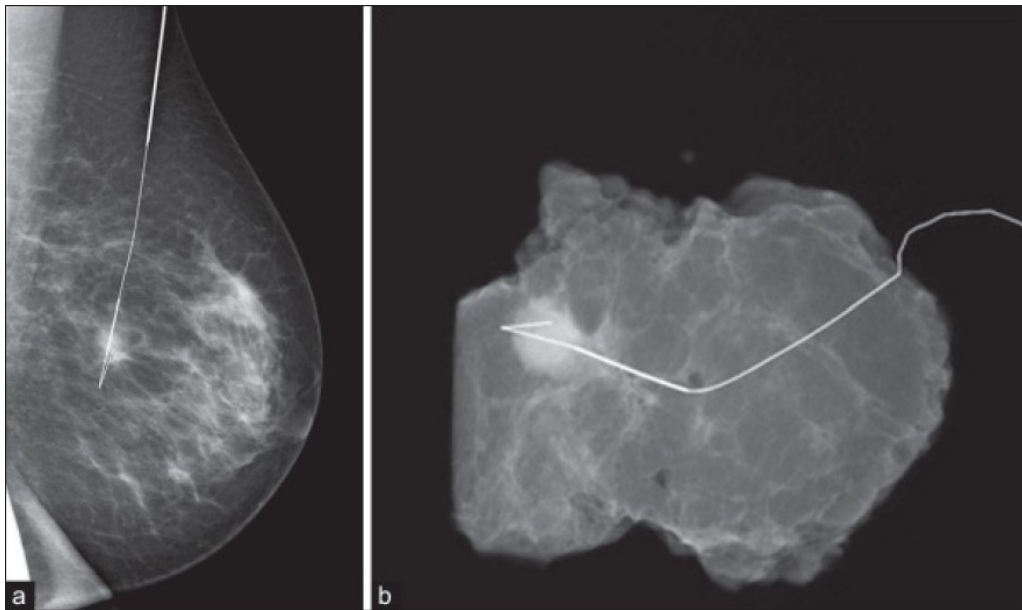
WHAT IS SEED LOCALIZATION?

- ▶ 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.



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WHAT WERE WE DOING BEFORE?



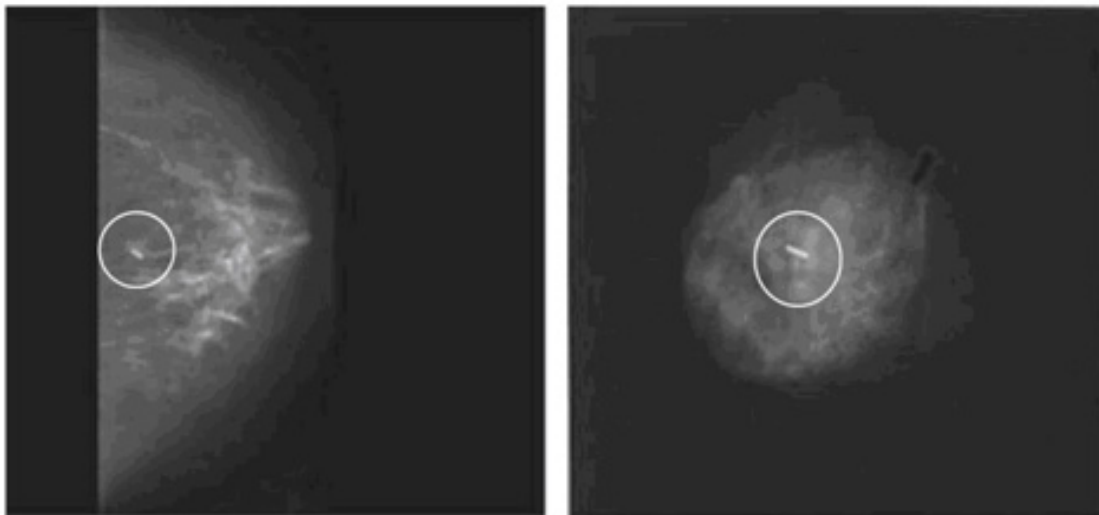
Disadvantages

- ▶ 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.



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WHAT ARE WE DOING NOW?



Advantages

- ▶ Allows for patients to be scheduled in the 1st 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.



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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.



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PROGRAM OVERVIEW

1. Radiology

2. Patient

3. Surgery

4. Pathology

5. Nuclear Medicine



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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					
PO #	<input type="text" value="RAD1476"/>	Activity Reference Date	<input type="text" value="10-Apr-15"/>	Loose Seeds	<input type="text" value="4"/>
Order Reference #	<input type="text" value="20608790"/>	# of Seeds	<input type="text" value="45"/>	Seeds Remaining	<input type="text" value="35"/>
Date Received	<input type="text" value="14-Apr-15"/>	Apparent Activity/Seed (mCi)	<input type="text" value="0.299"/>	Storage Container	<input type="text" value="1"/>
Received By	<input type="text" value="BZ"/>	Current Activity/Seed (mCi)	<input type="text" value="0.37"/>	Cartridge Rotor Position	<input type="text" value="12"/>



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2. PATIENT

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



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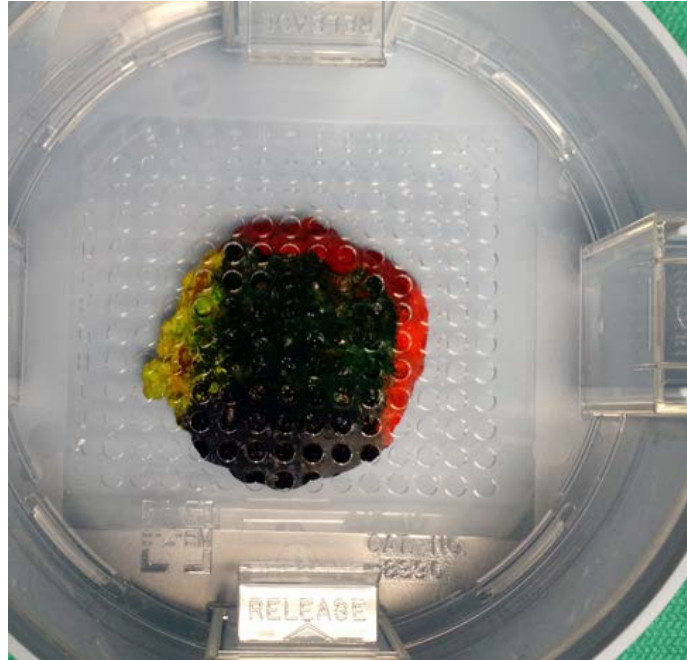
3. SURGERY

- ▶ 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.



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SPECIMEN IN CONTAINER



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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.



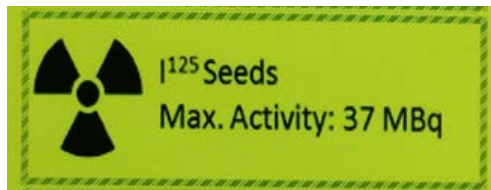
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OR LABELLING

Dubin Container

Activity Label

of Seeds Label



Pathology Requisition

of Seeds Label

Additional Patient Label



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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.



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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.**



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RUPTURED SEED

- ▶ The seeds are encapsulated in titanium and are quite durable.
- ▶ A knife can't pierce the seeds.



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LICENSING

- ▶ 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.



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TRAINING

Staff Member	Basic Radiation Safety	Hands-On Training	Labelling (Bracelet / Container)	Missing Seed Training	Awareness Training
Radiologists	X	X	X	X	
Radiology Technologists	X	X	X	X	
Radiology Support Staff					X
Surgeons	X			X	
OR Nurses	X		X		
Admitting Staff			X		
Pathologists	X	X		X	
Pathology Assistants	X	X		X	
Porters					X



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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.



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STAFF EXPOSURES

Staff Member	Estimated Annual Dose (mSv)
Radiologist*	0.020
Radiology Technologist*	0.055
Pathology Assistant*	0.52
Surgeon	0.11
Porter	0.011

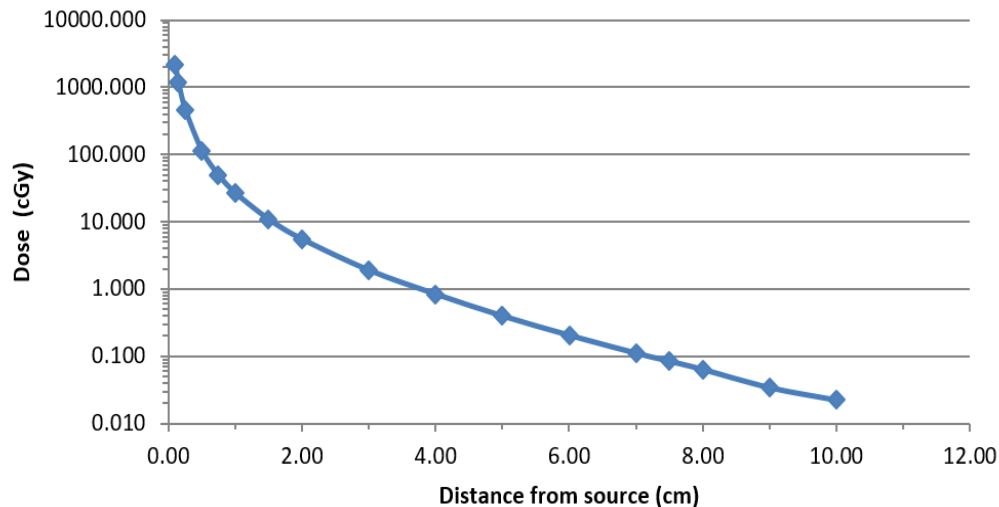
*Designated as NEWS



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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.



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CHALLENGES

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



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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.

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END

Questions?

