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Check out the Million Dollar Nuclear Quiz @ <http://nuclearpharmacy.uams.edu/resources/Games.asp>

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JNM: Gated SPECT Best Predictor of Heart Disease Prognosis

According to a study in the April issue of the Journal of Nuclear Medicine, the myocardial perfusion test with gated SPECT was a more accurate predictor of prognosis in chronic ischemic heart disease (IHD), compared to the capability of other medical techniques to determine the extent of heart disease and stratify patients.

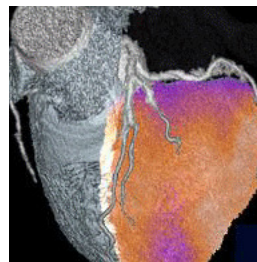


Image Source: Society of Nuclear Medicine and the University Hospital of Zurich.

Researchers selected a group of patients with known or suspected--albeit stable--IHD. Those participants with previous coronary artery bypass surgery, chronic kidney failure and hyperthyroidism were excluded, leaving 492 study subjects between the ages of 55 and 75. Each subject underwent a complete diagnostic work-up that included a medical history, physical examination, blood tests, electrocardiography at rest, 2D echocardiography and gated SPECT after stress and at rest. Patients also underwent coronary arteriography, which is currently the gold standard clinical procedure for diagnosing IHD, according to the American Heart Association.

During the next 37 months, patients returned for periodic exams in an outpatient setting. It was con-

cluded that of the techniques investigated--including coronary arteriography--gated SPECT is the best predictor of future cardiac events.

"The prognostic value of stress testing with MPI has been investigated for several years," said Alessia Gimelli, MD, at the Clinical Physiology Institute CNR, G. Monasterio Foundation in Pisa, Italy. "However, substantial changes in nuclear cardiology have occurred over the past two decades that have led to improved techniques. The clinical profile of patients with IHD has also changed, with patients often being older and affected by more diseases than in the past. We were therefore surprised to see that gated SPECT remains the best predictor of future cardiac events in patients with IHD."

Although left ventricular ejection fraction is more commonly used in clinical practice to predict patient outcome, this study revealed that the extent of damage to the heart muscle--as shown in the SPECT images--is a better prognosticator of how patients will fare. The ability to identify individuals at risk for future cardiac events, such as heart attacks, has considerable appeal because the early initiation of preventive therapies may alter the course of the disease.

"...We were therefore surprised to see that gated SPECT remains the best predictor of future cardiac events in patients with IHD."

—Alessia Gimelli, MD, at the Clinical Physiology Institute CNR, G. Monasterio Foundation in Pisa, Italy.

—From the SNM Smart-Brief, 4/02/09

Are Infiltrated Radiopharmaceutical Injections Dangerous?

An infiltrated radiopharmaceutical dose can cause a lot of problems including: delay in diagnostic information, delay in therapeutic benefit, scheduling time lost, patient inconvenience to repeat study, patient anguish for delayed study results, and excess radiation burden to the patient. However, is the radiation dose or amount of drug enough to cause any real physical harm?

The answers to these questions depend on the drug, the dose, and the volume infiltrated. Fortunately, most diagnostic radiopharmaceutical injections will not cause physical harm if infiltrated. The table below is from an article in the May 1991 JNM, and details dose estimates to the tissues in the infiltrated area from some commonly used radioisotopes.

Tissue damage has been noted after exposure of 49,000 rad or greater. Though there is a pretty large margin of safety with most of the diagnostic products, no such margin exists when infusing mCi quantities of I-131 or other therapeutic products such as Y-90, P-32, Sm-153.

Also keep in mind that other injectable drugs used in nuclear medicine may cause damage if infiltrated (i.e., dipyridamole, dobutamine, etc.).

Radionuclide	mCi	Rad/0.5 ml
Tc-99m	20	12,800
F-18	10	27,000
Ga-67	5	97,200
I-131	1	228,000

Joint Commission Update

The Joint Commission has released its Revised 2009 Accreditation Requirements for the Hospital Accreditation Program. Of particular note is the change in MM 05.01.07 (Chapter: Medication Management) which now states:

"For hospitals that use Joint Commission accreditation for deemed status purposes: In-house preparation of radiopharmaceuticals is done by, or under the supervision of, an appropriately trained registered pharmacist or doctor of medicine or osteopathy."

The word "direct" has been removed from in front of "supervision". This means that hospitals will be able to define what type of supervision is required to prepare a radiopharmaceutical.

On the Horizon: FLT PET

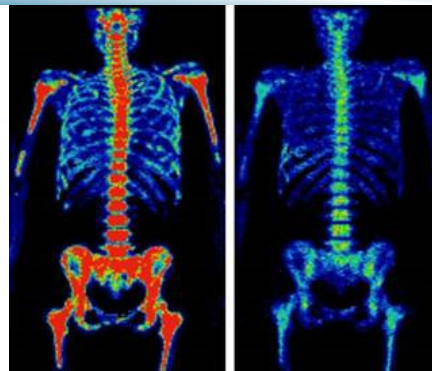
Further out on the research horizon is a PET scan that uses injections of a different radioactive material and has revealed chemotherapy's impact even faster. Experts figure it will be especially useful for assessing newer drugs that aim to stop a patient's cancer from growing rather than killing the tumor.

This scan is called FLT PET (radioactive fluorothymidine). FLT PET scans show whether cancer cells are dividing (see scan to the right). Uncontrolled division is a hallmark of active cancer, and stopping that division should be an early effect of successful chemotherapy.

"Our hope ... is you might be able to give a single dose of a chemotherapy agent and within a day or two figure out whether the tumor is going to respond," says Dr. Michael Graham of the University of Iowa.

If the tumor doesn't respond, doctors would "go on to Plan B," he said. "This is really ... giving us the ability to tailor the therapy to the disease."

Research into FLT PET is still in the early stages. There are approximately a dozen published human studies and most, if not all, involve too few patients to draw a firm conclusion.



This image, provided by The University of Wisconsin, Section of Hematology & Medical Oncology and taken from a FLT-PET scan of a 47-year old woman, shows that leukemia present in the bone marrow before treatment, left, persisted after chemotherapy, right.

One of the most impressive studies to date involved 28 patients undergoing treatment for advanced lung cancer. The normal wait time to measure therapy success is 6 weeks. With the use of FLT PET, the researchers reported that just one week after treatment began, they could tell, with 93 percent certainty, which patients would eventually respond to the drug and which would not.

—Associated Press

Returning Radioactive Waste to Radiopharmacy

Title 49 of the Code of Federal Regulations 49 (CFR 49) contains the regulation for shippers of radioactive materials. Radiopharmacy is the shipper of orders you receive, but you are the shipper of material returned to us for disposal. Boxes returned for disposal must be **limited quantity** (as defined in 49 CFR) and be packaged and labeled appropriately (as specified in 49 CFR).

In order for a package to be a "limited quantity" **all** three of the following must

apply; it may contain no more than the amounts of activity listed below, **and** the exposure rate on any surface may not exceed 0.5 mrem/hour, **and** non-fixed (removable) radioactive surface contamination on the external surfaces of the package may not exceed 6600 dpm from a wipe of 300 square centimeters (22dpm/square centimeter).

In order for the package to be labeled properly as a "limited quantity", both cards on the Radiopharmacy deliver cases must be turned over and placed on opposite sides of the box.

As always, if you are unsure of anything regarding returns, please give us a call.

Limits for Radioactive Packages Returned as Limited Quantity Package ↓

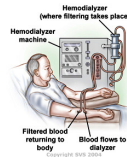
Isotope	Tc-99m	I-123	Tl-201	In-111	Co-57	Ga-67	I-131	Xe-133
mCi	11.0	8.1	11.0	8.1	27.0	8.1	1.9	270.0

Radiopharmaceuticals and Dialysis

Unusual radiopharmaceutical biodistribution has many causes and is often very difficult to explain. However, chronic renal failure and dialysis (both hemo- and peritoneal dialysis) are fairly well known causes of altered clearance and biodistribution of a lot of drugs, including radiopharmaceuticals.

Dialysis is usually used for patients with chronic or acute renal failure. Dialysis removes metabolic waste from the blood, but may also remove a variety of different drugs. In hemodialysis the blood is removed from the body and passed through a filter or dialyzer. This process depends on concentration and pressure gradients between the patient's blood and dialysate solution. A semi-permeable membrane separates the blood compartment from the dialysate solution. Small solute molecules (i.e., metabolic waste and drugs) move from the area of high concentration in blood to the area of lower concentration in the dialysate.

Various types of membranes are used between the blood flow and



the dialysate. Depending on the type used, the size of the molecules removed can vary between dialyzer operations. The rate of blood flow may also vary between operations

effecting the number of molecules removed. Since dialyzer operation can vary, the amount of drug (i.e., radio-pharmaceutical) removed from the blood by this process may vary.

Peritoneal dialysis removes metabolic waste from blood by using the patient's own semipermeable membrane—the peritoneal membrane. Dialysate is placed into the patient's peritoneal cavity where it accumulates substances that pass through the peritoneal membrane along concentration and osmotic pressure gradients. With peritoneal dialysis the dialysate needs to be changed periodically due to the decrease in the concentration and pressure gradients as waste is transferred from the blood to the dialysate. Removal of waste varies depending on the volume of dialysate exchanged, and how frequently exchange occurs. As with hemodialysis drugs may also be removed via peritoneal dialysis.

Similarly, drug removal rates may

vary greatly from patient to patient.

Most radiopharmaceuticals are eliminated, in at least some fraction, renally. Elimination is disrupted in patients with compromised renal function, resulting in prolonged blood pool activity and possibly increased clearance through the liver. Renal dialysis substitutes for kidney elimination. In many cases dialysis will not adversely affect the imaging results; as long as the administered radiopharmaceutical has been given time to localize in its organ of interest before beginning dialysis. However, the adverse physiologic effects of the dialysis procedure itself and the components of the dialysate fluid that enter the patient's bloodstream may cause very noticeable alterations in how a radiopharmaceutical is handled by the patient's body.

The information contained in this article is adapted from "Radiopharmaceuticals and Dialysis", by James Ponto in the University of New Mexico's Continuing Education Courses for Nuclear Pharmacists and Nuclear Medicine Professionals. If you would like a complete copy of the lesson, please call us at the Radiopharmacy.

Table 2. Reported Alterations in Radiopharmaceutical Biodistribution Caused by Dialysis

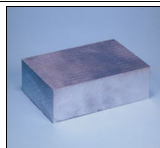
Radiopharmaceutical	Alteration	Mechanism
Tc-99m bone agents	↑ soft tissue activity	↓ renal clearance
	↑ uptake in joints, ↓ bone uptake	amyloidosis, aluminum-related bone disease
Tc-99m pertechnetate	↑ blood pool activity	radiolabeled red cells due to ↑ blood levels of Sn
	↑ uptake in choroid plexus, thyroid, and salivary glands	altered anion handling by tissues
Tc-99m DTPA	↑ blood pool activity	↑ renal clearance; mechanical damage to red blood cells (?)
	"cold spots" in abdomen	collections of CAPD dialysate fluid
Tc-99m sestamibi	↑ uptake in bone	↓ renal clearance
Tc-99m tetrofosmin	↑ uptake in parathyroid nodules	parathyroid hyperplasia
I-131 sodium iodide	↑ blood pool activity, ↑ thyroid uptake	↓ renal clearance, prolonged plasma concentrations
In-111 or Tc-99m leukocytes	↑ lung uptake	leukocyte aggregation related to activation of the complement cascade by the dialysis membrane

FOR SALE

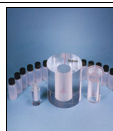
Slightly used, heavily discounted



Used Dose Calibrator
Capintec CRC-10R.....\$1,575.00
works well...



Lead Bricks.....\$60.00 each
*Rectangular Lead Brick; 8" l x 4" w
x 2" h (20 x 10 x 5 cm), 27 lb (12.5
kg)/each*



Thyroid Uptake Neck Phantom....
\$295.00
*(Complete with Bottle Carrier, Capsule
Holder and 12 Polyethylene bottles)*



Lead Apron.....\$100.00
.....a protective shield of lead and rubber
that may be worn by a patient, radiologic
technologist or radiologist.

Technologist Job Line

If you are interested in the following position please feel free to contact the department directly, or give us a call at the pharmacy.

Diagnostic Health Services is seeking a technologist to cover 1 day per week (Tuesdays) in Indiana. Call Bill Gooch at (800) 322-6341.

Deaconess Hospital is seeking a full-time technologist. Call Jason Boone @ 812-450-2455 if interested.

Technologist looking for full-time or part-time position .
Karen Foncannon
Contact info: Karen.foncannon@hotmail.com
731-661-9287 Wk: 731-541-7866

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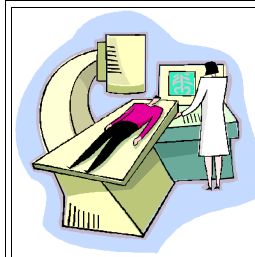
Linearity Check

Radiopharmacy, Inc. has a Lineator for performing dose calibrator linearity. The Lineator allows linearity to be performed in minutes rather than days. This equipment consists of a set of five lead tubes which are placed around a source of activity to simulate decay by shielding. Since linearity should be done according to the dose calibrator manufacturers recommendations, usually quarterly and upon installation, each time a substitute dose calibrator is used a linearity should be performed (geometry and accuracy should also be performed). When doing a linearity by decay method, it takes days to complete. This would mean that the loaner dose calibrator should not be used until the linearity is complete. By using a Lineator the linearity can be done in a much shorter amount of time, so the dose calibrator can be used almost immediately.



The Lineator is available for rent to all Radiopharmacy customers. The rental cost is \$25.00/day, it should not be needed for more than one day. Hopefully this will be of assistance to some of you in performing linearity on existing dose calibrators and on any loaner dose calibrators. Use of a lineator for linearity needs to be written into your radioactive materials license for Agreement States (Kentucky, Illinois). This is easy to amend, we have a standard form you can use, and there should be no fee. NRC States (Indiana) do not need a license amendment.

Co-57 Flood Sources and Dose Calibrator Reference Sources



Don't forget; Radiopharmacy, Inc. sells all types of radioactive sources for all types of cameras and equipment. We supply sources from a variety of major vendors in our efforts to pass along the best products at the lowest cost. Just give us a call for a price quote or for information about anything your department may need.

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