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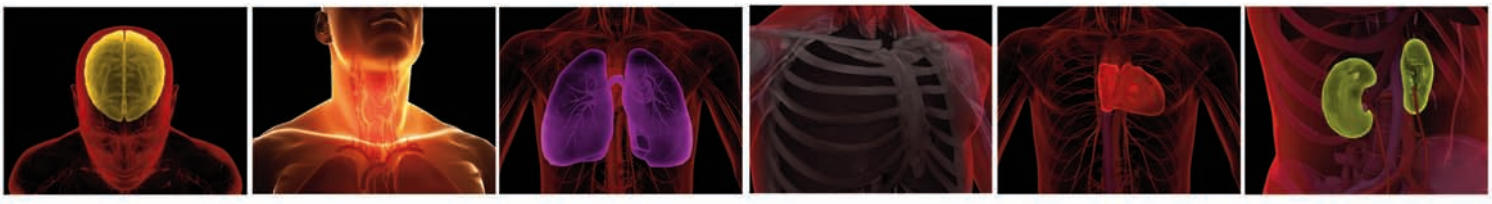

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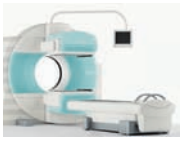

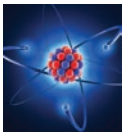

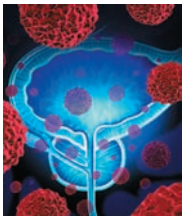

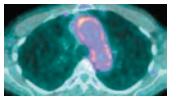

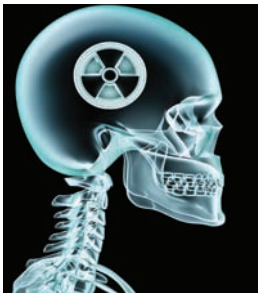

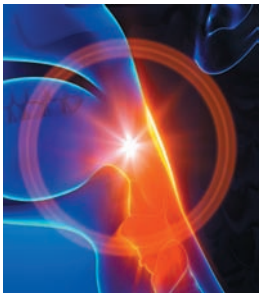

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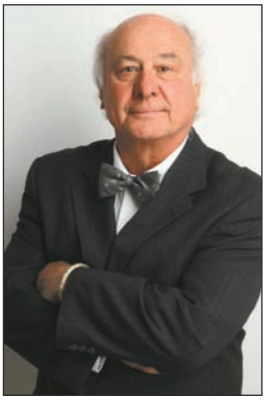

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President Elect of the Canadian Association of Nuclear Medicine

ANTIMATTER AT THE SERVICE OF NUCLEAR MEDICINE

We can now measure and visualize the metabolic activity of an organ in a human being and detect its functioning and integrity. This is positron emission tomography (PET) or, expressed another way, the functional imaging of cell metabolism.

Using PET, we can detect certain pathologies, such as cancer, which initially alter the normal physiology of cells.

In order to live, function and reproduce, the organism's normal cells need energy in the form of glucose (a sugar that can be metabolized by the organism.) This energy source is indispensable to all the living cells of the organism, and this sugar is found naturally in the blood. The more active a cell is, the more sugar it consumes.

A cancer cell that has lost all control over its unbridled multiplication must constantly consume large quantities of energy in the form of glucose (sugar).

In nuclear medicine, a glucose analog, deoxyglucose, is used as a decoy: it mimics glucose by entering cells but in a form that cannot be used as an energy source by the cancer cell.

To detect intracellular deoxyglucose, the molecule is radioactively labelled beforehand with a positron (antimatter) in the form of fluoride-18 (F-18).

As it accumulates in cancer cells, the positive electrons (e+) of F-18 come almost immediately in contact with the cell's negative electrons (e-). This produces a disappearance of the injected matter and antimatter, an annihilation reaction in which two photons are emitted at 180 degrees in the form of external radiation.

"With a simple intravenous injection of F-18 FDG that is painless and without identifiable side effects, we are pushing the diagnostic limits ever further and tracking down cancer cells in their very last cellular bastions."

The cell becomes radioactive and the emitted rays are captured by an external PET camera. Powerful computers interfacing with the PET camera identify abnormal areas of radiation emission, a sign of the abnormal accumulation of F-18 FDG in the cancerous tissue.

The cancer tumour is detected and its activity is measured. Then a 3-D reconstruction is done, in multiple slices and dynamically. The result is an exploratory metabolic autopsy of the patient *in vivo* that is non-invasive.

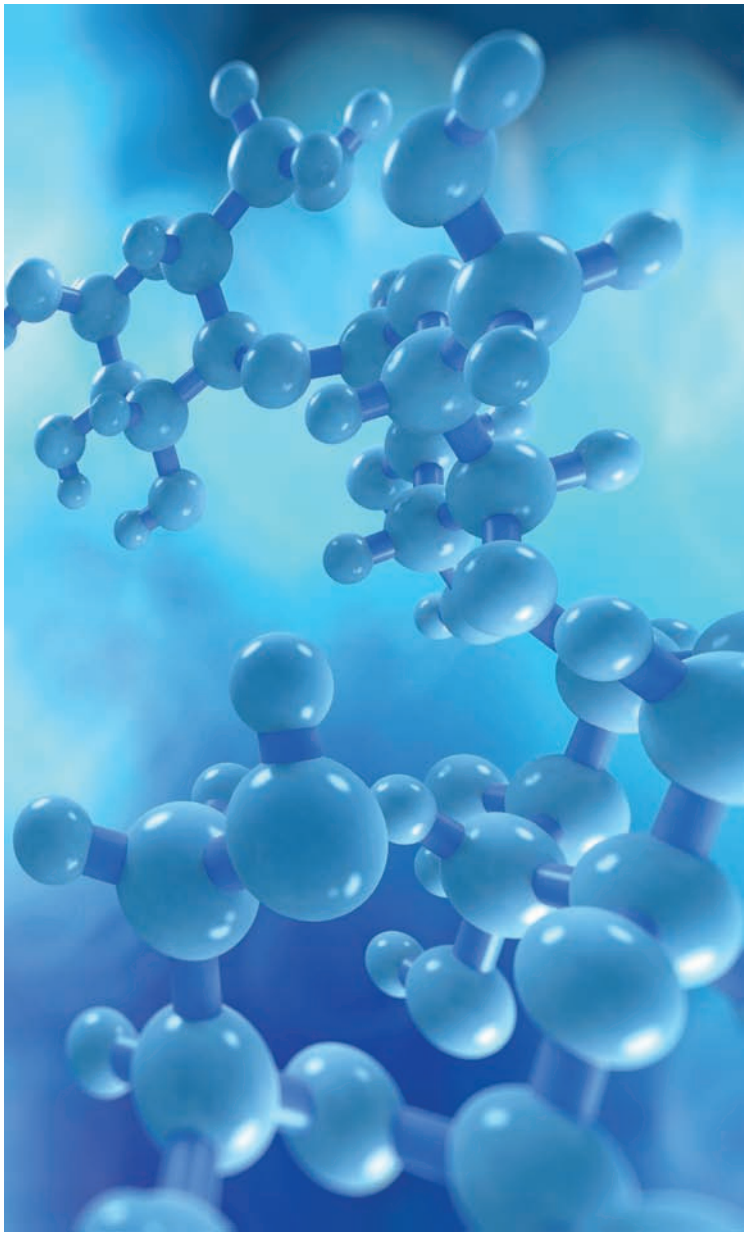
The external shape of the PET camera's detector resembles a tomodensitometer or magnetic resonance imaging device, but its function is completely different. The other two devices produce mainly anatomical images of the organs of the human body.

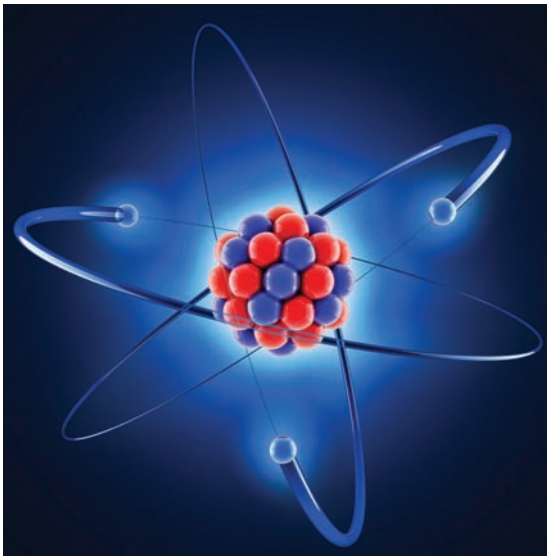
Moreover, today PET cameras are being teamed up with tomodensitometry detectors and, in the near future, will also be paired with magnetic resonance imaging devices in order to better localize the site of pathological processes.

With a simple intravenous injection of F-18 FDG that is painless and without identifiable side effects, we are pushing the diagnostic limits ever further and tracking down cancer cells in their very last cellular bastions.

While F-18 FDG is currently the most commonly used radioactive tracer, it is not the only one. Carbon-11, oxygen-15 and nitrogen-13, for example, can also be used to conduct neurological, cardiac or pulmonary exams.

In Quebec, PET technology is currently available in some nuclear medicine units. In mid-2008, thanks to new facilities in such places as Montréal, Quebec City, Chicoutimi, Gatineau, Rimouski and Trois-Rivières, this newly deployed technology enabled patients in centres that were not equipped with these cameras to have access to PET scans within a reasonable timeframe.





There are no inter-hospital charges or costs for either hospitalized patients or outpatients. The cost of each PET scan performed in a hospital centre is individually, directly and completely covered by the Government of Quebec. PET scans are prioritized based on a patient's clinical condition, whatever and wherever that may be, and not on the patient's physical location or the physical location of the PET camera.

Considering that PET technology has been applied as a just and universal social measure for all patients in Quebec, this is a success story and an example to follow. ■

INTERVIEW WITH DR ALP NOTGHI, M.D. M.SC.

PRESIDENT OF THE BRITISH NUCLEAR MEDICINE SOCIETY

1. British medicine has always been one of the most advanced in the world. What is the situation of nuclear medicine?

Nuclear medicine has always been one of the smallest specialities in medicine. However in the UK, because of its multidisciplinary nature and close association with physics and radio-pharmacy, it has always attracted people with broader interests beyond just medicine, and usually scientifically-minded, often from all over the world. This has helped to maintain its niche in the forefront of advances in nuclear medicine worldwide.

2. Is nuclear medicine accessible all over United Kingdom?

There are over 200 hospitals with nuclear medicine services in the UK. Some are dedicated nuclear medicine departments which are involved in research and development, mostly in larger hospitals and also deliver the more specialised investigations and therapies, whilst other departments deliver only the more common NM procedures, making these accessible for most of the UK population.

3. How many centres have Positron Emission Technology (PET)? And how many future PET centres will there be in the next five years?

PET facilities are mostly associated with cancer care centres (cancer hobs for each region) or are research based (all together, 63 PET cameras in the UK). However, there is a need for expansion in the services and with the recognition of developments in non-cancer applications of PET, there are plans to expand this to more centres and make it routinely available for more hospitals, as local expertise and local one-to-one discussion of cases with referrers (MDT meetings) are recognised to be as important as the test itself.

4. How is training done for nuclear medicine specialists and technologists?

Nuclear medicine training is one of the Royal College of Physicians specialities. However, with integration of hybrid imaging for attenuation correction, localisation and now, diagnostic scanners, we have developed a program to include an initial 3 years training in radiology (culminating in fellowship of the Royal College of Radiologists), followed by 3 years nuclear medicine training (including a minimum of university diploma in nuclear medicine); still remaining a RCP speciality. Technologist training is a separate training scheme from radiographers. However, closer integration may be necessary as an increasing number of hybrid cameras have diagnostic CT.

5. Nuclear medicine is expanding worldwide. How do you share your expertise with colleagues of other countries, and especially in Canada?

I see closer links between the British Nuclear Medicine Society with sister societies and organisations such as Canadian Association of Nuclear Medicine as a positive step which brings together the expertise developed which would have mutual benefit for the countries.

6. Where do you think nuclear medicine is going in the near future, and what should nuclear medicine specialists do next?

There are exciting developments with new tracers (in particular PET) and therapy which will expand the role of NM. New camera technology with increasing resolution and sensitivity has meant faster patient throughput, reduced radiation and better images, increasing the appeal of NM as a diagnostic modality. Better integration of hybrid technology (diagnostic CT and MRI) has meant we should rethink the patient pathways, reducing the number of patient visits and delays in diagnosis, giving more accurate diagnoses by combining the information from different modalities. There is a strong case for development of more SPECT agents as well as PET agents as the availability of SPECT is more universal, and in general costs of tests are lower.

7. Finally, what is your best wish for nuclear medicine?

To successfully integrate new developments into nuclear medicine whilst remaining a strong independent speciality and providing unique molecular and physio-pathological information, thus helping to understand and alter disease processes, therefore improving patient care. ■

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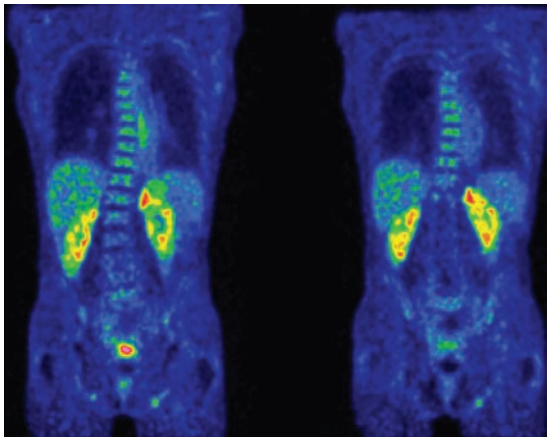
NUCLEAR MEDICINE: TECHNOLOGY TODAY AND THE ROLE OF THE TECHNOLOGIST



The Canadian Association of Medical Radiation Technologists (CAMRT) is the national professional association and certifying body for 12,000 radiological, nuclear medicine and magnetic resonance imaging technologists and radiation therapists (MRTs). CAMRT offers a suite of programs and services that advance the profession and the health of Canadians, and is the authoritative voice on issues that affect its members. 1,350 of these are nuclear medicine technologists.

Nuclear medicine procedures involve the application of radiopharmaceuticals in the diagnosis and treatment of disease. Nuclear medicine has been described as "radiology done inside out" because it records radiation emitting from within the body rather than radiation that is generated by external sources like X-rays.

Nuclear medicine scans are conducted by a certified nuclear medicine technologist (MRT). To become a certified technologist, one must first complete an undergraduate education program that is accredited by the Canadian Medical Association. The MRT provides the essential link between the sophisticated technology and compassionate patient care. In the course of performing their work, their expertise is applied to administering radioactive chemical compounds, known as radiopharmaceuticals, and performing patient imaging procedures using sophisticated radiation-detecting instrumentation. They also carry out the computer processing and image enhancement before providing images, data analysis, and patient information to the physician for diagnostic interpretation.

During an imaging procedure, the technologist is responsible for patient care. Not only do they obtain pertinent history, describe the procedure and answer any questions but they also closely monitor the patient's physical condition during the course of the procedure.

CHALLENGES AND OPPORTUNITIES OF THE FUTURE

Over the past few decades there have been exciting new developments in the field of nuclear medicine. Positron emission tomography (PET) has gained broad adoption. It uses very short life isotopes that are produced in cyclotrons. PET imaging is very sensitive and allows the visualization of functional processes in the body. It is used mainly in clinical oncology and neuroimaging. PET scanners are now often combined with CTs (PET-CT) and MRIs (PET-MR) to produce high quality anatomic and metabolic information. In Canada, the adoption of PET imaging has been slowed by the limited number of cyclotrons and the high cost of the procedures.

Single-photon emission computed tomography (SPECT) on the other hand is highly dependent on reactor produced medical isotopes. 2 of the 9 reactors used in the supply chain are scheduled to stop production in 2016 (including the Canadian NRU at Atomic Energy Canada Limited, Chalk River, and the French OSIRIS reactors). Together, these reactors account for about 25% of the current worldwide annual production volume. Other major existing producing reactors, except for OPAL in Australia, are aging and scheduled to shut down by 2030. There are many projects under way around the world to create alternative sources of supply. The Canadian government, for example, has invested over $35 million in research and development of innovative new approaches that involve the use of cyclotron technology to produce technetium-99m, an isotope used for 80 per cent of nuclear medicine diagnostic procedures. However, at this time, it is uncertain as to whether these projects will be fully operational on time to ensure a steady and reliable supply when the reactors close.

The CAMRT is monitoring the situation and coordinating ongoing investigation through dialogue and information sharing with CAMRT members, international colleagues and other national healthcare associations. Discussions are ongoing, with Health Canada, with provincial and territorial government representatives, and various industry players. The goal is to monitor the situation closely and stimulate the emergence of mitigation strategies that will ensure little or no disruption to Canadian patients who require a nuclear medicine scan. ■

François Couillard,
B. Eng, MBA, CMC,
CEO of the Canadian Association of Medical Radiation Technologists (CAMRT)

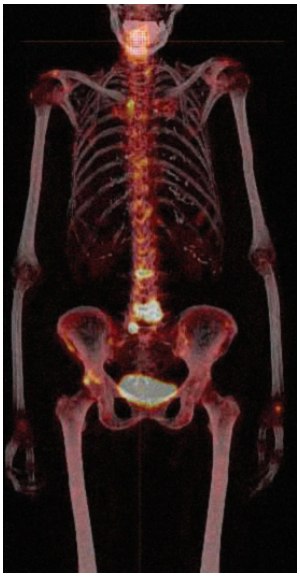
"Nuclear medicine has been described as "radiology done inside out" because it records radiation emitting from within the body rather than radiation that is generated by external sources like X-rays."

HERMES

HERMES MEDICAL SOLUTIONS

EXPERIENCE

HERMES Medical Solutions is proud to take part in this year's special nuclear medicine edition alongside its fellow industry partners and family of 28,000 users.



Celebrating 40 years of experience as a medical imaging software leader, HERMES is dedicated to meet and exceed the clinical, developmental, educational and research needs of its users. Providing state-of-the-art software, HERMES offers innovative and cost effective healthcare solutions while maintaining the highest medical imaging quality standards, playing a key role in the patient continuum of care.

A Unique Platform: The Global Experience

Historically, nuclear medicine has benefited from excellent software but, rarely on a single platform. One computer is generally used to display a certain type of exam, another to archive the data and, another is used for specific or dedicated applications.

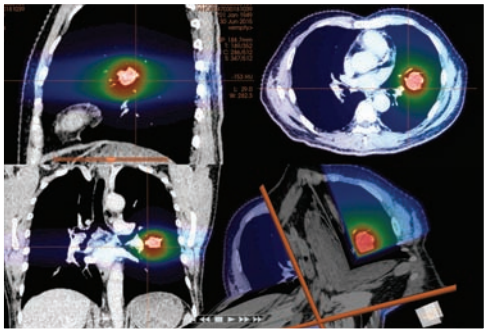
The lack of integration and the non-uniformity of components, continues to cause serious workflow obstacles for professionals working in imaging departments.

With crucial input from customers around the world, nuclear medicine pioneers, the HERMES R&D team has developed Hybrid Viewer PDR™: A unique and user-friendly software for Processing, Display and Reporting (PDR). This all-in-one tool allows the display of all medical imaging modalities (including angiography and ultrasound), image fusion (SPECT-PET-CT-MR) including analysis of this data, processing of conventional nuclear medicine and, the ability to generate medical reports. This technology is used on 6 continents and present in a majority of state-of-the-art NM Departments.

The raw and processed data is then stored in a metadata VNA in DICOM, native format, MS-Word™, MS-Excel™, .wav audio files, Adobe PDF™, etc. fully integrating with existing equipment in today's departments under a single master worklist.

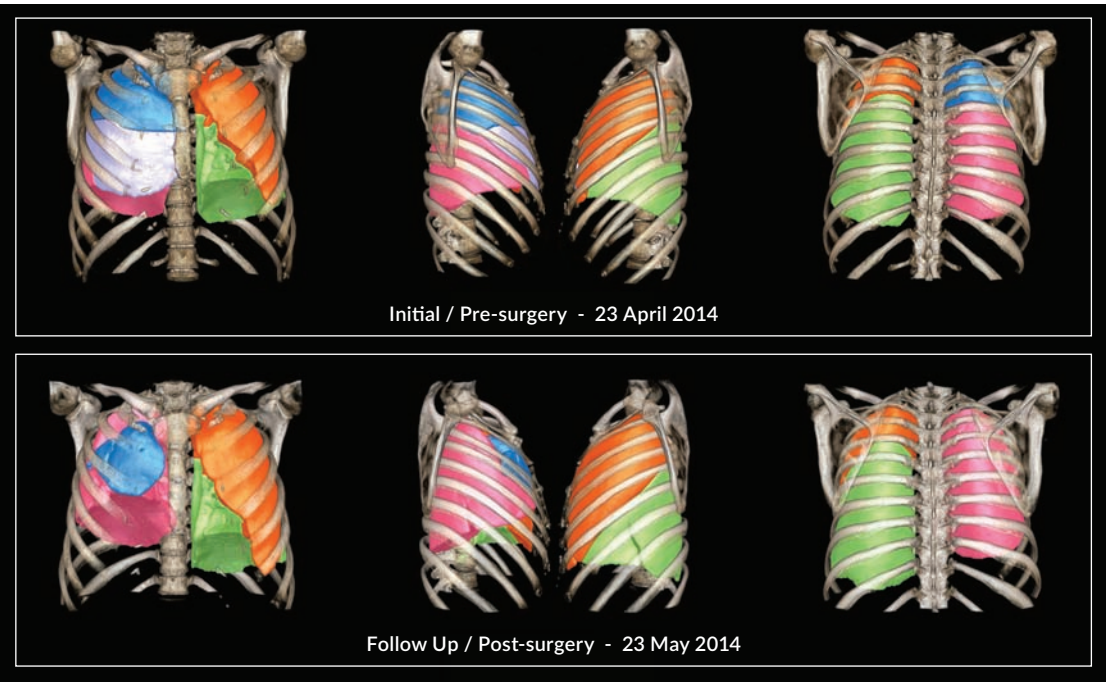
A Quantification revolution

From the early days of nuclear medicine, quantification has been a key aspect; self-defining the practice and at the same time distinguishing from other imaging modalities. The arrival of Positron Emission Tomography (PET and its SUV scale) certainly contributed to advances in the field, but the essence of nuclear medicine still remains the Single Photon Emission Computed Tomography (SPECT) environment for a vast majority of medical centers. The new breed of cameras coupled with CT components and optimized with advanced reconstruction tools started paving the way for the day when a-SUV scale, similar to the one used in PET, would help us quantify images obtained from SPECT-CT scanners. Despite the increasing availability of PET, the number of specific tracers used with this technique is still suboptimal. Absolute SPECT-CT quantification (SUV) is now available and opens the door to a plethora of possibilities with dozens of proven tracers already in use.



HERMES SUV SPECT®

The HERMES SUV SPECT® revolutionizes quantitative imaging by exploiting the use of SPECT's full potential in regions where a large portion of the population still does not have access to PET and/or associated reimbursements. HERMES SUV SPECT® software algorithms enable a conversion of the recorded counts per voxel into activity per unit volume with SUV calculations, providing essential and accurate quantitative results.



Accuracy with Quantification tools

Previously used for teaching purposes or display modelling, 3D applications now enable automatic lesions detection or the ability to establish more accurate diagnostics in comparison with still largely used 2D tools.

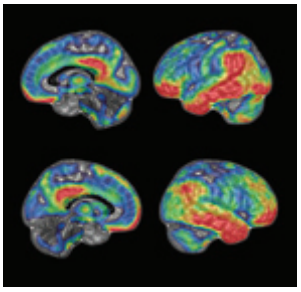
These amazing results can be obtained with the help of advanced segmentation methods especially useful with quantitative pulmonary studies. The Hybrid Viewer™ 3D module proceeds with an automatic co-registration of the SPECT-CT (and separate diagnostic CT if needed), an automatic L/R Lung and airways segmentation, a quick inter-lobar fissure definition, a fissure definition quality control, a lobar ventilation and perfusion quantification and an automatic report generation. Knowing that accurate results can drastically change the optimal surgical approach, comparative studies have been conducted between current 2D techniques (planar anterior image or real anterior reprojection divided in 6 segments) and 3D segmentation techniques. Preliminary results have shown differences ranging between -10% to +48% in the assessment of accurate volume calculation in ml.

Similar tools for automatic hepatic and kidney segmentation are now available and will help promoting for a closer collaboration between quantitative imaging and surgical departments.

QUANTIFICATION

Improved prognostic

HERMES is extremely proud to participate in high-level research to support healthcare professionals in the detection and treatment follow-up of diseases such as epilepsy, brain tumors, schizophrenia, Parkinson's and most recently Alzheimer's. New amyloid tracers, which are making their debut on the market, will facilitate HERMES efforts in assisting physicians worldwide in university facilities as well as in community hospitals, by providing them with normal templates for a precise and reliable quantification of the patient illness state. HERMES BRASS™ (Brain Registration & Analysis Software Suite) has appeared in more than 350 scientific publications and presentations around the world and has been validated with over 2 million patients.



TEAM WORK

HERMES provides its expertise by employing a solid team, dedicated to quantitative molecular imaging .

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FRACTURES

A DIFFERENT APPROACH: THE ROLE OF EARLY BONE SCANNING

Christopher O'Brien
MDCM; FRCPC

Medical Director,
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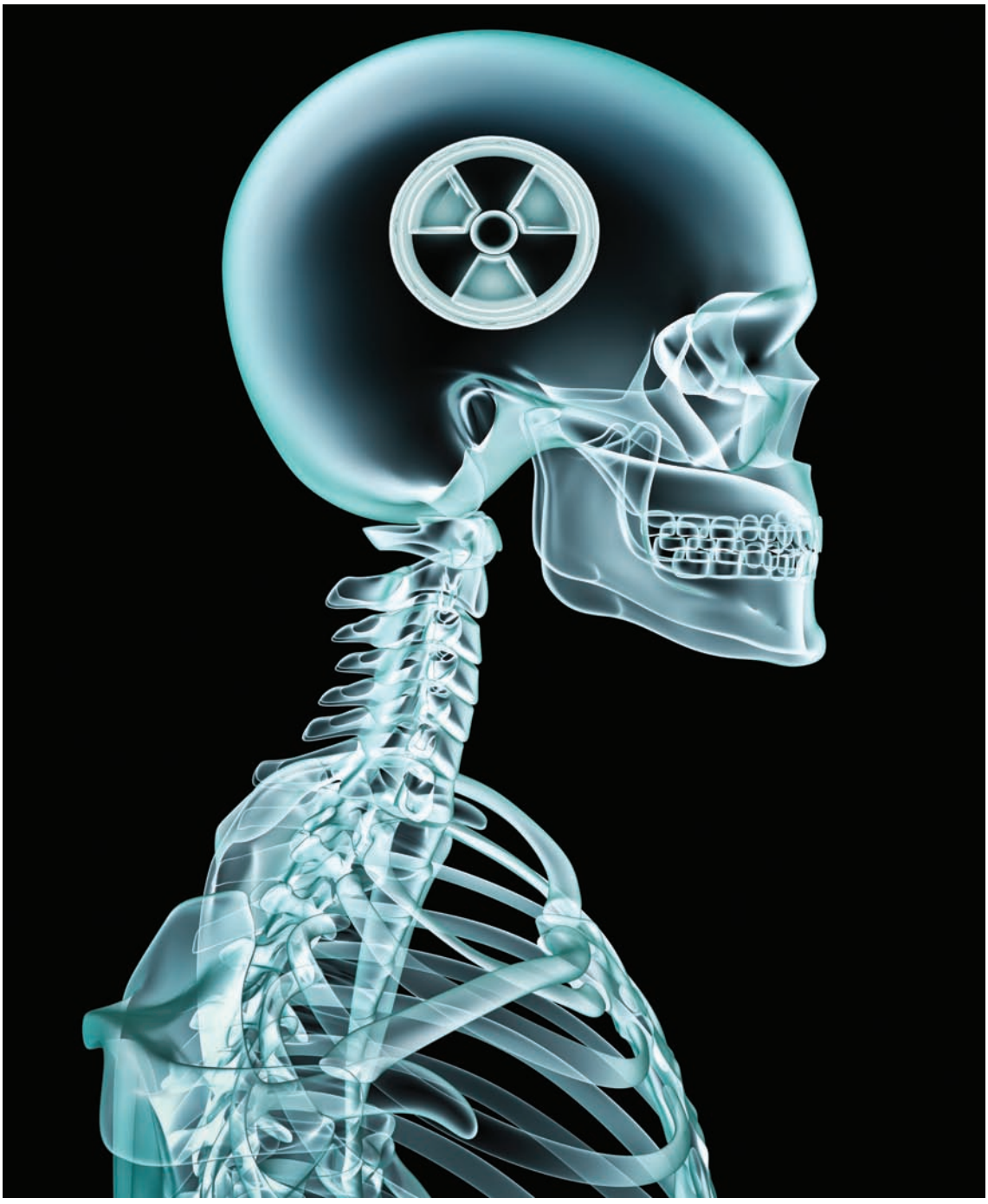
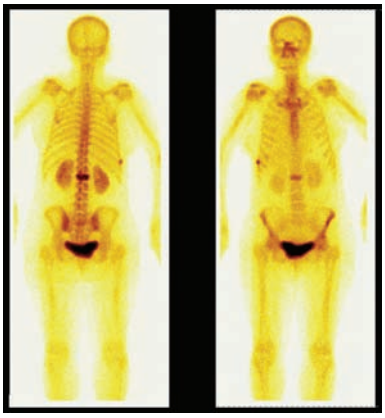
President of the Ontario
Association of Nuclear
Medicine



The three-phase bone scan is a very sensitive technique used in the detection of fractures of any cause. The sensitivity can be further increased through the use of SPECT and the specificity can be improved by adding the technique of SPECT/CT. The sensitivity ranges from 80% to 98% depending on when imaging is performed and whether SPECT is used, or 24 hour delayed imaging is obtained. Thus the sensitivity at 24 hours post event is 80%, 95% by 72 hours and 98% by one week.

The reason that the sensitivity is lower with early imaging is that the osteoblasts must become activated and it is osteoblastic activity that is assessed with the bone scan. The higher sensitivity is usually

achieved by 48 hours after the event. Up to 72 hours post event may be required for the severely osteopenic patient.



A bone scan can be tailored to assess a specific site only (e.g. the hand or foot) or a more regional assessment (e.g. the pelvis and lower extremities). At times a whole bone assessment may be required, especially in cases of more severe trauma. By tailoring the study, one can assess both the area of discomfort and also have the ability to assess for referred pain from occult fractures elsewhere.

It is important to realize that there is no increase in radiation exposure as one takes more images, as the radiation exposure comes from the injection. The addition of SPECT does not add any more radiation either as this is a simple 3-dimensional reconstruction technique. SPECT/CT, however, does add a very small amount of extra exposure linked to the CT, but a low dose technique is used to keep this exposure to a minimum.

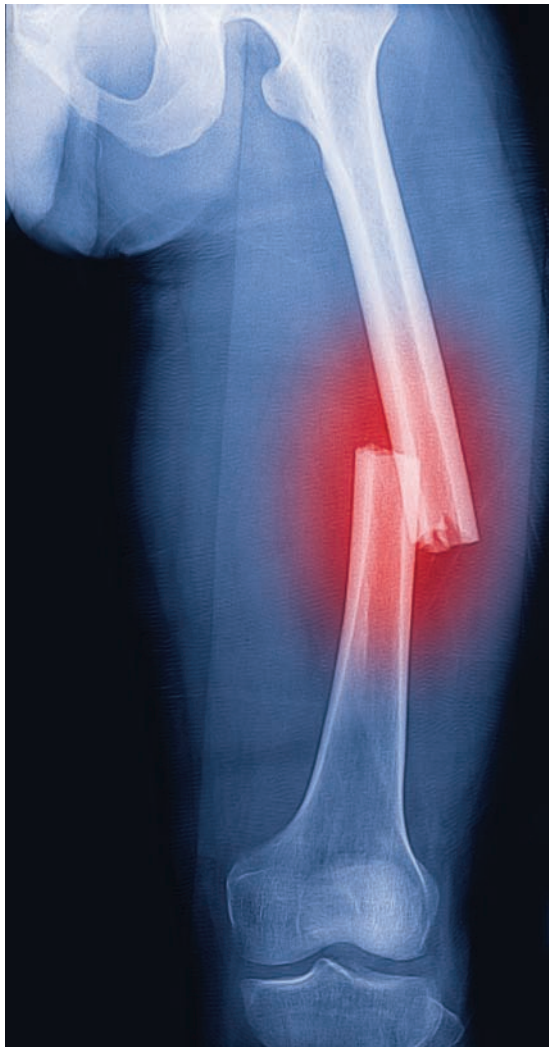
PATIENT MANAGEMENT ISSUES

When a patient presents complaining of bone pain, it is important to obtain a history to assess for possible post-traumatic causes, perhaps insufficiency causes, or perhaps neoplastic causes. After the history and if clinical indication exists, then the first imaging is usually plain film X-ray of the area of discomfort. If X-rays are obtained very shortly after the event, the sensitivity is low: 10 to 15% (especially with stress fractures and in those individuals with low bone density), and it may take up to two weeks or more before changes become more apparent with plain film X-ray. Thus there is the need for a follow-up X-ray if clinical symptoms persist.

However, even with this we see many patients presenting to Nuclear Medicine to obtain a bone scan to assess the possibility of fracture, even one month after the event because X-rays are still normal or inconclusive, and because of this the patient may not have received optimal clinical care.

To maximize patient care, one could consider a bone scan as the next imaging technique if initial X-rays are normal and clinical symptoms remain. Thus, one could consider performing a bone scan much earlier in the work-up of the patient due to its very high sensitivity which rivals MRI (sensitivity of 85 to 95%).

If referring physicians begin to request bone scanning earlier after initially negative X-rays in order to optimize patient management, then it will be necessary for the Nuclear Medicine department to establish a rapid response process to fast track patients with suspected fractures. If the waiting time is 2 to 3 weeks, this does not do the patient any good. In addition, the Canadian Medical Association Wait Time Alliance has suggested that urgent cases (which include fractures) should obtain a bone scan within one week of the request and preferably within around 48 hours of the request, in ideal situations.



I believe that by following this approach, the diagnosis of fractures will be made quicker, patients can then be referred for appropriate management sooner, and the patient will be able to return to routine activities of daily life and will also have better pain control.

In conclusion, the routine bone scan is a safe and highly sensitive technique (98% at one week) and with the addition of SPECT/CT, it now has high specificity as well. It should be considered as the next imaging technique if X-rays are normal and clinical symptoms persist one week after the initial X-rays. In addition, the Nuclear Medicine departments will have to set up a process to fast track these requests in order to optimize patient care. ■

"A bone scan can be tailored to assess a specific site only (e.g. the hand or foot) or a more regional assessment (e.g. the pelvis and lower extremities)."

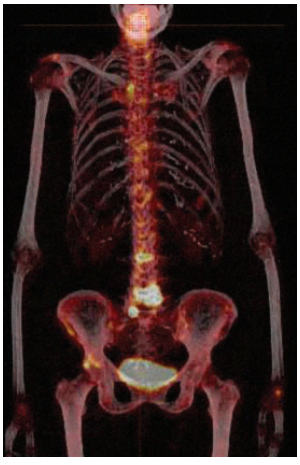
"To maximize patient care, one could consider a bone scan as the next imaging technique if initial X-rays are normal and clinical symptoms remain."

HERMES

HERMES MEDICAL SOLUTIONS

EXPÉRIENCE

C'est avec fierté que la compagnie HERMES Solutions Médicales se joint à ses partenaires d'affaires ainsi qu'à sa famille de 28000 utilisateurs pour ce cahier spécial sur la médecine nucléaire.



En tant que leader de logiciels d'imagerie médicale, HERMES, célébrant ses 40 ans d'existence dans le domaine, s'efforce de répondre tant aux besoins cliniques de ses utilisateurs qu'au développement, à la recherche et l'enseignement. Ses solutions à la fine pointe de la technologie favorisent une approche novatrice et efficiente permettant de diminuer de façon marquée les coûts de santé tout en maintenant les plus hauts standards de qualité en imagerie et ainsi jouer un rôle clé dans le continuum de soins du patient.

Une plateforme unique : l'Expérience mondiale

Historiquement, la médecine nucléaire a bénéficié d'excellents logiciels, mais malheureusement rarement regroupés sous la même enseigne. Un ordinateur pour visualiser un type d'examen, un autre pour archiver les données, un autre pour telle ou telle application spécifique...

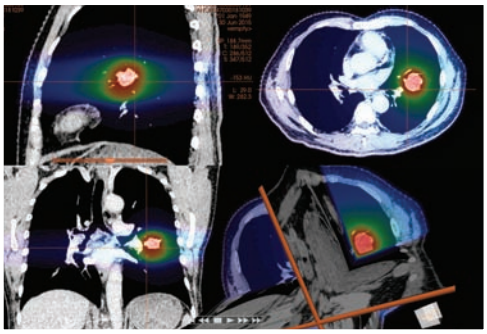
Le manque d'intégration et la non-uniformité de ces différentes composantes ont causé et causent toujours de bons maux de tête au sein de plusieurs départements.

À l'écoute de ces clients à travers le monde, pionniers de la médecine nucléaire, l'équipe de recherche et développement a créé et conçu Hybrid Viewer PDR™: un logiciel de visualisation, de traitement et de lecture utilisant une interface unique et conviviale. Un tout-en-un permettant de visualiser toutes les modalités d'imagerie (incluant l'angiographie et l'échographie), de fusionner les images (SPECT-TEP-TDM-IRM), d'analyser toutes ces données, de traiter les études de médecine nucléaire conventionnelle et de générer des rapports. Cette technologie est utilisée mondialement et est présente dans la majorité des départements de médecine nucléaire de pointe.

Toutes les données patient sont évidemment stockées par la suite dans une archive métadonnée universelle (VNA/Vendor-Neutral Archive) en format DICOM, natif, MS-Word™, MS-Excel™, fichiers audio wav., Adobe PDF™, etc. s'intégrant parfaitement à l'équipement existant des départements d'aujourd'hui sous une seule liste de travail maîtresse.

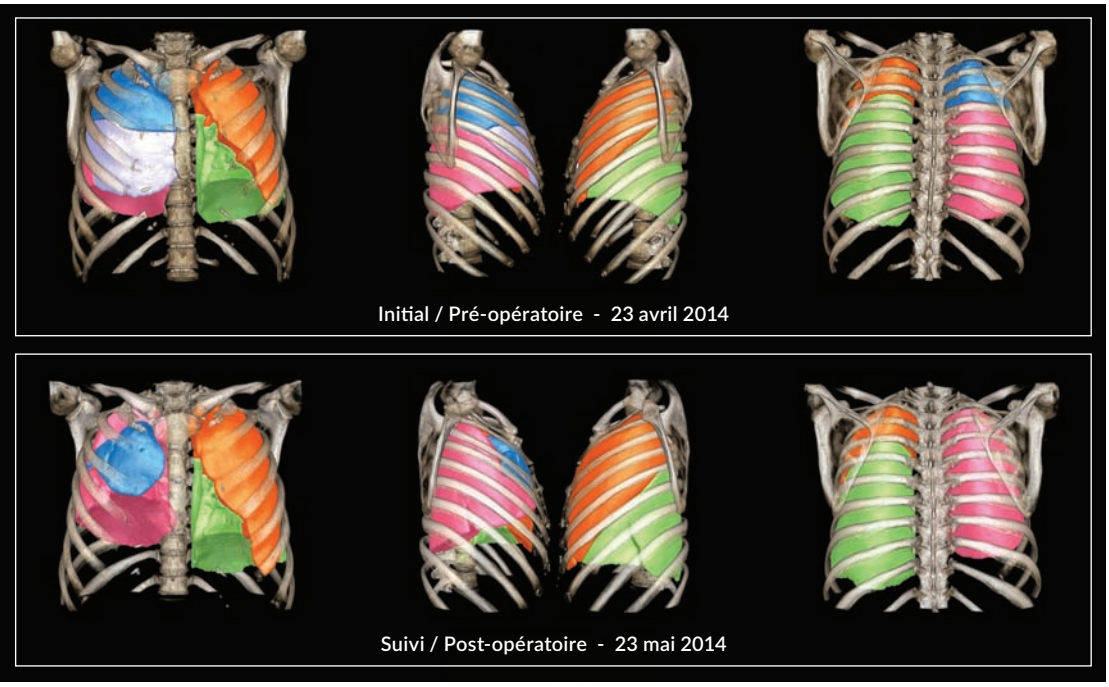
Une révolution en quantification

Depuis les premiers balbutiements de la médecine nucléaire, la quantification fut un facteur déterminant; définissant à la fois la pratique et lui permettant d'autre part de se démarquer des autres disciplines d'imagerie. L'arrivée de la tomographie par émission de positrons (la TEP et son échelle SUV) a certes contribué à l'avancement technologique, mais l'essentiel de la médecine nucléaire repose toujours sur la tomographie par émission mono-photonique (SPECT) pour la plupart des centres hospitaliers. Les nouveaux appareils couplés à la TDM, ainsi que les outils de reconstruction avancés, permettaient jusqu'alors de rêver au jour où il serait possible de quantifier les images obtenues en SPECT-CT en utilisant une échelle SUV similaire à la TEP. Bien que la TEP soit de plus en plus disponible, le nombre de traceurs spécifiques demeure toutefois limité. La quantification absolue (SUV) SPECT-CT est maintenant disponible et ouvre la porte à de nouvelles possibilités avec l'utilisation de dizaines de traceurs éprouvés.



HERMES SUV SPECT®

Cette technologie révolutionne l'imagerie quantitative en permettant d'exploiter le plein potentiel de l'utilisation de la SPECT-CT. Le logiciel HERMES SUV SPECT® est en fait un module spécifiquement conçu pour rehausser la reconstruction SPECT/SPECT-CT demi-dose/demi-temps HYBRID RECON™, fournissant ainsi des données quantitatives essentielles et précises. Les algorithmes de l'application SUV SPECT® permettent la conversion des comptes par voxel enregistrés en activité par unité de volume ainsi que les calculs SUV associés.



Des outils plus précis de quantification

D'abord utilisés à des fins d'enseignement ou d'affichage modélisé, les applications 3D nous permettent maintenant de détecter automatiquement des lésions ou d'établir de meilleurs diagnostics en comparaison aux outils 2D encore largement répandus.

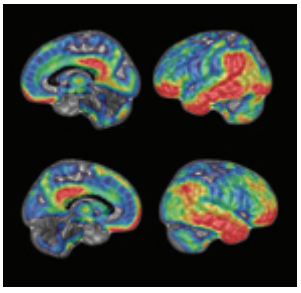
Des résultats remarquables peuvent être obtenus à l'aide de méthodes de segmentation avancées, comme par exemple pour les études pulmonaires quantitatives. Le module 3D du logiciel Hybrid Viewer™ procède au recalage des études SPECT-CT avec une TDM diagnostic (si nécessaire), à une segmentation automatique pulmonaire droite/gauche et de la trachée, à la définition des scissures interlobaires, au contrôle de qualité de la définition des scissures, à la quantification lobaire de la ventilation et de la perfusion, ainsi qu'à la création d'un rapport automatique. Sachant que des données précises peuvent changer du tout au tout l'approche chirurgicale optimale, des études comparatives ont été menées afin de comparer les techniques actuelles 2D (image antérieure planaire ou réelle reprojection antérieure divisées en segments) vs cette technique de segmentation 3D. Les différences en pourcentage des volumes obtenus en ml ont démontré dans certains cas des écarts de -10 % jusqu'à +48 %.

Des outils similaires pour la segmentation hépatique et rénale automatiques sont maintenant disponibles et ouvrent la voie à une collaboration plus étroite entre l'imagerie quantitative et les divers départements de chirurgie.

QUANTIFICATION

La quantification au service d'un meilleur pronostic

HERMES est extrêmement fier de participer à la recherche de haut niveau en soutenant les professionnels de la santé dans la détection et le suivi de maladies comme l'épilepsie, les tumeurs cérébrales, la schizophrénie, le Parkinson et plus récemment l'Alzheimer. L'arrivée sur le marché de traceurs amyloïdes permet à HERMES de supporter les médecins du monde entier, autant en centres universitaires que dans les hôpitaux communautaires, en leur fournissant les bases de données normales pour une quantification fiable et précise de l'état du patient. Le logiciel BRASS™ (Brain Registration & Analysis Software Suite) est paru dans plus de 350 publications et présentations scientifiques à travers le monde et a été validé avec plus de 2 millions de patients.



ÉQUIPE

HERMES compte sur son expertise et sur une solide équipe d'employés dédiée à l'imagerie moléculaire.

GLOBAL

HERMES possède des bureaux en Suède, au Royaume-Uni, aux États-Unis, au Canada et en Chine.

HERMES VNM™

La solution HERMES VNM™ inclut une archive neutre (VNA/Vendor-Neutral Archive) combinée à la puissance d'une plateforme d'imagerie médicale clinique complète, sur mesure pour une intégration multi-fabricants/multi-sites. HERMES propose des solutions efficientes dans le monde entier de l'architecture et l'infrastructure d'entreprise, à l'archivage, aux services de lecture, d'analyse et de traitements sur ses systèmes ou via son approche infonuagique TeleHERMES™

40 HERMES années d'innovation de pointe

Dr Guillaume Bouchard, M.D., nucléiste
Service de médecine nucléaire
CSSS de Laval,
Hôpital Cité-de-la-Santé

Figure 1

IQ-SPECT :
A SMART NEW CARDIAC ACQUISITION METHOD IN NUCLEAR MEDICINE

"The IQ-SPECT technology employs specialized collimators (SMARTZOOM), an advanced image-reconstruction algorithm and a customized cardio-centric image-acquisition orbit."

GAMMA CAMERAS AND COLLIMATORS

Nuclear medicine departments rely on two diagnostic equipment categories, each based on different physical principles to detect radioactivity: gamma cameras and positron emission tomographs, commonly referred to as PET scans. This article discusses a recent development in the instrumentation of gamma cameras, more specifically, a collimator dedicated to cardiac studies: the IQ-SPECT technology, exclusive to Siemens. Figure 1 shows a modern hybrid gamma camera model with an integrated CT scanner.

Before going any further, it is necessary to discuss the collimator, an essential component of the gamma camera. The collimator is a lead plate pierced through with hexagonal holes similar to a beehive, attached onto the surface of the radiation detector. It acts as a filter that arranges the radioactivity emitted by the patient in one direction, thus allowing an image to be formed. The conventional type of collimator is known as a parallel-hole collimator, whose holes are uniform. The disadvantage of collimation is that less than 1% of the radioactive tracer dose injected into the patient participates in the formation of the image. This low sensitivity is restrictive and requires a relatively long image-acquisition time.

During a conventional perfusion myocardial scinthigraphy, and based on our department's settings, 16 minutes were typically required to collect enough information and reconstruct images of optimal quality. These prolonged acquisitions are uncomfortable and often difficult to tolerate for our patients, who need to keep their arms raised above their head without moving. This seems incredibly long compared to the seconds it takes a CT scanner to acquire images of an anatomical region. However, the acquisition time is similar to that needed to acquire a sequence of images using magnetic resonance.

IQ-SPECT TECHNOLOGY

The idea of using a collimator that magnifies an organ and increases sensitivity is not new, but it faced huge technological hurdles. As early as 1993, Siemens published work describing a prototype for a "cardio-focal" collimator, the predecessor of the IQ-SPECT technology, available since January 2011. Nearly 20 years of advances in computer technology and research and development were necessary for its development!

The IQ-SPECT technology employs specialized collimators (SMARTZOOM), an advanced image-reconstruction algorithm and a customized cardio-centric

SIEMENS

Imprimé au Canada, mars 2016

Rendre l'invisible visible

siemens.com/symbia-intevo

La qualité des images conventionnelles de TEMP/TDM est limitée par la quantité minimale de données de TDM utilisée pendant la reconstruction.

Grâce à Symbia Intevo™, le premier système xSPECT au monde, vous pouvez non seulement produire des images d'une pathologie, mais aussi manipuler la haute résolution des images pour rendre l'invisible visible. Maintenant, pour la toute première fois, les capacités quantitatives du système Symbia Intevo procurent la possibilité d'effectuer le suivi et l'ajustement des traitements plus tôt en mesurant même les plus petites différences avec exactitude.

Prise de décision plus facile

Le système xSPECT procure un contraste d'image plus élevé et une caractérisation plus précise des lésions en imagerie osseuse pour aider les médecins à distinguer une maladie dégénérative d'un cancer, et faciliter la prise de décision des médecins.

Augmentation de la confiance pour l'interprétation

Symbia Intevo permet d'augmenter la confiance du médecin en matière d'interprétation grâce à une meilleure localisation visuelle des lésions par rapport à la technologie conventionnelle.

Figure 1 : Image de TEMP standard reconstruite à l'aide de l'imagerie itérative FLASH 3D

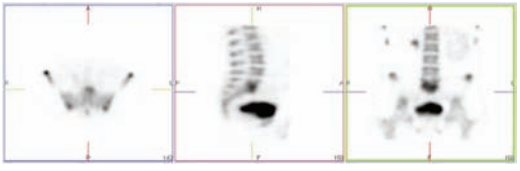
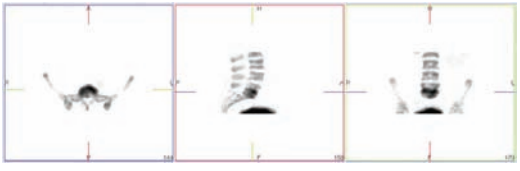


Figure 2 : Image produite grâce à la technologie xSPECT Bone



Images gracieuseté du CSSS de Gatineau, Hôpital de Hull

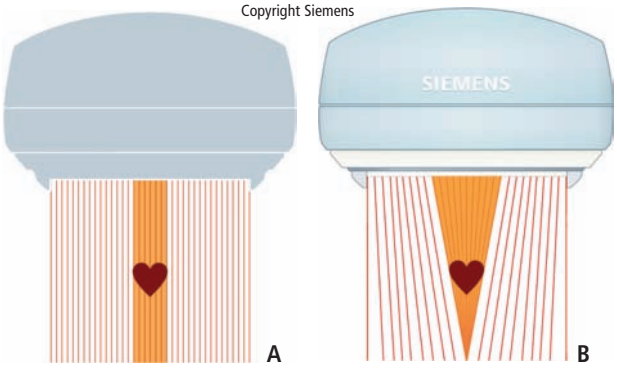


Figure 2

image-acquisition orbit. The holes of SMARTZOOM collimators are of various lengths and angles, which magnify the heart and help quadruple sensitivity without compromising image quality. This results in an acquisition time of only 4 minutes – an unthinkable achievement only a few years ago! This spectacular increase in sensitivity can also lead to a decrease in radioactivity dose needed, and allows for greater clinical flexibility. It has now become more effective to customize the patient's acquisition protocol.

"The holes of SMARTZOOM collimators are of various lengths and angles, which magnify the heart and help quadruple sensitivity without compromising image quality. This results in an acquisition time of only 4 minutes – an unthinkable achievement only a few years ago!"

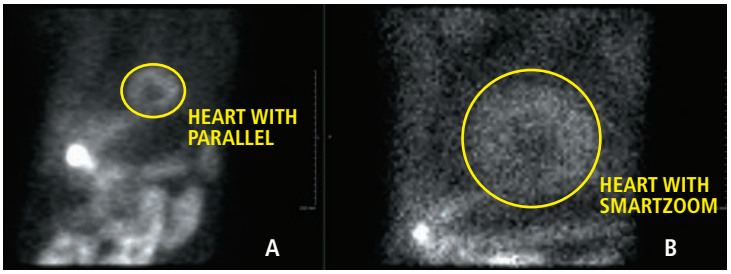
Figure 2 illustrates the differences between a conventional parallel-hole collimator (A) and the variable focal distance SMARTZOOM collimator (B) marketed by Siemens (IQ-SPECT technology). Figure 3 compares a 2D projection of a conventional cardiac study (A) with an IQ-SPECT study (B).

MYOCARDIAL PERFUSION STUDIES

Myocardial perfusion studies are an essential diagnostic and monitoring tool for heart disease. With approximately 40% of patients referred to us in Laval, they represent an important volume of activities in nuclear medicine. Their use is backed up by quality clinical studies published since the 1980s. One example of a typical indication is that of a patient with risk factors and suffering from chest pains, possibly of cardiac origin. The unique information that these studies provide are useful in customizing the risk assessment of cardiac events and in guiding decisions regarding treatment, among them the use of coronary angiography.

Three-dimensional rest images are compared with effort images taken after a treadmill test or after a drug-induced stress. It is then possible for the nuclear medicine physician to describe the presence and severity of myocardial ischemia and infarct. Figure 4 shows an example of these slice images.

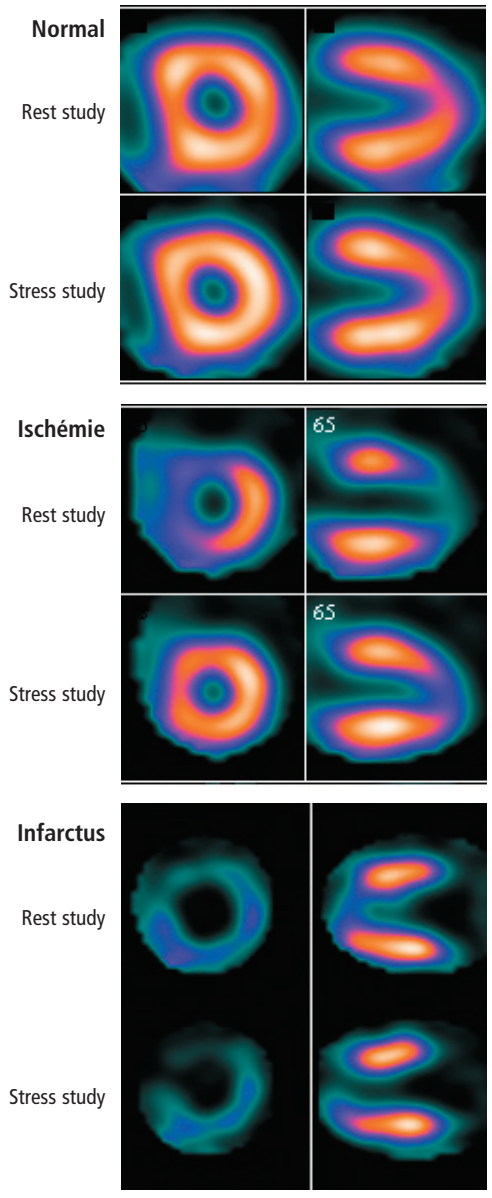
Figure 3



LAVAL, A PIONEERING INSTITUTION

Since adopting the IQ-SPECT technology at Cité-de-la-Santé Hospital in Laval, in January 2011, over 10,000 patients have been assessed using this innovative technology.The patients and the Nuclear Medicine department both benefit from this technology. It has been possible to group cardiac studies together onto a single camera, simplifying appointments management. The speed of image acquisition helps reduce patient movements, the primary cause of image quality degradation. The camera time freed up is equivalent to the addition of half a camera in our Department! This precious time has been reclaimed to reduce waiting lists and improve our service offering. Progressively, we are decreasing patient exposure to radiation and are considering new, improved protocols. This is a great example of a technological improvement positively transforming the nuclear medicine experience. ■

Figure 4



SIEMENS

Printed in Canada 03.2016

See the unseen

siemens.com/symbia-intevo

Conventional SPECT/CT image quality is limited by the minimal amount of CT data used during reconstruction.

With Symbia Intevo™, the world's first xSPECT system, you have the potential to not only image disease, but also leverage the high image resolution you need to see the unseen. Now, for the first time, Symbia Intevo's quantitative capabilities provide the ability to monitor and adjust treatments earlier by accurately measuring even the smallest differences.

Easier Decision Making

xSPECT enables higher image contrast and more precise lesion characterization for bone imaging to support physicians in distinguishing degenerative disease from cancer and facilitating easier physician decision making.

Increase Reading Confidence

Symbia Intevo has the ability to increase physician's reading confidence by offering better visual localization of lesions compared to conventional technology.

Figure 1: Standard SPECT Image reconstructed with Iterative FLASH 3D imaging

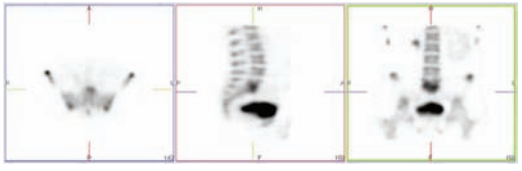


Figure 2: xSPECT Bone Image

Images courtesy of CSSS de Gatineau – Hôpital de Hull

THE 7.4 BILLION CITIZEN EDUCATIONAL PANGEA

Jean-Luc Urbain, M.D., Ph.D., CPE
Past President, CANM

"Technologists, scientists and physicians involved in nuclear medicine have always been eager to share their findings, discoveries and developments in the field through communications and publications."

Derived etymologically from the Latin "educo", the word education is defined by two major components: the action or process of teaching and the knowledge, skills and understanding acquired. The purpose, content and tools of education have evolved dramatically through the history of human kind.

In prehistoric and primitive culture, the purpose of education was to teach survival tools and cultural values and to guide individuals and children to become good members of the tribes or bands. At the time, it was carried through symbolic communication systems during initiation, rituals and probably through stone carving and paintings in caves. It was more relevant to what scientists now call socialization or enculturation.

As cultures began to extend their knowledge beyond individuals and survival skills, new forms of education emerged. The origin of classes and schools that we still know today parallels the start of civilization in Egypt and Mesopotamia about 3500 BCE with priests, scribes and government officials dispensing knowledge as teachers.

For millennia, education was reserved to the elite and the privileged. Bringing new ideas and challenging the dogma and authority of the Aristocracy and Catholic Church, the Age of enlightenment of the 15th and 16th centuries in Europe enabled to gradually provide education, literacy and learning to rich and poor alike. Today, in most countries, full-time education, whether at school or otherwise, is compulsory for all children up to a certain age.

Egyptian hieroglyphs, Chinese oracle bones, wax covered writing boards, clay tablets, strips of bark from trees, tick leaves, parchment and vellum made of goat skin and calf skin have been used until the Middle Ages to teach humanities and subjects such as science, medicine, mathematics and geometry. In the Middle Ages, Gutenberg's printing press invention played a key role in the development of the scientific revolution and laid the material basis for the spread of learning to and by the masses. The invention of the blackboard, in the 18th century, that replaced individual writing slates was also pivotal to the teaching of classrooms. By the middle of the 19th century, almost every classroom in America had a blackboard. Invented at the end of the 19th century, the overhead projector was only introduced in classrooms in the 1950's and early 1960's. From the 60's to the 90's slide projectors were commonly used for presentations.

Before the advent of microcomputers in the 1980's, mainframe computers were used to deliver printed drill and practice and simple tutorials for teaching students lessons. When microcomputers began populating classrooms in the late 80's and 90's, they rapidly transformed the multi-millennial era of analog education into our digital epoch. The development of inexpensive multimedia computers and the eruption of the Internet in the mid-1990's and social media tools in the mid-2000's have dramatically transformed the nature of education.

Nowadays, digital communications tools (e.g., e-mail, social media…) and multimedia (e.g. video conference, webinars…) dominate our world and life. Besides the traditional elementary, primary, secondary, higher and adult forms of education, people across the world have, could or should be given access to alternative, indigenous, informal, open and self-directed education.

Your reading of this article in this magazine or via the web portal (www.lepatient.ca) illustrates nicely the educational evolution in our field. Dedicated to education of patients and physicians outside their scope of practice and field of expertise, the magazine "Le Patient" is among the first and rare examples of

dissemination of simple, practical and useful medical and nuclear medicine information to the masses.

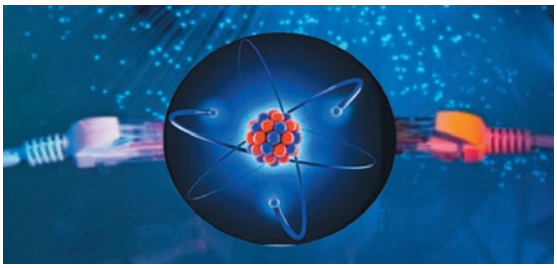
Less than a century old and largely an outcome of the WWII Manhattan Project, the field nuclear medicine has evolved into a vast, multidisciplinary and complex body of knowledge. In parallel to its enormous impact on human health through unique diagnostic and therapeutic approaches, nuclear medicine has also become a multi-billion dollars industry that is part of the economic fiber of continents.

Technologists, scientists and physicians involved in nuclear medicine have always been eager to share their findings, discoveries and developments in the field through communications and publications. Over the past 50 years and in partnership with the industry, national, regional and international nuclear medicine organizations (SNMMI, EANM, AANM, ALASBIMN, AOCNMB, IAEA, WFNMB, WHO) have fostered a vast and collaborative environment for the dissemination of knowledge and the education of our community.

Unfortunately, mostly preoccupied to develop the field and to improve patients' services, nuclear medicine professionals have neglected to focus on and to develop initiatives for the teaching of patients and non-nuclear medicine professionals that remain concerned about the use of radioactive material.

The recent involvement of patient advocacy groups in government agencies and the availability of targeted radiopharmaceuticals for the treatment of cancers have created a new paradigm and challenge for our community: the need to educate government bureaucrats, patients and non-nuclear medicine professionals about the safe use of medical isotopes for the diagnosis and treatment of diseases.

In partnership with the industry and in collaboration with our sister organizations, some members of the Canadian Association of Nuclear Medicine are embarking into a major educational initiative across the globe.



Taking advantage of 21st century cognitive intelligence, Internet, social media and communication tools, we aim to create a unique, useful, multilingual educational reference nuclear medicine library understandable by patients, colleagues and public servants.

"Over the past 50 years and in partnership with the industry, national, regional and international nuclear medicine organizations have fostered a vast and collaborative environment for the dissemination of knowledge and the education of our community."

Norman Laurin
MD, FRCP, CMQ
(Nuclear Medicine)
Past President
ACMN/CANM

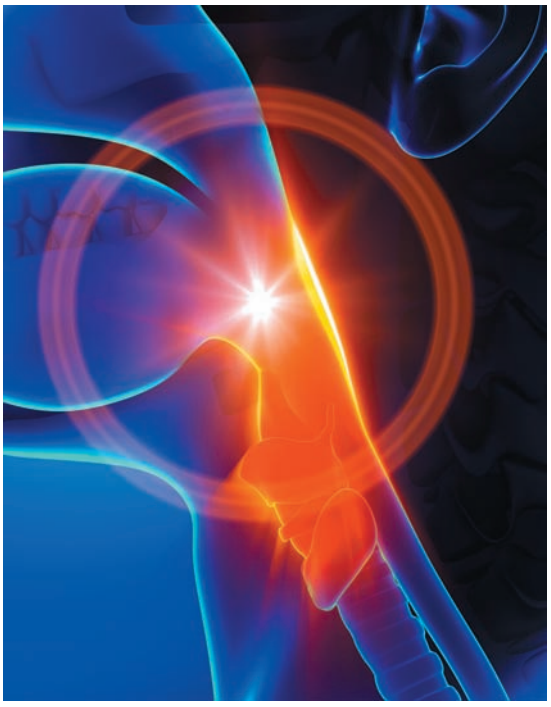
HEAD AND NECK CANCERS: Role of FDG PET-CT

Head and Neck Cancers (HNC) are malignant neoplasms arising from the oral cavity, the nasal cavity, the pharynx, the larynx, the paranasal sinuses, the salivary glands or the thyroid gland. With the exception of the thyroid gland (which will not be covered in this brief review), HNC are largely composed of squamous cell carcinomas (epidermoid carcinomas) of various degree of differentiation. The main factors involved in the genesis of HNC are tobacco use, alcohol consumption (synergistic effect) and Human Papilloma Virus (HPV) infection. Even though the incidence of HNC in some parts of the world is increasing, it has been decreasing over the past 20 years in North America. This is in large part due to a declining prevalence of smoking. However, despite the global trend, the incidence of HNC of the oropharyngeal region is rapidly increasing in North America and in developed countries, and is strongly linked to HPV infection of the oropharyngeal region, mostly of the HPV-16 subtype. The multiplicity of sexual partners combined with changing sexual practices (increased incidence of oral-genital sex), are strongly suspected for the increased transmission of HPV.

The clinical presentation of HNC will vary greatly depending on the primary site and the extent of the disease. A neck mass (metastatic lymph node) is often the first sign of the disease. Oral cavity non-healing ulcers, mouth pain, dysphagia or odynophagia, referred otalgia are possible symptoms of oral cavity and oropharyngeal cancers. Persistent hoarseness, a change in the voice character or stridor may be the presenting symptoms of laryngeal cancer. Tumors of the nasal cavity may present with facial or head pain, chronic unilateral obstruction and epistaxis.

The diagnosis is usually made by biopsy of the primary tumor or Fine Needle Aspiration (FNA) biopsy if the presentation is a neck mass (lymph node). The therapy will strongly depend on the TNM stage (which is complex in HNC and varies according to the primary site). Therapy consists mostly of surgery (sometimes limited, sometimes extensive) or combined radiation therapy and chemotherapy. Both have major associated morbidities. The diagnostic and staging evaluation will include a thorough evaluation of the HN region by physical examination, including the use of mirror examination and/or flexible fiberoptic endoscopy.

Imaging studies are essential for assessing loco-regional spread and distant metastatic disease, along with the presence of occult second primary tumors (which are not uncommon and can mostly occur in another HN site, the lungs or the oesophagus). For the primary tumor, the first imaging procedure is often a contrast enhanced CT scan, often complemented by MRI if the lesion involves the base of the skull or the paranasal sinuses. For the staging of nodal metastatic disease, both CT and MRI are useful. Unfortunately, they are notoriously unreliable to detect occult or small nodal involvement. CT criteria are primarily based on the size and the shape of the node, along with the presence of necrosis. This greatly limits the identification of small metastatic nodes (less than one centimeter) and often identifies false positive nodes (nodes greater than 10-11 mm not involved with metastasis). PET-CT imaging is a molecular imaging modality combing the anatomic information obtained from a CT scan (size, shape, density, location of the anomaly) along with the metabolic information provided by the radiopharmaceutical. The radiopharmaceutical FDG (flurodeoxyglucose) is an analog of glucose labelled with a positron-emitting radioisotope (Fluorine-18) that can be detected and imaged with a Positron Emission Tomograph (PET scan). Malignant tumors, both at the primary and metastatic site and for a variety of reasons, often consume excessive amounts of glucose in their metabolism by comparison with normal tissues. This abnormal metabolism is readily detected with modern PET-CT scanners which combine both high resolution CT and PET tomographs.

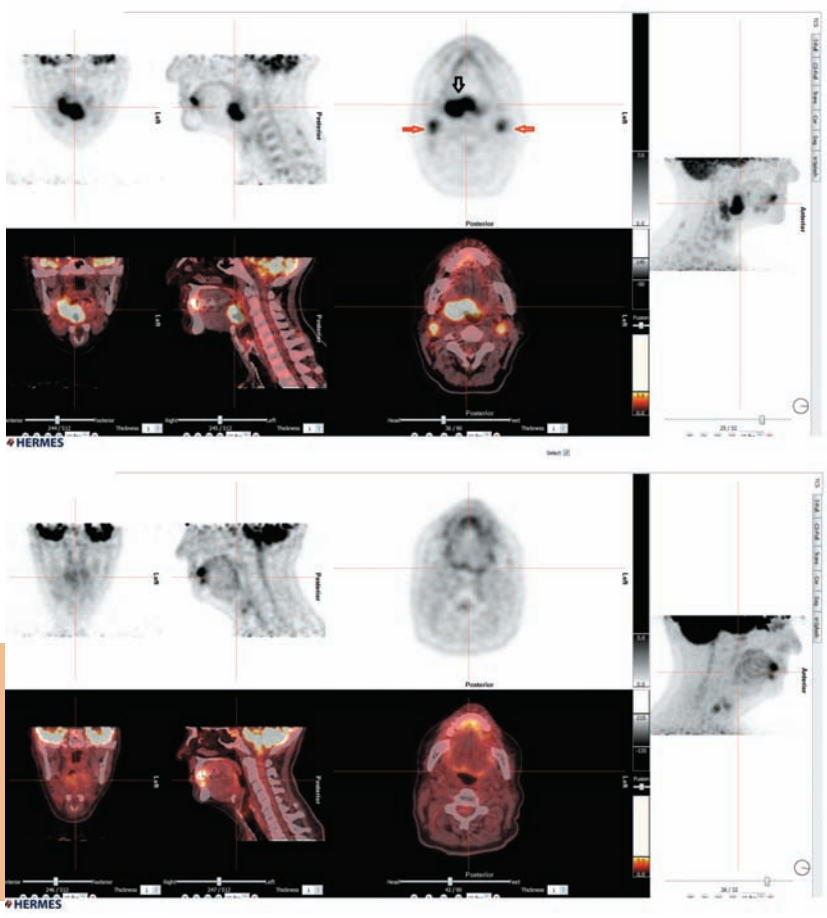


In the literature, FDG PET-CT has consistently showed superior results compared to CT scan or MRI alone in the initial staging of HNC. It is more accurate in identifying the site of the primary tumor (and sometimes the local extension), evaluating cervical lymph nodes' involvement, identifying distant metastatic disease (lungs, liver and bones) and detecting a second (synchronous) primary tumour. Overall, the use of FDG PET-CT changes management in 20-30% of patients including cancellation of surgery or significant change in the radiation therapy. It is also

"Imaging studies are essential for assessing loco-regional spread and distant metastatic disease, along with the presence of occult second primary tumors (which are not uncommon and can mostly occur in another HN site, the lungs or the oesophagus)."

superior to CT for the detection of recurrent disease after therapy. Some limitations of FDG PET are the presence of false positive results (mostly due to active infection or inflammation) either locally or at a distant site. In some cases, this may require additional biopsy to confirm the presence of disease. Also, PET-CT is suboptimal in detecting very small occult nodal metastasis (typically less than 5 mm). PET-CT cannot and will never be able to detect microscopic involvement of a lymph node. If a neck node dissection was contemplated as part of the therapy, it cannot replace it for this reason. Other potential limitations of FDG PET-CT are its higher cost and lesser availability compared to CT scans, although the availability is rapidly improving.

In conclusion, HNC are a complex and prevalent problem in oncology. Metabolic imaging with FDG PET-CT now plays a central role in the disease's evaluation before therapy and during follow-up of patients.



57-year old female with squamous cell carcinoma of the oropharynx (T3N2c, positive for HPV-16). FDG PET-CT of the neck before and after therapy with combined chemo-radiation therapy. Pre therapy, there is intense uptake in the primary tumor (black arrow) and in bilateral jugular lymph nodes (red arrows). Post therapy, there is a complete response in both the primary tumor and the metastatic lymph nodes. The patient has been in complete remission for almost 2 years.

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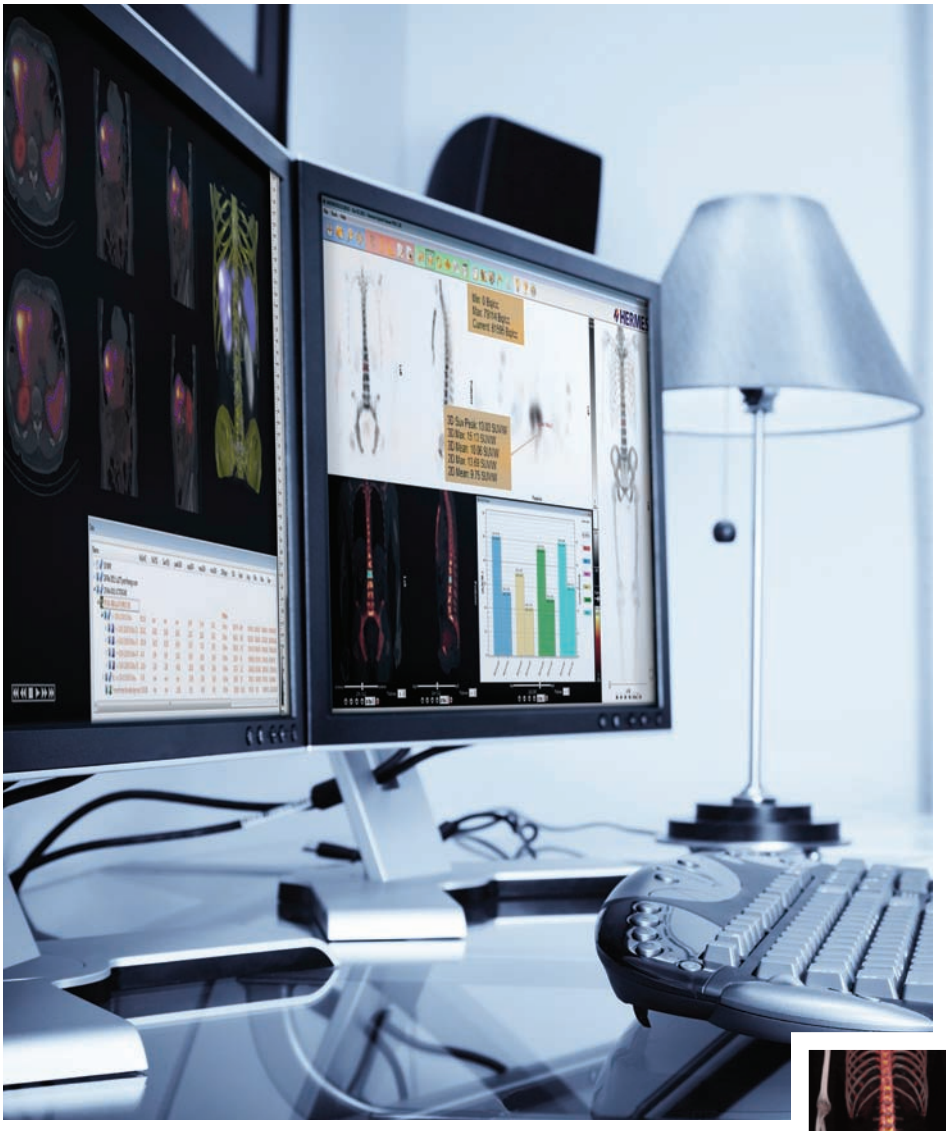

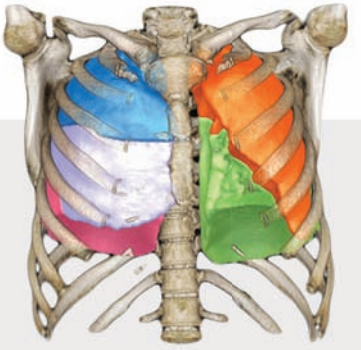

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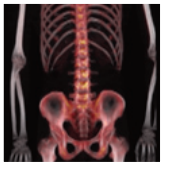

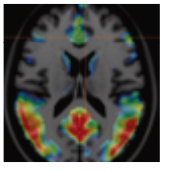

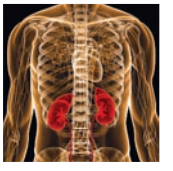

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INTERVIEW WITH JAN BERTLING HERMES MEDICAL SOLUTIONS

Jan Bertling
Founder & President
HERMES Medical Solutions

HERMES is celebrating 40 years of leading innovations this year in Nuclear Medicine and medical imaging, can you tell us a bit more about the company? How and where did you first start your activities?

HERMES Medical Solutions started in 1976. I founded the company, which, at the time, was operating under the name of Nuclear Diagnostics. The motivation was and still is today to work very closely with its users to develop easy-to-use software specifically designed to generate accurate clinical reports. The business idea has always been to capture the users' interests around the globe, giving the company access to a wide range of experienced issues, and allowing HERMES to dynamically develop flexible, powerful and cost-effective solutions to solve those issues.

1. How is HERMES currently deployed in Nuclear Medicine facilities around the globe?

HERMES Medical Solutions operates in 6 continents from 5 offices, including the headquarters in Stockholm, Sweden. We have approximately 28,000 users utilizing our solutions in more than 40 countries. The company started early on to develop an innovative means of communication to support our customers and bring them closer together. A good example is our contribution to cloud and telemedicine through our TeleHERMES™ application. HERMES is also extremely proud to implement the development of software and practice standardization by providing tools such as quantification for both PET-CT and SPECT-CT with SUVs.

2. What do you think is HERMES biggest contribution to departments and the Nuclear Medicine scientific community nowadays?

Providing more efficiency. Physicians working with HERMES solutions are more confident when performing day-to-day activities; they know they can rely on our system in optimizing and streamlining their workflow. Furthermore, our high-level of systems integration also increases cost-efficiency at the same time.

3. What major challenges is Nuclear Medicine currently facing?

Ensuring continuity. The NM community needs to take advantage of the unique sensitivity and specificity that SPECT and PET tracers offer and use them to their fullest potential. As NM departments are getting more and more absorbed into radiology, it will be critical to make sure that the singularity and knowledge of Nuclear Medicine is put forward and that trained specialists play a key role in the daily activities. We need to continue promoting excellence to ensure that the need for NM will endure in the future.

4. How can HERMES Medical Solutions help Nuclear Medicine physicians in coping with these challenges on a day-to-day basis?

HERMES is developing very advanced software applications to integrate all image data into an efficient master workflow in combination with clinical tools for a personalized and evidence-based medicine approach. During the past 40 years, HERMES has collected a very large number of clinically normal and abnormal cases, consequently building an impressive database to guide physicians in making diagnostic decisions.

5. With the emergence of new communication technologies, the need to share Nuclear Medicine data around the world is becoming essential for diagnostic, archiving and/or teaching purposes. Does HERMES offer solutions to facilitate and secure this process?

Using TeleHERMES™, thousands of users around the globe can securely access their images for viewing and processing. Our technology has helped to build the foundation for more interdisciplinary collaboration than ever before. HERMES is hosting a Global Pediatric Hodgkin Network (170 hospitals from over 15 countries with centralized expertise for diagnostic recommendations) that continues its worldwide expansion. Our latest project will soon take place in Canada, where a HERMES peer teaching library system will be deployed across the province of Alberta, allowing the 3,000 imaging users to access anonymized teaching files from any of their 134 imaging sites. HERMES also partners with the best educational sites in the U.K., Austria, Belgium, China, Scandinavia, the United States and Canada using our cloud solutions.

6. How do you envision the future of Nuclear Medicine? What do you identify as being critical areas to focus on in terms of development, innovation and consolidation? How does HERMES prepare to meet and exceed those future needs?

The future belongs to the people who will be able to easily adapt to the ever-changing situations and are able to meet those needs. This is a very old statement, but it is still relevant today. HERMES will continue to listen and learn from the patient representatives, political systems, insurance companies and academic circles to bring this knowledge back and channel it through our solutions development.

7. Last but not least, Mr. President, what would be your ultimate wish for the future of Nuclear Medicine? What do you consider as your most important accomplishment so far in your career?

I would like to make Nuclear Medicine accessible to any patient, when needed, regardless of where he or she lives in the world. My most important accomplishment would be being a team leader with a team that has made all the dreams possible for our family of users with over 90 First-to-Market product developments.

HERMES Medical Solutions is now moving forward with its next generation of team leaders starting with Sofia Bertling taking over as our new Global CEO. Sofia has been with HERMES for more than 10 years working in-depth and overseeing every level of activities.

I can now proudly say Mission Accomplished! ■

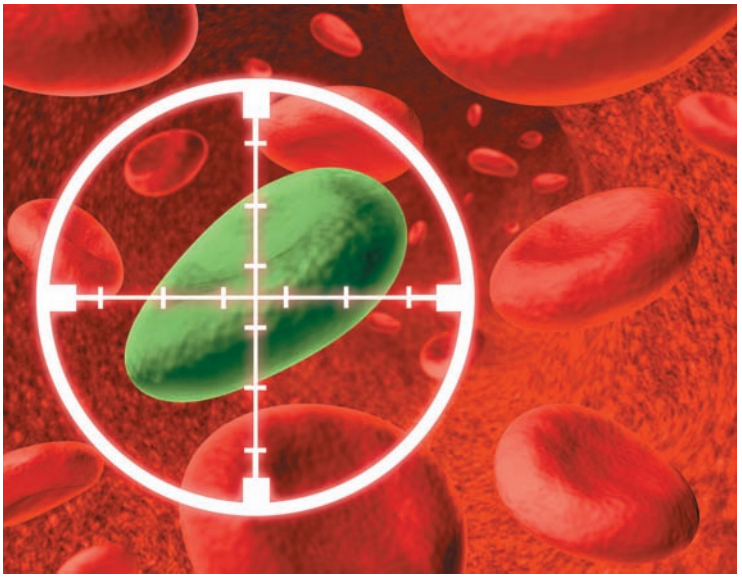
NUCLEAR MEDICINE IN CANADA

Dr. Andrew Ross
M.D, FRCP

Head of Nuclear Medicine
QE11 Health Sciences Centre
Halifax, Nova Scotia
Canada

President of the Canadian Association of Nuclear Medicine

As in the rest of the world, the practice of Nuclear Medicine in Canada continues to rapidly evolve. Although not without challenges, the future is scintillating. A bad pun, no doubt, but an apt descriptor. New technology and the promise of exciting tracers to diagnose illness and provide therapy abound. Nuclear Medicine plays an ever increasing role in investigation and treatment of patients.



The deployment of advanced SPECT/CT and PET/CT imaging cameras over the last decade can now accurately show changes in physiology caused by diseases and link it with the anatomy. This powerful fusion has enhanced the relevance and importance of Nuclear Medicine, expanding its scope within diagnostic medicine. PET, in particular, has seen exponential growth. After a slow deployment (outside Québec), virtually all provinces now possess or have access to, and have recognized this important diagnostic tool providing thousands of patients with vital information.

The growth has been significantly fuelled by FDG PET, radioactive labeled sugar. Its power to diagnose and provide important information about cancer has revolutionized how this disease is investigated. It can also provide important information in certain patients with heart disease and brain disorders.

There are many other promising tracers used elsewhere in the world such as radioactive dopamine, which has use in difficult to manage cancers, amyloid based agents which can provide vital information to help manage some patients with dementia. These are now beginning to be used in Canada. As well, Gallium based PET tracers able to provide some of the highest diagnostic

accuracy in prostate cancer and neuroendocrine tumours will hopefully be the next wave of expanded use.

The exciting new therapies using radioactive molecules to kill cancer cells very specifically, while not hurting other body tissues, are also seeing increased use in Canada to help patients. These will hopefully be expanded in terms of both availability across the country and in different patient groups.

As Canada begins to assume a more progressive role on the world stage, our Nuclear Medicine community recognizes the importance of this engagement. Canada has much to share but as well can learn greatly from the experience and practice of our colleagues outside the North American continent where regulatory regimes and medical practice differ, allowing exposure to different paradigms that may be beneficial to our patients.

Canada has many positives to share as well. We have a very high level in all aspects of Nuclear Medicine practice including the medical practitioners, technologists and ancillary scientists. The standard of care provided is world class. An important aspect of this is the Royal College of Physicians and Surgeons, which provide a backbone for medical specialty training and competency assessment that is one of the strongest in the world and one to share. Similarly, our technologists training and oversight provides the highest quality of practice.

Because of the small nature of the specialty, sometimes its vital role can be overlooked. By actively collaborating with those involved in the practise, this can be overcome. In Canada, Nuclear Medicine Specialists are collaborating with technologists, radiopharmaceutical scientists and others as advocates. Working with Health Canada to help understand and deal with the regulatory process will help improve access for patients to vital medical isotopes for diagnosis and therapy.

The CANM is working hard to bring the World Federation of Nuclear Medicine and Biology conference to Vancouver in 2022. This important conference brings together the World Nuclear community from developed and developing countries. Although a few years away, efforts to hopefully bring the meeting to this country are well advanced. It will provide a great opportunity to showcase and share all of Canada's achievements and natural beauty while learning from the rest of the world.

As we get closer to the end of the second decade of the 21st Century, there are many challenges to ensuring Nuclear Medicine reaches its full potential but many of the advances in the science and efforts of advocacy will ensure the future remains bright. ■

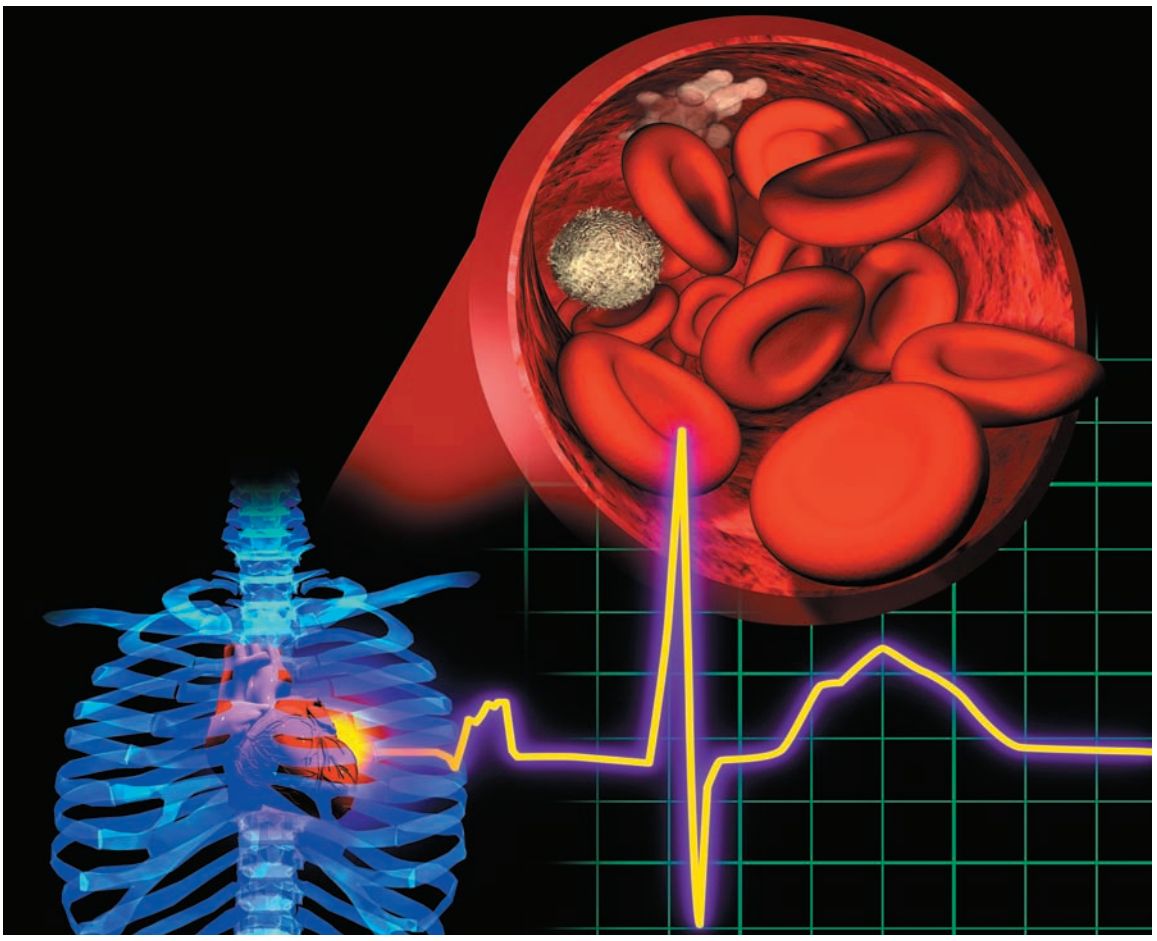
"The deployment of advanced SPECT/CT and PET/CT imaging cameras over the last decade can now accurately show changes in physiology caused by diseases and link it with the anatomy."

Daniel P. Levin, MD, FRCPC

Section Head, Nuclear Medicine, Grace Hospital, Winnipeg, Manitoba

Nuclear Medicine Physician, Health Sciences Centre, Winnipeg, Manitoba

Board member, CANM



A CLINICAL CASE SHOWING THE GREAT USEFULNESS OF MYOCARDIAL PERFUSION IMAGING

"People can have many different kinds of pain in their chest. Some of these pains can be caused by coronary artery disease, a blockage of the blood vessels supplying the heart muscle."

Some people go to see their doctor with problems that are clear-cut. A sore throat and a stuffy nose usually mean the person has a cold. For other patients, the diagnosis is not as easy.

People can have many different kinds of pain in their chest. Some of these pains can be caused by coronary artery disease, a blockage of the blood vessels supplying the heart muscle. If an elderly man has squeezing or pressing chest pain in the centre or left side of the chest which comes on with exercise and goes away with rest, the pain is almost certainly caused by coronary artery disease. The diagnosis can be made with an exercise stress test, and this may lead to an angiogram, an x-ray that looks directly at the coronary arteries. If there are obvious areas of blockage, they can be repaired during the angiogram or with bypass surgery.

Other times, it is not so clear. I will describe a patient in whom the diagnosis was not clear at all, and how Nuclear Medicine imaging allowed him to get the treatment he needed.

This 54-year old man was experiencing right chest pain which was sometimes sharp and sometimes dull, lasted for a long time, sometimes came on at rest and occasionally with exercise, and did not always go away when the patient rested. This is not the typical pain caused by coronary artery disease. He also couldn't walk as far as he used to. The first group of tests were all negative, and an exercise stress test was also negative, although he couldn't exercise for very long. He was sent to Nuclear Medicine for Myocardial Perfusion Imaging (MPI).

In a case like this, when the patient can't exercise enough to raise their heart rate, a Myocardial Perfusion Imaging study (MPI) can be performed with Dipyridamole. This test involves injection of a radiopharmaceutical, a radioactive material or agent, which goes to the heart muscle. There are two injections of the agent: one is done with the patient in a resting state, and the other is done after the patient is given Dipyridamole, a medication which affects blood flow to the heart. Images of the heart are taken after each injection and the Dipyridamole (stress)

images are compared to the rest images. Decreased uptake of the agent in an area of the heart muscle means poor blood flow to that area, and can indicate a blocked artery.

Our patient had a Dipyridamole MPI study which was very abnormal. Figure 1 shows what is called an extensive reversible defect. The defect at stress (left column) is outlined by the white arrows and is shown in purple or blue. The orange or white areas are normal. On the rest images, uptake in the area of the defect is improved. This represents a large area of heart muscle at risk for a heart attack, which is shown graphically in Figure 2.

As soon as the result was available, an angiogram was arranged to see how many arteries were blocked and what could be done. The angiogram showed severe narrowing of all three of the major arteries supplying the heart, and the patient had a bypass operation to improve the blood flow to his heart.

This patient's symptoms were so unusual that his doctors weren't sure that the problem was caused by his heart. But Nuclear Medicine Myocardial Perfusion Imaging was able to give the correct diagnosis, and the patient had the surgery he needed. ■

FIGURE 1

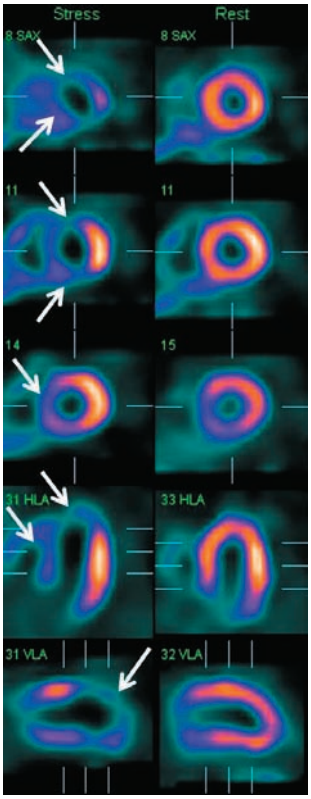


FIGURE 2

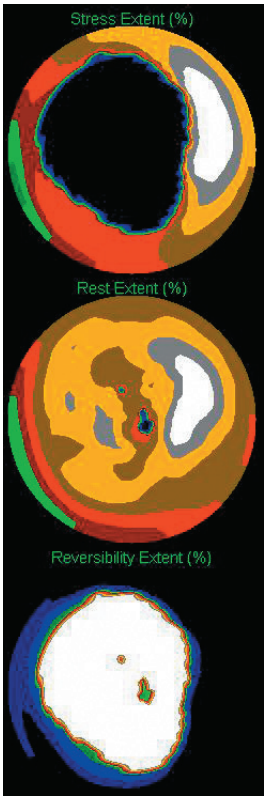


Figure 1: Imaging slices through the heart after Dipyridamole stress (left column) show decreased uptake of the agent in the left side of the heart and the apex, the end of the heart (white arrows). At rest, these areas are much brighter, showing improved uptake. This means that when the heart works harder, there is not enough blood flow to some areas.

Figure 2: These maps represent the uptake of the agent by the heart. The large black area on the top map shows how much of the heart has abnormal flow after Dipyridamole. The middle map shows that at rest, blood flow is normal. The bottom map shows the difference of these two, and the white area tells us how much of the heart is at risk.

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Dre **SIMARD,** Dr **PEREZ,**
Dr **GÉLINAS,** Dre **HUARD,**
Dre **MÉTIVIER** et tous les autres

Les pharmaciens du réseau Jean Coutu vous remercient de votre collaboration pour le bien-être des patients.

Jean Coutu

SCINTIMAMMOGRAPHY AND CANCER OF THE BREAST

Prof. **Einat Even-Sapir**
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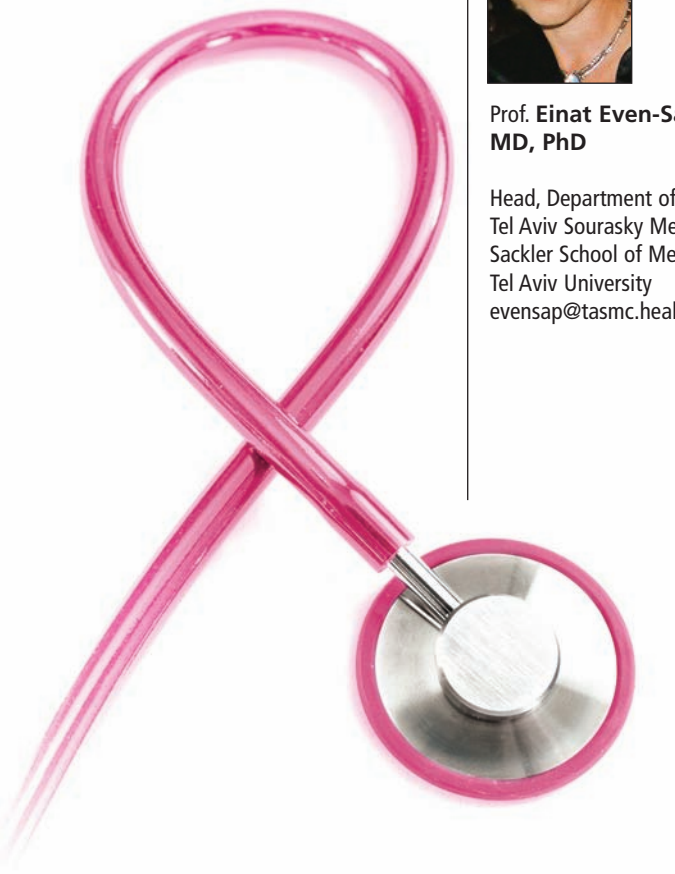
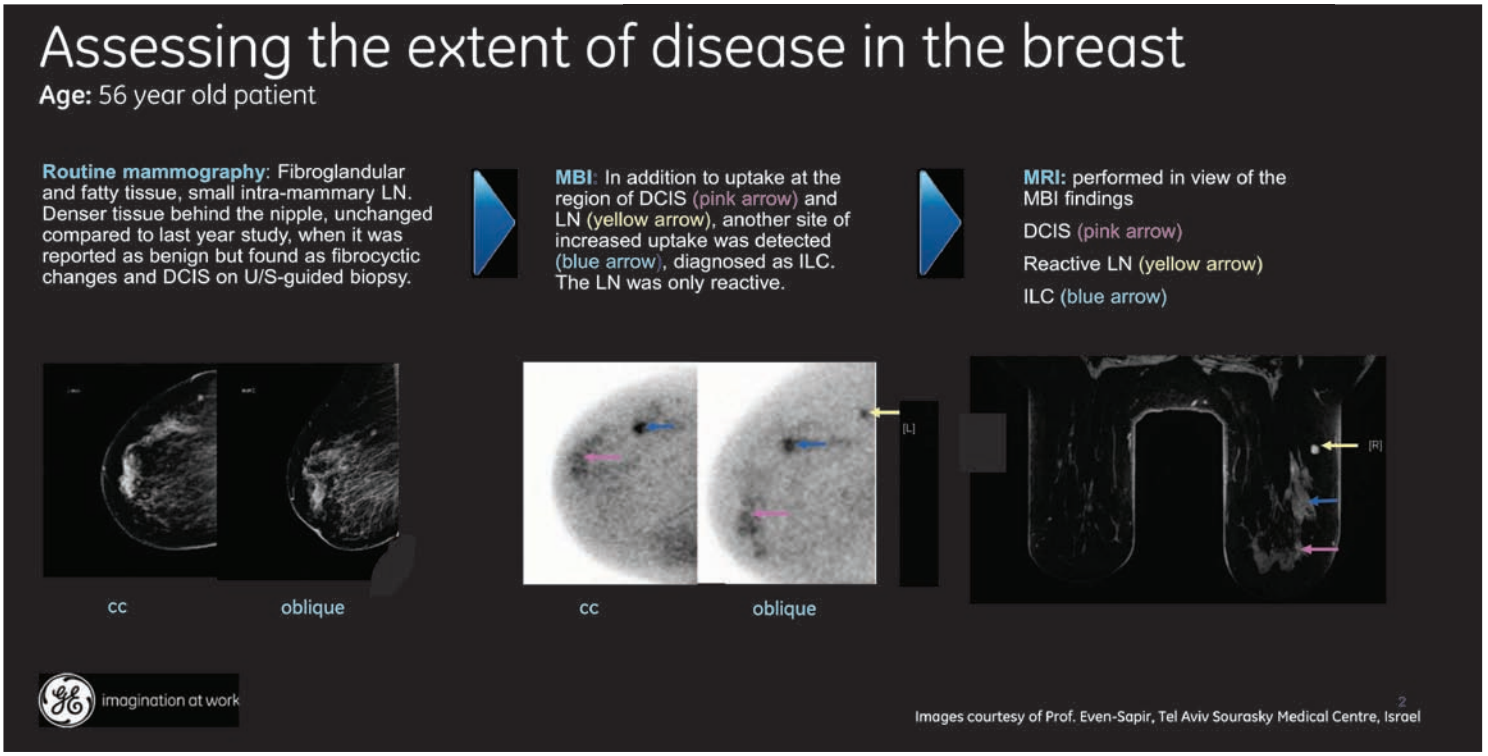
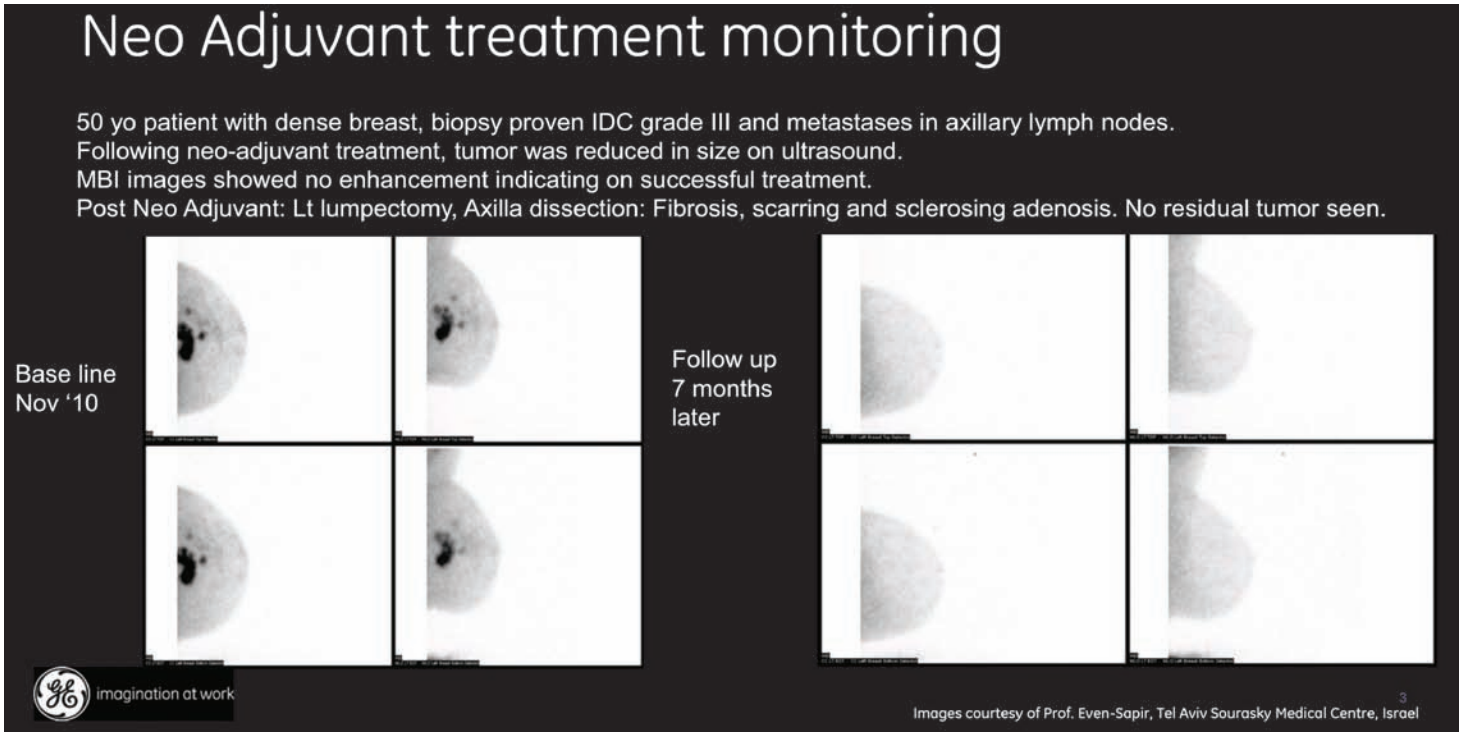
There are various goals to breast imaging. In patients with no known malignancy, breast imaging is performed with the aim of early detection of cancer, as well as assisting in separating benign lesions and premalignant or malignant lesions. Morphology of the breast is individual. It may vary from one patient group to another, may vary in the same individual during the menstrual cycle and may change with age. So is the risk for malignancy and the performance of the different imaging modalities. Mammography, which is the most readily available screening modality, may be satisfactory in patients with fatty breasts, but its lesion detect ability deteriorates the denser the breast tissue is.



Once breast cancer in diagnosed, imaging of the breast is no longer aimed for screening but is rather diagnostic, assessing the local extent of the disease and monitoring response to therapy. Based on the extent of the disease, the patient may be referred for lumpectomy, mastectomy, neo-adjuvant therapy, etc. During the course of the disease, assessment of tumor viability and detection of local recurrence are common indications for breast imaging. After treatment, morphology of the breast becomes even more variable.

The use of MRI (magnetic resonance imaging) has overcome many of the limitations of mammography, even when combined with sonography in screening of high-risk patients and patients with dense breasts, as well as in patients with proven malignancy. But MRI is not





always the optimal solution. MRI may be less available. There are contraindications for MRI and it may be difficult to perform a study in claustrophobic patients. MRI may be of compromised specificity leading to a high rate of futile biopsies and it is not always sensitive for assessment of tumor viability.

In recent years, novel functional techniques, dedicated for breast imaging with radiotracers have emerged in clinical practice of breast health. Breast cancer can be detected on PET, preferably on Positron Emission Tomography (PEM), in places where there are nearby cyclotrons and for FDG-avid tumors.

^{99}Tc-MIBI technetium-99m (Tc-99m) sestamibi is a single-photon emitter tracer routinely used in most departments of nuclear medicine for myocardial perfusion studies and, therefore, is readily available. It concentrates in cells with increased mitochondrial density, a common condition in malignant breast disease. This tracer was used two decades ago for breast imaging using the general routine gamma cameras, which are suboptimal for detection of small tumors in breasts, which are approximately 15 cm from the collimators and up to 25 cm from the region of interest. Currently there are small breast gamma-cameras designed as organ-specific cameras, including devices composed of the routine NaI(Tl) detectors (breast-specific gamma imaging, BSGI) and MBI – molecular breast imaging devices composed of the novel dual-head cadmium zinc telluride (CZT) detectors, improving resolution and allowing for the detection of smaller lesions.

Using a dual-head cadmium zinc telluride (CZT) detectors cameras (Molecular Breast Imaging, MBI), researchers in the Mayo clinic have found small malignant lesions of 3 mm and calculated a sensitivity of 90% in tissue abnormalities, with diameters of 5 mm to 20 mm. Screening 936 at-risk women, Rhodes et al of the Mayo Clinic reported that the sensitivity of mammography alone for these difficult-to-image patients was 27%, while the sensitivity of combined mammography and MBI was 91%. Recently at the RSNA, the group in Mayo Clinic have reported good performance of MBI with low-dose Tc-99m sestamibi of 8mCi having an ongoing dose-reduction work aiming to perform MBI with 4 mCi Tc-99m sestamibi, with an effective dose comparable to a screening mammogram.

18 months ago, an MBI system (Discovery* NM750b, GE healthcare) has been installed in the department of Nuclear Medicine at the Tel Aviv Medical Center. We approached our clinicians; breast surgeons and oncologists as well as breast radiologists, conducting research aimed at understanding the potential complementary role of MBI. We offered the physicians to refer for MBI women in whom it was felt that additional non-invasive imaging was clinically indicated. In addition to patients with no malignancy but high- risk for cancer, dense breast or equivocal breast imaging, over 100 patients with already proven cancer were referred, assisting in building a range of indications for the use of MBI as a breast diagnostic modality. These indications included determining the extent of disease in patients referred for lumpectomy in whom clinically, or on other imaging, the possibility of more extensive disease could not be ruled out, patients prior to and post neo-adjuvant therapy, assessing the presence of viable tumor tissue post-surgery and patients with axillary metastatic lymph node spread and occult primary. Sensitivity of MBI in these complicated cohorts was 88%. Causes for false negative were low- grade DCIS, microscopic remnant disease after treatment and lactating breast within a week from delivery. In patients who had MRI, MBI and MRI resembled for the majority of premalignant and malignant lesions. These preliminary findings encourage further accumulation of data. ■

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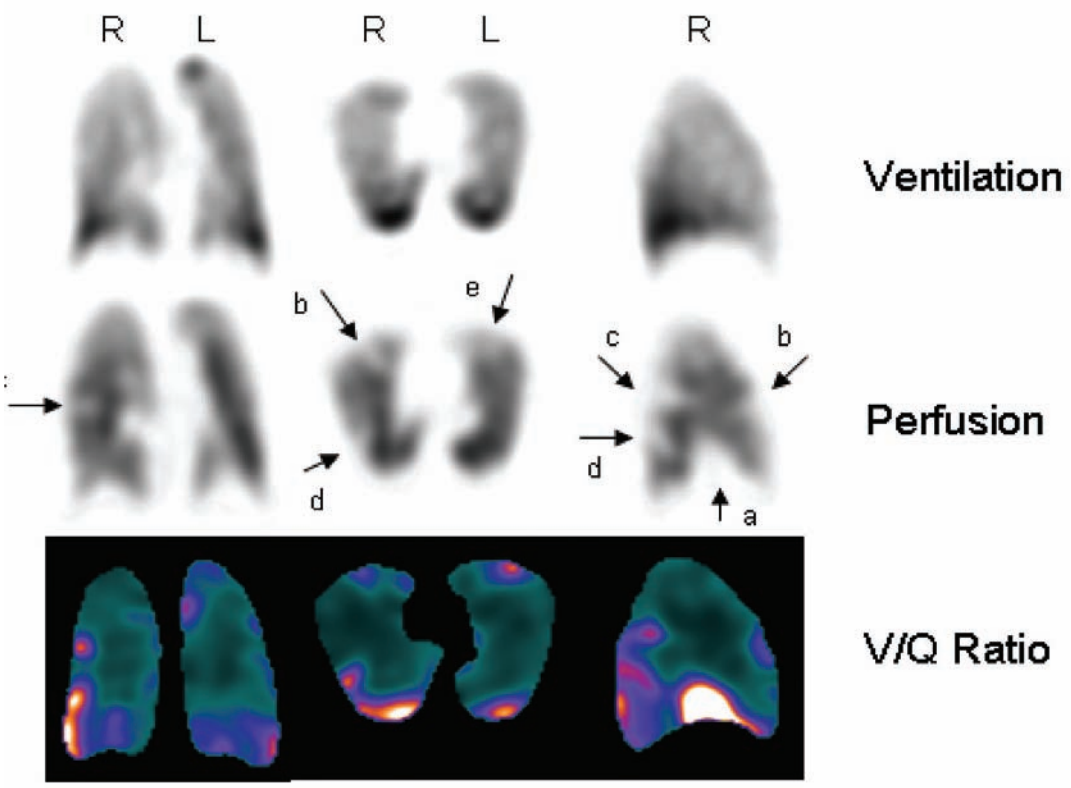

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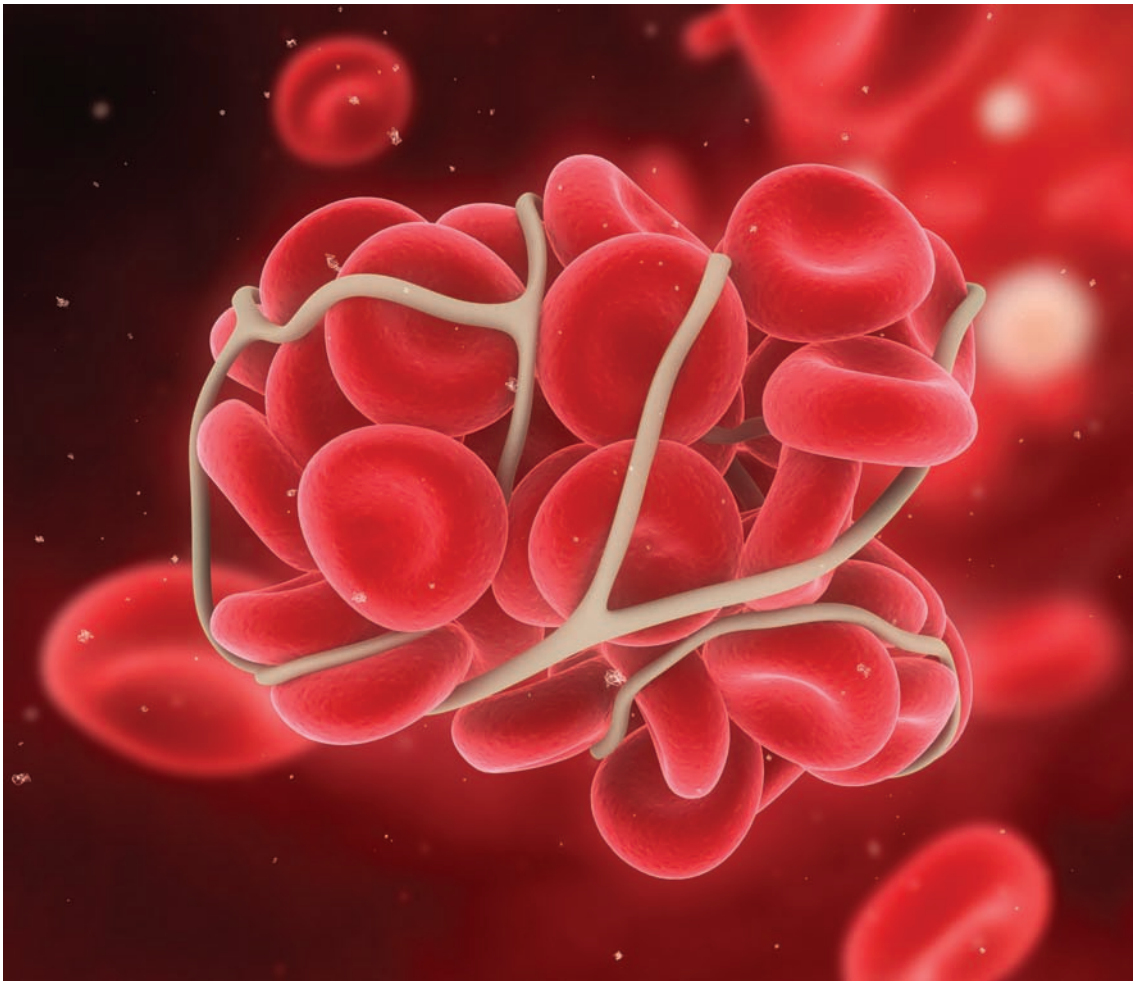
V/Q SPECT IN PULMONARY EMBOLISM

Michel Leblanc MD; RCPSC; ABNM
Chef du Département de Médecine Nucléaire, Centre Hospitalier Affilié Universitaire Régional de Trois-Rivières

Chargé d'enseignement clinique, Université de Montréal

Chargé d'enseignement clinique, Université de Sherbrooke



"Using tomographic imaging improves sensitivity for PE and drastically reduces indeterminate readings (< 5% of cases) due to better contrast and 3D visualisation of perfusion defects."

Pulmonary embolism (PE) is a frequent and potentially lethal disease caused by a loose thrombus, originating most frequently from the lower limbs, migrating to the lungs and causing occlusion of a part of the pulmonary circulation. The diagnosis of pulmonary embolism is difficult because no combination of signs and symptoms is sensitive or specific. Different strategies have been devised to evaluate the clinical probability, for example, Wells score. They are usually combined with D-Dimer measurements and, if the resultant probability is moderate or high, further investigation is warranted.

Therefore, imaging tests are often required to establish the diagnosis. Traditionally, it was mainly based on planar ventilation and perfusion scintigraphy ("lung scan"). When it showed one or several areas of poorly perfused but adequately ventilated lung, it was considered compatible with PE. However, because of the high rate of indeterminate readings, especially within the PIOPED scheme of interpretation, it was progressively replaced in most settings by computerized pulmonary tomographic angiography (CTPA).

Within the last few years, the availability of a highly performing nuclear medicine ventilation agent (technegas) enabled the emergence of a major technical enhancement, tomographic tridimensional analysis of ventilation and perfusion, mainly known as Ventilation Perfusion Single Photon Emission Computed Tomography (V/Q SPECT). This technique has major advantages over traditional planar ventilation perfusion imaging.

Using tomographic imaging improves sensitivity for PE and drastically reduces indeterminate readings (< 5% of cases) due to better contrast and 3D visualisation of perfusion defects. This enables classification of defects into vascular or non-vascular origin, with much more accuracy than with conventional planar imaging. Matching or mismatching of ventilation with perfusion is easily

determined (much better than with xenon gas) in 3D. Therefore, a probabilistic interpretation of results is totally discarded in favor of a binary interpretation (embolism present or absent), even though the basis of the diagnosis remains the same: embolism is deemed present when a vascular type perfusion defect is ventilated. Figure 1 shows a normal exam, while figures 2 to 4 show embolism of increasing size.

Available studies show that V/Q SPECT and CTPA have very similar accuracies, with V/Q SPECT being slightly more sensitive, but slightly less specific. Besides a very high sensitivity and a negative predictive value over 95%, V/Q SPECT has several benefits over CTPA, namely a much lower radiation dose, absence of allergic reactions or contrast nephropathy and a more reliable detection of sub-segmental embolism. This profile makes it the imaging test of choice for most of the usual indications, especially if the chest X-ray is not severely abnormal. CTPA can be used as a first line study for more complex cases, specifically those who would require a chest CT anyway for a complete evaluation of their symptoms. CTPA is also a good choice for unstable patients, as it can be completed much quicker than a V/Q SPECT. Table 1 compares characteristics of V/Q SPECT to those of CTPA.

In the last few years, concern has been raised about the radiation dose incurred to patients by the rising use of CT in clinical practice. Table 2 compares the radiation dose given by both imaging tests. As can be seen, dose levels are much lower for V/Q SPECT, which is much more appropriate for widespread use in a large population, including low to moderate clinical probabilities. The dose to the breasts is very high for CTPA, representing the equivalent of 10-25 mammograms. Even if we take into account special low dose protocols for CTPA, the difference with V/Q SPECT is still substantial. Fetal dose is very low for both tests (negligible risk in both cases), but the high total and breast doses incurred by CTPA to young mothers make V/Q SPECT a much better option for this group.

When PE is diagnosed, it is important to obtain a follow-up exam three months later to assess the degree of reperfusion.

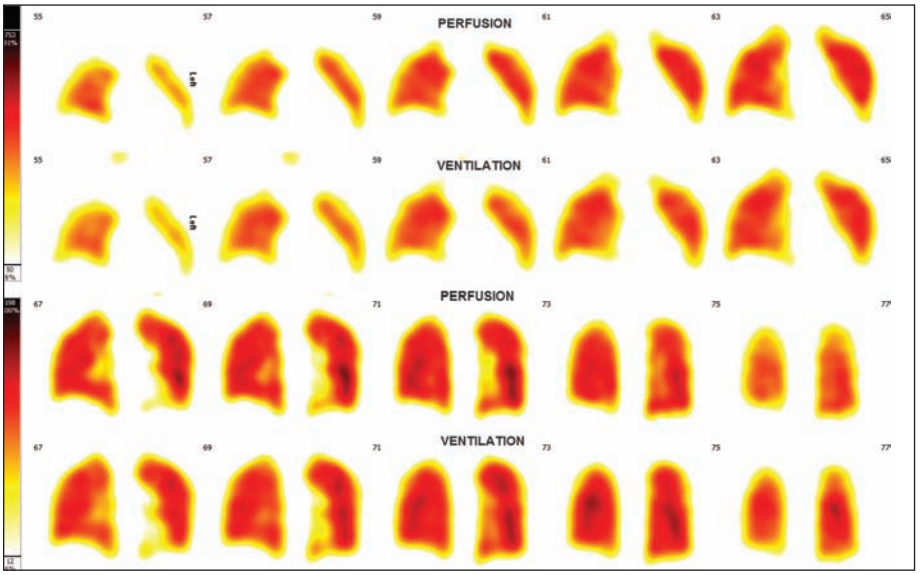


Figure 1:
Normal V/Q SPECT, coronal slices. Note homogenous distribution in both ventilation and perfusion.

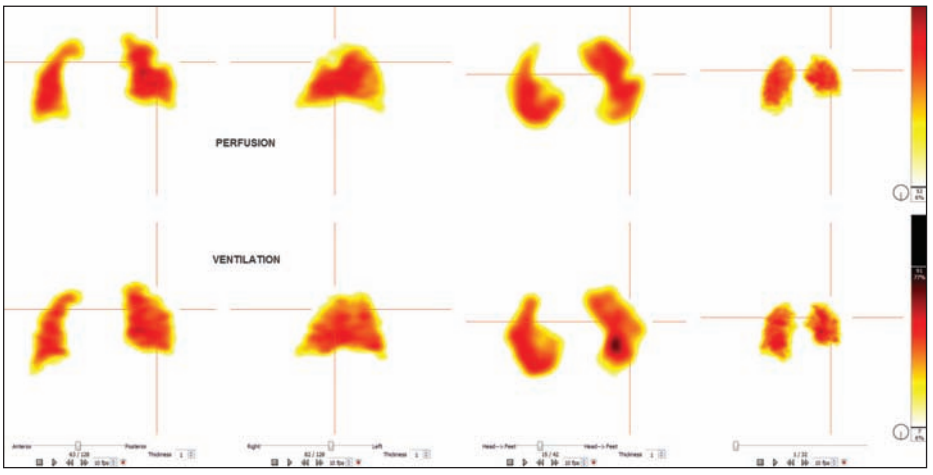


Figure 2:
Sub-segmental PE. Small typical vascular type perfusion defect with normal ventilation, viewed in triangulation mode (coronal, sagittal and transverse slices).

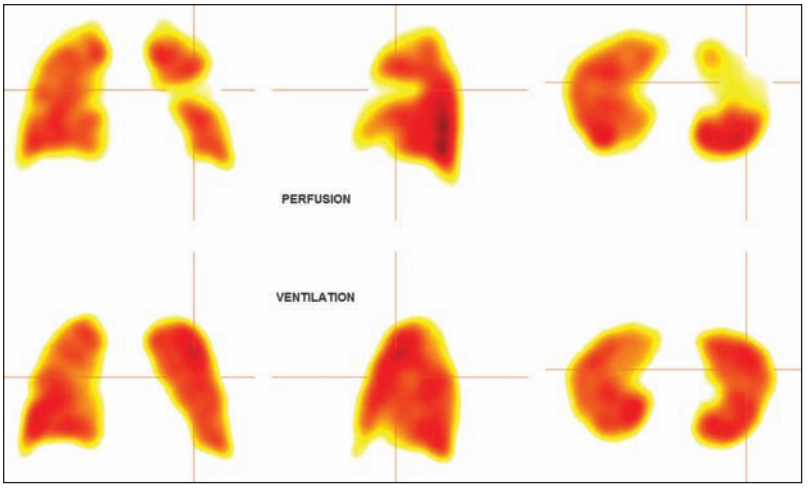


Figure 3:
Large segmental PE. Large typical vascular type perfusion defect with normal ventilation, viewed in triangulation mode (coronal, sagittal and transverse slices).

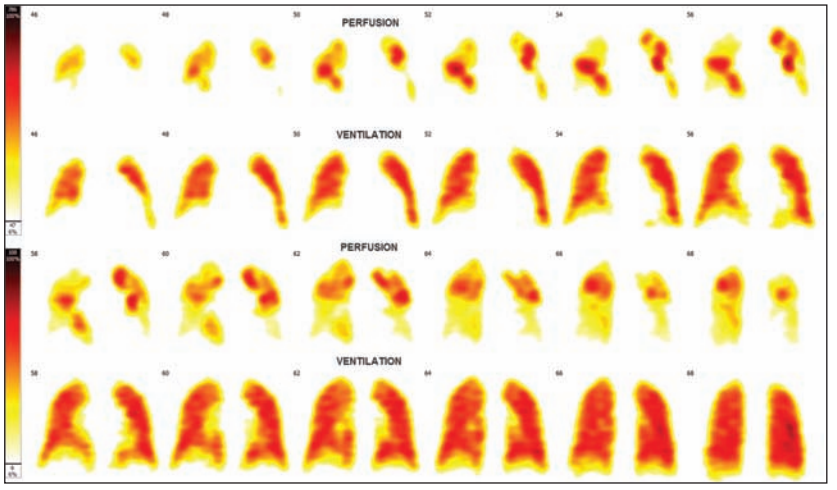


Figure 4:
Extensive PE. Multiple and extensive perfusion defects, both complete and partial, with normal ventilation.

This control will also serve as a baseline in case of recurrence and will identify patients with chronic embolism at risk of pulmonary hypertension. In case of massive initial embolism, a first follow-up exam is obtained 7-10 days after the initial episode, which will serve as provisory baseline image in case of early symptom recurrence.

CONCLUSION

V/Q SPECT has superseded traditional planar ventilation perfusion imaging for the evaluation of pulmonary embolism. It is a highly accurate test that can be used as a first line procedure in most usual clinical scenarios. ■

Table 1:
Summary of advantages and limitations of CTPA and V/Q SPECT

	CTPA	V/Q SPECT
Sensitivity	May be lower	May be higher
Specificity	May be higher	May be lower
Possible allergies	Yes	No
Contrast induced nephropathy	Yes	No
Radiation dose	Higher	Lower
Non-related incidental findings requiring follow-up	Yes, frequent	Rare or nonexistent
Useful alternate diagnosis	Yes, frequent	Less frequent
Availability	Better availability out of hours	Less available out of hours
Accuracy with abnormal X-ray	Probably unaffected	May be affected in cases with moderate to severe changes
Accuracy in pregnancy	Strongly affected	Unaffected
Accuracy in chronic PE	Low	High
Ease of follow-up	More difficult, with higher radiation dose	Easier, with lower radiation dose
Performance in COPD	Probably not affected	May be affected in severe cases
Technical failure rate	Higher	Lower

Table 2:
Summary of typical radiation doses incurred from CTPA and V/Q SPECT (mSv = millisievert)

	CTPA	V/Q SPECT
Whole body	15-20 mSv	3-4 mSv
Breasts	10-70 mSv	< 1.5 mSv
Lungs	± 10 mSv	± 10 mSV
Foetus	< 1 mSv	< 1 mSv

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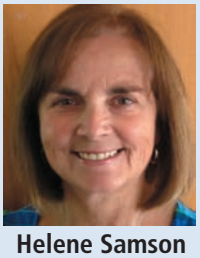
- ✓ Its proven commitment to educate and provide **high level training** to nuclear medicine professionnals from across the world, **particularly from emerging countries** in collaboration with the **Royal College of Canada.**
- ✓ Its ability to **promote, develop and support** the use of medical isotopes **in the emerging countries.**
- ✓ Its firm commitment to have an **international scientific committee** for the organization of the 2022 Congress.


Anna Danilenko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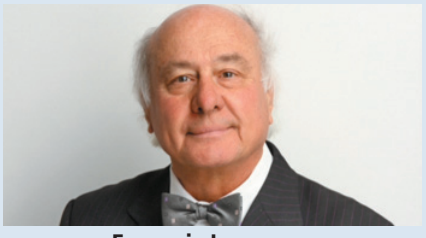
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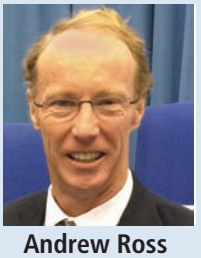
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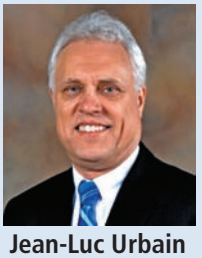
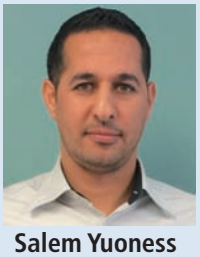

Jean-Luc Urbain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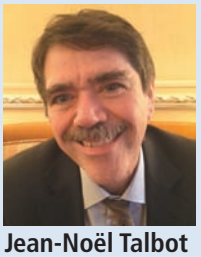
Jean-Noël Talbot


Normand Laurin

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Presidency Candidate: Dr. Jean-Luc Urbain

- MD: University of Louvain, Belgium
  - Board Certified in Internal Medicine
  - Board Certified in Nuclear Medicine
- Ph.D.: Temple University, Philadelphia
  - Molecular Biology and Genetics
- CPE: Certified Physician Executive
- University of Louvain, Temple University, Cleveland Clinic, University of Western Ontario
- Membership: ASNC, EANM, SNMMI, CANM
- > 1000 lectures in Europe, NA, Asia, SA, Middle East, Australia
- Radiant Educational Award, Canada; Homi Babbha Scientific Award, India
- Main interests: NM Education, Hybrid Imaging, Molecular & Personalized Medicine

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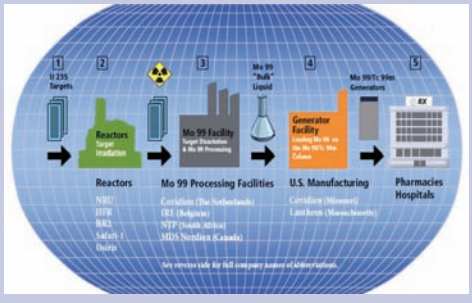
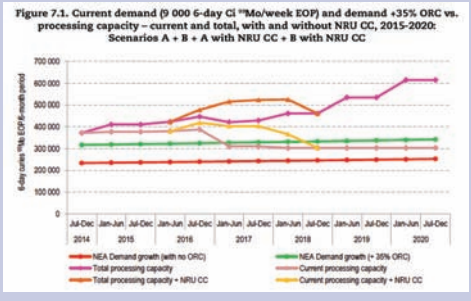
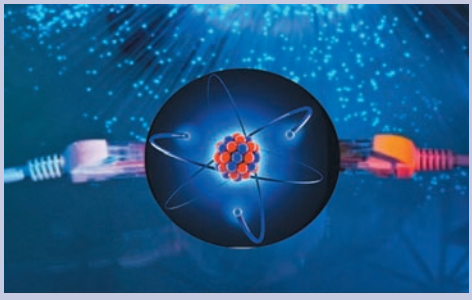
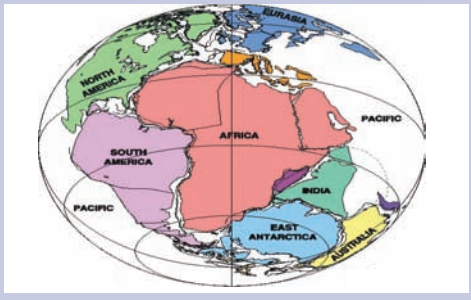




2. Create a Nuclear Medicine Educational Pangea





By 2020, using cognitive computer intelligence, we will create a Pangean Nuclear Medicine Educational Library accessible to the entire Nuclear Medicine Community, all Patients and Referring Physicians from around the world

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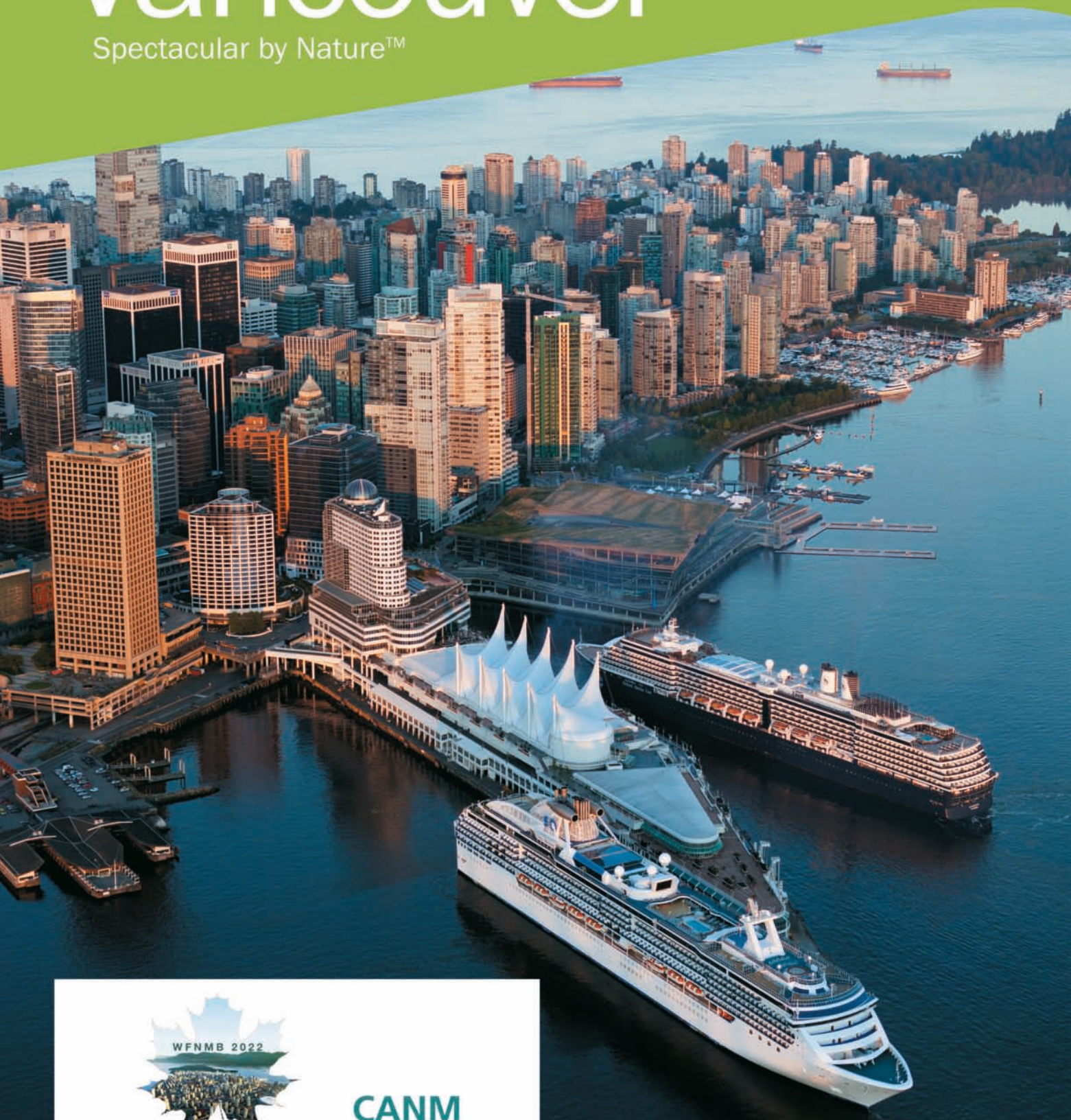

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TOURISM VANCOUVER

SAFER NUCLEAR MEDICINE FOR CHILDREN

Zvi Bar-Sever, MD

Director of Nuclear Medicine, Schneider Children's Medical Center of Israel

Chairman of the Pediatric Committee of the European Association of Nuclear Medicine

President of the Israeli Society of Nuclear Medicine

Nuclear medicine studies provide unique information on metabolic and physiologic processes in our body. This is achieved by intravenous administration (less commonly by ingestion or inhalation) of radioactive substances (radiopharmaceuticals) that localize in systems, organs, tissues and cells, according to their chemical properties. Specialized nuclear medicine cameras (gamma and PET cameras) detect the small amount of radiation emitted from the body and produce diagnostic images showing the distribution and uptake pattern of these substances in the body.

Many radiopharmaceuticals are available for nuclear medicine scans providing unique information on the function of organs (e.g. heart, lungs, kidneys, brain) as well as on the presence and spread of tumors and on their response to therapy. Nuclear medicine studies (scans) are known for their high sensitivity, allowing detection of diseases at very early stages when anatomical imaging modalities such as ultrasound CT and radiographs may be completely normal.

Nuclear medicine studies expose the body to low doses of ionizing radiation. When used judiciously, they are considered safe diagnostic procedures. The valuable information they provide outweighs, by far, the small risk from exposure to low-level ionizing radiation. Ionizing radiation can cause alterations in the DNA structure. Specialized enzymes rapidly repair these alterations. Rarely, the repair mechanism fails or is overwhelmed, resulting in permanent changes that can sometimes lead to development of leukemia or solid tumors 5-50 years after the exposure. By mathematical extrapolation of data derived from studies of populations exposed to high dose ionizing radiation (Hiroshima, Nagasaki, Chernobyl), the likelihood of developing cancer from exposure to low-level ionizing radiation from diagnostic nuclear medicine and radiologic procedures can be estimated. For example, exposure to an effective (whole body) dose of 10 mSv, which is higher than the effective dose from most nuclear medicine studies, carries a 0.05% risk for development of fatal cancer during lifetime. To put this number in proportion, the natural prevalence of developing cancer during lifetime is 22%.

These estimates are based on the common assumption that any level of ionizing radiation exposure can be potentially harmful. This assumption is challenged by some investigators. It should be emphasized that there is no direct epidemiologic data demonstrating clear excess in the risk for cancer from low dose ionizing radiation used in diagnostic studies.

Nuclear medicine has an important role in the evaluation of many diseases affecting children. For example, nuclear medicine studies are essential for proper evaluation and clinical management of

"Nuclear medicine studies expose the body to low doses of ionizing radiation. When used judiciously, they are considered safe diagnostic procedures."

pediatric malignancies, especially neuroblastoma and Hodgkin's lymphoma. Nuclear medicine provides important information in the evaluation of common bone pathologies encountered in children such as infections, fractures, etc. Congenital anomalies of the kidneys and urinary tract are commonly assessed with nuclear medicine scans that provide unique functional information. This information guides clinical management. Many other pediatric conditions benefit from data provided by nuclear medicine studies.

"Exposure of children to ionizing radiation carries a higher risk than in adults. Growing tissues in children are more sensitive to direct and indirect deleterious effects from ionizing radiation."

Exposure of children to ionizing radiation carries a higher risk than in adults. Growing tissues in children are more sensitive to direct and indirect deleterious effects from ionizing radiation. Children also have a longer life span than adults, allowing a longer time for the cancer risk to be expressed. Pediatric nuclear medicine is therefore optimized to provide the required diagnostic information at the lowest possible radiation risk. Studies should only be performed if they are appropriate for answering the clinical questions. The administered dose should be the lowest one that can provide adequate diagnostic images.

The administered radiopharmaceutical activity is the most easily controlled parameter affecting the radiation dose. It is usually determined from the body weight of the child. A survey among pediatric nuclear medicine centers in North America, that was published eight years ago, revealed concerning differences among these centers in the administered activities for common pediatric studies. These findings triggered efforts in North America and in Europe to optimize and standardize the recommended doses for pediatric studies. In Europe, the recommended pediatric doses were completely revised in 2007 and a new version of the "EANM pediatric dosage card" was published. The dosage card has been updated several times since then. On the other side of the Atlantic, the "North American Consensus Guidelines for Administered Radiopharmaceutical Activities in Children and Adolescents" were published in 2010. In general, the European and North American recommendations were similar except for some specific studies where the differences were quite significant. A joint working group of experts from the North American Society of Nuclear Medicine and Molecular Imaging (SNMMI) and the European Association of Nuclear Medicine (EANM) was established in 2012 in an attempt to resolve these differences and to harmonize the recommended pediatric radiopharmaceutical doses globally. This work resulted in the development of a set of international guidelines, also referred to as "Pediatric Radiopharmaceutical Administration: Harmonization Guidelines" published in 2014.

Adherence to the newly recommended guidelines is an important safety measure in pediatric nuclear medicine. These recommendations should nevertheless be evaluated on a regular basis. Continuing advances in PET and SPECT camera technology with improved detector sensitivity can provide diagnostically adequate images at lower administered activities.

Advances in image processing provide additional options for dose reduction. "Resolution Recovery" processing of acquired data results in the ability to maintain image quality at half the administered dose or half the acquisition time. These algorithms were mostly implemented in adult cardiac studies but were also reported with promising results in pediatric renal and bone studies.

New solid state digital detectors for nuclear medicine cameras can produce optimal diagnostic images at significantly lower administered doses. These new cameras are not widely available today but hold promise in reducing the radiation dose to the patient.

Finally, hybrid nuclear medicine cameras such as PET/CT and SPECT/CT are increasingly used for various indications especially in oncology. The dose to the child from the CT component of the study can be significantly reduced by optimizing the CT acquisition parameters according to pediatric CT protocols. When performing bone scans with SPECT/CT the CT dose can be further reduced by limiting the field of view of the CT component to the region of the abnormality detected on the SPECT part of the study. ■

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NOVEL RADIOPHARMACEUTICALS FOR PET IMAGING

Dr. Peter Hollett
Chief, Nuclear and
Molecular Medicine
Eastern Health
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Newfoundland and Labrador
Canada

A golfer uses different clubs as he makes his way around the golf course. Certain shots require a driver while other shots require a wedge or a putter. The same functionality is now being developed for PET (Positron Emission Tomography) imaging agents. I recently completed a sabbatical at the Peter McCallum Cancer Institute in Melbourne, Australia. Due to the regulatory framework in Australia, they are able to more rapidly insert novel imaging agents into their clinical practice and therefore help their patients in a manner that we currently can't in Canada. It's like playing a round of golf with a full range of options; while here in this country we have to play all our shots with one club.

GATATE

Dotate is an analogue much like octreotide that shows great affinity for somatostatin receptors particularly Type II. It can be bound to the positron emitting isotope Gallium 68 and is locally known as Gatate. It is highly useful for looking at neuroendocrine tumors. Once identified, the Peter McCallum Institute has a very strong peptide receptor therapeutic program and often times these patients would receive treatment with beta emitting radiopharmaceuticals bound to Dotate that would allow a therapeutic administration of radiation directly to these tumors. This concentrates the therapy on the cancer and spares surrounding normal tissue. The most commonly used beta emitting radiopharmaceuticals were lutetium and yttrium and they also use a SPECT CT program that quantifies the delivered dose in these tumors.

PSMA

Perhaps the most intriguing agent that I saw while on sabbatical, was prostate specific membrane antigen (PSMA). This material was first developed at the University of Heidelberg in Germany but was very rapidly adopted both in England and Australia.

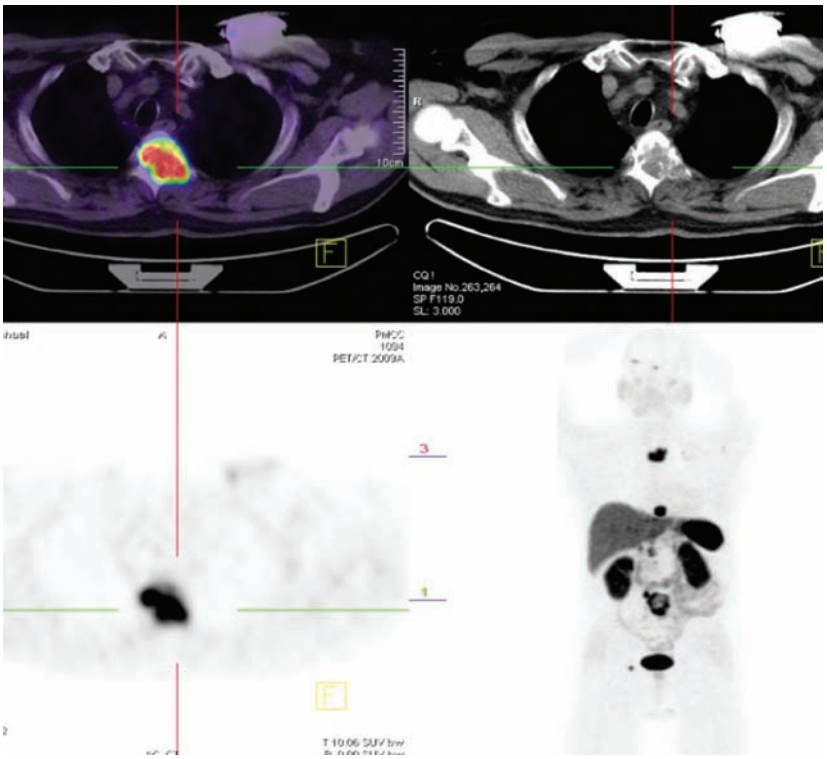


Figure 1: Gatate images of a patient with metastatic neuroendocrine tumour (paraganglioma). Note multiple deposits and bone lesion with cord compression. This patient was treated with Lutate rather than external beam radiotherapy with good result. With permission of the Peter MacCallum Cancer Centre, Melbourne

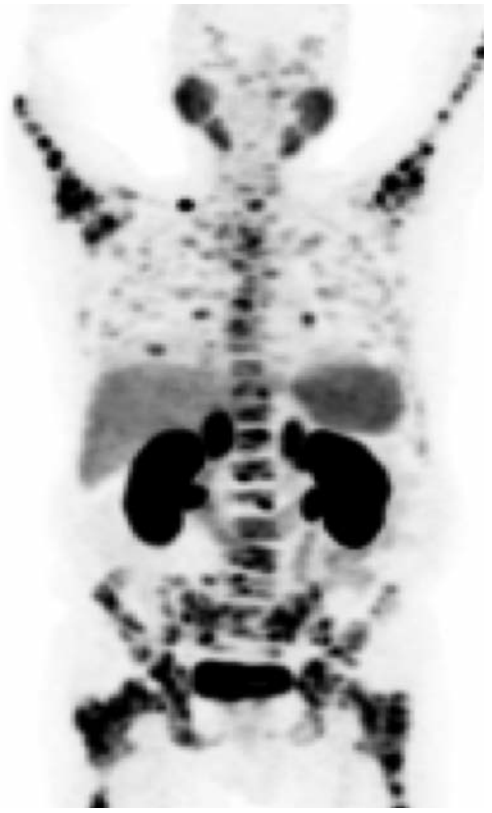


Figure 2: Ga68PSMA images of patient with extensive bone and soft tissue metastasis from Ca prostate PSA above 100. With permission of the Peter MacCallum Cancer Centre, Melbourne

This agent shows a very high affinity for prostate cancer which generally has a very low affinity for the more standard imaging agent FDG. Even in prostate cancer patients with minimal elevations of their PSA, this imaging agent was able to identify early metastatic spread far before any imaging modality including CT or MRI. It has terrifically high target to background ratio; much higher than choline that had been used for this purpose before. Like Gatate, PSMA can also be labelled with beta emitting agents for therapy of early or even late metastatic spread of prostate cancer.

There continues to be evolution and development of exciting new PET radiopharmaceuticals for the diagnosis and treatment of cancer. Further development of molecular imaging and therapy will be the corner stone of our specialty for many years to come. For the sake of our patients, we need to expand these into our game here in Canada. We need to engage our federal regulators to make this happen as quickly and safely as possible. ■

"There continues to be evolution and development of exciting new PET radiopharmaceuticals for the diagnosis and treatment of cancer. Further development of molecular imaging and therapy will be the corner stone of our specialty for many years to come."

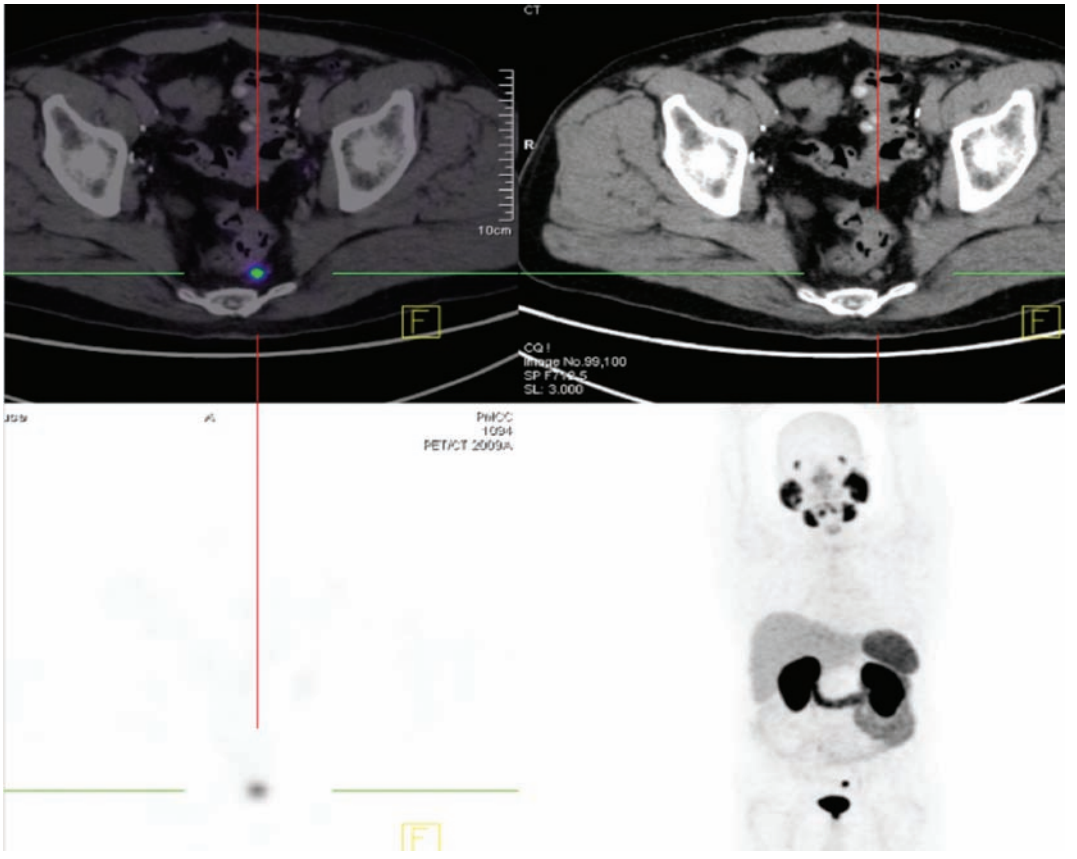


Figure 3: Ca prostate patient with PSA 0.5. Note tiny nodal metastasis in pelvis. With permission of the Peter MacCallum Cancer Centre, Melbourne

LEVER LE VOILE SUR L'HIDRADÉNITE SUPPURÉE

Les Drs Shear, Tran et George discutent de l'hidradénite suppurée.

Dr NEIL SHEAR
chef du service de dermatologie, Hôpital Sunnybrook

Dr VU KIET TRAN
urgentologue, Réseau universitaire de santé

Dr RALPH GEORGE
professeur agrégé, Université de Toronto, division de chirurgie générale

Qu'est-ce que l'hidradénite suppurée ?

L'hidradénite suppurée, aussi appelée hidrosadénite suppurée ou suppurative, est une maladie inflammatoire, chronique et douloureuse de la peau qui touche de 1 à 4 % de la population adulte générale[1,4]. Elle se caractérise par l'apparition de furoncles, généralement dans les régions où siègent certaines glandes sudoripares, par exemple sous les seins, sur les fesses et à l'intérieur des cuisses. Les furoncles peuvent grossir et se rejoindre pour former des sinus de drainage d'où s'écoule un pus malodorant[1,2,4].

Qu'est-ce qui cause l'hidradénite suppurée ?

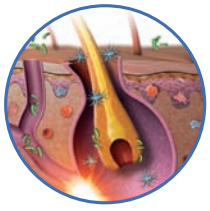
La cause de l'hidradénite suppurée n'est pas claire. Certains marqueurs et anomalies génétiques au niveau des follicules pileux seraient à l'origine de la maladie[2]. Au nombre des facteurs de risque figurent le tabagisme et l'obésité[1]. Environ un tiers des personnes atteintes de la maladie présentent des antécédents familiaux[1]. Les rapports font état de cas d'hidradénite suppurée en présence de plusieurs comorbidités, surtout des maladies inflammatoires de l'intestin[1].

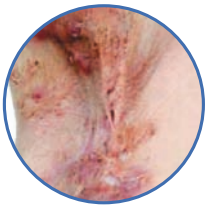
En quoi l'hidradénite suppurée nuit-elle à la qualité de vie ?

L'hidradénite suppurée est souvent mal diagnostiquée ou non diagnostiquée[2,3,4]. Elle nuit aux interactions sociales, à la performance au travail et aux relations intimes; elle est souvent source d'isolement[1]. Elle est également douloureuse, et crée un sentiment de honte et d'embarras[1].

Les personnes atteintes d'hidradénite suppurée se rendent-elles à l'urgence pour recevoir un traitement ?

Les personnes atteintes d'hidradénite suppurée qui se présentent à l'urgence pendant une poussée sont sujettes à une douleur intense et sont très gênées à cause du pus qui s'écoule de leurs furoncles et qui nécessite l'intervention d'un professionnel pour être drainés[4]. Il n'est pas rare que ces personnes rentrent chez elles sans avoir reçu de diagnostic[4].





Existe-t-il un moyen de guérir l'hidradénite suppurée ?

Il n'existe actuellement aucun moyen connu de guérir l'hidradénite suppurée[4,5]. Le diagnostic précoce et une prise en charge adéquate sont importants pour préserver la qualité de vie du patient[1]. La première chose que les personnes atteintes d'hidradénite suppurée doivent faire, c'est de parler à leur dermatologue pour obtenir un diagnostic précis[1].

Comment traite-t-on l'hidradénite suppurée ?

Les solutions antibactériennes, la clindamycine pour application topique, divers antibiotiques à action générale, l'hormonothérapie, les rétinoïdes à action générale, le traitement laser, les injections intra-lésionnelles de corticostéroïdes et les médicaments biologiques comptent parmi les traitements médicaux utilisés à ce jour pour prendre en charge l'hidradénite suppurée[3]. La fenestration et l'excision large sont de longue date le traitement définitif en cas d'hidradénite suppurée grave[3]. Rien ne permet de garantir que l'hidradénite suppurée ne se manifestera pas à nouveau dans les régions excisées[3].

Références : 1. Dufour, D., Emtestam, L., & Jemec, G. (2014). Hidradenitis suppurativa: A common and burdensome, yet under-recognised, inflammatory skin disease. *Postgrad Med J* 90, 216-221. doi:10.1136. **2.** Esmann, S., & Jemec, G. (2011). Psychosocial Impact of Hidradenitis Suppurativa: A Qualitative Study. *Acta Derm Venereol* 91, 328-332. doi:10.2340/00015555-1082. **3.** Gill, L., Williams, M., & Hamzavi, I. (2014). Update on hidradenitis suppurativa: Connecting the tracts. F1000 Prime Reports, 6(112). doi:10.12703/P6-112. **4.** Revuz, J. (2009). Hidradenitis suppurativa. *JEADV* 23, 985-998. doi:10.1111/j.1468-3083.2009.03356.x.

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GAMMAGRAFÍA RENAL EN NIÑOS

Anna Danilenko M.D., FRCPC

CHU de Québec Associate Professor | Departement of Nuclear Medicine| University Laval Board of directors | Canadian Association of Nuclear Medicine

Las técnicas de medicina nuclear son de importancia primordial en el diagnóstico inicial y en el seguimiento de muchas enfermedades renales en niños. Se utiliza una pequeña cantidad de sustancias radioactivas (radiofármacos) para evaluar el funcionamiento de los riñones. La alta sensibilidad de la gammagrafía renal (GR) la ha colocado en un papel central en la evaluación del tracto urinario. El diagnóstico precoz y el tratamiento de las anomalías de las vías urinarias en los niños pueden reducir morbilidad y mortalidad en éstos. Una evaluación adecuada es crucial para evitar la pérdida de la función renal. Las consecuencias de este tipo de problemas son aún más dramáticas en los pacientes con un solo riñón, sea por razón congénita u otra causa.

La gammagrafía renal es un estudio no invasivo y sin contraindicaciones. Es de fácil realización y no requiere ninguna preparación especial, solo una buena hidratación. Las sustancias inyectadas no son tóxicas, no provocan alergias, son indoloras, y no presenta interacción con medicamentos. Los padres pueden estar presentes en la sala para tranquilizar al niño y mejorar su cooperación.

Aproximadamente el 10% de la población se ve afectada por anomalías renales, aunque muchas de éstas son menores y carecen de importancia clínica. La GR se ha utilizado en nefrourología clínica desde el 1960. Este examen aporta una información funcional única, la cual con frecuencia no es posible obtener con las modalidades anatómicas (ecografía, RM, TC), proporcionando además información adicional sobre la naturaleza y gravedad del problema. La gran ventaja reside en su elevada sensibilidad diagnóstica, que

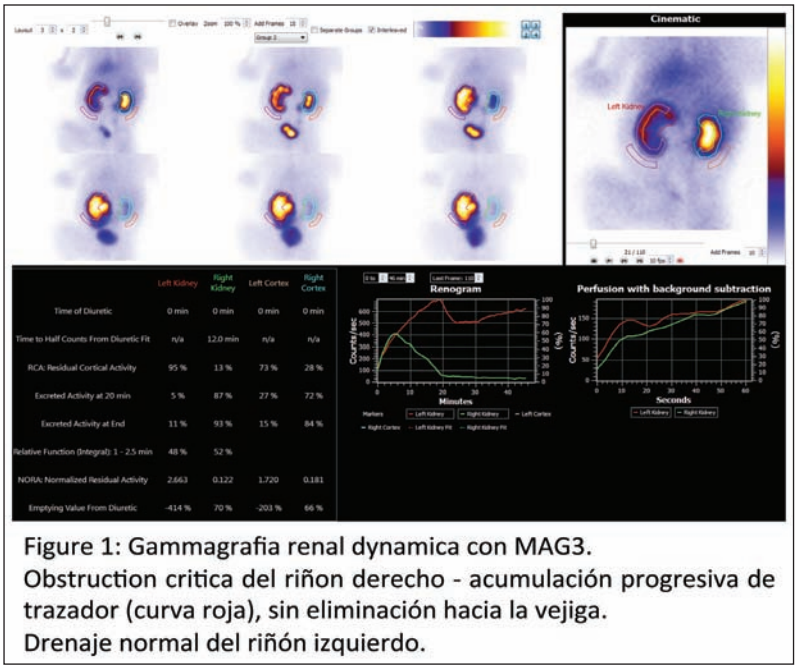


Figure 1: Gammagrafia renal dynamica con MAG3.
Obstruction critica del riñon derecho - acumulación progresiva de trazador (curva roja), sin eliminación hacia la vejiga.
Drenaje normal del riñón izquierdo.

permite la detección temprana de la enfermedad, antes de que los cambios estructurales sean evidentes.

Por lo general, es prescrita por un nefrólogo o un urólogo para evaluar diversas enfermedades renales de origen congénito, funcional, infeccioso, traumático o tumoral. Para cada problema diagnóstico se han desarrollado diferentes radiofármacos. Hay principalmente dos tipos. La selección dependerá de la pregunta clínica específica, y el procedimiento se puede adaptar para cada caso en concreto.

La GR dinámica constituye la exploración renal más común en MN. La información se presenta en forma de imágenes seriadas en el tiempo. Mediante los radiofármacos excretados por los riñones, es posible valorar la perfusión, la función renal, y la permeabilidad de las vías urinarias. La popularidad de esta exploración ha conducido a la investigación y la comercialización de varios trazadores, de cuales el más empleado es MAG3. La GR está especialmente indicada en la uropatía obstructiva, la insuficiencia renal aguda y la detección de enfermedad vasculorrenal en pacientes hipertensos. Es también necesaria en el control de los trasplantes renales, cuando se sospecha la existencia de rechazo, infección o complicaciones vasculares.

Otro radiofármaco, el DMSA, permite visualizar el tejido renal, y detectar anomalías corticales tales como infecciones, cicatrices, infarto, anomalías congénitas, y masas difíciles de investigar por otros métodos de imagen.

APLICACIONES CLINICAS

A menudo, los niños nacen con vías urinarias dilatadas (hidronefrosis neonatal). Esto generalmente se detecta por ecografía y necesita ser investigado. Aunque en muchos casos se trata de estasis funcional que se resuelven espontáneamente, es importante saber si hay un problema de obstrucción mecánica crítica que pueda causar un deterioro progresivo de la función

renal si no es tratado a tiempo. La gammagrafía renal dinámica hace esta distinción, demostrando en la forma más grave una desaceleración de la progresión del trazador en el tracto urinario, incluso después de la administración de diuréticos. Es posible además conocer el grado de daño funcional. Los pediatras y urólogos se basan en el renograma diurético para orientar el tratamiento de estos niños. La hidronefrosis no obstructiva es tratada de forma conservadora, mientras que una hidronefrosis obstructiva (figure 1) habitualmente requiere una intervención quirúrgica.

Otro problema común en los niños es el reflujo vésico-ureteral, que facilita la llegada de bacterias al tracto urinario superior y pone en peligro la función renal. (Existe también otra prueba de medicina nuclear, la cistografía isotópica, que permite comprobar el paso de orina desde la vejiga a los riñones.) Las infecciones de las vías urinarias afectan al 3-5% de los niños. La diferenciación entre la infección del riñón (pielonefritis) y de las vías urinarias bajas es muy importante, pero los hallazgos clínicos y de laboratorio a menudo no son precisos en esta distinción. La GR con DMSA es la técnica de imagen de elección actual, ya que es más sensible que la ecografía o CT para la detección de la pielonefritis. (figure 2)

En algunos casos uno de los dos riñones funciona muy poco debido a un problema estructural como quistes, cicatrices o hidronefrosis. El médico puede preguntarse si es mejor extirparlo o por el contrario, preservarlo y arriesgarse a complicaciones derivadas de su mala función. Esta decisión no puede ser tomada sin saber exactamente cuál es el porcentaje de la función global con la que contribuye este riñón.

Indicationes de la Gammagrafia renal

Insuficiencia rénal aguda o cronica
Alteraciones de la perfusión
Cuantificación de la función renal
Hidronefrosis - valoración de la obstrucción ureteral
Reflujo vesicoureteral
Infección renal (pielonefritis)
Masas o tumores renales
Traumatismo renal, complicaciones quirúrgicas
Bloqueo de las arterias renales en patientes hipertensos
Anomalías congénitales:
- ectopia renal
- atrofias o ausencia renal
- enfermedad renal polykystica
- duplicación renal

Complicationes de un transplante renal:
- complicationes vasculares
- necrosis tubular aguda
- obstrucción
- estado de anastomosis
- hematoma
- infección
- rechazo

Dado que esta información no es estructural sino funcional, la GR proporciona la información más precisa.

En mi centro (Canadá), todos niños evaluados en urología o nefrología tendrán al menos una gammagrafía renal. Por desgracia, la accesibilidad varía según los diferentes países, pese a que la información proporcionada frecuentemente conduzca a la solución diagnóstica, y no pueda ser obtenida por otro tipo de estudio. ■

« La hidronefrosis no obstructiva es tratada de forma conservadora, mientras que una hidronefrosis obstructiva habitualmente requiere una intervención quirúrgica. »

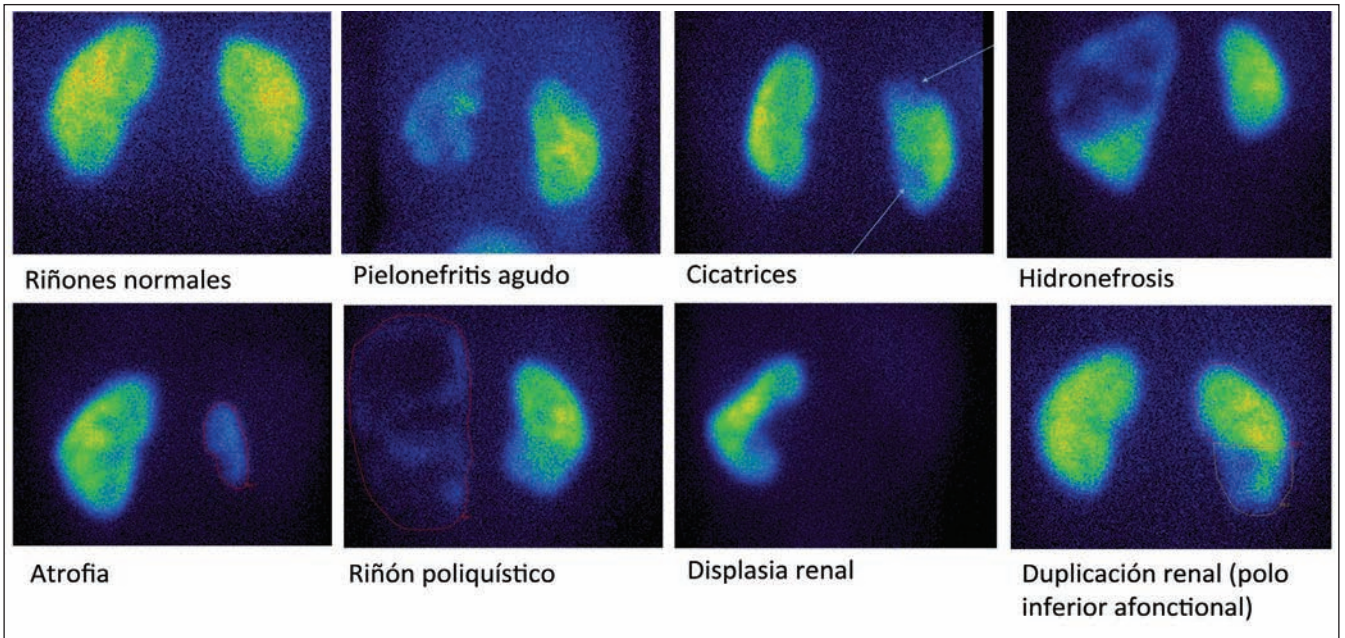
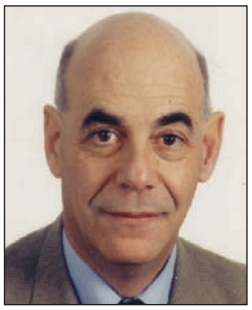


Figure 2: Ejemplos de patologías diagnosticadas con DMSA

BRAIN PERFUSION SPECT, A HIGHLY USEFUL TEST FOR THE DIAGNOSIS OF THE DEMENTIAS



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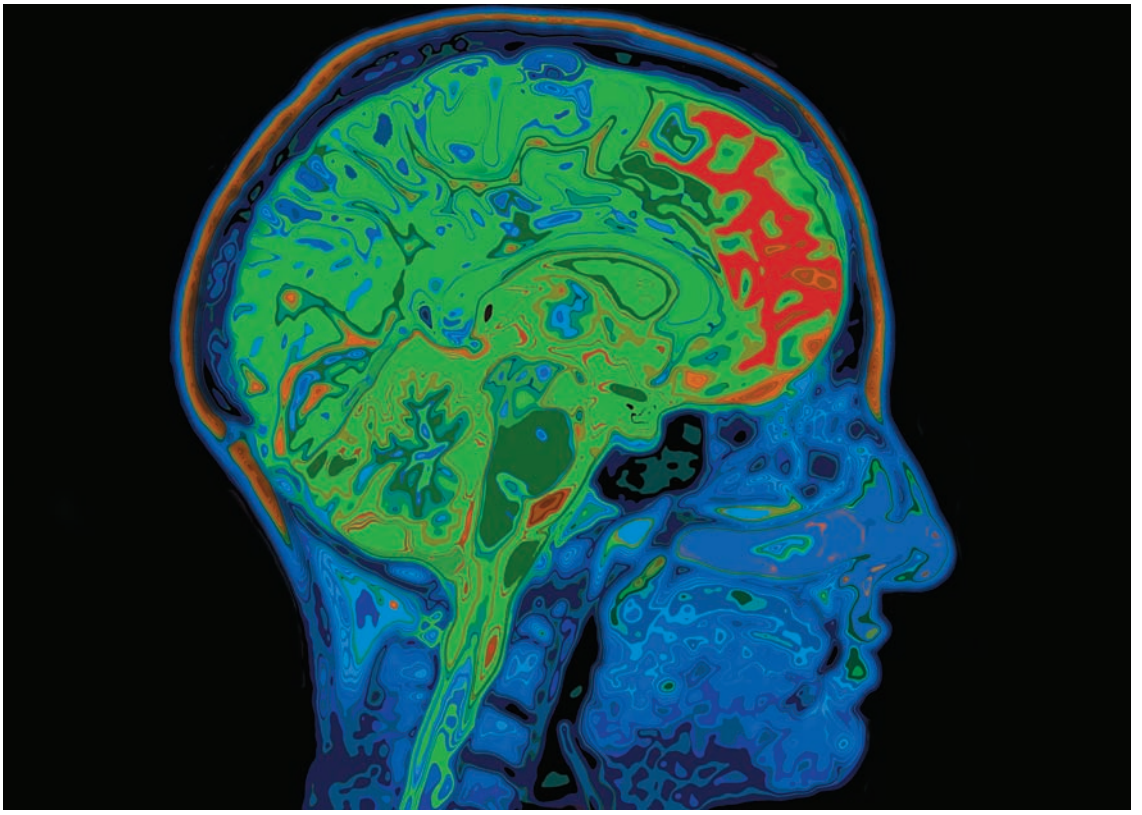
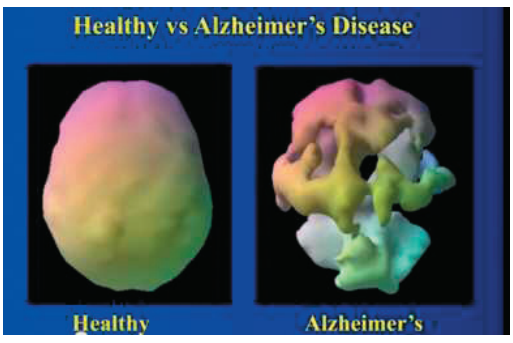
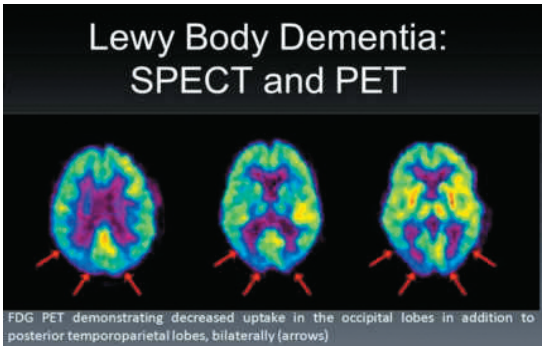


Brain perfusion SPECT is highly useful for the diagnosis of the dementias, including Alzheimer's disease, Frontotemporal Dementia and Lewy Body Disease. Studies of the accuracy of SPECT for diagnosing Alzheimer's disease report sensitivities of 65%–85% and specificities (for other dementias) of 72%–87%[1]. In the largest study to date, both HMPAO SPECT and 18F-FDG PET were able to completely separate 26 AD cases from controls[2]. SPECT has been advocated over 18F-FDG PET on the basis of its wider availability, lower cost and perceived better patient tolerability, although a recent review suggested 18F-FDG PET had greater diagnostic accuracy over Brain Perfusion SPECT, where available[3]. Guidelines of the European Association of Nuclear Medicine and the American College of Radiology endorse the clinical use of Brain Perfusion SPECT in the workup and diagnosis of dementia[4,5].

Brain perfusion SPECT is useful because the clinical diagnosis of dementia is often inaccurate, especially in early dementia when patients have only mild cognitive impairment, and can be confused with depression, bipolar disorder, metabolic disorder or multiple infarct dementia, a potentially treatable cause of dementia[6]. The anatomic imaging modalities –CT and MRI– often show no abnormality. Structural abnormalities in the hippocampus, which can be seen on MRI, are currently difficult to assess in routine clinical practice. New amyloid PET tracers show promise in early detection of Alzheimer's disease, but to date are not reimbursed for routine use[7]. Brain Perfusion SPECT is widely available and reimbursed, but ideally should be performed with optimal dedicated nuclear medicine SPECT systems with high spatial resolution, three dimensional reconstruction software, parametric mapping and fan beam or multi-pinhole collimators[8]. New SPECT detectors using multiple pinholes show resolutions

"Brain Perfusion SPECT is widely available and reimbursed, but ideally should be performed with optimal dedicated nuclear medicine SPECT systems with high spatial resolution, three dimensional reconstruction software, parametric mapping and fan beam or multi-pinhole collimators."





comparable to PET detectors and can simultaneously image both perfusion and Dopamine receptor agents such as I-123 beta-CIT, to more accurately diagnose dementia with Lewy-bodies[9]. Originally developed for animal studies, new detectors with multiple pinholes are now available for human brain SPECT and promise sensitivities and resolutions competitive and possibly exceeding current PET scan detectors[10].

Patterns of abnormal perfusion in dementia can show very characteristic perfusion changes, although no perfusion patterns are 100% sensitive or specific. In very advanced dementias, almost completely absent cortical perfusion may be present to make all dementias essentially indistinguishable.

Scans of patients with advanced Alzheimer's dementia usually show a typical hypo-perfusion in the tempero-parietal regions. In Frontotemporal Dementia, hypoperfusion is usually seen in the frontal cortex and frontal temporal lobes. In dementia with Lewy-Bodies, decreased perfusion is seen in the occipital cortex, and studies with SPECT dopamine tracers (DaTScan I-123 beta-CIT or Tc-99m Trodat) show decreased uptake of dopamine in the basal ganglia[9]. Multi-infarct dementias show multiple perfusion defects throughout the cortex and white structures. In the earliest stages of Alzheimer's disease, impaired memory deficit has been shown to correlate with hypometabolism of temporal mesial structures (especially the hippocampus), posterior cingulate gyrus and basal frontal cortex[11]. ■

1. Dougall NJ, Brugg KS, Ebmeier K. Systematic review of the diagnostic accuracy of 99mTc-HMPAO SPECT in Dementia, Am J Geriatr Psychiatry. 2004;12:554–570

2. Herholz K, Schopphoff H, Schmidt M, et al. Direct comparison of spatially normalized PET and SPECT scans in Alzheimer's disease. J Nucl Med. 2002;43:21–26

3. O'Brien, JT, Firbank, MJ, Davison, C, Barnett, N, Bamford, C Donaldson, C Olsen, K Herholz, K Williams D 18F-FDG PET and Perfusion SPECT in the Diagnosis of Alzheimer and Lewy Body Dementias, J Nucl Med, 2014, 55: 1959-1965

4. Kapucu, OL Nobili F, Varrone A, Booij J, Vander Borght T, Någren K, Darcourt J, Tatsch K, Van Laere.K EANM procedure guideline for brain perfusion SPECT using 99mTc-labelled radiopharmaceuticals, version 2 Eur J Nucl Med Mol Imaging DOI 10.1007/s00259-009-1266-y

5. ACR Res. 25 – 2012, Amended 2ACR–SPR Practice Parameter for the Performance of Single Photon Emission CT (SPECT) Brain Perfusion and Brain Death Examinations014 (Res. 39)

6. Woodford H.J., George J. Cognitive assessment in the elderly: a review of clinical methods DOI: http://dx.doi.org/10.1093/qjmed/hcm051 469-484 First published online: 12 June 2007

7. Kubota T, Ushijima Y, Yamada K, Okuyama C, Kizu O, Nishimura T. Diagnosis of Alzheimer's disease using brain perfusion SPECT and MR imaging: which modality achieves better diagnostic accuracy? Eur J Nucl Med Mol Imaging 2005;32:414-421.

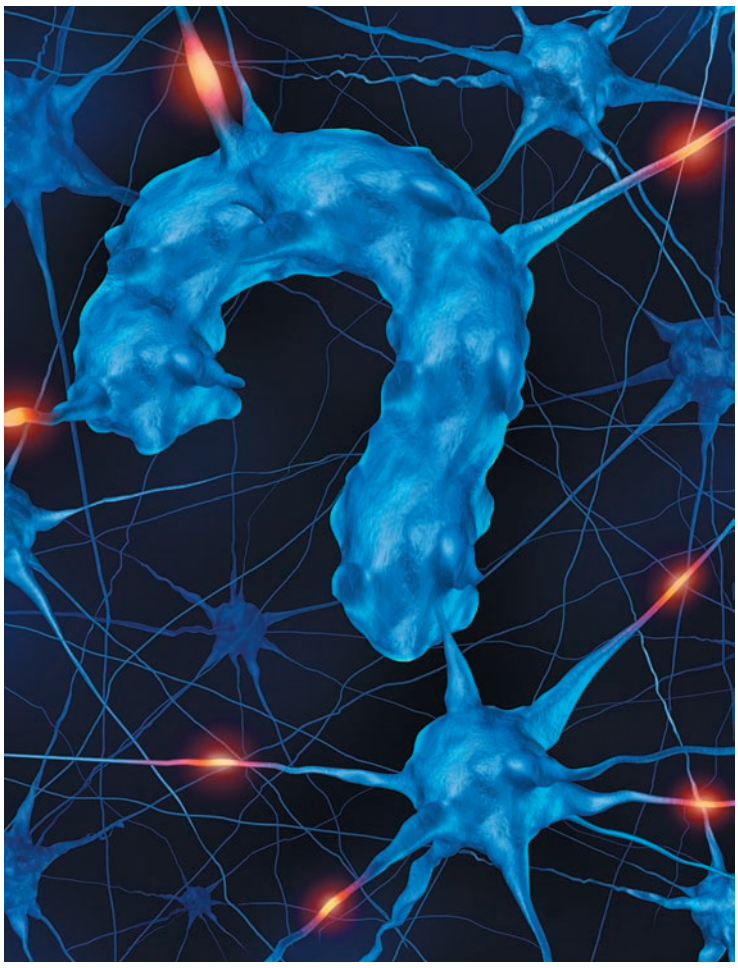
8. Juni J, Waxman A, Devous, M et al Society of Nuclear Medicine Procedure Guideline for Brain Perfusion Single Photon Emission Computed Tomography (SPECT) Using Tc-99m Radiopharmaceuticals version 2.0, approved February 7, 1999

9. O'Brien JT, Colloby S, Fenwick J, et al. Dopamine transporter loss visualized with FP-CIT SPECT in the differential diagnosis of dementia with Lewy bodies. Arch Neurol. 2004;61:919–925

10. Miwa K, Inubushi M, Takeuchi Y, Katafuchi T, Koizumi M, Saga T, Sasaki M Performance characteristics of a novel clustered multi-pinhole technology for simultaneous high-resolution SPECT/PET Annals of Nuclear Medicine June 2015, Volume 29, Issue 5, pp 460-466

11. Bonte FJ, Harris TS, Roney CA, Hynan LS. Differential diagnosis between Alzheimer's and frontotemporal disease by the posterior cingulate sign. J Nucl Med. 2004;45:771-4.

"Originally developed for animal studies, new detectors with multiple pinholes are now available for human brain SPECT and promise sensitivities and resolutions competitive and possibly exceeding current PET scan detectors."



RADIOSINOVIORTESIS EN HEMOFILIA

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Introducción

La hemofilia es una enfermedad hereditaria que altera la capacidad del cuerpo de controlar el sangrado. Una de las características de la hemofilia es la hemorragia intra articular (hemartrosis). La hemartrosis a menudo comienza en la niñez, cuando el niño empieza a caminar [1]. Una hemartrosis puede dar lugar a una sinovitis de bajo grado, que predispone generalmente a una articulación, llamada la articulación blanco a una hemartrosis recurrente, con lo cual comienza un ciclo vicioso de sinovitis crónica, artritis inflamatoria y artropatía progresiva.

« La colaboración interdisciplinaria con otras especialidades, como reumatólogos o cirujanos ortopedistas, es clave en este tipo de tratamiento. »

El objetivo del tratamiento en los pacientes hemofílicos es el de romper este círculo vicioso lo más pronto posible, eliminando la hemartrosis y suspendiendo de esta forma el proceso de degeneración articular, permitiendo al paciente alcanzar una madurez esquelética con articulaciones funcionales, minimizando de esta forma la incapacidad y mejorando la calidad de vida y reduciendo el costo total del tratamiento [2].

El buen entendimiento de la fisiopatología de los procesos de la enfermedad es vital y el médico nuclear debe estar familiarizado con ésta y otras formas de tratamiento. La colaboración interdisciplinaria con otras especialidades, como reumatólogos o cirujanos ortopedistas, es clave en este tipo de tratamiento.

« Se estima que existen unos 350.000 pacientes con hemofilia en el mundo y unos 28.000 en los Estados Unidos. »

Incidencia y tipos

La hemofilia es una enfermedad hereditaria, ligada al sexo, autosómica recesiva. El 85% ocurre por deficiencia del factor VIII (Hemofilia A o clásica), que tiene una incidencia de 1 en 5.000 niños. La hemofilia B (enfermedad de Christmas) es el 15% restante, con una incidencia de 1 en 30.000 niños. La hemofilia ocurre en todos los grupos étnicos y raciales.

El 25% de los nuevos casos de hemofilia A ocurren sin historia familiar, como casos esporádicos, que ocurren por mutación genética, con una tasa de ocurrencia alta entre todas las alteraciones genéticas.

Se estima que existen unos 350.000 pacientes con hemofilia en el mundo y unos 28.000 en los Estados Unidos.

Fisiopatología

La artropatía producida por la sinovitis crónica y la artritis degenerativa progresiva es la complicación músculo esquelética más común y devastante en los pacientes hemofílicos y es consecuencia de la hemartrosis recurrente.

El proceso comienza con una hemorragia articular simple, en la cual los productos de degradación sanguínea, como la hemosiderina y la ferritina que contienen hierro se absorben en la membrana sinovial. El exceso de hierro causa alteración de los sinoviocitos con ruptura lisosomal y liberación de encimas condrolíticas [2]. Aproximadamente 4 días luego de la hemorragia, el sinovio se vuelve reactivo, con áreas de proliferación vellosa, con incremento marcado de la vasculatura, lo cual lo vuelve susceptible de nuevos episodios de sangrado.

Los cambios inflamatorios en la sinovitis hemofílica son similares en algunos aspectos a los de la artritis reumatoidea y la sinovitis vellonodular pigmentosa. Las células fagocíticas sinoviales, tipo A (células

fagocíticas superficiales) están cargadas con hemosiderina. Existe infiltración perivascular con linfocitos y plasmocitos en las etapas iniciales, que son reemplazados por histiocitos repletos de hemosiderina en las etapas tardías. La vasculatura que está por debajo de la superficie se vuelve hiperplásica, con dilatación de los sinusoides venosos, que toman apariencia aneurismática. La artropatía hemofílica es a menudo rápidamente progresiva, con erosiones en la superficie articular, que comienzan antes de la adolescencia.

Las erosiones del cartílago tienen márgenes gruesos que rompen la membrana sinovial engrosada con el movimiento de la articulación, lo cual puede causar hemartrosis crónica, en la cual la articulación siempre está con derrame a pesar del uso del factor antihemofílico (factor VIII). La historia natural de la sinovitis hemofílica es la de progresión hacia una artropatía terminal y artrofibrosis. En el estadío final la membrana hiperplásica, densa y pigmentada evoluciona desde metaplasia hasta fibrosis y presenta contracturas, que finalmente llevan a anquilosis fibrosa. De forma típica, los pacientes con artritis inflamatoria desarrollan atrofia muscular progresiva y subluxación de la articulación, con quistes sinoviales gigantes peri articulares.

Las articulaciones más comúnmente comprometidas son las rodillas, codos y tobillos. Las caderas, hombros y articulaciones subtalares tiene un compromiso menos frecuente. La poliartropatía es común en hemofilia severa, poco común en hemofilia moderada y rara en hemofilia leve.

Definiciones

Sinoviolisis isotópica, radiosinoviolisis, sinovectomía por radiación o radiosinoviortesis son los términos empleados para designar al tratamiento intra-articular con radioisótopos que busca destruir la membrana sinovial en diferentes patologías [3].

Radiocoloide es el término empleado para referirse a una sustancia coloidal que va ligada a un isótopo radioactivo.

Diagnóstico

Antes de comenzar con una radiosinoviolisis, se debe confirmar el diagnóstico con rayos X, ecografía (ECO) y/o resonancia magnética nuclear (RMN). El diagnóstico diferencial entre sinovitis y hemartrosis se puede determinar con ECO y RMN. Los rayos X sirven para valorar el grado de artropatía hemofílica en el momento del diagnóstico.

Clasificación radiológica

Existen dos sistemas de clasificación radiológica de la artropatía hemofílica: la clasificación de Pettersson, que se usa en investigaciones y la clasificación modificada de Arnold – Hilgartner. Cada grado de esta clasificación representa una alteración patológica significativa que influencia el pronóstico y el manejo.

Manejo

La clave para la prevención exitosa de la artropatía hemofílica es el manejo de la hemartrosis inicial antes de que desarrolle sinovitis crónica y erosiones en la superficie de la articulación. La hemartrosis en la articulación sana debe ser manejada de forma agresiva con aspiración, administración de factor antihemofílico, terapia física y seguimiento clínico. La colocación de una férula por unos pocos días puede reducir el riesgo de sangrado recurrente y facilitar la resolución de la sinovitis. Las indicaciones para la aspiración de una articulación con artropatía moderada a avanzada se limitan a los casos con dolor y limitación funcional, ya que es demasiado tarde para prevenir la destrucción de la superficie del cartílago.

La administración intra articular de esteroides y la colocación de yeso circular por 2 semanas es efectiva en algunos pacientes con hemartrosis crónica, en etapas iniciales.

Se usan profilaxis primaria y secundaria para limitar y controlar el sangrado articular. La primaria se inicia en la niñez luego del primer episodio de sangrado, para prevenir hemartrosis futuras y limitaciones funcionales posteriores. A los pacientes se les administra una dosis diaria de factor para prevenir hemartrosis espontáneas.

En la profilaxis secundaria se inicia el factor lo más pronto posible luego de un episodio de hemartrosis y se continúa hasta que la articulación regrese a su estado normal, para prevenir el daño de la articulación.

La terapia física, en especial el fortalecimiento, es importante para prevenir la hemartrosis recurrente y se utiliza usualmente hasta 2 – 4 semanas luego de un episodio de hemartrosis, para continuar con terapia física en casa de forma permanente. La sinovitis se clasifica como crónica, cuando persiste por más de 2 – 6 meses [1].

Sinovectomía

Esta técnica debe realizarse antes que ocurra destrucción irreversible de la articulación. Es muy efectiva en la reducción de la frecuencia de sangrado pero no puede mejorar la degeneración

« Las erosiones del cartílago tienen márgenes gruesos que rompen la membrana sinovial engrosada con el movimiento de la articulación, lo cual puede causar hemartrosis crónica, en la cual la articulación siempre está con derrame a pesar del uso del factor antihemofílico (factor VIII). »

« Existen dos sistemas de clasificación radiológica de la artropatía hemofílica: la clasificación de Pettersson, que se usa en investigaciones y la clasificación modificada de Arnold – Hilgartner. Cada grado de esta clasificación representa una alteración patológica significativa que influencia el pronóstico y el manejo. »

« La sinovectomía artroscópica ha reemplazado la técnica de cirugía abierta, pero ambas técnicas son útiles en la reducción de la frecuencia de hemartrosis, con tasas de éxito de 80% en la abierta y 70% en la artroscópica. Existe la técnica de sinovectomía con láser. »

« La complicación más importante es la artrofibrosis, con severa disminución de la motilidad. Otra técnica es la de sinovectomía química, con sustancias como el thiotepa, ácido ósmico, Dpenicilamina y Rifampicina, que busca reducir las complicaciones de la sinovectomía quirúrgica. »

existente de la articulación y el dolor artrítico persistirá sin cambios. La sinovectomía artroscópica ha reemplazado la técnica de cirugía abierta, pero ambas técnicas son útiles en la reducción de la frecuencia de hemartrosis, con tasas de éxito de 80% en la abierta y 70% en la artroscópica. Existe la técnica de sinovectomía con láser.

Si bien la sinovectomía abierta o artroscópica son técnicas muy efectivas en la remoción del sinovio hipertrófico, tienen complicaciones potenciales. Requieren de altas dosis del factor antihemofílico y, en ocasiones, hospitalizaciones prolongadas. La complicación más importante es la artrofibrosis, con severa disminución de la motilidad. Otra técnica es la de sinovectomía química, con sustancias como el thiotepa, ácido ósmico, D-penicilamina y Rifampicina, que busca reducir las complicaciones de la sinovectomía quirúrgica.

Radiosinoviolisis

Historia de radiosinoviolisis en hemofilia

La Radiosinoviolisis, una forma local de radioterapia, fue usada por primera vez de forma experimental por Fellinger et al en 1952 [4]. La radiosinoviolisis fue introducida en 1963 en Estados Unidos en artritis reumatoidea. El tratamiento de la membrana sinovial con materiales radioactivos en pacientes con hemofilia fue realizado por primera vez en 1971 por Ahlberg y Petterson con Oro – 198 (^{198}Au). Estos autores postularon que la radiación de los isótopos radioactivos causaba fibrosis del sinovio, con disminución de la extensa vasculatura, disminución de la sinovitis y de la frecuencia del sangrado.

Fernández – Palazzi et al publicaron inicialmente en 1984 y luego en 1986 sus resultados con ^{198}Au, Renio – 186 (^{186}Re) y con Ytrio - 90 (^{90}Y), con una mejoría reportada en el 88% de los casos [5]. En 1991 Erken publicó sus resultados usando ^{90}Y, con excelentes resultados. En 1993 y luego de 14 años de seguimiento, Rodríguez Merchan publicó una serie grande de pacientes tratados con (^{198}Au). En 1994 Rivard et al reportaron los resultados de 92 radiosinoviolisis con Fósforo – 32 (^{32}P) coloidal (en forma de fosfato crómico) y luego, en 1994 Siegel, Luck et al reportaron sus resultados con este mismo isótopo.

Principio de acción

Las partículas coloidales marcadas con isótopos son rápidamente fagocitadas por los macrófagos de la membrana sinovial inflamada. Las partículas se localizan luego en las cavidades vacuolares de la sustancia intercelular.

Las partículas beta liberadas por la desintegración de los átomos radioactivos que hacen parte del radiocoloide causan daño a las células de la membrana sinovial, que comienza con excitación e ionización de los átomos y moléculas en este medio, creando un gran número de partículas subatómicas secundarias. También se forman radicales libres que inician efectos bioquímicos, que a su vez ocasionan apoptosis y ablación de la membrana sinovial inflamada. Las dosis que se reciben en la membrana sinovial son del orden de 0.01 – 2 Gy/Mbq (dependiendo del radiofármaco y del estadío de la enfermedad), con dosis totales de hasta 100 Gy [4].

Isótopos radioactivos

Varios isótopos radioactivos emisores de partículas beta para uso intra articular han sido aprobados para el tratamiento de algunas patologías de la membrana sinovial: silicato o citrato de ^{90}Y, ^{32}P en fosfato crómico, sulfuro de ^{186}Re y citrato de Erbio – 69 (^{69}Er). Existen otros en investigación como el Renio – 188 (^{188}Re), el Disprosio – 165 (^{165}Dy) y el Holmio – 166 (^{166}Ho) [6].

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El radioisótopo ideal es aquel que [2]:

- Sea emisor beta puro
- Que tenga una penetración de 3 – 5 mm (para que tenga efecto solo en la membrana sinovial y evite el potencial efecto de irradiar a los tejidos vecinos, incluyendo el cartílago de crecimiento)
- Esté en forma coloidal, con un tamaño aproximado de 1000 Å (para prevenir su absorción y evitar efectos sistémicos)
- Que tenga una vida media intermedia (para permitir una acción gradual de la energía y evitar efectos inflamatorios inmediatos)

De éstos, el ^{32}P en forma de fosfato crómico es uno de los isótopos más usados en Norteamérica y Latinoamérica. Es un emisor beta puro, con una penetración de 3 – 5 mm, que permite que se concentre en la membrana sinovial y que tenga poco daño sobre los tejidos que le rodean, incluyendo el cartílago de crecimiento. Se usa en forma coloidal, que tiene un tamaño aproximado de sus partículas de 600 – 2000 Å, con lo cual se previene su absorción y se evitan los efectos sistémicos. Su vida media intermedia, de 14 días permite una deposición gradual de energía, lo cual evita las reacciones inflamatorias inmediatas, que se presentan con otros isótopos de vida media corta. Es el radiofármaco preferido en el tratamiento de la sinovitis hemofílica, por su perfil de dosis absorbida, su posibilidad de administrar una alta dosis de radiación con poca penetrabilidad en un período de tiempo suficientemente largo como para permitir una circulación pasiva en el espacio articular [7].

« Es el radiofármaco preferido en el tratamiento de la sinovitis hemofílica, por su perfil de dosis absorbida, su posibilidad de administrar una alta dosis de radiación con poca penetrabilidad en un período de tiempo suficientemente largo como para permitir una circulación pasiva en el espacio articular. »

Actividad administrada de fosfato crómico de ^{32}P en adultos: 0.3 – 2 mCi:

- En rodilla: 1 mCi diluido en 1cc de solución salina, que aportará unos 10.000 Rads (100 Gy) en la articulación.
- 0.5 mCi en codos, tobillos y hombros.
- Niños 2 – 6 años = 1/3 adulto
- Niños de 6 – 10 años = 1/2 adulto
- Niños de 10 – 16 años = 75% [8].

Otros isótopos

El ^{186}Re tiene una penetración entre 1.2 y 3.7 mm pero está compuesto de partículas pequeñas (10 Å) y produce radiación gama y beta. El ^{198}Au también es un emisor beta y gama, con una vida media de 2.7 días y una penetración de cerca de 1.2 a 3.6 mm y que tiene algún grado de absorción sistémica. El ^{90}Y, un emisor beta puro, se ha usado de forma exitosa en la sinovitis hemofílica; tiene un tamaño de partícula que fluctúa entre 1000 y 2000 Å y tiene una penetración máxima de 4 mm, pero tiene una vida media corta (2.4 días) y tiene reacciones secundarias por inflamación [2].

Selección del isótopo

Para seleccionar el isótopo deben considerarse factores como:

- *Su vida media:* la severidad de la reacción inflamatoria se asocia con la tasa de exposición. Un isótopo con una vida media relativamente larga (días) tiene ventajas con respecto a los de vida media corta (horas). La vida media larga causa un depósito gradual de energía, lo cual minimiza el potencial de respuesta inflamatoria aguda [8].
- *El tamaño de la partícula:* existe una relación inversamente proporcional entre el tamaño del radiocoloide y su tendencia a escapar del espacio articular. El tamaño grande disminuye el potencial de filtración y el drenaje linfático.
- *Tipo de partículas:* Los emisores beta puros tienen menor tasa de dosis en todo el cuerpo, con respecto a los que emiten radiación beta y gama de forma simultánea (^{198}Au, ^{186}Re y ^{165}Dy). Los emisores beta puros tienen un rango menor de penetración en los tejidos.

El radiocoloide ideal para la radiosinoviolisis debe cumplir estos 3 requerimientos:

- El coloide debe ser una partícula lo suficientemente pequeña para ser fagocitada pero no muy pequeña, para que permanezca en la articulación antes de su fagocitosis. Los rangos apropiados de tamaño fluctúan entre 2 – 10 µm.
- La unión entre el radioisótopo y la partícula debe ser estable durante el curso de la radiosinoviolisis
- Las partículas radiomarcadas se deben distribuir de forma homogénea en el espacio intra articular sin que inicien una respuesta inflamatoria.

Aunque algunos autores usan el mismo radioisótopo en articulaciones de diferente tamaño, basados en que el tamaño de la articulación

	^{32}P	^{90}Y	^{186}Re	^{198}Au
Radiación β	-	2.7 mm	-	3.6 mm
Penetración	3 – 5 mm	1.0 mm	1.2 – 3.7 mm	0.9 mm
Radiación γ	No	No	**Si**	**Si**
Energía	1.71 MeV	0.98 MeV	1.1 MeV	0.96 MeV
Tamaño	600 – 2000 Å	1000 – 2000 Å	10 Å	300 Å
Vida media	14.3 días	2.4 días	3.7 días	2.7 días

Tabla 1. Características de los isótopos radioactivos más utilizados en radiosinoviolisis

determina el espesor del tejido sinovial, se ha recomendado usar radioisótopos de diferente energía en las diferentes articulaciones: El ^{90}Y se recomienda solo para las rodillas, por sus partículas beta de alta energía, con una penetración tisular media de 3 – 4 mm; mientras que el ^{186}Re, con una penetración media de 1 – 2 mm se recomienda en articulaciones de tamaño medio, como el hombro, codo, muñeca y tobillo [9] [10].

Indicaciones y contraindicaciones de la radiosinoviolisis

Indicaciones

La indicación principal para la radiosinoviolisis es la sinovitis hipertrófica crónica asociada con hemartrosis recurrente que no responde al tratamiento hematológico [11]:

- Artritis reumatoidea
- Artritis indiferenciada con sinovitis
- Enfermedad inflamatoria articular de otro origen (enfermedad de Lyme, artritis psoriática, espondilitis anquilosante)
- Derrame sinovial persistente (p. ej. luego de endoprótesis)
- Osteoartritis con sinovitis
- Sinovitis vellonodular
- Hemartrosis y sinovitis en hemofilia (hemartrosis recurrente no controlada por el tratamiento hematológico) [12].

La indicación para radiosinoviolisis en pacientes con hemofilia es la presencia continua de derrame articular o hemartrosis y tres o más episodios de hemorragia en la misma articulación en los últimos 6 meses [9].

Contraindicaciones

Las contraindicaciones absolutas incluyen [4]:

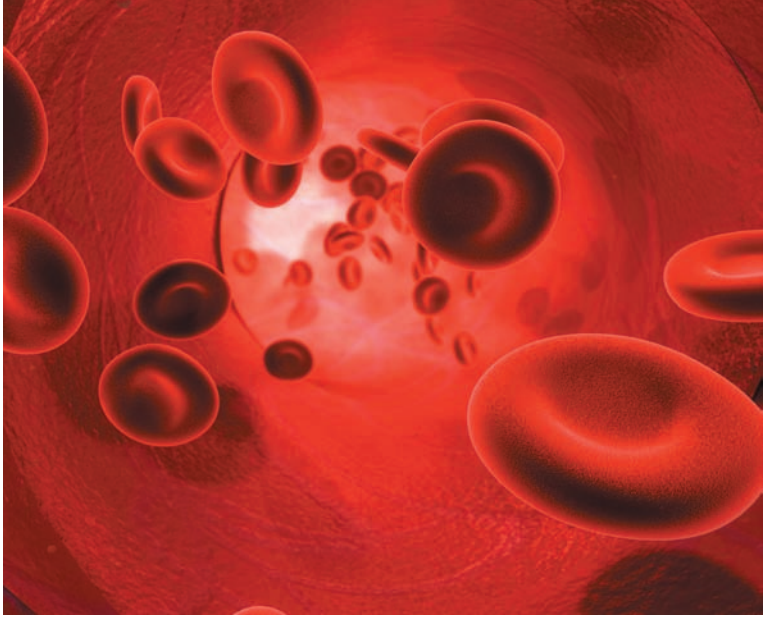
- Embarazo
- Lactancia
- Ruptura de quiste de Baker
- Infección local de la piel
- Hemartrosis masiva

Contraindicaciones relativas:

- Edad menor de 20 años (debe valorarse el riesgo/beneficio)
- Evidencia de pérdida de cartílago significativa
- Inestabilidad de la articulación con destrucción ósea

Criterios de exclusión [6]:

- Inestabilidad de la articulación
- Destrucción ósea
- Osteoartritis (grado IV)



- Quiste de Baker
- Infección de la articulación o de la piel
- Hemofilia de menos de 2 años de evolución
- Episodios de sangrado agudo

Las ventajas de la radiosinoviolisis frente a la sinovectomía quirúrgica son [8]:

- Requiere una mínima dosis de factor antihemofílico
- Es un procedimiento ambulatorio
- Pueden tratarse de forma simultánea varias articulaciones
- Existe un bajo riesgo de hemorragia en pacientes con inhibidores del factor antihemofílico
- Puede administrarse solo con anestesia local, con beneficio en pacientes en quienes no puede realizarse cirugía (enfermedades sistémicas)
- Bajo costo del procedimiento
- Disminuye hospitalizaciones

Requisitos técnicos

Todos los isótopos emisores de partículas β deben ser administrados en sitios dedicados y habilitados por las autoridades nacionales competentes; en ambiente estéril y con procedimientos estériles.

El manejo de los radioisótopos requiere de precauciones especiales por las altas tasas de dosis que pueden ser absorbidas en los dedos de quien las manipula. Deben blindarse de forma adecuada las jeringas con blindajes de plástico o acrílico. Se han calculado dosis en los dedos de 22,1 Sv/Mbq cuando no se usa blindaje, comparativamente con dosis de 0.4 Sv/MBq cuando se usan blindajes de acrílico.

Consentimiento informado

El consentimiento informado por escrito es mandatorio. La información debe administrarse de forma verbal y escrita y debe cubrir el procedimiento, sus riesgos y beneficios.

A los pacientes se les debe informar sobre la naturaleza radioactiva del tratamiento y su mecanismo, indicaciones y contraindicaciones. Debe

« La indicación para radiosinoviolisis en pacientes con hemofilia es la presencia continua de derrame articular o hemartrosis y tres o más episodios de hemorragia en la misma articulación en los últimos 6 meses. »

« El manejo de los radioisótopos requiere de precauciones especiales por las altas tasas de dosis que pueden ser absorbidas en los dedos de quien las manipula. Deben blindarse de forma adecuada las jeringas con blindajes de plástico o acrílico. »

informárseles que la respuesta puede tardarse hasta 1 mes, con mejoría progresiva hasta los 6 meses. Inicialmente puede ocurrir un incremento en la sinovitis y el dolor. Se les debe informar sobre los posibles efectos secundarios y complicaciones, incluidos los riesgos de una punción articular, como infección, hemorragia local o extravasación; el riesgo de radionecrosis si la administración no es exclusivamente intra articular (muy raro); la posibilidad (teórica, aunque aún no comprobada) de neoplasias; el riesgo post inyección de pirexia o alergia (muy raro) y el riesgo de trombo embolismo después de la inmovilización de la extremidad por 48 horas.

También se les debe informar que el procedimiento tiene una tasa de éxito del 60 – 80% y que puede repetirse luego de un mínimo de 6 meses [4].

« La punción articular debe realizarse bajo estrictas condiciones de asepsia por personal médico y de enfermería, con supervisión del médico nuclear con entrenamiento y licenciamiento específico en el uso de radiofármacos y en radioprotección. »

Procedimiento

La profilaxis con el factor se comienza 1 – 2 horas antes del procedimiento y se continúa por algunos días después [9]. La dosis de factor antihemofílico con factor VIII es de 50 U/kg y 25 U/kg a las 24 y 96 horas después del procedimiento. A los niños con deficiencia de factor IX se les administra concentrado de factor IX en dosis de 100 U/kg antes del procedimiento y 40 U/kg a las 24 y 72 horas [7]. Luego de la administración del factor se deben garantizar niveles plasmáticos de al menos 50% de lo normal.

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Deben usarse guantes estériles y debe aplicarse anestesia local antes de la punción. Debe garantizarse que la punción está intra articular, lo cual en la rodilla es relativamente fácil. En articulaciones pequeñas puede requerir la ayuda de un intensificador de imágenes.

« A los pacientes se les debe advertir que tengan inmovilizada la articulación por al menos 48 horas. Si ocurre una exacerbación temprana del dolor, puede tratarse con medidas antiinflamatorias. »

Se administran hasta 10 ml de Lidocaína para anestesiar la piel y los tejidos profundos, incluyendo la cápsula articular y la membrana sinovial [13]. Generalmente con una aguja 16 o 18 es suficiente, pero en algunos casos se necesita un catéter 12 o 14 para evacuar una hemartrosis viscosa. Luego de la punción, todo el líquido debe ser evacuado (sangre o líquido sinovial) y una vez se esté seguro de estar en el espacio intra articular, se administra el radiocoloide en un volumen de 1cc utilizando una jeringa separada, con protector de acrílico. En caso de usarse ^{32}P, se administran cantidades de 1mCi en articulaciones grandes (rodilla y codos) y 0.5 mCi en articulaciones pequeñas. De forma empírica, se usa la mitad de la dosis en niños.

Luego de la administración del radiocoloide, debe garantizarse que éste no quedará alojado en el canal de inyección, por el riesgo de radionecrosis en los tejidos, mediante el lavado durante la extracción de la jeringa y la aguja con solución salina al 0.9% o con glucocorticoides de larga acción, que a su vez ayudan a reducir el potencial de sinovitis aguda.

Luego se aplica presión a medida que se efectúa un rango completo de movimiento para dispersar el radiocoloide en toda la superficie sinovial. La articulación tratada se inmoviliza durante 2 días y se recomienda reducir la actividad física durante 2 semanas [2].

En caso de administración a varias articulaciones, se sugiere hospitalizar al paciente. Pueden realizarse imágenes en la gamacámara o tomar mediciones con contadores Geiger – Müller en la articulación comprometida, en la contralateral, en el hígado y en el bazo, inmediatamente después de la inyección.

Considerando el estado actual en el mundo acerca de los materiales radioactivos y de su costo, se requiere de organizar grupos de pacientes (6 – 8 pacientes) a quienes se les practicará radiosinoviolisis. Es posible que los pacientes tengan un tiempo de espera de unos 3 – 6 meses hasta que el grupo se complete, tiempo en el cual se debe aplicar un buen tratamiento profiláctico [12].

Efectos secundarios

- Un efecto temprano y temporal es el incremento del dolor articular ocasionado por la sinovitis inducida por la radiación
- Pueden ocurrir linfedema o fiebre en raras oportunidades
- Los efectos secundarios severos como radionecrosis son muy raros
- La inducción de neoplasias es un potencial teórico pero nunca se ha demostrado [4].

Instrucciones para los pacientes

A los pacientes se les debe advertir que tengan inmovilizada la articulación por al menos 48 horas. Si ocurre una exacerbación temprana del dolor, puede tratarse con medidas antiinflamatorias. El paciente debe revisarse a los 4 – 6 días después de la terapia, en busca de posibles efectos secundarios.

El paciente debe evitar la exposición innecesaria de otros miembros de la familia y del público.

La excreción urinaria o fecal del radiocoloide no es un problema en estos pacientes; sin embargo, deben instruirse sobre el incremento de las medidas de higiene.

Seguimiento

Luego de 3 – 4 meses, el especialista tratante debe evaluar para posible actividad inflamatoria de la membrana sinovial y sobre la respuesta a la terapia.

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La evaluación clínica se centra en la tendencia al sangrado y en la recuperación de la función de la articulación tratada (rango de motilidad).

Costos

El costo promedio del tratamiento con ^{32}P, incluyendo el factor antihemofílico, los honorarios médicos; los gastos hospitalarios y la terapia de rehabilitación es de US$ 2.850 en Estados Unidos versus US$ 61.140 para sinovectomía quirúrgica (abierta o artroscópica) [1] [2].

« La radiosinoviolisis requiere solo 1 o 2 dosis del factor y no requiere en la mayoría de los casos de terapia física o de hospitalización. Cuando se practica en varios pacientes de forma simultánea, los costos pueden ser de US$ 1.300 a 1.800 por paciente. »

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Potencial de malignidad

Existe una preocupación teórica en cuanto a que los linfocitos circulantes puedan experimentar incremento de la retención en la membrana sinovial inflamada. No se ha demostrado incremento en la tasa de leucemia en niños. Después de más de 30 años del uso de la radiosinoviolisis no se ha demostrado daño articular o sistémico publicado en la literatura [11] [12] [14].

« Los estudios cromosómicos realizados en pacientes que han recibido radiosinoviolisis, sin importar cual radiocoloide se ha usado, han demostrado que no se produjeron anomalías cromosómicas premalignas. »

La radiosinoviolisis puede realizarse a cualquier edad en pacientes hemofílicos, siempre y cuando esté bien indicada y realizada de forma adecuada. En niños pequeños debe realizarse bajo anestesia general. Aún hasta 30 años luego de su uso, la radiosinoviolisis no ha demostrado daño articular o sistémico ni tampoco complicaciones hematológicas o neoplásicas por los materiales radioactivos. Los estudios cromosómicos realizados en pacientes que han recibido radiosinoviolisis, sin importar cual radiocoloide se ha usado, han demostrado que no se produjeron anomalías cromosómicas premalignas. Tampoco se demostró penetración de los radiocoloides al cartílago articular y tampoco que éstos alcancen la placa de crecimiento [15].

Eficacia de la radiosinoviolisis

En promedio, la radiosinoviolisis tiene una eficacia del 75% a 80% a largo plazo. Desde el punto de vista clínico, la eficacia se mide en la reducción del número de hemartrosis, con desaparición completa de estos episodios por varios años en muchos casos. Debe tenerse en cuenta que en el 20 – 25% de los casos la radiosinoviolisis falla en el control de la hemartrosis. En estos casos puede repetirse. No se recomiendan más de tres procedimientos, en intervalos de 3 – 6 meses [11] [12].

La radiosinoviolisis con ^{32}P en forma de fosfato crómico tiene unos resultados clínicos excelentes, con un promedio de reducción de hemartrosis del 75% (75 – 100% en el 80% de los casos primarios y 62% en los casos secundarios, hasta 3 años luego de la administración primaria) [1] [2].

Múltiples articulaciones

Los hemofílicos comúnmente tienen más de una articulación blanco. Se puede realizar más de una radiosinoviolisis en el mismo procedimiento. Se recomienda realizar no más de dos inyecciones al mismo tiempo y no inyectar la misma articulación de forma bilateral; debe considerarse realizar el procedimiento en lo posible en el mismo lado, por ejemplo codo y rodilla, codo y tobillo, etc, para no incapacitar al paciente de forma extensa en sus funciones normales [11]. ■

Bibliografía

1. Hemophilic Arthropathy. Luck, Jr, James V. 12 2004, J Am Acad Orthop Surg, pp. 234-245.

2. 32P Radiophosphate Synovectomy for Chronic Haemophilic Synovitis. Silva, M, Luck, Jr., J V and Siegel, M V. suppl. 2, 2002, Haemophilia, Vol. 7, pp. 40 - 49.

3. EANM Procedure Guidelines for Radiosynovectomy. 12, 2003, European Journal of Nuclear Medicine, Vol. 30, pp. 12 - 16.

4. Radiosynovectomy in Rheumatology, Orthopedics, and Hemophilia. Schneider, Peter. 1, 2005, J Nucl Med 2005, Vol. 46, pp. 48S - 54S.

5. The history of synoviorthesis in haemophilia. Gilbert, M S and Cornwall, R. supp 2, 2001, Haemophilia, Vol. 7, pp. 3 - 5.

6. Effects of Radiosynovectomy with P-32 Colloid Therapy in Hemophilia and Rheumatoid Arthritis. Soroa, Victoria Ester and Velázquez, Mariana del Huerto. 3, 2005, Cancer Biotherapy & Radiopharmaceuticals, Vol. 20, pp. 344 - 348.

7. 32P Radiosynoviorthesis in Children with Hemophilia. Manco - Johnson, Marilyn J and Nuss, Rachelle. 7, 10 2002, Journal of Pediatric Hematology/Oncology, Vol. 24, pp. 534 - 539.

8. Phosphate-32 Colloid Radiosynovectomy in Hemophilia. Outcome of 125 Procedures. Siegel, Herrick J, Luck, Jr., James V and Siegel, Michael E. 2001, Clinical Orthopaedics and International Research, Vol. 392, pp. 409 - 417.

9. Radiosynovectomy in Hemophilic Synovitis: Correlation of Therapeutic Response and Blood-Pool Changes. Türkmen, Cüneyt and Zülflkar, Bülent. 3, 2005, Cancer Biotheraphy & Radiopharmaceuticals, Vol. 20, pp. 363 - 370.

10. Current treatment of hemophilic arthropathy. Hilgartner, M W. 2002, Current Opinion in Pediatrics, Vol. 14, p. 46.

11. General principles and indications of synoviorthesis (medical synovectomy) in haemophilia. Rodriguez - Merchan, E C and Wiedel, J D. Suppl 2, 2001, Haemophilia, Vol. 7, pp. 6 - 10.

12. Radionuclide Synovectomy (Radiosynoviorthesis) in Hemophilia.. A Very Efficient and Single Procedure. Rodríguez - Merchan, E Carlos. 1, 2003, Seminars in Thrombosis and Hemostasis, Vol. 29, pp. 97 - 100.

13. The technique of synoviortesis. Rodriguez - Merchan, E C and Goodard, N J. Suppl 2, 2001, Haemophilia, Vol. 7, pp. 11 - 15.

14. Advances in Radionuclide Therapeutics in Orthopaedics. Siegel, Herrick J and Luck, James V. 1, 2004, Journal of the American Academy of Orthopaedic Surgeons, Vol. 12, pp. 55 - 64.

15. On the Safety of Synoviorthesis in Haemophilia. Fernandez - Palazzi, F and Caviglia, H. suppl. 2, 2002, Haemophilia, Vol. 7, pp. 50 - 53.

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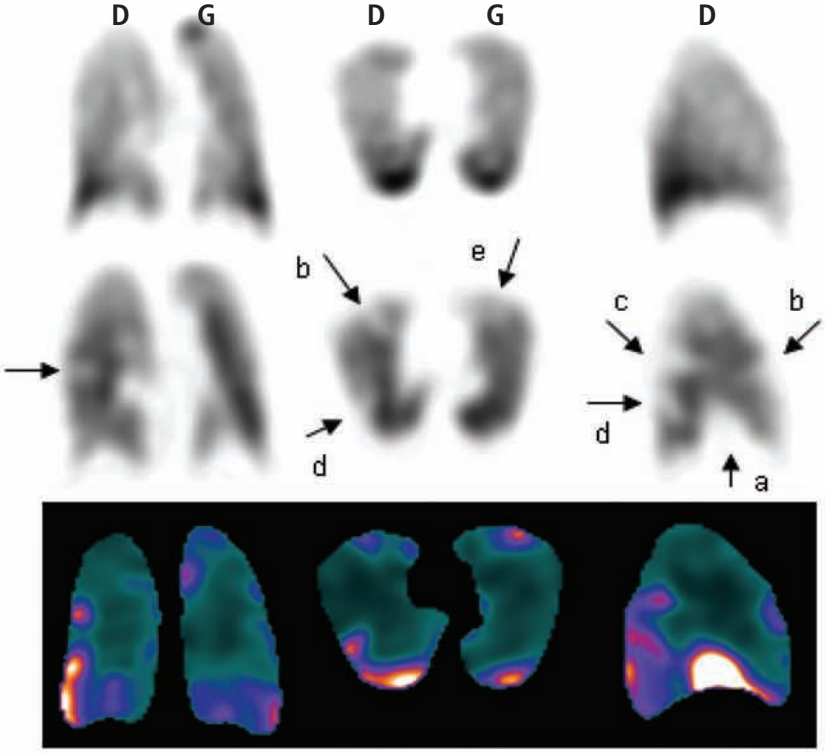

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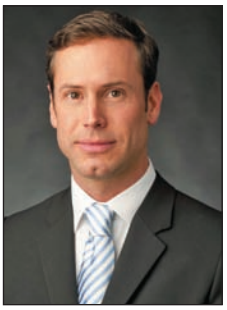
^{18}F-FLUOROCHOLINE PET/CT IN PROSTATE CANCER



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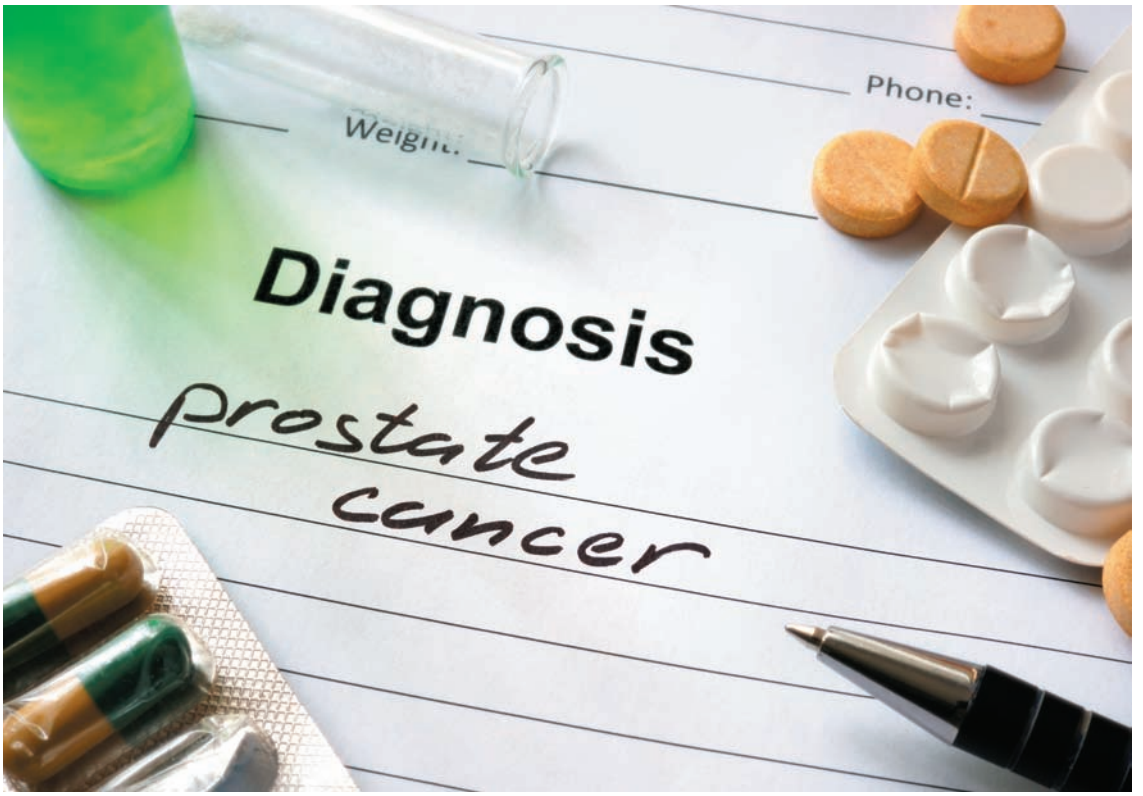


"Prostate cancer is the second most common cancer and the leading cause of cancer death in North American men older than 50 years."

Prostate cancer is the second most common cancer and the leading cause of cancer death in North American men older than 50 years. As is the case with most malignancies, accurate diagnosis, staging and restaging are essential for optimal management and diagnostic imaging continues to play an indispensable role in the work-up of these patients.

In general, diagnostic imaging can address two matters, structure and function. Anatomy can be studied using structural imaging modalities such as plain film radiography (X-ray), computed tomography (CT) and MRI, or chemical processes, physiology and function can be imaged with radiopharmaceuticals in single-photon nuclear medicine imaging and positron emission tomography (PET). The strength of the functional imaging methods is that these changes can be more sensitive and often precede anatomic changes in the course of the disease. Positron emission tomography/computed tomography (PET/CT) is a nuclear medicine procedure based on the measurement of positron emission from radiolabeled tracer molecules with correlative CT imaging. This technology allows *in vivo* biologic processes to be mapped and measured on whole body images.

^{18}F-fluorodeoxyglucose (^{18}F-FDG), a glucose analog, is the most common PET/CT radiotracer and has found applications in a wide range of solid tumors. However, the relatively low glucose uptake of many prostate cancers makes FDG a less-than-stellar performer in this malignancy. Radiolabeled choline derivatives such as ^{11}C-choline and ^{18}F-fluorocholine are commonly used tracers in the USA and Europe for prostate cancer PET imaging and have been in use for about 10 years. ^{18}F-fluoromethylcholine is preferable to ^{11}C-choline because the ^{18}F-labeling has a much longer half-life for easier scanning logistics (109 minutes versus 20 minutes in the case of ^{11}C), a shorter positron range for better spatial resolution and rapid clearance from the blood for improved target-to-background ratios.

^{18}F-fluorocholine is injected intravenously and is transported from blood to tissues in a manner similar to choline. Like choline, ^{18}F-fluorocholine enter the cell through choline transporters with accumulation in tumors due to malignancy-induced overexpression of choline kinase that catalyzes the phosphorylation of choline to form phosphorylcholine, followed by generation of phosphatidylcholine in the tumor cell membrane. This accumulation of radiolabeled cellular membrane phospholipids forms the basis of

tumor metabolic imaging with ^{18}F-fluorocholine and allows the detection of prostate cancer cells wherever they may be in the body.

Clinically, there are a number of well-established indications for ^{18}F-fluorocholine PET/CT in the context of prostate cancer. Amongst them are:

- Defining a dominant intraprostatic cancer nodule for targeted biopsy when prior biopsies have been non-diagnostic or there is clinical concern of a false-negative biopsy.

- Initial prostate cancer staging in select high risk patients with disease features such as:

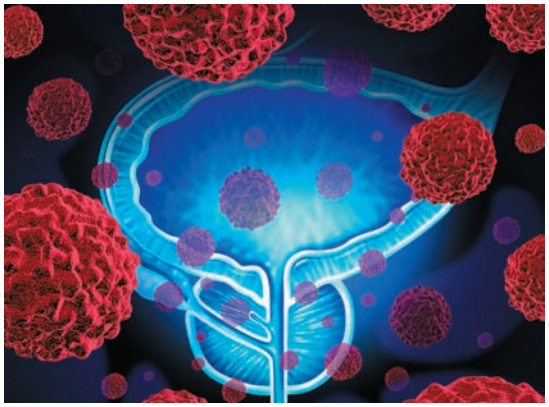
    a. Gleason score > 7
    b. Serum PSA > 15 ng/ml
    c. T stage of T3 or greater on TNM staging
    d. Equivocal conventional staging such as CT, MRI or bone scan

- Biochemical recurrence following either radical prostatectomy or curative-intent radiotherapy or other prostate-ablative definitive management.

- Identification of men with isolated local recurrence for salvage curative-intent therapy.

- Treatment monitoring after radiation and medical oncology therapy.

^{18}F-fluorocholine PET/CT shows a high sensitivity in detecting local disease and cancer recurrence, an excellent specificity in detecting malignant lymph nodes and excellent overall accuracy for metastatic bone disease. The test is more likely to accurately show biochemically recurrent disease if the patient's serum PSA at the time of the exam is higher than 2 ng/ml. Gleason scores greater or equal to 7 and shorter serum PSA doubling times also seem to confer better likelihood of a true-positive ^{18}F-fluorocholine PET/CT in the setting of biochemical recurrence. Overall diagnostic performance of ^{18}F-fluorocholine PET/CT seems to be considerably superior to conventional imaging modalities, FDG PET/CT and even seems to out-do ^{18}F-NaF PET/CT for the detection of metastatic bone disease.



There is no established toxicology for diagnostic doses of fluorinated choline derivatives and no adverse events other than mild injection site reaction have ever been documented in the worldwide experience with many thousands of patients. As with all nuclear medicine and CT procedures, the test involves a certain amount of ionizing radiation exposure. Whole body effective dose equivalent per patient averages 18-20 mSv, comparing favorably to FDG PET/CT and well within the range of other clinical diagnostic nuclear medicine and radiology examinations. Given the cost of ^{18}F-fluorocholine, the highly specialized and expensive equipment it requires, it remains a test to be used selectively by experts in prostate cancer. Unfortunately, ^{18}F-fluorocholine PET/CT in Canada is only available under research protocol given that it is not a Health Canada approved radiopharmaceutical.

In summary ^{18}F-fluorocholine PET/CT is powerful and safe nuclear medicine tool which shows excellent diagnostic accuracy for staging, restaging and response assessment in prostate cancer patients. Further work will be needed to expand Canadian patients' access to this phenomenal technology. ■

Figure 1. Intense ^{18}F-FCH uptake in subcarinal node, which was biopsy-proven to be metastatic prostate cancer. Patient underwent targeted radiotherapy with excellent imaging and biochemical response.

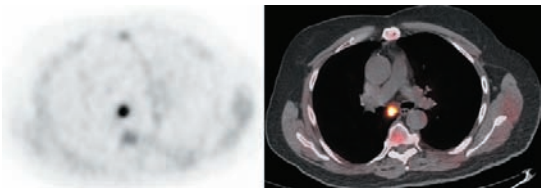
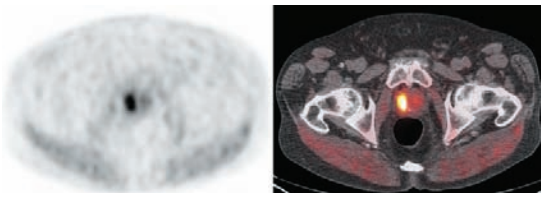
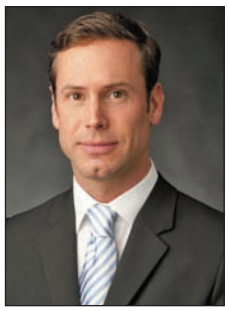


Figure 2. Patient with history of prostate cancer treated with curative-intent radiotherapy who presented with increased serum PSA. ^{18}F-FCH PET/CT demonstrated intense uptake at the right prostate bed which was proven to be local recurrence. Patient was referred for salvage therapy.



"^{18}F-fluorocholine PET/CT shows a high sensitivity in detecting local disease and cancer recurrence, an excellent specificity in detecting malignant lymph nodes and excellent overall accuracy for metastatic bone disease."



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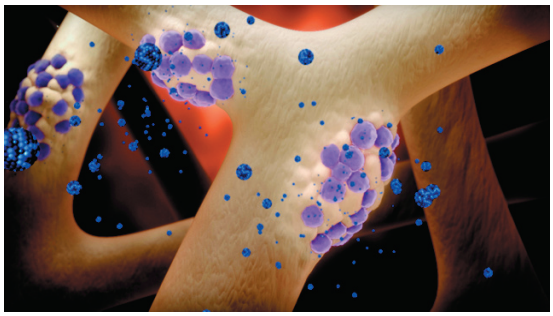
RADIUM-223 THERAPY FOR PROSTATE CANCER



Prostate cancer is the most prevalent form of cancer in men and second most common cause of cancer death in North America. First line therapies for metastatic prostate cancer very often involve androgen ablation either by chemical or surgical means, known broadly as castration. While castration is initially highly effective at controlling the disease, almost all cancers eventually become resistant to treatment and enter a phase known as castration-resistant prostate cancer (CRPC). For a long period ending in 2004 with the approval of docetaxel, treatments with overall survival (OS) advantage were elusive for CRPC patients. More recently, two new androgen-signaling pathway inhibitors, abiraterone and enzalutamide, seem to be quite promising with similar modest OS advantage, however the prognosis for metastatic CRPC patients remains guarded at best.

CRPC has a very strong predilection for bone metastases with up to 90% of patients developing osseous lesions. These osseous metastases – and ensuing so-called skeletal related events – confer an increased risk of death, a lower quality of life, high healthcare utilization and increased morbidity. Skeletal related events (SRE) fall into four categories, namely: (1) use of external beam radiation to relieve bone pain in a palliative setting, (2) tumor-related pathological fracture, (3) tumor-related spinal cord compression and (4) tumor-related orthopedic surgical intervention.

While many other tumors kill via soft-tissue metastases, deaths from prostate cancer are often due to bone disease and its complications. Given that bone disease and SREs are strong drivers of morbidity, mortality and healthcare costs in CRPC, there is considerable interest in new therapeutic options for this group of patients. Prior bone-targeted therapies such as bisphosphonates, denosumab, and beta-emitting radioisotope treatments all failed to show OS advantage, although some did offer modest pain palliation.

In 2014 the latest addition to the metastatic CRPC armamentarium, Radium-223 (Xofigo®), was approved by Health Canada based on the pivotal ALSYMCA trial which showed OS benefit, clinically significant reduction in bone pain and a delay in time to first SRE.

Radium-223, administered IV as the dichloride salt $RaCl_2$, is a bone-seeking, alpha-emitting radiopharmaceutical which selectively targets bone metastases. As a calcium mimetic, it is incorporated into the bone matrix by osteoblastic activity and delivers high doses of very concentrated alpha radiation. Given the very short path-length of alpha particles *in vivo*, the adjacent bone marrow is largely spared, yielding a vastly superior toxicity profile as compared with the previous generation of therapeutic bone-seeking radiopharmaceuticals, the beta emitters based on strontium-89 and samarium-153. This allows a much higher radiation dose to be delivered to the tumor without causing bone marrow suppression in treated patients.

Administered in Nuclear Medicine departments on a weight-based single-dose monthly basis for 6 total doses over 6 months, the treatment is simple, extremely well tolerated and it is safe for the patients to go home to their families immediately following the short infusion. Radium-223 is rapidly cleared from the blood and accumulates in regions of high osteoblastic activity; the portion which is excreted leaves the body mostly via the feces.

Safety and efficacy including OS benefit have been demonstrated in multiple subgroups of CRPC patients, namely those both pre and post docetaxel and those with anywhere from 2 bone lesions to a "superscan." Hematologic safety profile is excellent with about 5% of patients developing thrombocytopenia or neutropenia over placebo and no increase in anemia. Diarrhea (10% over placebo) and vomiting (4% over placebo) seem to be the most common side effects and these are usually mild and easily treated. A majority of patients have no treatment-related side effects whatsoever. Unlike other systemic cytotoxic chemotherapy regimens, where patients often need to decide between quality of life and quantity of life, with Radium-223 no such trade-off exists. Quality of life scores are improved across the board with major reductions in bone pain and a significant delay in time to first SRE: Patients are both living longer and living better.

Preliminary data seems to indicate that Radium-223 is synergistic with abiraterone and enzalutamide in CRPC although large-scale randomized controlled trials are currently underway to define the sequence in which these agents are best administered. Large trials are also currently enrolling patients with metastatic bone disease from breast and other malignancies.

In summary, the alpha-emitter radium-223 is a novel, safe, well tolerated, effective therapy with OS and quality of life benefit for patients with metastatic bone disease from CRPC. ■

"Preliminary data seems to indicate that Radium-223 is synergistic with abiraterone and enzalutamide in CRPC although large-scale randomized controlled trials are currently underway to define the sequence in which these agents are best administered."

In the treatment of patients with CRPC with symptomatic bone metastases*

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PrXofigo® (radium Ra 223 dichloride) is indicated for the treatment of patients with castration-resistant prostate cancer with symptomatic bone metastases and no known visceral metastatic disease.

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- Other relevant warnings and precautions regarding receiving, storing, using, transferring, administering and disposing of Xofigo®, completing treatment for spinal cord compression and/or stabilizing bone fractures before starting or resuming Xofigo®, avoiding risk of contamination, patients with inflammatory bowel disease and increased risk of bowel obstruction, patients with constipation, patients with Crohn's disease or ulcerative colitis, performing hematological evaluation of patients at baseline and prior to every dose of Xofigo®, use of condoms in men who are sexually active and use of effective contraception in female partners of reproductive potential during, and for 6 months after their partner's treatment with Xofigo®.
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*CRPC: castration-resistant prostate cancer.
‡Best standard of care (BSC) was defined as the routine care provided at each center such as local external-beam radiation therapy, glucocorticoids, antiandrogens, ketoconazole, estrogens, or estramustine.
§Updated analysis results.
¶Hazard ratio <1 favours Xofigo®. Hazard ratio is from a Cox proportional hazards model adjusted for total ALP, current use of bisphosphonates, and prior use of docetaxel.

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Xofigo® radium Ra 223 dichloride SOLUTION FOR INJECTION

See additional safety information on page 74

A MORE ENJOYABLE AND MORE DIAGNOSTIC IMAGING EXPERIENCE FOR CHILDREN

Dr. Steven Burrell, MD, FRCPC

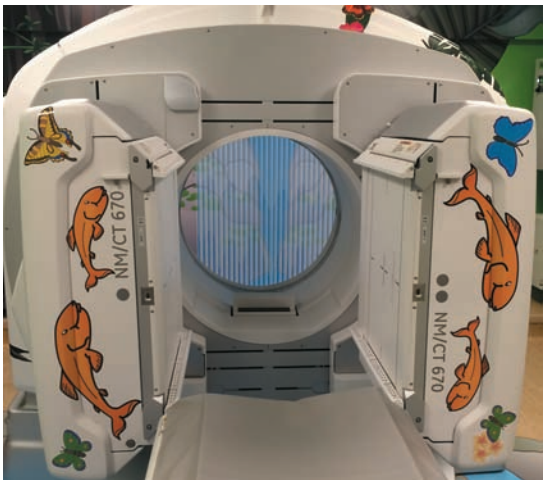
Nuclear Medicine Specialist, IWK Health Centre and QEII Health Sciences Centre

Professor of Radiology, Dalhousie University Nova Scotia Canada

Nuclear Medicine plays an important role in the management of pediatric diseases. By assessing physiologic and molecular processes, Nuclear Medicine provides a unique assessment of childhood disorders of the kidneys and bladder, the gastrointestinal tract, the bones and joints, and the heart and lungs, and assesses systemic illnesses including infection and cancer. However, there are two limitations. Nuclear Medicine studies do not depict anatomy well, which sometimes hinders assessment. Further, these studies can take a long time to acquire, leading to difficulties imaging young patients who are unable or unwilling to fully cooperate. Both of these limitations are addressed by a new scanner and accompanying jungle-themed room at the IWK Health Centre in Halifax, the tertiary pediatric facility for the Maritime Provinces.

The first thing the young patient encounters upon entering the room is a bright, captivating jungle environment, incorporating the scanner and the surroundings, with lush vegetation and friendly animals. The theme of this GE Adventure Series is a jungle safari: stepping stones lead from the door to a "stream" in the middle of the floor. The scanner bed simulates a dug-out canoe, which the child is eager to climb onto. The canoe travels into the "tunnel" of the scanner, and fish on the scanner appear to leap over the young patient as the camera slowly rotates to perform the scan. The child is entertained, and distracted, throughout the scan by seeking and discussing the various jungle creatures, aided by the Nuclear Medicine technologist. The net result is a more fun experience, which is less stressful for the child, and thus for family members. Many patients now look forward to return visits, which is important as many undergo several scans throughout the course of their illness. There is an important medical benefit as well. Patients have to lie still during the 30-60 minutes required to complete the scan in order to obtain diagnostic quality images, and in children this often requires sedation. Centres with this Adventure Series have demonstrated a substantial reduction in the number of children requiring sedation for their scans.

"The first thing the young patient encounters upon entering the room is a bright, captivating jungle environment, incorporating the scanner and the surroundings, with lush vegetation and friendly animals."



Figures 1 and 2:
GE Adventure Series SPECT-CT scanner and room at the IWK Health Centre in Halifax.

But this system is about more than just style; there is substance as well. The scanner itself is a state of the art hybrid SPECT-CT machine, incorporating in a single device a nuclear medicine camera with 3-dimensional capabilities (SPECT, or Single Photon Emission Computed Tomography), and a conventional CT (Computed Tomography) scanner. These 2 cameras assess physiologic processes (SPECT) and anatomy (CT), creating a diagnostic synergy which frequently leads to a more accurate diagnosis than either approach alone. While patients could undergo both a SPECT scan and a CT scan separately on different machines, acquiring the 2 at the same time allows accurate fusion of the 2 types of images, and importantly means the child only has to undergo 1 imaging session. These hybrid scanners have greatly enhanced the field of Nuclear Medicine in the past several years, including recently in pediatric centres.

There are 2 general advantages to adding a CT scan to a Nuclear Medicine scan:

1. **Localization.** Nuclear Medicine scans depict the distribution of an injected radiopharmaceutical, some of which goes into disease processes, while some goes into normal organs. It can sometimes be difficult to distinguish between the two on a scan due to a lack of anatomy in the images.

2. **Characterization.** Sometimes abnormal activity is detected on a Nuclear Medicine scan but it cannot be determined precisely what process is responsible for that activity. Frequently the CT scan reveals the specific nature of the abnormality. In such cases the Nuclear Medicine scan finds the abnormality, while the CT helps determine what it is.

One of the most common specific applications in pediatrics is in bone scanning, performed with ^{99m}Tc-MDP. The enhanced localization and characterization is very helpful in assessing cancer in the bone, either originating from the bone (primary) or spread to the bone (metastases). Other important uses in bone scanning include benign (non-cancerous) bone lesions such as osteoid osteomas, bone injuries, bone infection, and developmental abnormalities, for example of the spine or bones of the foot.

Hybrid SPECT-CT imaging is very useful in other cancer imaging applications in children. It is particularly helpful in imaging of neuroblastoma with ^{123}I-MIBG. Neuroblastoma is the most common childhood solid tumor outside of the brain. Hybrid SPECT-CT imaging is particularly important in this form of cancer, as MIBG activity is critical in monitoring therapy, and yet MIBG scans alone can be difficult to interpret due to a lack of anatomic landmarks. ^{111}In-Octreotide scans are used to assess neuroendocrine tumors which occasionally present in childhood, and here too hybrid SPECT-CT imaging is very helpful in accurately determining the extent of disease, at initial presentation and in response to therapy.

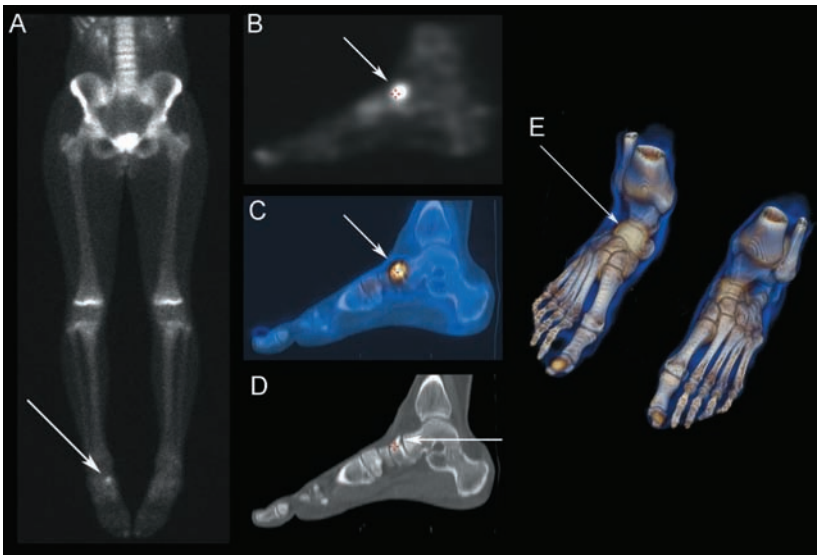


Figure 3:
A teenage girl presented with pain and a limp. A lower-body bone scan with ^{99m}Tc-MDP (A) revealed a focus of abnormal activity in the right foot. SPECT-CT was performed of the feet, and sagittal slices are displayed (B-D). The SPECT (bone scan) component (B) confirms intense activity in the mid foot. The fused SPECT-CT scan (C) accurately localizes the abnormality to the navicular bone, adjacent to the talo-navicular joint. Finally, the anatomic information provided by the CT scan (D) identifies a tiny fracture (osteochondral injury) responsible for the activity on the bone scan. A 3-Dimensional rendering (E) depicts the functional data from the bone scan (colour) fused with the anatomic data from the CT. The combined bone scan and CT proved invaluable in establishing the diagnosis in this patient.

SPECT-CT is valuable in a number of other pediatric Nuclear Medicine scans where the anatomic data from the CT scan provides important collaborative information, including ^{111}In-White Blood Cell scans for infection and inflammation, ^{99m}Tc-sesta-MIBI scans for parathyroid adenomas, ^{99m}Tc-Heat Damaged Red Blood Cell scans for splenules, and ^{99m}Tc-Pertechnetate scans for Meckel's diverticulum.
It should be noted that not all scans performed on the hybrid scanner require the CT component. Many Nuclear Medicine scans are diagnostic in their own right, and a CT is not performed. Conversely the CT can be run independently, and CT scans can be performed in the event of a problem with the hospital's main CT scanner.

In summary, hybrid imaging of children with a SPECT-CT scanner provides important diagnostic information in a wide range of diseases, better than either approach alone, and often better than if both scans are acquired separately. The jungle-themed GE Adventure Series scanner and room provide an engaging experience for the child, with less stress, fewer sedations, and an all-round better experience. ■

"The child is entertained, and distracted, throughout the scan by seeking and discussing the various jungle creatures, aided by the Nuclear Medicine technologist."

ENTREVUE AVEC LE DR. JEAN PHILIPPE VUILLEZ PRÉSIDENT DE LA SOCIÉTÉ FRANÇAISE DE MÉDECINE NUCLÉAIRE (SFMN)

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« En 2014, on comptait 595 médecins nucléaires en France, dont 60 % d'activité libérale (dont une partie est réalisée par les médecins hospitaliers). »

1. Tant en France que sur la scène internationale, la médecine nucléaire française jouit d'un grand respect. Comment cette reconnaissance est devenue possible?

Disons que la médecine nucléaire est en France reconnue comme une spécialité à part entière, ce qui nécessite beaucoup d'efforts, mais ce à quoi la communauté tient beaucoup, et qu'il faut, à mon avis, absolument préserver.

Ceci passe par un acharnement permanent à maintenir au premier plan, et à les dynamiser, les spécificités de la spécialité, à savoir :

- La valorisation du type d'information apportée par la médecine nucléaire : il s'agit d'informations liées à la physiologie et la biologie cellulaires, véritable accès à une « biochimie *in vivo* », et qui correspond tout à fait au concept moderne d'imagerie moléculaire.

- C'est donc le concept de biologie des « traceurs » (médicaments radiopharmaceutiques, MRP) qui est au cœur de la spécialité et qui explique la biodistribution, étudiée au cours du temps (aspect dynamique), de ces MRP.

- La compétence des médecins nucléaires repose donc avant tout sur de solides connaissances en biologie, biochimie, biologie cellulaire et physiologie

– alors que les radiologues sont avant tout d'excellents anatomistes, ce qui permet de souligner la très grande complémentarité des deux spécialités – imagerie médicale et médecine nucléaire.

- La médecine nucléaire s'affirme donc comme la spécialité la mieux à même d'éclairer la compréhension des mécanismes physio-pathologiques des maladies, ce qui lui confère une grande pertinence pour la caractérisation des pathologies, les approches pronostiques et l'évaluation de l'efficacité des traitements.

- La médecine nucléaire est donc aussi une spécialité très clinique, ce qui nécessite une bonne formation à la clinique, et un exercice proche des patients (consultation systématique dans toute la mesure du possible).

- La médecine nucléaire comporte un versant thérapeutique en cancérologie en particulier (également en rhumatologie avec les syno-viorthèses), en apportant une modalité originale et non redondante avec les autres modalités (donc idéale pour réaliser des associations), à savoir la radiothérapie interne vectorisée (RIV) qui, malgré les difficultés, se développe en France.

2. Quelle est la situation actuelle de la pratique de la médecine nucléaire en France?

Les données exhaustives en 2014 (entre parenthèses, l'évolution par rapport à 2013) :

a. *Combien d'unités de médecine nucléaire en France et dans ses territoires ou départements outre-mer?*

On compte 229 services de médecine nucléaire répartis en environ 60 % de services publics et 40 % de services libéraux.

b. *Combien de nucléistes?*
En 2014, on comptait 595 médecins nucléaires en France, dont 60 % d'activité libérale (dont une partie est réalisée par les médecins hospitaliers).

c. *Combien de jeunes nucléistes sont en formation ?*

Il existe actuellement 36 places pour intégrer de nouveaux internes dans le DES de médecine nucléaire chaque année

d. *Combien de caméras : 569 (-1,5 %) réparties en :*

- 123 caméras TEP-TDM (+2 %)
- 446 caméras TEMP (-2 %) dont :
    - 197 TEMP seule (-16 %)
    - 217 TEMP-TDM (+9 %)
    - 32 caméras CZT (+ 39 %)

Il faut remarquer que, bien que ce ne soit pas une règle imposée, il y a près d'un médecin nucléaire par machine installée.

3. Quels sont les principaux défis dans l'immédiat et dans un futur éloigné de la pratique de la médecine nucléaire en France?

Le premier et le principal défi, à mon avis, est la préservation de la spécialité en tant que spécialité à part entière. La tendance actuelle est forte à favoriser les regroupements de plateaux techniques et à tout fondre en services centralisés réunissant toutes les modalités d'imagerie. Cette tendance est encore majorée par le mythe du « one stop shop » selon lequel en un seul passage sous machine, toutes les informations seraient recueillies, pour un temps minimal et un confort maximal du patient.

Si la logique de regroupement logistique des moyens est évidente et certainement à promouvoir, en revanche le risque est grand, si on n'y prend pas garde, d'appauvrir dans le même temps l'imagerie médicale (la radiologie) et la médecine nucléaire : à vouloir tout faire en même temps, on ne fait rien de satisfaisant…

Le second défi est d'accélérer la mise à disposition pour la clinique des nouveaux médicaments radiopharmaceutiques. Il faut là être imaginatifs pour la recherche translationnelle, à la fois sur le plan réglementaire et sur le plan financier. Nous y travaillons avec les tutelles et avec les industriels.

Le troisième défi est celui de l'intégration : la médecine nucléaire doit s'imposer dans l'approche multidisciplinaire de la prise en charge des maladies, et sortir du relatif isolement où la confinent les questions de radioprotection et leurs aspects réglementaires contraignants. Cette intégration est très avancée en cardiologie, elle se développe en cancérologie et en neurologie, mais il faut encore progresser… ceci souligne à nouveau l'impérieuse nécessité d'une solide formation clinique pour les médecins nucléaires, qui doivent participer pleinement aux démarches diagnostiques et thérapeutiques.

Enfin, j'insisterai sur un dernier défi qui est de ne pas louper le virage de la RIV. Celle-ci doit absolument trouver sa place, notamment en consolidation ou en adjuvant, dans les cancers où son efficacité est démontrée : lymphomes malins, tumeurs endocrines ou très probable : cancers bronchiques, cancers digestifs, cancers de la prostate et prometteuse avec les nouveaux MRP marqués au lutétium 177 ou avec des émetteurs alpha.

4. Quels seront les grands développements de la médecine nucléaire dans un avenir prévisible, autant dans le domaine diagnostique que thérapeutique?

La médecine nucléaire a maintenant dépassé le stade du simple aspect diagnostique, complémentaire de l'imagerie morphologique, qui lui a permis de venir à maturité : diagnostic d'extension des cancers, diagnostic de l'ischémie myocardique, mise en évidence de plaques amyloïdes dans le cerveau, anomalies de perfusion, troubles d'expression de récepteurs etc.

Le fait que les images scintigraphiques traduisent des mécanismes biologiques précis transforme *de facto* les examens de médecine nucléaire en outils de **caractérisation tissulaire** (en cancérologie, on parle de caractérisation tumorale), laquelle débouche sur des applications très performantes pour le **pronostic** et pour **l'évaluation thérapeutique** qui devraient constituer deux axes majeurs de développement dans les années à venir.

On peut également évoquer les possibilités de prédiction, devant des syndromes mal définis ou bénins, d'une évolution vers une pathologie donnée : prédiction des démences devant des troubles cognitifs non spécifiques, prédiction des accidents vasculaires dans les syndromes métaboliques, diagnostic des plaques à risque dans l'athérome, diagnostic des formes agressives de certaines maladies qu'il est nécessaire de traiter (à la différence des formes latentes qu'il faut simplement surveiller) : cancers prostatiques, myélome multiple, tumeurs endocrines…

Enfin, la RIV devrait s'imposer dans tous les cas où une maladie cancéreuse persiste sous forme de lésions disséminées de petite taille (quelques mm) : en consolidation en cas de maladie résiduelle probable, en adjuvant dans les formes à haut risque métastatique, en première ligne dans les maladies

« La médecine nucléaire a maintenant dépassé le stade du simple aspect diagnostique, complémentaire de l'imagerie morphologique, qui lui a permis de venir à maturité : diagnostic d'extension des cancers, diagnostic de l'ischémie myocardique, mise en évidence de plaques amyloïdes dans le cerveau, anomalies de perfusion, troubles d'expression de récepteurs etc. »

« La médecine nucléaire peut donc, et doit, contribuer à l'application de traitements véritablement adaptés à chaque patient; combiné avec sa capacité à apprécier l'efficacité des traitements et ses performances en matière de pronostic, tout est là pour une forte contribution à la médecine dite personnalisée. »

métastatiques à un stade précoce… l'arrivée des émetteurs alpha sera pour cela d'un apport considérable.

5. La médecine nucléaire a-t-elle un rôle dans la médecine personnalisée?

Cela semble une évidence. Encore faut-il le démontrer, et encore plus le mettre en pratique. Comme nous venons de le dire, le ciblage sélectif de molécules dans l'organisme, ayant une signification biologique et donc physiopathologique précise, mettent en évidence chez chaque patient l'expression de telle ou telle molécule cible, ce qui dégage un véritable « profil phénotypique scintigraphique » (ce que Wagner, en 1994, qualifiait déjà de « chemotype ») et ouvre la voie à l'application de traitements adaptés à cette cible.

La médecine nucléaire peut donc, et doit, contribuer à l'application de traitements véritablement adaptés à chaque patient; combiné avec sa capacité à apprécier l'efficacité des traitements et ses performances en matière de pronostic, tout est là pour une forte contribution à la médecine dite personnalisée. Mais cela passe, insistons à nouveau, sur une excellente connaissance et la maîtrise de la biodistribution des MRP toujours plus sélectifs que nous utilisons, c'est-à-dire du comportement biologique de ces MRP. L'imagerie « hybride », qui fait la part belle au support anatomique apporté par la TDM (ce qui représente une avancée majeure pour la précision du diagnostic), ne doit pas obérer cet aspect fondamental qui est au cœur même de la spécialité.

Si on sait s'en souvenir, alors oui la médecine nucléaire est une part de la médecine personnalisée. Cela pose d'ailleurs des problèmes, car le corollaire est que les MRP, étant de plus en plus sélectifs, sont appelés à être utiles à des groupes de patients de plus en plus restreints : leur rentabilité économique doit donc être recherchée ailleurs que dans la quantité utilisée, ce qui devra être résolu en inventant des valorisations adaptées en s'appuyant par exemple sur les évaluations socio médico économiques montrant les bénéfices réalisés grâce à leur utilisation.

6. En tant que président de la Société Française de médecine nucléaire, quel est votre plus grand souhait?

Que la jeune génération des médecins nucléaires s'approprie tout ce que nous avons dit, investisse dans les techniques d'avenir en gardant les spécificités de la médecine nucléaire et en les développant encore. Il y a un énorme potentiel chez les jeunes, nous devons leur montrer la voie et leur faire confiance pour qu'ils prennent le relais, mais en préservant les caractéristiques d'une spécialité médicale à part entière et qui doit le rester. Pour cela il faut entretenir l'enthousiasme actuel des internes pour notre spécialité. ■

Dr. JEAN PHILIPPE VUILLEZ
MD, PhD

CAS CLINIQUES

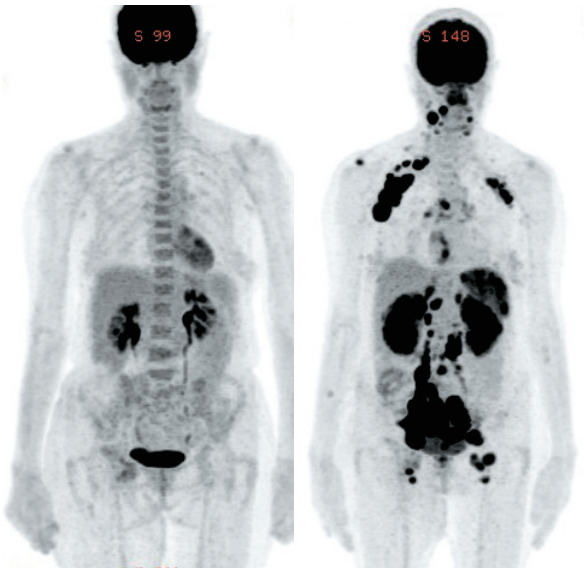
À QUOI SERVENT LES MÉDICAMENTS DIAGNOSTIQUES RADIOACTIFS EN CANCÉROLOGIE ?

La médecine nucléaire est une spécialité médicale d'imagerie fondée sur l'utilisation de « médicaments radiopharmaceutiques » (MRP), médicaments marqués avec un atome radioactif et avec des propriétés biologiques qui en font des « molécules intelligentes », capables de se fixer sélectivement sur une cible donnée dans l'organisme. Convenablement choisie, cette cible est représentative d'une maladie et lorsque le MRP reconnait la cible, il se fixe dans les tissus malades, qui accumulent ainsi de la radioactivité. La détection de cette radioactivité avec des caméras spécialement conçues pour cela se traduit par des images appelées « scintigraphies ». En fonction du MRP administré, chaque scintigraphie renseigne sur tel ou tel dérèglement de tel ou tel organe, ou sur la présence de tissus anormaux.

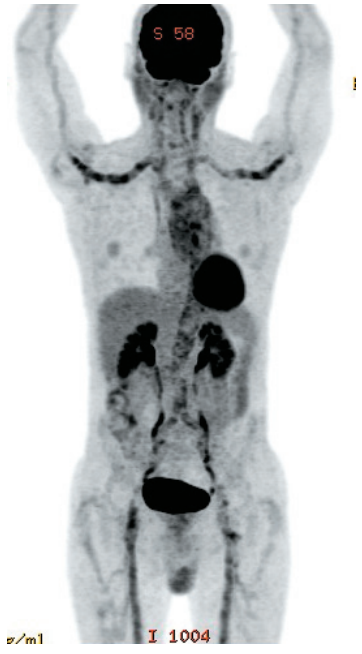
Un champ d'application important est la cancérologie. Un MRP très utilisé est le FDG (pour fluorodéoxyglucose) marqué au fluor 18 qui est un émetteur de positons qu'on peut détecter avec les caméras à positons (TEP).

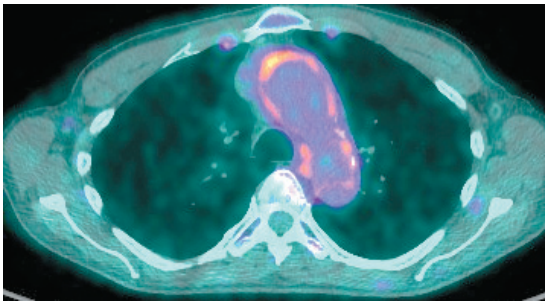
Le FDG est un analogue du sucre (le glucose) qui s'accumule dans les cellules de nombreux cancers, très consommatrices de glucose pour assurer leur croissance et leur prolifération. Nous en avons un exemple sur l'image de gauche ci-dessous, obtenue en face antérieure chez un patient atteint d'un lymphome malin (maladie cancéreuse des ganglions lymphatiques). On voit, outre la fixation normale dans le cerveau et les reins, de très nombreuses fixations anormales (en noir) qui correspondent à des localisations nombreuses et disséminées de la maladie dont on a ainsi une très bonne idée de

l'étendue et de la gravité. Mais la technique apporte encore plus : après seulement deux cures de chimiothérapie, on constate (image de droite) que toutes ces images de consommation excessive de glucose ont disparu (les lésions elles sont toujours là), ce qui veut dire que la chimiothérapie est efficace et doit donc être poursuivie (si les fixations persistaient, on changerait de traitement).



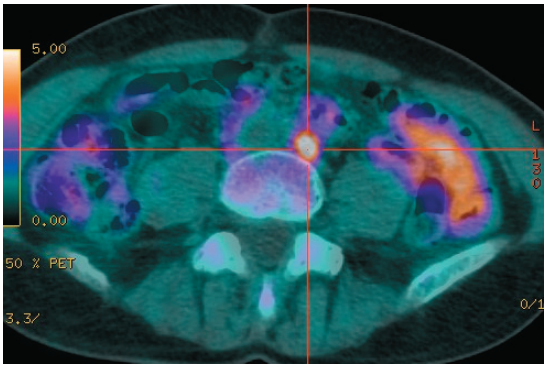
Le FDG est ainsi très utile en cancérologie, mais aussi dans les maladies inflammatoires car les foyers inflammatoires contiennent aussi des cellules qui consomment beaucoup de glucose. L'image suivante montre (à gauche) une important inflammation des artères chez un patient atteint d'une maladie de Horton; à droite une coupe horizontale du thorax montre bien l'inflammation de l'aorte, que l'on visualise sur la coupe de scanner réalisée simultanément avec des rayons X.

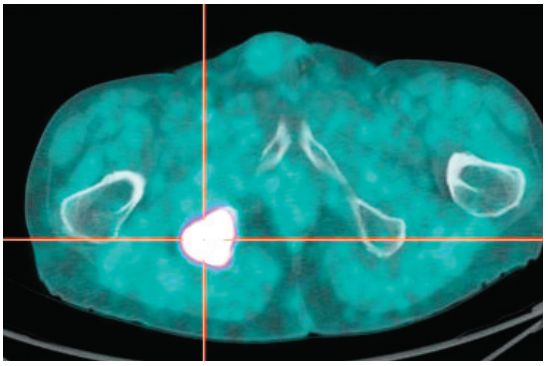




Par ailleurs, le FDG n'est pas performant dans tous les cancers; par exemple il est très peu utile dans les cancers de la prostate. C'est pourquoi un autre MRP marqué aussi au fluor 18, la fluorocholine, est utilisée : elle s'accumule dans certaines cellules cancéreuses, en particulier dans les cancers de prostate.

Chez un patient traité et en rémission, mais chez qui un marqueur sanguin (le PSA) augmente, on doit rechercher une rechute et la TE à la fluorocholine permet de localiser celle-ci. C'est le cas ici chez ces deux patients : sur l'image de gauche, on repère très bien en avant de la vertèbre une rechute dans un nœud lymphatique. Sur l'image de droite, cet autre patient a une atteinte osseuse métastatique de l'os du bassin. ■





« La médecine nucléaire est une spécialité médicale d'imagerie fondée sur l'utilisation de « médicaments radiopharmaceutiques » (MRP), médicaments marqués avec un atome radioactif et avec des propriétés biologiques qui en font des « molécules intelligentes », capables de se fixer sélectivement sur une cible donnée dans l'organisme. »

L'ÉPARGNE FORCÉE…
SOLUTION POUR LES INDISCIPLINÉS?

Sylvain B. Tremblay, ADM. A., PL. FIN.
Vice-président
Relations d'affaires
Gestion privée
OPTIMUM GESTION DE PLACEMENTS INC.

Épargner, c'est comme les fibres, ou les légumineuses. On sait que c'est bon pour nous. Essentiel, même, mais quand vient le temps de passer à l'action, On est inégalement enthousiaste, inégalement efficace…

Il suffit de regarder autour de soi pour se rendre compte que bon nombre de consommateurs abordent la retraite avec comme seul actif leur maison, mais trop souvent que partiellement payée. En disposant de sa résidence, le consommateur libère ainsi un bon montant de capital producteur de revenu avec lequel il pourra soit s'acheter une rente viagère auprès d'un assureur ou bien se constituer un portefeuille de placements qui convient à son degré de tolérance au risque, à partir duquel il ponctionnera mensuellement les émoluments dont il aura besoin pour vivre. Imaginez quel aurait été la situation s'il avait passé sa vie locataire au lieu d'un jour décider de devenir propriétaire?

AUTO-IMPOSÉE PAR L'ÉPARGNANT

Achat d'une résidence
et financement hypothécaire

Prenons un exemple simplifié à l'extrême. Denis possède une maison qui nécessite des paiements en capital et intérêts de 1000 $ par mois, dont l'équivalent de 500 $ sera récupéré à la disposition de celle-ci. Il récupère à l'échéance du terme 500 $m mais la transaction implique un coût de 500 $ (1000 - 500). En le forçant à payer 1000 $, on a réussi à lui faire épargner 500 $. C'est ce qu'on peut définir comme de l'épargne forcée. D'autres options de logement sont bien entendu disponibles à coût moindre pour Denis, comme la location, disons à 600 $, mais saura-t-il se discipliner à épargner les 400 $ autrement capitalisés dans le paiement de sa maison? Dans notre exemple, on constate que bien que le logement de Denis ne constitue pas l'affaire du siècle, cette façon de faire lui permet d'accumuler un montant en capital qu'il n'aurait pas eu la discipline d'accumuler autrement.

« En passant, au sujet du marché immobilier, nous sommes présentement à l'apogée d'une période haussière qui dure depuis plus de 15 ans. »

En passant, au sujet du marché immobilier, nous sommes présentement à l'apogée d'une période haussière qui dure depuis plus de 15 ans. La situation n'est hélas pas toujours caractérisée par ce type de tendance. Certains d'entre nous se rappelleront les années 90 au cours desquelles la croissance de valeur a été pratiquement nulle, voire négative, pendant que les taux hypothécaires diminuaient de plus de 50 %... Est-ce que ce même marché pourrait vivre une période baissière en contexte de hausse des taux hypothécaires ? Possible.

AUTRES MOYENS?

Voici quelques moyens simples de s'astreindre à épargner auxquels plusieurs personnes ont recours :

1. Placement périodique systématique

Il s'agit pour l'épargnant de budgéter une mensualité déterminée qu'il déposera dans un portefeuille de placements lui permettant de progressivement se constituer un capital qui pourra répondre à ses objectifs à moyen et long termes.

2. Cotisation maximum au fonds de pension

Pour les personnes ayant à leur disposition un fonds de pension à cotisations déterminées, s'assurer de se prévaloir de l'avantage maximum offert par le régime. À la cotisation de base obligatoire à ces régimes (3 % employé – 3 % employeur) est souvent assortie l'option de verser un supplément à partir d'un certain âge (+ 2 % à partir de 40 ans et 2 % supplémentaire à partir de 50 ans).

3. Achat d'un portefeuille de placement en utilisant son levier financier

Certaines sociétés financières que je ne nommerai pas offrent la possibilité de placer chez-elles une somme d'argent que vous ne possédez pas. Ils vous avancent alors l'argent, moyennant un taux d'intérêt quelconque, que vous placez dans les fonds de placements qu'ils offrent. Cette stratégie peut avoir un certain sens à long terme lorsque vous contrôlez ses coûts inhérents et que les placements choisis génèrent les performances suffisantes. Ce qui m'agace dans ce genre de stratégie c'est que certains représentants l'ont utilisée à outrance et qu'elle ne devrait être réservée qu'aux épargnants avisés.

IMPOSÉE PAR L'ÉTAT

Hausse des cotisations au régime de la RRQ et/ou RPC

Les cotisations que nous effectuons à partir de nos paies constituent une forme d'épargne collective forcée. Elles servent en effet à la capitalisation de nos régimes de retraite d'État. Ces cotisations ont augmenté de façon passablement importantes au cours de la dernière décennie et il n'est pas exclu que ce soit le cas au cours de la prochaine. « On veut notre bien et on l'aura… ».

Au risque qu'on m'affuble du qualificatif de « vil capitaliste », nous n'en serions pas à penser à de telles mesures correctives si tous nos concitoyens se prenaient un peu plus en main…

Qu'elle soit naturelle pour l'avare, le frugal et l'insécure ou forcée pour le commun des mortels, la faculté à épargner sous-entend toujours une certaine privation à court terme au profit d'un bénéfice à plus long terme. En d'autres termes, nous parlerons de consommation différée. ■

« Les cotisations que nous effectuons à partir de nos paies constituent une forme d'épargne collective forcée. Elles servent en effet à la capitalisation de nos régimes de retraite d'État. »

LE PATIENT
LE SEUL MAGAZINE DU MÉDECIN ET DU PHARMACIEN

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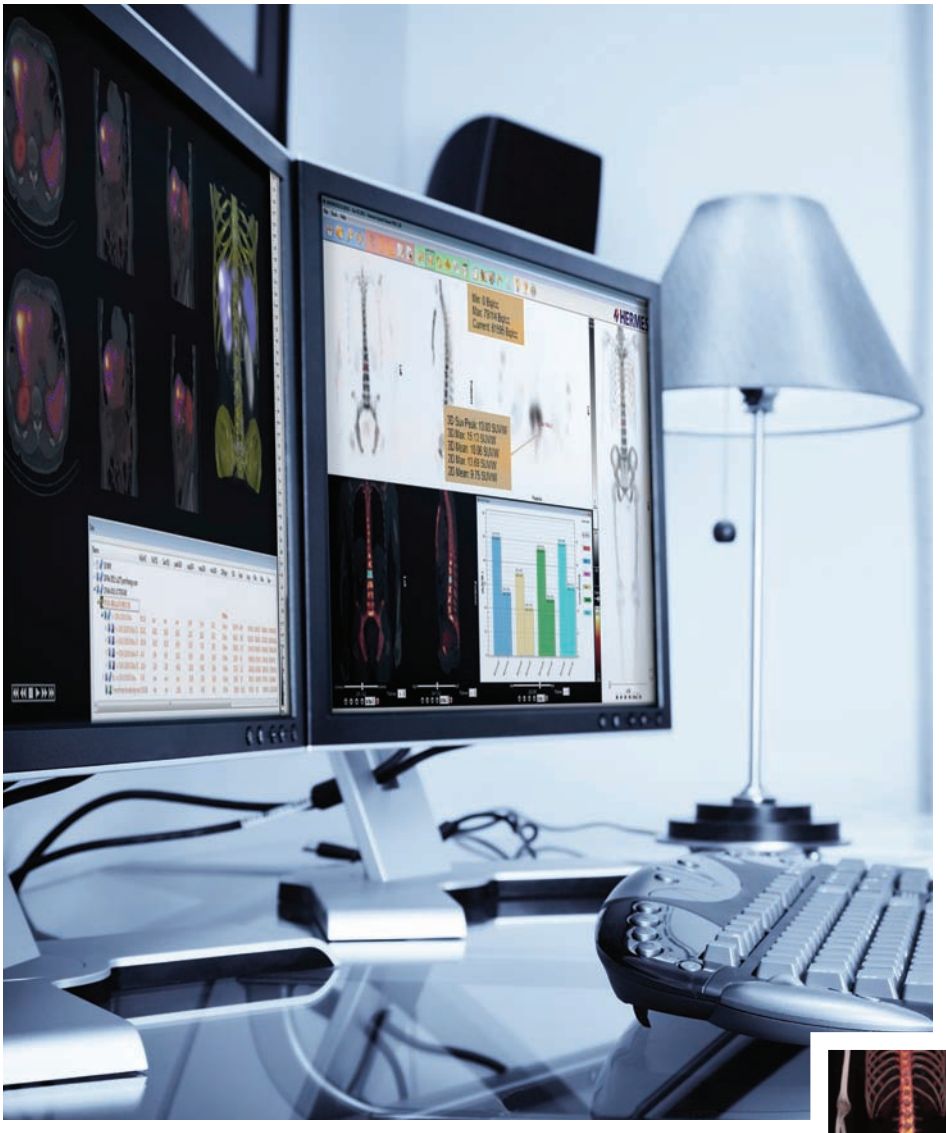

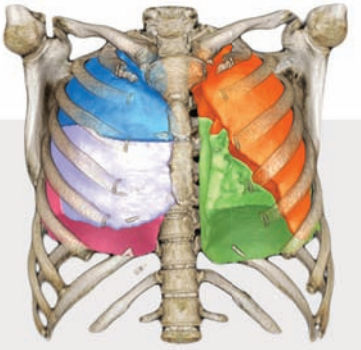

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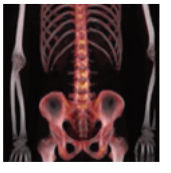

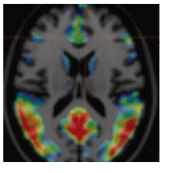

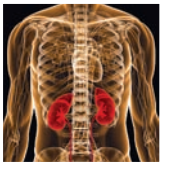

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