LE PATIENT

LE SEUL MAGAZINE DE TOUS LES PROFESSIONNELS DE LA SANTÉ

ÉDITION SPÉCIALE 2021 : MÉDECINE NUCLÉAIRE

SPECIAL EDITION 2021: NUCLEAR MEDICINE

Les femmes de la médecine nucléaire

Women in nuclear medicine

Marie Curie
et sa fille */ and her daughter*
Irène Joliot-Curie

AVRIL 2021
VOL 15 • NO 1
5,95 $
7 78313 04268 9 01
Société canadienne des postes. Envoi de publications canadiennes. Contrat de vente n° 40011180.

TECHNEGAS™
FUNCTIONAL LUNG IMAGING

BENEFITS
V/Q SPECT TECHNEGAS™

Proven diagnostic accuracy
with high sensitivity and specificity [1]

Minimally invasive
aiding patients's confort and compliance [2]

Detects subsegmental
Pulmonary Embolism (PE) [3]

Low radiation burden
26-36 times less absorbed dose to breast of females [4]

Technegas™ has minimal exclusion criteria and may be administered to most patients[4-6] including:
Renal impaired | Contrast allergy | Diabetics
Chronic Obstructive Pulmonary Disease (COPD) | Critically ill
Pregnant

V/Q SPECT TECHNEGAS™
IN NUCLEAR GUIDELINES

The EANM Guidelines[7] strongly recommend ventilation-perfusion single photon emission computed tomography (V/Q SPECT) as it allows the diagnosis of PE with accuracy even in the presence of COPD and pneumonia.

The CANM Guidelines[8] consider Technegas™ as the agent of choice in COPD population because it has less central airway deposition, better peripheral penetration and it does not wash away quickly as traditional aerosols. Only a few breaths are sufficient to achieve an adequate amount of activity in the lungs, reducing time and personnel exposure.

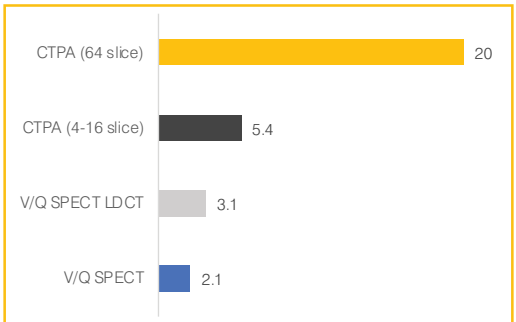


Table 1: Radiation exposure [8] (mSv)
(adapted from CANM guidelines, 2018)

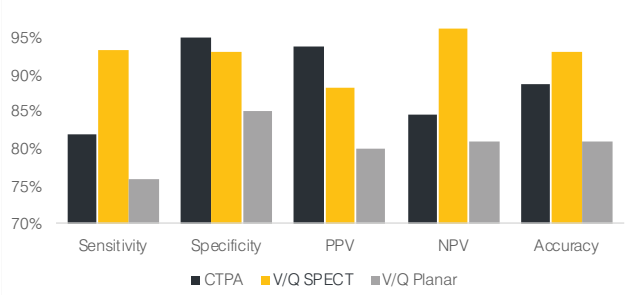


Table 2: Diagnostic ability of CTPA, V/Q SPECT and V/Q Planar to detect PE (adapted from Hess et al, 2016)

All PE's should have a final control 3 months after diagnosis to assess final reperfusion and to benefit from the availability of a baseline exam in case of recurrent symptoms. Low radiation exposure allows repeated studies (*table 1*).

With the uptake in SPECT imaging, V/Q SPECT results are seen as being superior to planar imaging and computed tomography (CTPA) when comparing sensitivity, negative predictive value and accuracy (*table 2*).[1]

Therefore, in situations of acute PE, chronic PE, pregnancy, paediatrics and the COPD population, V/Q SPECT can be considered as a first-line investigation due to its high sensitivity and specificity, low radiation and no adverse reactions.[8]

CLICK HERE TO LEARN HOW TO PERFORM A V/Q SPECT STUDY WITH TECHNEGAS™

References

1. Hess S, et al. Semin Thromb Hemost 2016; 42: 833–845
2. Sánchez-Crespo A, et al. Nucl Med Commun 2008; 29(2): 173-177
3. Grüning T, et al. Clin Imaging 2014; 38(6): 831-835
4. Isidoro J, et al. Phys Med 2017; 41: 93-96
5. Miles S, et al. Chest 2009; 136: 1546-1553
6. Nasr A, et al. EC Pulmon and Respir Medicine 2017; 4(3): 85-91
7. Bajc M, et al. Eur J Nucl Med Mol Imaging 46, 2429–2451
8. Leblanc M , et al. CANM Guidelines 2018; published Nov 2018

Technegas™ is not yet available for sale in the USA.
Last revision (A4): v.2.1 (14/Apr/2021)
For more information please visit **www.cyclomedica.ca** or email **technegas.sales@cyclomedica.ca**

cyclomedica

Éditeur
Ronald Lapierre

Comité d'orientation
Francois Lamoureux, M.D.,M.Sc, président
Jean-Luc Urbain M.D., Ph.D.

Directrice de la publication
Dominique Raymond

Développement des affaires et marketing
Nicolas Rondeau-Lapierre

Le Prix Hippocrate
Francine Champoux, directrice générale
Tél: 514-755-4029
fchampoux@prixhippocrate.com

Direction artistique et impression
Le Groupe Communimédia inc.
contact@communimedia.ca
www.communimedia.ca

Correction-révision
Anik Messier

Publicité
Nicolas Rondeau-Lapierre
Tél. : (514) 331-0661
nlapierre@editionsmulticoncept.com

Les auteurs sont choisis selon l'étendue de leur expertise dans une spécialité donnée. **Le Patient** ne se porte pas garant de l'expertise de ses collaborateurs et ne peut être tenu responsable de leurs déclarations. Les textes publiés dans **Le Patient** n'engagent que leurs auteurs.

Abonnement
4 numéros (1 an)
Canada : 30 $ par année
International : 46 $ (cdn) par année

Pour vous abonner
Par correspondance :
1600, boul. Henri-Bourassa Ouest, Bureau 405
Montréal (Québec)
H3M 3E2

Par téléphone : 514-331-0661

Le Patient est publié quatre fois par année par les Éditions Multi-Concept inc.
1600, boul. Henri-Bourassa Ouest, Bureau 405
Montréal (Québec)
H3M 3E2

Secrétariat :
Tél. : (514) 331-0661
Fax : (514) 331-8821

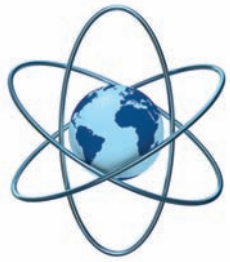
Toutes les annonces de produits pharmaceutiques sur ordonnance ont été approuvées par le Conseil consultatif de publicité pharmaceutique.

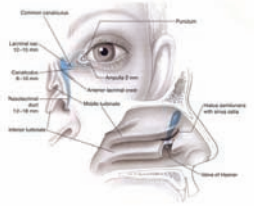
Dépôt légal :
Bibliothèque du Québec
Bibliothèque du Canada

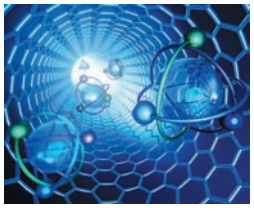
Convention de la poste-publication
No 40011180

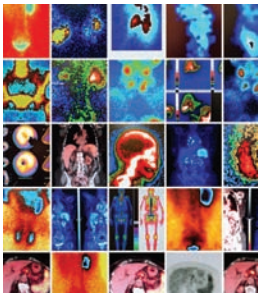
Financé par le gouvernement du Canada | Canada

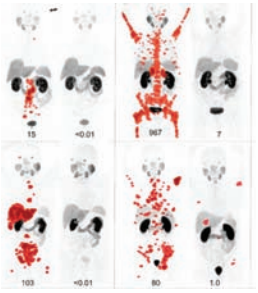
SOMMAIRE

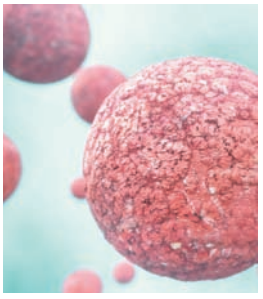












INTRODUCTION TO THE SPECIAL EDITION 2021: **NUCLEAR MEDICINE**

François Lamoureux
M.D.,M.Sc., FRCPC
President, CANM

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

" To contribute actively to the rebirth of Nuclear Medicine, we should be inspired by the illustrious, remarkable and exemplary life and professional achievements of Marie Curie whom We consider the mother of Nuclear Medicine. "

Francois Lamoureux and I are thrilled to introduce to our numerous readers this new issue of the internationally acclaimed Nuclear Medicine magazine LePatient.

The lack of concerted efforts in research and development of new radiopharmaceuticals in the last part of the 20th century created a climate of uncertainty about the field of nuclear medicine at the eve of the 21st century. In a very interesting and remarkable turn of events, the development of diagnostic and therapeutic radiopharmaceuticals based on diseases genotypes and phenotypes and so-called isotopes pairs (Nuclear Theranostics) have triggered a true renaissance of the field of Nuclear Medicine. the potentials of becoming the new holy grail of nuclear medicine.

Through their exquisite sensitivity and specificity, Nuclear Theranostics, in combination with hybrid imagers (SPECT/CT, PET/CT and PET/MR), will undoubtfully play a major role in precision medicine by significantly improving patient disease management, particularly in oncology. This is nicely elaborated in the recent article published in the recnt issue of the Macleans magazine https://www.healthinsight.ca/innovations/ushering-in-a-new-era-of-cancer-care/#.

As exhilarating as the rebirth of Nuclear Medicine can be, it is also full of challenges. A fully integrated diagnostic and therapeutic specialty, the practice of nuclear medicine requires in depth knowledge in many different fields of medicine, complex imaging equipment along with an in depth understanding of patient's diseases and management, health care systems and health care economics. The needs for this type of complex knowledge, experience and expertise represents both unique opportunities and significant challenges for medical school and nuclear medicine centers across the globe.

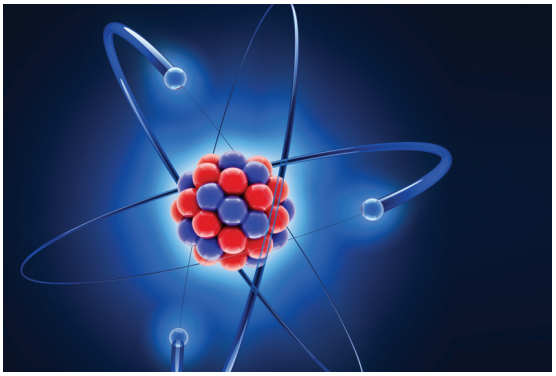
To contribute actively to the rebirth of Nuclear Medicine, we should be inspired by the illustrious, remarkable and exemplary life and professional achievements of Marie Curie whom we consider the mother of Nuclear Medicine. For her pioneered work and discovery of radioactivity, a term that Marie Curie and her husband Pierre Curie coined in their publications, the Royal Swedish Academy of Sciences awarded in 1903 Marie Curie, her husband Pierre Curie and Henri Becquerel the Nobel Prize in Physics. Her daughter, Irene Joliot-Curie, who followed her mother's steps also received with her husband, Frederic Joliot, the Nobel Prize in Chemistry Marie Curie, her husband and Henri Becquerel were awarded in 1903, the Nobel Prize in Physics for their discovery of artificial radioactivity.

Too often the women contributions to the field of nuclear medicine are unsung and unnoticed. The first part of the magazine is dedicated to the memory of Marie and Irene Curie who died of leukemia from exposure to radiation exposure resulting from their discovery of and work on radioactivity. The month of March is Women History Month. Through a series of interviews, we also wanted to celebrate in this issue of the magazine, the courage, strength, leadership, achievements, and challenges of contemporary women colleagues in Nuclear Medicine.

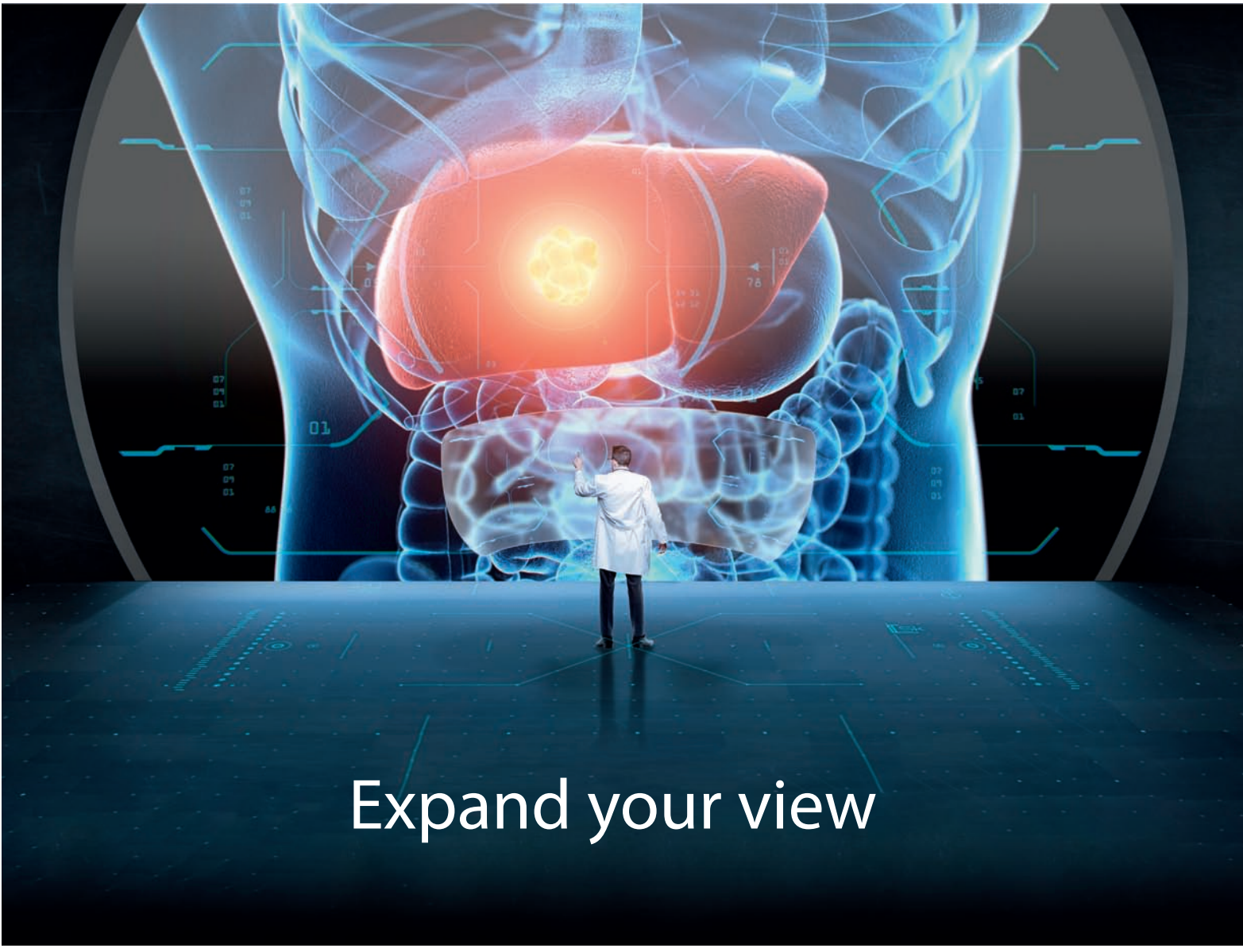
In the second part of the magazine, you will find the genuine testimony of international leaders in the field of Nuclear Medicine who are expressing their views on the current state of affairs on our field and wishes for the rebirth of our specialty.

Finally, we hope you will enjoy reading a potpourri of articles that illustrate nicely the current and future of our beloved specialty. ■

François Lamoureux
Jean-Luc Urbain



Canon
CANON MEDICAL



Aquilion Exceed LB

Contact Your Local Representative
CMSCA-Inquiry@medical.canon

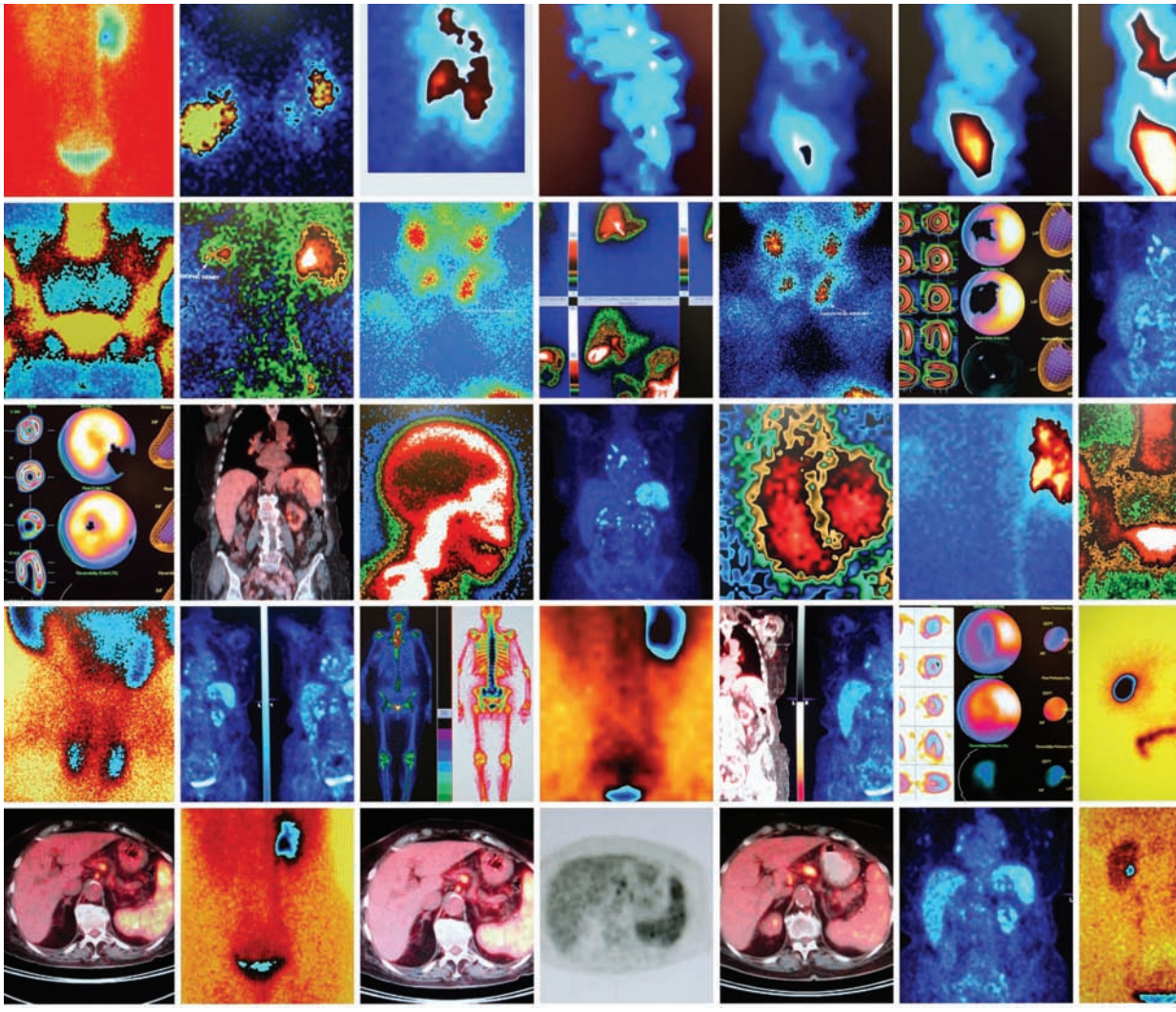
An advanced radiation oncology solution

With its 90 cm large bore, the Aquilion Exceed LB enables you to easily position your patients with extraordinary precision. Its powerful AI-based imaging technologies and advanced treatment-specific features allow for an efficient radiation oncology workflow without compromising on patient position, image quality, or reproducibility.

CANON MEDICAL SYSTEMS CANADA LIMITED
ca.medical.canon

Made For life

François Lamoureux,
M.D, M.Sc., FRCPC



LES AVANCÉES MÉDICO-PHARMACOLOGIQUES

L'ÉNERGIE NUCLÉAIRE
L'ARME SUPRÊME DES MÉDECINS NUCLÉISTES

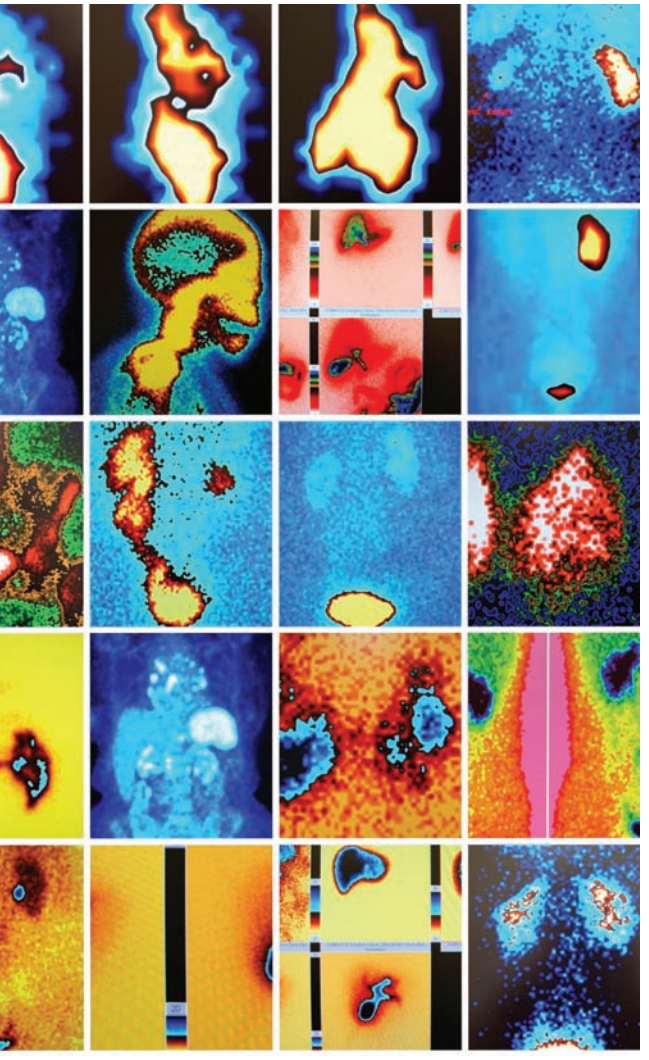
« Les médecins nucléistes, les technologues, les radiochimistes et les physiciens et informaticiens de ce monde sont les troupes d'élite utilisateurs au jour le jour de cette arme atomique pour le plus grand bénéfice de ces patients contre des maladies, c'est une sorte de guerre. »

Toutes les grandes puissances de ce monde se sont assurées de détenir une maîtrise de cette énorme puissance qu'est l'Énergie nucléaire. Que ce soit à des fins de production d'énergie pour éclairer des villes ou chauffer des maisons ou encore d'assurer la protection des maisons de ses citoyens, par exemple par des détecteurs de fumée à l'Américium 241, un émetteur de rayonnement alpha.

Aussi, l'Énergie nucléaire assure la grande liberté de déplacements de navires de guerre comme des porte-avions ou encore de sous-marins qui peuvent demeurer sous l'eau plus de six mois, contrairement aux sous-marins au diésel qui ne peuvent rester sous l'eau que quelques jours.

Certaines de ces grandes puissances produisent et accumulent des armes effroyables d'Énergie nucléaire à des fins de dissuasion ou potentiellement d'attaques nucléaires en cas de guerre. De multiples autres applications existent également, que ce soit pour stériliser des aliments, contribuer au dessalement de l'eau de mer, évaluer l'âge de fossiles d'animaux ou d'êtres humains momifiés, par exemple.

Mais l'application de cette énergie offre à l'être humain une avancée extraordinaire pour La détection de certaines maladies et, mieux encore, pour le traitement de multiples maladies qui soit abrègent prématurément la vie de nombreux êtres humains ou rendent la vie malheureuse ou souffrante à de multiples patients, c'est la MÉDECINE NUCLÉAIRE.



Les médecins nucléistes, les technologues, les radiochimistes et les physiciens et informaticiens de ce monde sont les troupes d'élite utilisateurs au jour le jour de cette arme atomique pour le plus grand bénéfice de ces patients contre des maladies, c'est une sorte de guerre.

Voilà la véritable ennemie de l'être humain, celle qui abrège sa vie, lui enlève ses proches ou encore le fait souffrir.

La Médecine nucléaire existe depuis les années 1940. Elle consiste à introduire dans le corps humain soit par une simple injection intraveineuse ou par inhalation d'infinitésimales quantités de radioisotopes seuls ou couplés à une molécule. Parfois on préparera un repas radioactif.

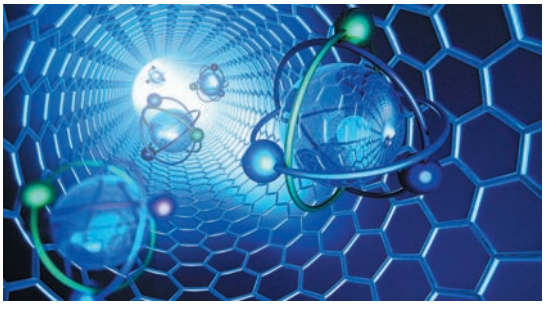
Ainsi, le patient sera, pour une courte période radioactive et au moyen de détecteurs couplés à de puissants ordinateurs que l'on nomme caméras à détection tomographique TEP ou SPECT, on visionnera en trois dimensions au niveau moléculaire différentes pathologies souvent à leur tout début. Le tout s'effectue de façon indolore, sans effraction significative et pratiquement sans effet secondaire. La majorité de ces examens se pratiquent en externe tant pour les adultes que pour les enfants. C'est une médecine douce, sécuritaire et combien un grand plus pour le patient.

De nouveaux radiotraceurs fourbissent continuellement l'armamentarium du médecin nucléiste et repoussent les limites du dépistage précoce de plusieurs pathologies comme des cancers, de l'ischémie cardiaque, des infections, des saignements occultes ou encore de sournoises fractures osseuses, par exemple. La Médecine nucléaire s'implique aussi de plus en plus ces dernières années dans le traitement de diverses maladies comme l'hyperthyroïdie, les cancers de la thyroïde, de la prostate, des tumeurs neuroendocrines, etc. La THÉRANOSTIQUE que d'aucuns pourraient qualifier d'arme suprême de la Médecine nucléaire. C'est un champ à peine exploré et en continuelle croissance. Dans plusieurs pathologies les schémas de traitement sont déjà ou seront à être modifiés. Au Canada, il y a environ 240 unités cliniques de Médecine nucléaire et tous les hôpitaux universitaires et régionaux possèdent un service de Médecine nucléaire. Cette médecine est devenue tellement indispensable que l'Agence Internationale de l'Énergie Atomique (AIEA), division de l'ONU, a reçu comme mandat de rendre accessible cette Médecine nucléaire à l'ensemble des pays émergents ou en voie de développement qui ne possèdent pas d'unité de Médecine nucléaire sur leur territoire.

L'Association canadienne de Médecine nucléaire et plusieurs de ses membres contribuent à l'effort de l'AIEA dans ces projets.

L'Énergie nucléaire est pour l'être humain inodore, incolore et non spontanément détectable. On a besoin, par exemple, de petits détecteurs personnels comme des dosimètres ou des compteurs Geiger ou des caméras de médecine nucléaire. C'est pourquoi l'être humain peut souvent craindre cette énergie soit par méconnaissance ou par sa difficulté à la détecter.

Mais une fois que l'on a bien compris toutes les propriétés de cette fantastique énergie, on réalise à quel point cet être humain a réussi à se prémunir d'une arme suprême pour détecter et combattre la maladie, cette grande ennemie de l'être humain. ■



« La Médecine nucléaire existe depuis les années 1940. Elle consiste à introduire dans le corps humain soit par une simple injection intraveineuse ou par inhalation d'infinitésimales quantités de radioisotopes seuls ou couplés à une molécule. »

« La théranostique que d'aucuns pourraient qualifier d'arme suprême de la Médecine nucléaire. C'est un champ à peine exploré et en continuelle croissance. »

Les femmes de la médecine nucléaire
Women in nuclear medicine

DR. HELEN NADEL

Helen R. Nadel
MD FRCPC (Diag Rad) (Nuc Med),
ABR (Ped Rad), ABNM
Director of Pediatric Nuclear Medicine
Lucile Packard Children's Hospital at Stanford
Clinical Professor of Radiology
Stanford University School of Medicine
Stanford, CA

In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/ nuclear medicine practitioner in Canada and in the US?

In medicine things have changed dramatically in the 35 years of my career and medical school classes are now 50% women. By sheer force of numbers, women have more chance to succeed and participate in leadership roles. It still takes a lot of work, passion, commitment, to help others and oneself advance the field with our patients always in our mind. In many ways, I was fortunate to be engaged in a relatively small field in nuclear medicine and then pediatrics. Some of the benefits of that allowed me to take advantage of opportunities to further my skills and interest and was able to get to know many people in my field who have been mentors, collaborators and most of all friends. I can't overemphasize how all of these roles in the people I have met along the way have been integral in my success. I think this is easier for women today than it would have been in Marie Curie's time. This benefits the field. My goal has always been to do the best for my patients and pass on the things I have learned along the way to make it easier for others to succeed. Just as I was successful, I now try to pay it forward to help others. These are some of the factors that have helped me become an expert in my field, help promote pediatric nuclear medicine, and help build a collaborative base for the future.

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine

Marie Sklodowska Curie was a unique human being who is in the limited distinguished group of people; and only woman; that have won two Nobel Prizes; one in Physics in 1903 with her husband Pierre Curie and Henri Becquerel; and a second in 1911 in Chemistry.

Her drive, work ethic and determination were unparalleled. She succeeded despite poor social situation of her family, barriers to her education, multiple barriers due to her gender which even included public social shaming. Her unequaled passion, drive, determination was her story despite these personal barriers and tragedy. She refused to allow this to deter her from her scientific goals. She must have had a great deal of confidence in her ideas and abilities that are more commonplace now but uncommon in her time. Her bringing radiology machines to the frontlines in World War 1 was a practical culmination of her life's scientific research and helped save countless lives. Her legacy continues with the success of her children and grandchildren in the scientific field.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

There is no greater gift than to have a passion and profession that allows you to help people. I encourage anyone, man or woman, who wants to devote their passion and conviction to a career in medicine. The way forward is to follow your compassion and conviction to enhance and enlarge your interests and carve out a niche over time by doing the best you can to push your field forward. I would encourage women to realize contributions to Professional Societies are a gift that gives back and helps make you a rounder, broader physician and offers a different opportunity for developing aspects of medicine that are not just clinical; to include medical scholar, leader, health advocate, communicator. Women often have to make choices early in their career to balance family, interests and needs while remembering that time is defined and that should not deter one from forging ahead. Women need to seek out meaningful mentors at various stages in their career.

Technological advances and the human genome project have brought the medical and scientific knowledge to

levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

The future of medical imaging is like the past; filled with change and opportunity. Medical imagers in the future will have to be more adept at learning new skills that have not necessarily been traditional such as new and different therapies and embracing a big part of the future that is artificial intelligence (AI) and genomics. Our specialty has always thrived on change and will continue to do this in the future as a collegial, collaborative part of the healthcare team. This will be necessary to provide the best care for our patients. Women are equal partners who realize that the future is filled with change and opportunities in an era of lifelong learning.

Should you be elected as Vice President-Elect of the SNMMI, what would be your major endeavors to establish and develop the field of Theranostics in the US.

I am honored to be nominated for the position of Vice President-Elect of the SNMMI and I am especially honored to follow four extraordinary women who have held this position, and one other Canadian. We are entering in a period of growth and expansion to be able to diagnose and treat our patients with advances in our field. I hope to be able to make a substantial contribution. There will be three main areas that I would direct my efforts:

1. Promoting a deeper understanding of the basic sciences that underpin out future as the leading practitioners of Theranostics and advocating for deeper collaboration with our allied health colleagues who help us advance our effort to help patients with these amazing techniques on a daily basis.

2. Expanding the SNMMI footprint in advocacy particularly around regulatory burden as the field increases in genomics, AI, bioethics. If we have learned anything in the past year of COVID-19, it has provided a model for how science, government, and private sector can radically shape the outcome of a public health issue. This is a template for how Theranostic development can be furthered in our field.,

3. Encouraging the development of comprehensive training programs for technologists, physicians, basic scientists.

Theranostics requires a broader and wider understanding of basic science. The radiation oncology aspects of therapy will be more and more demanding of nuclear medicine practitioners. No one specialist can know everything and there will be a greater need for collaboration with other specialties including Radiation Oncology, informatics, health physics, radiochemistry.

Professional associations including SNMMI with input from other societies such as CANM will lead the way in these three areas to ensure these life-altering therapies are accessible to all who need them. I am confident that we will accomplish this and more. ■

DR. JOLANTA KUNIKOWSKA
Professor of Nuclear Medicine
Warsaw Poland
President EANM

DR. JOLANTA KUNIKOWSKA

YOU ARE THE PRESIDENT OF the European Association of Nuclear Medicine (EANM). Could you succinctly describe the role of the EANM in the field od Nuclear Medicine?

The European Association of Nuclear Medicine (EANM) is the largest organisation dedicated to nuclear medicine, molecular imaging and theranostics in Europe. In this role, it has become the umbrella organisation which represents the whole sector (individuals as well as national societies) towards the European and international institutions. The EANM's vision is to optimise and advance science and education in nuclear medicine for the benefit of public health and humanity within the concept of personalised healthcare.

What have been the three most important changes that you have seen in the field of Nuclear Medicine over the last five years?

Nuclear Medicine over the last five years changed dramatically. First of all, new diagnostic radiopharmaceuticals were introduced to clinical practice. The best example is PSMA. Nowadays this is the main agent for prostate cancer imaging. PMSA, or glutamate carboxypeptidase II, was originally found to be specifically expressed in the epithelial cells of prostate

Les femmes de la médecine nucléaire
Women in nuclear medicine

cancer cells. However, recent studies have shown that PSMA is also involved in angiogenesis in other cancer types, such as glioblastoma, gastric cancer, colon cancer, bladder cancer, HCC, clear cell renal carcinoma, breast cancer, ovarian cancer, melanoma, and mesothelioma. PSMA it not only a novel target for diagnosis but also for therapy.

And this is the second major change in the evolution of nuclear medicine - targeted therapy. In the last years somatostatin analogue labeled with lutetium-177 was registered for treatment of neuroendocrine tumors. Recently, results of the first randomized trial *Thera-P [^{177}Lu]Lu-PSMA-617 versus cabazitaxel in patients with metastatic castration-resistant prostate cancer* was published. So it will be a game changer in the treatment of prostate cancer.

Last but not least, alpha therapy was introduced to clinical practice. Starting with registered radium-223 for metastatic bone lesion as first agent not only improving quality of life but also prolong overall survival time of the patients.

How do you see the field of Nuclear Medicine evolving during the next 5 years?

The next five years will lead to the rapid expansion of new PET imaging biomarkers. That will be the first step to new theranostic approaches. Precision or personalized medicine is often described nearly exclusively in the context of genomics. Underlying this concept raised the hope that single oncogenic drivers could be identified and targeted successfully for most cancers.

How do you see the training of residents and technologists in our Nuclear Medicine training programs?

I am fully aware of the strength of our next generation of experts within EANM, whom we want and need to represent, and who deserve a fully fledged educational programme, that EANM offers through its educational wing ESMIT (European School for Multimodality Imaging & Therapy) and equal chances to develop and grow within the EANM Committees. We will need to be focused on the training of young people – physicians as well technologists, because we are partners in the further development of molecular imaging and metabolic radiotherapy.

That was one of the main reasons to modernize our ESMIT online learning platform. It will allow easy access via single platform to live webinars, self-paced and facilitated online courses, on-demand video material, course registrations and certificates. All is available for all residents as well nuclear medicine physicians, not only in Europe but around the world.

As president of the EANM, what is your greatest wish for the speciality of Nuclear Medicine?

My greatest wish for Nuclear Medicine is that it stays an independent specialization and that we work tougher for a further development of THERANOSTIC approach. ■

Ass. Prof. Jolanta Kunikowska is a nuclear medicine as well as internal medicine physician specialist. She is currently assistant professor at the Nuclear Medicine Department, Medical University, Warsaw/Poland. She has a broad interest in positron emission tomography (PET), molecular imaging applications in oncology and theragnostics (radionuclide therapy).

She has a particular interest in novel PET radiotracers, and theragnostic applications including prostate, neuroendocrine tumors and glioblastoma. She has authored over 90 peer-reviewed articles and several book chapters. She received several prestigious awards provided by various scientific communities including the Gold prize for Hisada award in 2018 and Marie Curie Award for outstanding scientific work presented at the 29th Annual Congress of the European Association of Nuclear Medicine (EANM) in Barcelona in 2016. She is currently the President of the EANM.

Advanced Accelerator Applications

A Novartis Company

Transforming patients' lives

Advanced Accelerator Applications Canada Inc.
2810 Matheson Blvd. E., Suite 700, Mississauga, ON L4W 4X7

Les femmes de la médecine nucléaire
Women in nuclear medicine

DR. ANITA THOMAS

In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/nuclear medicine/technologist/scientist/nurse/nurse practitioner in the US?

Society has undergone dramatic changes since the time I entered medicine. Not so long ago, women were often faced with choosing between family and career. During my medical school interview, I was told that you could not have both and that women applying to medical school would get married and leave medicine behind. Fortunately, societal expectations have changed, and most young women now look forward to both. Institutions are slowly recognizing the value of contributions and experiences from differing sexes/sexual orientations as well as differing ethnic backgrounds and nationalities. Departments flourish when there is input from all.

Anita Thomas, MD
Associate Professor of Radiology/Nuclear Medicine
Wake Forest University/Baptist Medical Center

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

The two traits that come to mind are determination and a belief in her own abilities. Knowing how much discrimination against women in the professional world existed just 50 years ago, it was greatly magnified 120 years ago. Marie Curie persisted despite challenges of early life poverty, family losses, and early substandard laboratory working conditions. She remained focused on her love of science which led to revolutionary discoveries in the new field of radioactivity. It also helped that in that age she picked a partner who respected her intelligence and supported her work.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

First, I would congratulate anyone entering medicine on choosing a fascinating field that is ever evolving. Advances in medicine are accelerating at a rapid pace and the field will never become boring. One also must realize that sometimes the workload will be very heavy and the timing of work is not convenient as people get sick and injured 27/7. You will need to take care of critically ill patients sometimes in the middle of the night and on weekends. However, the personal rewards are worth the hard work as this is a profession that really makes a difference in patients' lives, often at their time of greatest need. I would also advise anyone entering medicine to take small steps along the way to expand your comfort zone. Women with traditional female upbringings are sometimes not at first comfortable with assertiveness and conflict, but confidence comes with experience.

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

The future of medicine is precision medicine and nuclear medicine leads the way. We image disease on the molecular level where a disease process can be seen earlier, as well as treated more appropriately. Artificial intelligence will continue to grow in importance. Men and women will share equally in new discoveries. It is encouraging to me now to look around and see so many differing backgrounds in the young trainees, quite different than when I was in training. I am happy to see more talented young girls being directed towards math and science in their early education. Although women in medical school have increased, the number in radiology and nuclear medicine have not increased proportionately. Sometimes there is a belief that we do not have much patient contact in nuclear medicine, but that is not the case. We are a valued member of the treatment team with theranostics and are able to spend time and get to know our patients and their families as we deliver direct patient care in the field of targeted oncologic treatments.

What is your recipe to balance a very active professional career and a happy and thriving family life?

First is self-care. You cannot take care of others if you don't take care of yourself. This is easy to forget with a very demanding schedule. Exercise and yoga have been helpful to me, although sometimes by necessity in small segments. Involve the family in these activities as much as possible.

Second, your house does not have to be perfect. Those of us in science and medicine have perfectionistic personalities and our professional work demands no errors either in the performance or interpretation of a study. However, at home it really does not matter if the house is sometimes messy, toys all over the place, and laundry piling up. Enjoy your family. There will come a time later in life to have an organized home, and then you will probably miss the hectic and cluttered years. ■

GE Santé | GE Healthcare

Discovery MI Gen 2

La prochaine génération. Encore plus en vue. | Next generation. Even more in sight.

Une nouvelle génération de la première plateforme TEP/CT numérique au monde.
A new generation of the world's first digital PET/CT platform.

Détecteurs numériques
Conçu pour être évolutif de 15 cm FOV à 30 cm FOV[1]

Sensibilité la plus élevée
Conçu pour atteindre une sensibilité exceptionnelle par cm (cps/kBq/cm)[2]

Correction de mouvement
Le tout premier système numérique pour la gestion du mouvement respiratoire

Précision du SUV
Jusqu'à deux fois plus de précision dans la quantification (SUV_{moyen}) de la TEP avec Q.Clear

Digital detectors
Designed for scalability from 15 cm FOV up to 30 cm FOV[1]

Highest sensitivity
Engineered to achieve exceptional sensitivity per cm (cps/kBq/cm)[2]

Motion correction
First-ever digital respiratory motion management solution

SUV accuracy
Up to two times improvement in PET quantitation accuracy (SUV_{mean}) with Q.Clear

1. Travaux en cours optionnels. La configuration AFOV 30 cm n'est pas à vendre. Non approuvé par la FDA américaine ou tout autre organisme de réglementation mondial pour une mise sur le marché.
1. Optional works in progress. 30 cm AFOV configuration not for sale. Not approved by the U.S. FDA or any other global regulator for commercial availability.
2. Discovery MI Gen 2 a la sensibilité la plus élevée du marché selon NEMA, par rapport aux systèmes TEP/CT courants ayant un AFOV identique ou similaire (d'après le rapport 2019 de la division de l'information médicale d'IMV, les fabricants représentant plus de 90 % de la base installée aux États-Unis).
2. Discovery MI Gen 2 has the highest NEMA sensitivity in the market, comparing with common PET/CT systems with same or similar AFOV, (based on IMV's Medical Information Division's 2019 report as the manufacturers representing more than 90% of the US Installed Base).

JB00188CA

Les femmes de la médecine nucléaire
Women in nuclear medicine

DR. LIZETTE LOUW

Dr. Lizette Louw
Nuclear Physician,
Netcare LINKSfield Hospital PET-CT,
South Africa

In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/nuclear medicine/technologist/scientist/nurse/nurse practitioner in the US?

There has been a gradual increase in the awareness of the value and qualities that female leaders bring to the table, which men cannot. With this awareness, there has been an increase in the support offered to women by men in positions of power, as well as more public acknowledgement of women's success. It is a very slow process to change cultural perceptions on the roles (and limitations) of females in the workplace, but every small victory is a step forward.

It has been difficult for me, especially on an emotional level. It has often been very demotivating to experience resistance to my growth and success from within my own community and even my own department. It made me realize how deep the subconscious bias lies with regards to female roles and behaviour. This sparked my passion in advocating for women in healthcare.

I became president of our national nuclear medicine society within five years of qualifying and connected with several international leaders in the process. Those connections and the support and encouragement they offered me on a personal level enabled me to branch out onto the international playing field to where I am today – the president elect of the World Federation of Nuclear Medicine and Molecular Biology (WFNMB).

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Not much is written about her personality, so it's difficult to postulate. She had a very supportive husband, who insisted that she be acknowledged and accredited for her own work. I have often experienced that I can accomplish more if there is a male voice speaking up for me, or vouching for me. My dream is that we can continue to evolve to a point in time where a woman can accomplish her goals and be recognized for them without the additional voice of a supportive male figure.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

You will have to work hard to accomplish success, and then you will have to continue working hard to maintain what you managed to accomplish. It's not easy, but it is incredibly rewarding. Just keep going – it is the collective impact of your daily efforts and actions that pays off.

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

I hope to see more collaboration in the medical imaging field. Not only collaboration between radiology and nuclear medicine, but also between imaging specialists and clinicians. That is the only way we can move forward and achieve true "patient centered care". It is well known that women are good at mediation, collaboration and establishing personal connections. It will be to the advantage of all to tap into these inherent qualities to achieve better interdisciplinary collaboration and ultimately better patient care and outcomes.

What is your recipe to balance a very active professional career and a happy and thriving family life?

My approach in life is to do every single task that comes my way to the best of my ability, no matter how big or small. It sounds so simple, but looking back over my journey I can see where small tasks ended up being the foundation for bigger and better things.

I apply the same principles in my personal life as well. Maintaining a balance as a single working mom is not always easy and I find myself constantly prioritizing and re-prioritizing as I go through my day. Multitasking skills are essential, and I could not achieve my career goals without the love and support of my children. Coming home to a hug and a cuddle makes up for anything bad that happened at work! ■

Des défis sanitaires sans précédent exigent une collaboration sans précédent.

Développer des médicaments et vaccins novateurs qui améliorent la santé des Canadiens prend du temps, des investissements et un travail acharné.

Découvrez comment nous travaillons ensemble, comme jamais auparavant, pour relever les défis sanitaires d'aujourd'hui.

lespoiruntravailacharne.ca

L'ESPOIR,
UN TRAVAIL
ACHARNÉ.

INNOVATIVE MEDICINES CANADA
MÉDICAMENTS NOVATEURS CANADA

Les femmes de la médecine nucléaire
Women in nuclear medicine

DR. BHAVANA BUDIGI

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Marie Curie's relentless drive and determination led to her exceptional contributions to radiology and nuclear medicine which continue to revolutionize healthcare practices to this day. It was not an easy road for her especially given the gender bias and lack of expectations from women during her career span. Yet she persisted and succeeded. She is an inspiration to women physicians and women in all professions who continue to face challenges at their workplace to this day.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

My advice to women in medicine and all working women would be to prioritize themselves, be confident in your abilities and set professional boundaries. Do not be afraid to ask for your worth and do not shy away from letting your peers know what you bring to the table. Humility is a great virtue, but it always helps to ascertain the value you add at your workplace.

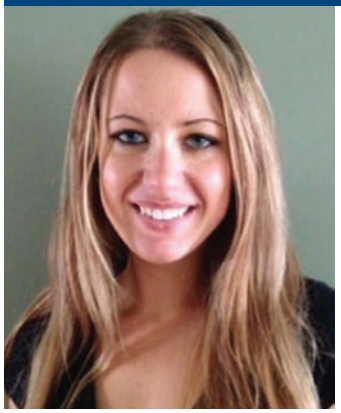
Budigi, Bhavana
MD Radiology-Neuroimaging,
Wake Forest University ,
Baptist Medical Center,
North Carolina, Usa

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging?

The latest advances in precision medicine offer great promise in their endless therapeutic capabilities and their ability to guide personalized treatment plans. I am excited to see these results translate into clinical practice in nuclear medicine particularly with cancer therapies. I hope this era of personalized medicine will bring better delivery systems, lesser healthcare costs and more effective therapies that can be easily implemented at the nuclear medicine clinic.

What is your recipe to balance a very active professional career and a happy and thriving family life?

I have one rule that I try my best to follow and that is to never take my work home. I try my very best to separate work from my personal life. I give my work my full concentration and dedication but once I leave the hospital I switch off and unwind with my family. As an international physician, I have always felt the distance from everything I knew growing up. It helps to make a home wherever you are in this world and build a community that is contributory to your mental growth. My other passion that keeps me grounded and conscious of myself as a human and woman is travel. It has helped me evolve constantly. 36 cities around the world so far, and I am just beginning to learn. ■



Tina M. Buehner, PhD, CNMT, NMTCB(CT)(RS), FSNMMI-TS
Woman Technologist, Scientist and Researcher
Proud Mother of two amazing children
Health Physicist for Rush University Medical Center
Adjunct Professor for Rush University
Current President, SNMMI-TS, USA

DR. TINA M. BUEHNER

In the 20th century it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist, nuclear medicine, technologist, scientist, nurse, nurse practitioner in the US?

Akin to most careers in medicine and allied health apart from nursing, early nuclear medicine technology was a role primarily dominated by male technologists. Gender-affiliated roles in medicine were often related to the perceived qualities required to perform their respective responsibilities. Early physicians and researchers who were expected to be perpetually poised in any situation were almost always men. The caretaker role of the nurse was often related to the perception of innate nurturing characteristics believed to be that of a woman. While there has been a positive paradigm shift in the diversity of applications and professionals in practice throughout all health professions over the years, these gender-biased preconceived roles still exist today. When a patient can, without much consideration, refer to a male nuclear medicine technologist as "Doctor" and in that same breath refer to

the female nuclear medicine physician as "nurse", we clearly need to do better in elevating the respect and equality of women in medicine and health care.

By the time I began my career as a nuclear medicine technologist in 2001, there was a growing trend of women entering the field of nuclear medicine technology compared to men. Despite this, the inequalities were still very real and often very clear in regard to compensation and roles in leadership and research. I believe this change must begin intraprofessionally before the rest of the world can meaningfully change their perceptions. I am grateful to the many women technologists before me who have paved the way for others, like myself in nuclear medicine technology and in research. The late Susan Weiss was a pioneer in pediatric nuclear medicine research and the first woman president of the Society of Nuclear Medicine Technologist Section. As I write this today, I am currently the 25th woman president in the 50-year history of the SNMMI-TS which is a significant indication of women's growth in nuclear medicine technology leadership. It is my hope that the women physicians and scientists in our profession will experience the same leadership growth that the technologist section has seen over the last few decades.

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Madam Marie Curie was a pioneer in radioactivity, research and academia. After being denied admission to medical school in the late 19th century because women were not permitted entrance, she obtained a degree in physics. Madam Curie's contributions to nuclear physics and chemistry have led to modern day advancements in science and medicine that cannot be understated. Her numerous accolades which include being the first woman in France to defend her doctoral thesis, the first woman to win a Nobel prize, and the only woman to ever receive two Nobel prize awards, are a testament to her perseverance, strength, and courage in her work despite seemingly insurmountable challenges throughout her life and career.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

A professional woman mentor is an invaluable asset for other women seeking to establish themselves in all areas of clinical practice, leadership, research, and academia. Mentors can share real-world challenges and learning experiences for other women on the same path. Women mentors serve as navigators to help us along on our professional journeys, often offering precious recommendations for detours from bumps on the road to success that they have also encountered. They can also serve as a source of strength and resiliency when the obstacles that lay ahead are unavoidable and discouraging. There are many types of mentor-mentee relationships, but in my opinion the best ones are the ones that form naturally and effortless, as they are often the most fruitful both professionally and personally. The life-long bond created between myself and my doctoral research mentor and friend, Dr. Bital Savir-Baruch who is an amazing nuclear medicine physician and researcher, demonstrates the genuine benefit of a woman mentor-mentee relationship.

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

Mapping of the human genome allows us continued advancement in enhanced prediction, prevention, and treatment of disease. Women scientists are indispensable members of research teams around the world, and technological advancements that have increased the globalization of biomedical research can provide synergistically progressive discovery. The demand for woman scientists will continue to be a critical necessity in research as novel tracer development remains an integral component of molecular imaging and target therapeutic treatments in precision medicine.

What is your recipe to balance a very active professional career and a happy and thriving family life?

One of the most taxing experiences for me is the notion that successful woman professionals cannot have a good balance in all aspects of her life. Most often this relates to her family and the assumption that professional success must equate to a lack of commitment or presence at home. It is not uncommon for a successful woman to be questioned on how one's family "deals" with or "handles" their success, an inference that the family unit must suffer at the cost of a mother/wife's professional success. In contrast, it is exceptionally rare to hear a professional male counterpart of equal success being asked the same questions regarding the coping of his family or the need for him to defend his parenting skills against his accomplishments. This is another gender-biased stigma that is all too common among professional women and one that is exhausting for me as a professional and a mother.

I have read several well-established and professional magazines and their suggestive tips for busy professional women looking to find the best work-life balance, but often these recommendations are not applicable to women in medicine and health care. How does one "Find the time to disconnect" when we often cannot disconnect as part of our job of being professionals on-call 24/7? I do not believe there is one prescription for ensuring a good balance in all families. For me, finding balance starts with a reflection of gratitude every morning. It is an attempt for me to be more mindful and present throughout the day. It also includes seven interlinking electronic calendars with reminder alerts for each role in my life telling me where I need to be and when. At its simplest core, professional and personal success for me is the happiness and health of the 3 most important people in my life. It requires continued improvement from me in all areas including communication, patience, and learning to embrace imperfection. At the end of the day, the relationships I have with my family are the foremost motivators for my success, my greatest accomplishments, and yet another area in my life to require life-long learning and continued personal growth. ■

Les femmes de la médecine nucléaire
Women in nuclear medicine

Valerie R. Cronin

In the 20th century, it seems that very few women were able to achieve leadership position in (nuclear) medicine. What has changed and how difficult was it for you to achieve success and become an influential radiologist/nuclear medicine/technologist/scientist/nurse/nurse practitioner in the US?

When I entered the field in Nuclear Medicine, I realized early on that if you wanted to grow in your field you would need to become involved in our profession outside of your department walls. Doing so would allow you to meet other colleagues and to see what was being done in other parts of the country and where our field would be heading over the next several years. I started out becoming involved in the local chapter of SNMMI which was the Eastern Great Lakes Chapter. Being elected president allowed me to attend the national meetings which opened many doors for me in Nuclear Medicine. Women were not really encouraged to pursue such difficult careers. My own father son of Polish immigrants and a physician discouraged me when I said I wanted to pursue medical school. He said the course would be too long and hard for me and suggested instead that I become a dietician. Yet he encouraged both my brothers to pursue pre-med. I started out at university as a physics major and was the only girl in my class. Of course, initially my career was not intended to be such a big piece of my life. When my husband suffered a devastating stroke at the age of 49, I realized I was now the bread winner and head of the family. Also facing the additional costs of his care was frightening to me. Advancing my career became a necessity.

Valerie R. Cronin, CNMT, FSNMMI-TS, MSHSA
Past President of SNMMI-TS 2005-2006

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

I am especially proud that this publication has Marie Curie on the cover. Like her I am of Polish decent so have always followed her achievements not only as a professional in our field but also her as a Polish female scientist. Her remains along with her husbands are still sealed in lead lining in Paris. A few years back while visiting Paris I tried to visit her tomb but at the time it was under construction and unavailable for viewing. In preparation for this article, I did some research and found that Poland is ranked as one of the hardest working nations in Europe. Marie Curie's hard-working ethic kept her on track to discover two new elements despite everything else that was going on in her life. Her perseverance to obtain her education took dedication as it was not an easy path during those times especially for a woman. She devised a plan and stuck with it. Her love of family and marriage was evident when she was young and then again with her own marriage and family. Decisions were made but in keeping with loyalty to the family and to her homeland. Her approach to radioactivity was so unique that others did not believe that a woman could devise such original work. The extra hurdles she crossed for the profession were ongoing. She wanted her research but included her family at all times like women want to do today.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

Healthcare and medical imaging have faced so many changes over the years and now this Pandemic has caused even more changes. New people entering the career want more of a life balance and are choosing paths that provide that. Many technologists don't want all the overtime or on call pay they can get. They want their weekends and family time. Women are choosing careers that they can hand off their patient to someone else at the end of a shift and walk away to do what they want whether it be a family dinner or a daughter's soccer game. They are seeking employers that help support them with child care or flexible hours. It is also important to find a mentor and be a mentor. Network as much as you can and keep your contacts current and growing. To this day as President of the Board of the YWCA of the Niagara Frontier I work to empower young women and help domestic violence victims. As a Board Member of the Chamber of Commerce of the Tonawandas I started a GLOW (Growing Leadership Opportunities for Women) Task force. Other women are a great support to you as you go forward. The SNMMI has started a fantastic mentoring program for Women in Nuclear Medicine (WINM) to help. This group focuses on the promotion of professional and academic leadership. The technologist section of the SNMMI-TS also has a successful leadership academy.

What is your recipe to balance a very active professional career and a happy and thriving family life?

Know your limits. This is not avoiding what needs to be done but knowing when you have too much on your plate as you go forward. Also prioritizing what is important to you and not

getting bogged down by things that are not part of your plan or path. When I was President of the SNMMI-TS I was promoted to my first Vice President position as VP of Imaging Services which was quite a promotion. One Friday I left work to catch a plane to Dallas for a vendor workshop. My presence in Dallas was not critical. I remember driving to the airport with white knuckles on the steering wheel because of the snowstorm I was in, worried I'd miss my flight, worried I needed to be preparing for next week's meetings and presentations and when I got to the "Departing Flights" turn off I went straight. I said "I can't do this now I am overwhelmed" and I drove home for a quiet weekend to prepare for my new job. Get help if it makes sense…my husband was disabled so it didn't seem practical that I would get up and shovel my driveway at 5 AM to make a 6:30 meeting at the hospital so I contracted that out. I lived in Buffalo, New York and snow is a reality here. The year I was president of the Technologist section I travelled to 29 cities and made 3 trips to Asia. You can't take that kind of role on when you have a new born. My children were older and actually were able to travel with me from time to time. That amount of time commitment has to fit into where you are in your life and the support needed from employer to family. However, the pandemic has changed even that as meetings have become virtual this last year and travel reduced by all organizations. Always keep up your five-year plan and stay on track. Make the life you planned not the life you stumbled upon. The younger generation is coming into their careers wanting a balance in their lives maybe it'll be easier for them.

Denise Grady

Denise Grady Nurse Practitioner
Nuclear Medicine Department
Wake Forest Baptist Medical Center

Marie Curie is rightfully considered as the mother of nuclear medicine. In your opinion, which human and professional qualities did she have to have such a successful career and pave the ground for a new field in medicine?

Marie Curie possessed the human quality of strong will which she used to succeed against any obstacles placed in front of her. She exerted professional qualities, such as the ability to stand her ground for what she believed in. Alongside this was her determination to not allow men to overpower her because she was a female in the professional field. These two qualities worked in unison to allow Marie Curie to prosper with a successful career and pave the ground for a new field in medicine.

As a medical professional, teacher and mentor what would you advise women interested by medicine to consider when entering the medical profession in order to succeed?

Education takes time, commitment and organizational skills to be successful. Finding a mentor that you can trust in the field is a key factor to succeed. A Combination of both education and mentorship will provide the best possible success in the medical field.

Technological advances and the human genome project have brought the medical and scientific knowledge to levels that none of us expected. How do you see the future of medical imaging? What will be the role of women in medicine/medical imaging in the era of precision medicine?

Theranostics is paving the way as the future of medical imaging and therapy. Nurse Practitioners will find a place in Nuclear medicine and theranostics to facilitate and coordinate radioactive therapies for patients. It is an exciting adventure for women in nuclear medicine to be a part of precision medicine as new therapies are approved by the FDA for treatment.

What is your recipe to balance a very active professional career and a happy and thriving family life?

The recipe to balance a very active professional career and a happy and thriving family life is one that needs to remain constant, however, is more often than not stretched to its limits. My father once told me that he was golfing with a friend who was in his 70's who said, "I wish I had made a scheduled date night once a week while I was married". The man was now divorced, with regrets of not having planned more time for his wife. We, as a society, are quick to get caught in the loop of the need to always complete tasks for work, answer constant emails, and return back phone calls. Everyone has a loop similar to this one and I am sure everyone can imagine what their loop may look like. If you spend all day in your loop, at the end of the day your family will be left feeling neglected and unimportant. Although it is difficult to get out of the loop, to maintain an effective family work-life balance, one must prioritize their family. I have discovered the key that works for me is scheduling time with family. We make time for what's on our schedule already, right? It could include watching Netflix, Amazon Prime, going out to dinner, taking a walk, as long as it is set aside time to spend with your spouse or children. There is no perfect plan of balance that will work for everyone because career path and family life differ between each individual, however I have found that family is most understanding when they know you have set aside time especially for them. As an end note, my father and mother have a date night every Wednesday and have been married for 50 years.

DACRYOSCINTIGRAPHY IN PATIENTS WITH EPIPHORA

Salem Yuoness MD, FRCPC
President elect - CANM
Medical Director,
Nuclear Medicine Department
Diagnostics Imaging services.
Brandon Regional Health Centre
Brandon, Manitoba
Canada

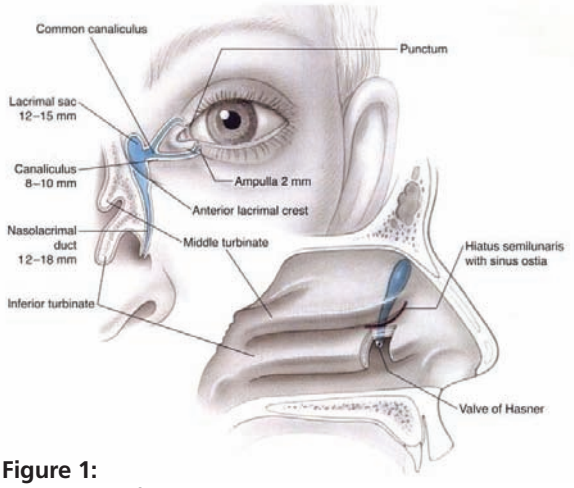


Figure 1:
The anatomy of lacrimal drainage system.

Epiphora is a common ophthalmology symptom, characterized by excessive tearing of one or both eyes due to disruption in the balance between tear production and tear loss. Causes include excess production of tears due to ocular irritation or inflammation, as well as obstruction of the tear outflow tract including nasolacrimal duct obstruction. Epiphora can have a negative impact on the quality of life as it affects the daily activities such as inability to read, drive, and gives the false impression of emotional tearing. If left untreated, epiphora may affect the visual function, with significantly lower visual acuity scores.

The lacrimal system consists of two lacrimal canaliculi converging into the lacrimal sac at the level of the Maier's sinus separately or together into a common lacrimal canal with a one-way valve (Rosenmüller valve). The nasolacrimal duct originates from the lacrimal sac, extending down to the level of the inferior turbinate, where lacrimal outflow occurs through the one-way (Hasner's valve). Obstruction of the nasolacrimal system causes lacrimal drainage impairment and epiphora can occur above or below the lacrimal sac level. Nasolacrimal duct obstruction is more frequent in women over 40 years of age. Dacryocystorhinostomy is the treatment of choice for primary acquired nasolacrimal duct obstruction.

Dacryoscintigraphy is a Nuclear Medicine imaging modality used in the evaluation of epiphora. It is an alternate non-invasive modality when compared to dacryocystography (an invasive radiological counterpart which has an approximately 100 times more radiation exposure). Dacryoscintigraphy provides useful physiological information regarding the functioning of lacrimal apparatus unlike contrast dacryocystography which provides only anatomical information. Dacryoscintigraphy has also been used to evaluate the success of dacryocystorhinostomy, because it would reflect the patency of the lacrimal duct system in the most physiological way.

The technique to perform dacryoscintigraphy study: One drop (10 µl) of technetium pertechnetate (or technetium sulfur colloid) instilled simultaneously in the outer canthus of both eyes (50-100 µCi). Upright dynamic (8 min) and anterior static images of the eyes (up to 20 min) were acquired on a gamma camera fitted with a low-energy high-resolution collimator (a high-resolution collimator is found to be an efficient substitute for the conventional pinhole collimator). Physiological interventions can be used like eye blinking, saline intervention, and lacrimal sac massaging. The study end point is the detection of radionuclide in the nasal cavity. In a typical normal dacryoscintigraphy, visualization of canaliculi and sac occurs before 30 s and with passage into the nasal cavity in 10–20 min. Addition of SPECT-with low-dose CT to planar scintigraphy allows for improved anatomic correlation and can localize the site of lacrimal obstruction more accurately than planar images.

In summary dacryoscintigraphy is a non-invasive, simple, fast, safe, and easy to perform Nuclear Medicine imaging modality used in the evaluation of epiphora and assessing the patency of nasolacrimal system. ■

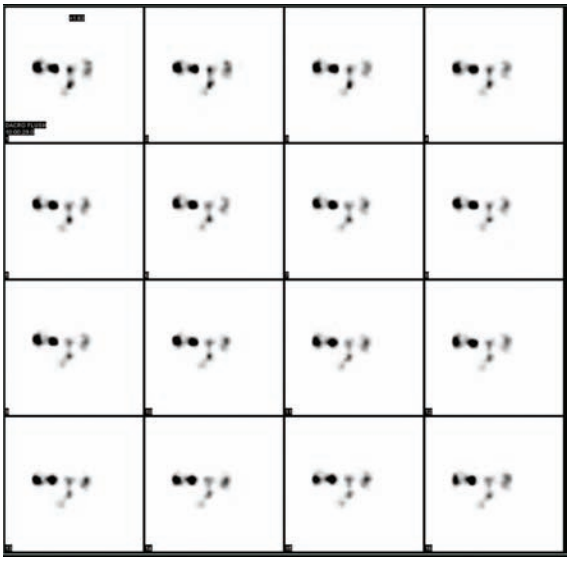


Figure 2.
A dacryoscintigraphy scan demonstrated a right-side complete obstruction at the junction between the lacrimal sac and the nasolacrimal duct. Left side demonstrated normal tracer uptake in the left lacrimal sac and physiological progression in the left nasolacrimal duct.

" Dacryoscintigraphy is a Nuclear Medicine imaging modality used in the evaluation of epiphora. It is an alternate noninvasive modality when compared to dacryocystography (an invasive radiological counterpart who has an approximately 100 times more radiation exposure). "

20 ET 21 MAI

ÉTATS GÉNÉRAUX **VIRTUELS** 2021

Au cœur de l'expertise infirmière

Les États généraux 2021 représentent une occasion unique d'ouvrir ensemble une discussion essentielle pour l'avenir de la profession infirmière et des soins à la population.

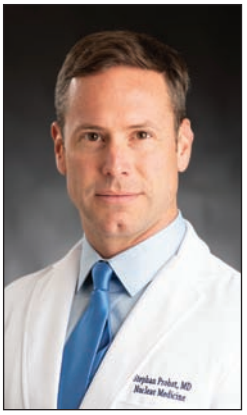
Ordre des infirmières et infirmiers du Québec

Trois thèmes de réflexion

- **Savoirs infirmiers et compétences infirmières :** mieux y recourir pour mieux soigner
- **Innovation et spécialisation infirmières :** une voie pour les soins de l'avenir
- **Formation infirmière :** pour relever les défis du 21e siècle

Pour vous inscrire, visitez oiiq.org/états-generaux

NUCLEAR MEDICINE THERANOSTICS



Stephan Probst, MD
Chief of Nuclear Medicine
Jewish General Hospital
Montreal, QC
Canada

Theranostics (a portmanteau of therapeutics and diagnostics) is a new field of medicine which combines targeted therapy based on similarly targeted diagnostic tests. Although not specific to nuclear medicine, theranostics has taken up a prominent role in the field as of recently, and mostly comprises diagnostic and therapeutic radiopharmaceutical pairs. Although his work predates the term, Dr. Saul Hertz is widely considered the father of theranostics for his pioneering research on the medical use of radioiodine in beginning in 1941.

Theranostic nuclear medicine begins with diagnostic radiopharmaceutical, that is to say imaging. The presence of the target must be confirmed before the therapeutic radiopharmaceutical can be applied successfully. Once the patient's disease is confirmed to express the target, the therapy is administered. In the words of Dr. Richard Baum, "You treat what you see, and you see what you treat."

" Although not specific to nuclear medicine, theranostics has taken up a prominent role in the field as of recently, and mostly comprises diagnostic and therapeutic radiopharmaceutical pairs. "

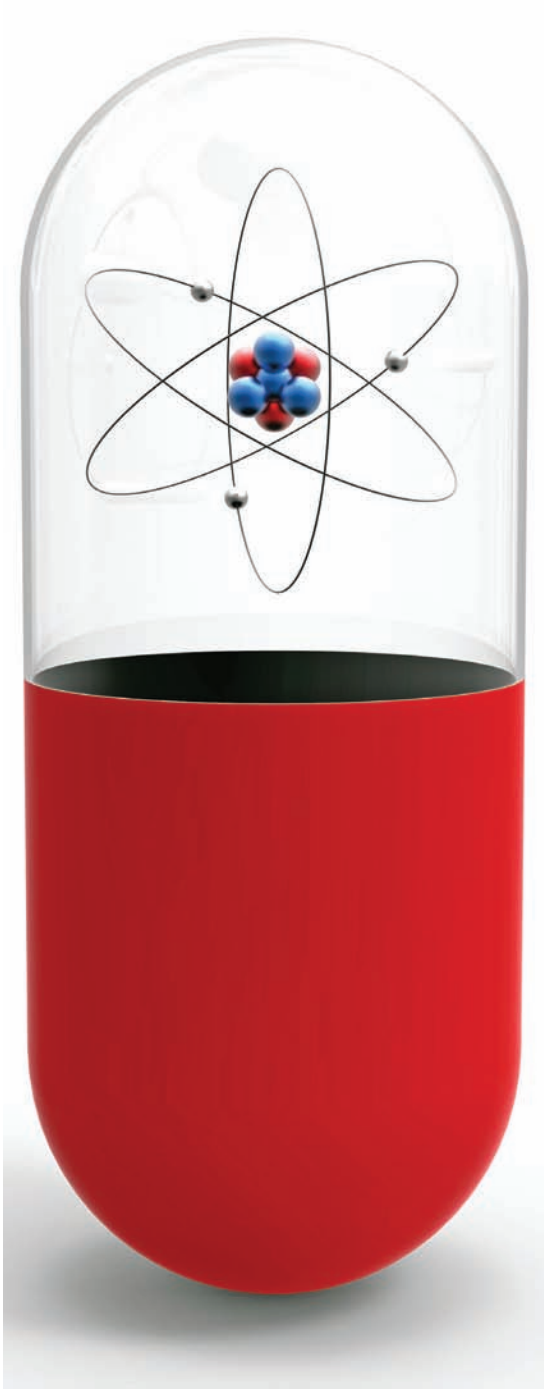
Bone-Seeking Theranostics

Although not often thought of as a theranostic, radium-223 is a bone-seeking, alpha-emitting radiopharmaceutical which selectively targets bone metastases. Its diagnostic pair is MDP bone scan or NaF bone scan. As a calcium mimetic, radium-223 is incorporated into the bone matrix by osteoblastic activity and delivers high doses of very concentrated alpha radiation. Given the noticeably 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. Radium-223 therapy improves overall survival and bone pain and is approved for patients with bone metastases from castration-resistant prostate cancer.

PSMA Theranostics

Prostate specific membrane antigen (PSMA) is expressed by greater than 90% of prostate cancers and its expression is further increased in poorly differentiated, metastatic and hormone-refractory prostate cancers, rendering it a useful target in these patients. Theranostics using PSMA-targeted small molecules attached to beta-emitters has demonstrated promising results. These molecules bind the extracellular domain of PSMA selectively with high affinity and are internalized thus allowing absorption of the intense energy emitted and resulting in cancer cell death.

Dr. Michael Hofman and his group in Australia published results from a single-arm, single-center phase II trial showing that treatment with 177Lu-



PSMA-617 theranostics has high response rates, low toxic effects and reduction of pain in men with metastatic castration-resistant prostate (mCRPC) who have progressed after conventional treatments. Patients with mCRPC underwent a screening PSMA PET/CT confirm high PSMA-expression and of those treated, 57% achieved best PSA decline of 50% or more. Best responses in this trial are illustrated in Figure 1.

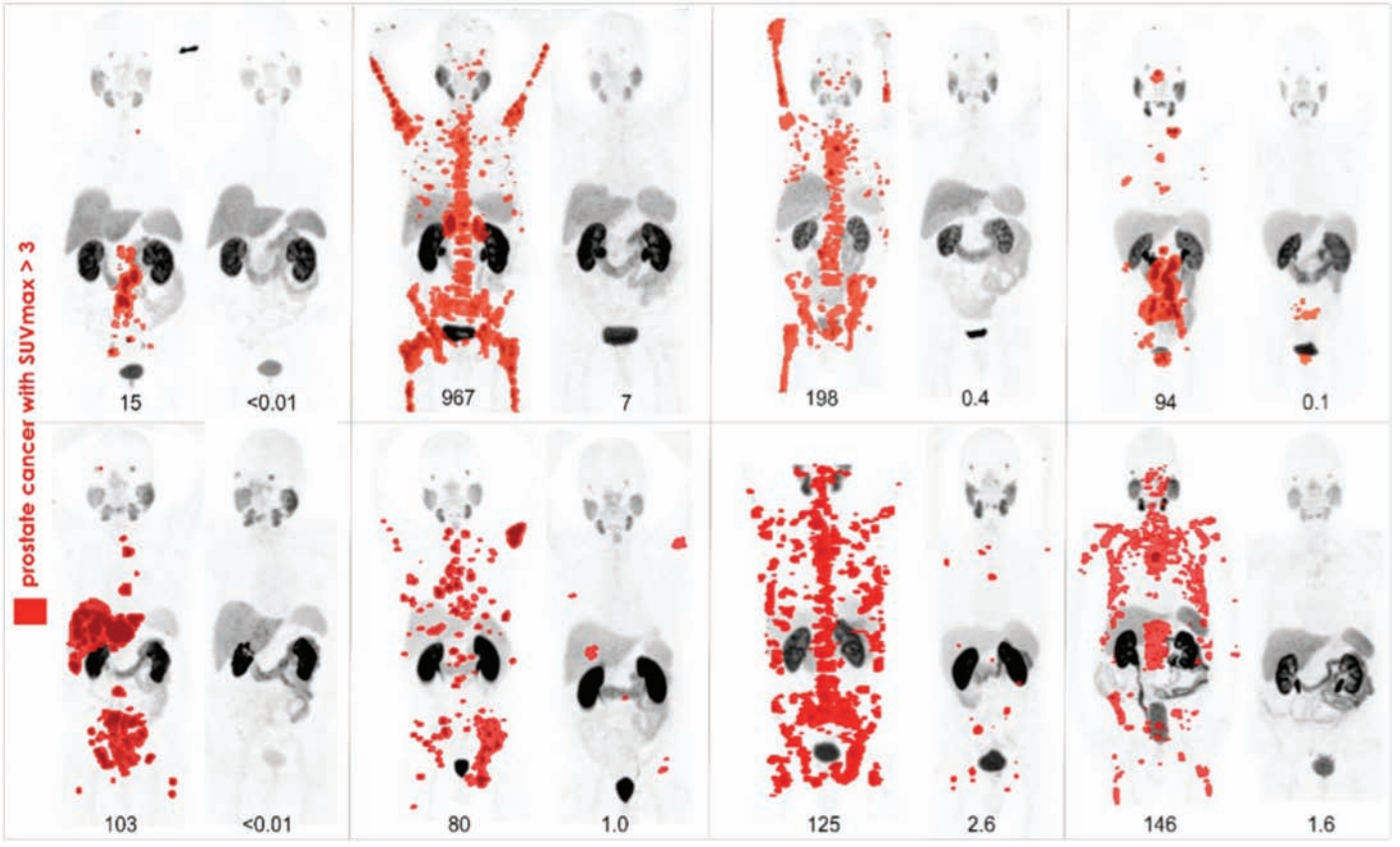


Figure 1. SNMMI Image of the Year, ^{68}Ga-PSMA-11 PET maximum intensity projection (MIP) images at baseline and 3 months after ^{177}Lu-PSMA-617 in 8 patients with PSA decline ≥98 percent in a prospective phase II study. Any disease with SUV over 3 is in red. Credit: Michael Hofman, John Violet, Shahneen Sandhu, Justin Ferdinandus, Amir Iravani, Grace Kong, Aravind Ravi Kumar, Tim Akhurst, Sue Ping Thang, Price Jackson, Mark Scalzo, Scott Williams and Rodney Hicks, Peter MacCallum Cancer Centre, Melbourne, Australia.

DOTATATE Theranostics

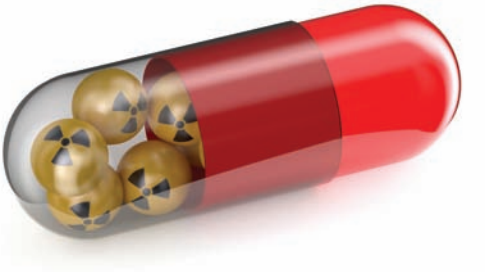
Somatostatin transmembrane receptors (SSTR) can be targeted with imaging probes to yield specific imaging techniques to stage and follow neuroendocrine tumors (NETs). The NETTER-1 trial was a randomized controlled trial that showed clear benefit of SSTR theranostics with 177Lu-DOTATATE for metastatic or unresectable small bowel NETs, compared to a control group receiving high-dose non-radioactive somatostatin analog therapy. Since the mechanism of tumor accumulation is the same as for the imaging agents (e.g., 68Ga-DOTATATE), SSTR radiopeptide therapy is therefore used exclusively in patients with demonstrated high tumor uptake on SSTR PET imaging. It is approved in patients withs unresectable or metastatic gastroenteropancreatic NETs which progress under non-radioactive somatostatin analog therapy and should be considered for off-label use in progressing SSTR-positive NETs of others origins as well.

Ongoing Research

As well, radioisotopes more potent than lutetium-177, such as actinium-225 - an alpha emitter - are being investigated with promising results. Alternate routes of administration, including intra-arterial delivery to the liver, also appear to be helpful by delivering most of the dose directly to the location of the largest burden of the disease. Theranostics is an area of active research.

Conclusion

The rapid-fire approval of numerous theranostic agents has thrust the era of molecular personalized medicine upon us. Nuclear medicine physicians, urologists and medical oncologists have powerful new tools at their disposal. Although much work remains to be done to bring these discoveries to all Canadian cancer patients, the future is promising. ■



" The rapid-fire approval of numerous theranostic agents has thrust the era of molecular personalized medicine upon us. "

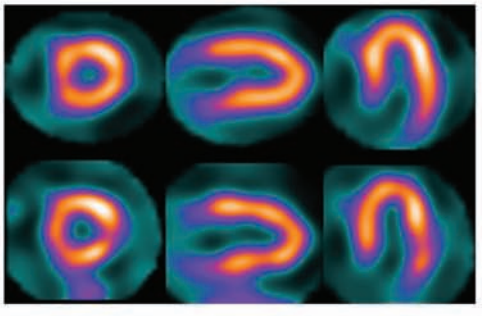
GE Healthcare

Quand la vitesse compte

Débuter l'imagerie cardiaque plus tôt

- Myoview vous permet de commencer à acquérir des informations diagnostiques tôt, 15 minutes après l'injection*[1]

*Selon la monographie de produit de Myoview, l'imagerie SPECT peut commencer 15 minutes après l'administration de l'agent.



Préparation efficace de la trousse[1]

- Myoview n'a pas besoin d'être bouilli et refroidi, ce qui peut faire gagner du temps avant son administration au patient

Durée de conservation post-reconstituée plus longue

- La durée de conservation de Myoview après reconstitution est de 12 heures[1]

La biodistribution de Myoview peut contribuer à raccourcir les études et les temps d'attente et peut aussi réduire le nombre d'examens répétés[2]

Au cours d'une étude prospective par Ravizzini :

- Il a été démontré que les études au repos et le temps d'étude total sont significativement plus courts avec Myoview[2]
- Les patients recevant Myoview ont subi moins d'examens répétés en raison d'une activité hors du cœur[2]

MYOVIEW™
[Trousse de préparation de la tétrofosmine marquée au technétium 99m (99mTc) pour injection]

Références : 1. Myoview [product monograph], February 12, 2018 (revised August 21, 2019), Control No. 211075.
2. Ravizzini GC, Hanson MW, Shaw LK, et al. Efficiency comparison between 99m Tc-tetrofosmin and 99m Tc-sestamibi myocardial perfusion studies. *Nucl Med Comm.* 2002;23:203-208.

IPM, Imagerie de perfusion myocardique; **TEMP,** tomographie par émission monophotonique.

INDICATIONS ET UTILISATION CLINIQUE DU PRODUIT : Myoview™ [Trousse de préparation de la tétrofosmine marquée au technétium 99m (99mTc) pour injection] est indiqué pour réaliser une scintigraphie myocardique après des administrations séparées sous stress (exercice et (ou) stress pharmacologique) et au repos chez les patients souffrant de coronaropathie connue ou soupçonnée. Il est utile dans la localisation des régions d'ischémie myocardique réversible en présence ou non de tissus myocardiques infarcis. L'épreuve de stress pharmacologique provoquée par du dipyridamole peut constituer une alternative à l'exercice chez les patients qui ne peuvent faire d'exercice adéquatement.

Renseignements importants sur l'innocuité de Myoview

CONTRE-INDICATIONS: Aucune connue. **MISES EN GARDE :** Lorsqu'on réalise des épreuves chez des patients présentant une coronaropathie connue ou soupçonnée, il est nécessaire d'assurer une surveillance cardiaque continue et de disposer des installations nécessaires pour administrer un traitement cardiaque d'urgence. L'usage de Myoview n'est pas recommandé chez les patients présentant une hypersensibilité connue à la tétrofosmine. Des réactions graves d'hypersensibilité et des réactions anaphylactoïdes ont été signalées pour Myoview. Le contenu d'un flacon de Myoview est destiné à être utilisé uniquement dans la préparation de tétrofosmine marquée au technétium 99m en injection et NON à être administré directement au patient. L'induction pharmacologique de stress cardiovasculaire peut être associée à de graves réactions indésirables telles que l'infarctus du myocarde, l'arythmie, l'hypotension, la bronchoconstriction et des accidents cérébrovasculaires. La prudence est de mise lorsque le stress pharmacologique provoqué par du dipyridamole est l'alternative retenue à l'exercice; cette substance doit être utilisée au moment indiqué et conformément à la monographie du produit et aux instructions relatives au dipyridamole (Persantine®). **MISES EN GARDE – Générales :** Des réactions allergiques et une anaphylaxie peuvent survenir avec Myoview. L'injection de tétrofosmine marquée au technétium 99m, comme c'est le cas de tout médicament radioactif, doit être manipulée avec précaution et des mesures de sécurité appropriées doivent être utilisées pour réduire au minimum l'exposition aux rayonnements pour le personnel clinique. Le contenu de cette trousse n'est pas radioactif. Cependant, après l'ajout du pertechnétate de sodium Tc-99m, un blindage adéquat de la préparation finale doit être maintenu pour réduire au minimum l'exposition aux rayonnements pour les travailleurs et les patients. Des précautions doivent également être prises pour réduire au minimum l'exposition des patients aux rayonnements, conformément à une prise en charge appropriée des patients. Afin de réduire au minimum la dose de rayonnements dans la vessie, les patients doivent être encouragés à vider leur vessie lorsque l'examen est terminé et aussi souvent que possible par la suite. Une hydratation adéquate doit être encouragée pour permettre des mictions fréquentes. Les réactions de marquage du Tc-99m dépendent du maintien de l'étain (ion stanneux) à l'état réduit. Par conséquent, les oxydants contenant du pertechnétate de sodium Tc-99m ne doivent pas être utilisés. Les produits radiopharmaceutiques devraient être utilisés uniquement par les praticiens dûment qualifiés dans l'utilisation de substances radioactives prescrites chez ou sur les humains. Les composants du flacon de réactif sont stériles et apyrogènes. Il est essentiel que l'utilisateur suive attentivement les instructions et applique une technique aseptique stricte. **Interactions médcamenteuses :** Les interactions médicamenteuses n'ont pas été notées et n'ont pas été étudiées dans les études cliniques au cours desquelles Myoview a été administré à des patients recevant un traitement concomitant. Des médicaments tels que les bêtabloquants, les inhibiteurs des canaux calciques et les nitrates peuvent influencer le fonctionnement du myocarde et la circulation sanguine. Les effets de ces médicaments sur les résultats d'imagerie ne sont pas connus. **Carcinogenèse, mutagenèse, altération de la fertilité :** Aucune étude n'a été menée pour évaluer le potentiel cancérogène ou les effets sur la fertilité. Le sulfosalicylate de tétrofosmine n'était pas mutagène *in vitro* dans le test d'Ames, le lymphome de souris ou les tests de lymphocytes humains, ni clastogène *in vivo* dans le test des micronoyaux chez la souris. **Utilisation chez les femmes enceintes :** Étant donné qu'aucune étude adéquate sur la reproduction n'a été réalisée chez l'animal pour déterminer si ce médicament affecte la fertilité des mâles ou des femelles, s'il a un potentiel tératogène ou s'il a des effets indésirables sur le fœtus, cette préparation radiopharmaceutique ne doit pas être administrée aux femmes enceintes, sauf si l'on considère que le les avantages l'emportent sur les dangers potentiels. **Femmes qui allaitent :** Le pertechnétate de technétium Tc-99m peut être excrété dans le lait maternel. Lorsqu'une évaluation du rapport avantage/risque suggère l'utilisation de ce produit chez les mères qui allaitent, le lait maternel doit être remplacé par du lait maternisé. **Utilisation pédiatrique :** Il n'existe pas d'études adéquates pour soutenir l'utilisation de ce produit radiopharmaceutique chez les enfants. **RÉACTIONS INDÉSIRABLES :** Les événements suivants ont été observés chez moins de 1 % des patients à l'étude : Angine de poitrine, hypertension, torsades de pointes, rougeurs, vomissements, douleur/gêne abdominale, allergie cutanée, hypotension, dyspnée, goût de métal, sensation de brûlure dans la bouche, sentir une odeur et vision anormale. Il y avait une faible fréquence (moins de 4 %) d'une augmentation transitoire et cliniquement non significative du nombre de leucocytes après l'administration de l'agent. **Pharmacovigilance :** Les réactions indésirables comprenaient une hypersensibilité, un choc anaphylactique ou anaphylactoïde, une réaction anaphylactique ou anaphylactoïde, une altération du goût, des étourdissements, une tachycardie, des douleurs thoraciques, une hypotension, une dyspnée, un bronchospasme, un serrement de la gorge, une toux, des nausées, des vomissements, des douleurs abdominales, de l'urticaire, des démangeaisons, des éruptions cutanées et un œdème de Quincke.

Avant l'administration de Myoview, veuillez lire la monographie complète du produit, disponible en appelant au 1 800 654-0118 (option 2, puis option 3).

Pour signaler des RÉACTIONS INDÉSIRABLES SOUPÇONNÉES, contactez GE Healthcare au 1 800 654-0118 (option 2, puis option 1), ou écrivez à l'adresse courriel canadainfo@ge.com pour demander un formulaire de signalement des réactions indésirables, ou encore envoyez une demande de formulaire par télécopieur au 905 847-5849. Les réactions indésirables peuvent également être signalées à Santé Canada comme suit :

- En ligne sur le site Web www.santecanada.gc.ca/medeffet
- Par téléphone au 1 866 234-2345 (sans frais)
- En remplissant un formulaire de déclaration du programme Canada Vigilance et en l'envoyant
  - par télécopieur au 1 866 678-6789 (sans frais);
  - par la poste au programme Canada Vigilance, Santé Canada, localisateur postal 0701E Ottawa, ON K1A 0K9
- Les étiquettes avec frais de port et le formulaire de déclaration de Canada Vigilance sont disponibles au www.santecanada.gc.ca/medeffet

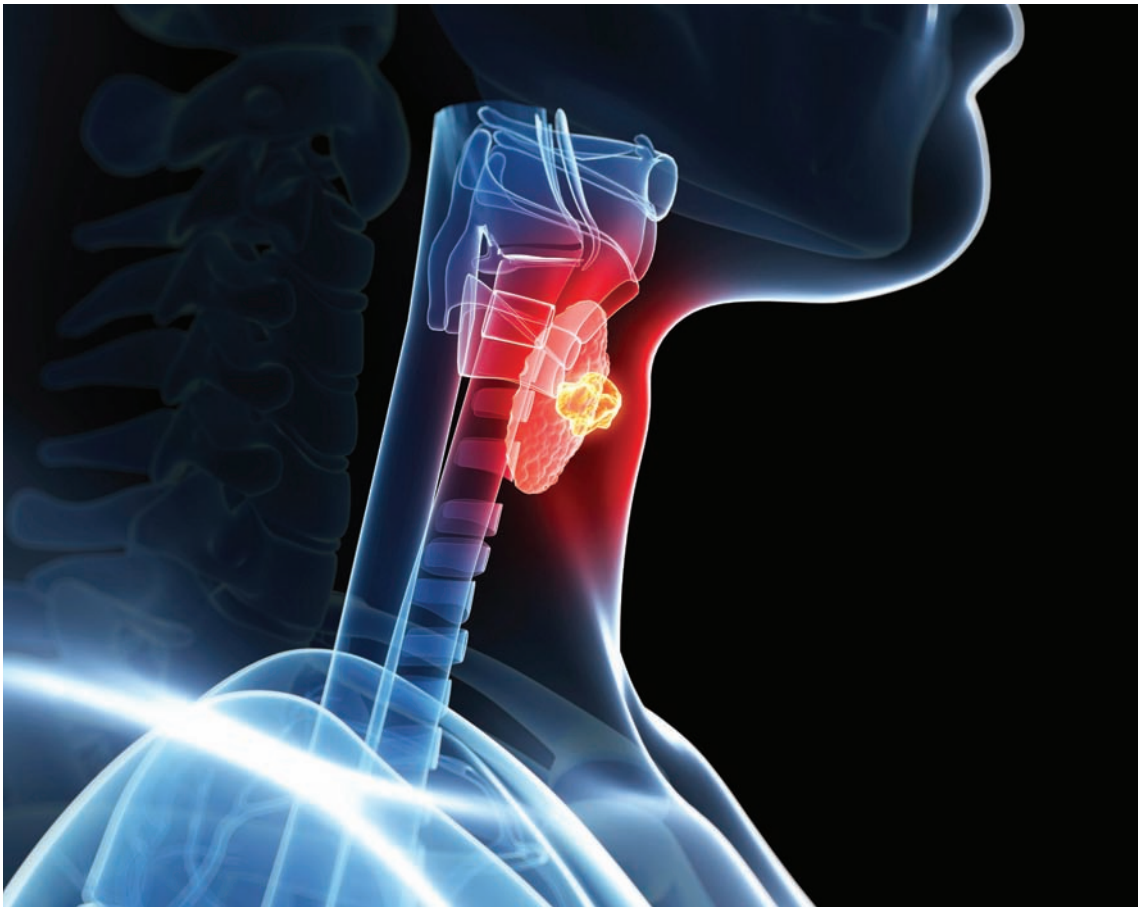
MYOVIEW™

[Trousse de préparation de la tétrofosmine marquée au technétium 99m (99mTc) pour injection]

Novembre 2020 JB00042CA

IODINE 131: HEADING TO A CENTURY OF THERANOSTICS!

Sylvain Prévost, MD
Médecine nucléaire
Centre hospitalier universitaire de Sherbrooke (CHUS)
Québec, Canada



" The role of ^{131}I in the characterization of thyroid nodules is relatively limited, their investigation being mainly conducted by ultra-sound and fine needle aspiration (FNA). "

Iodine 131 can be considered as the ancestor of theranostic agent. In 1939, a Berkeley team first demonstrated that it accumulated in the thyroid and successfully treated a few patients with hyperthyroidism a year later approximately. This isotope remains a cornerstone in the diagnosis and treatment of thyroid cancer nowadays. This article briefly summarizes its main indications in this field which have evolved further during the last decades. Most recommendations below are based on American Thyroid Association (ATA) Guidelines which are followed by many medical centers around the world.

It has been estimated that yearly, incidence of thyroid cancer tripled from 1975 to 2009. Smaller cancers are diagnosed due increasing use of US and other imaging modalities a large proportion being discovered incidentally. Whereas palpable nodules can be found in 5% of women and 1% of men on physical examination, they can be found in 19-68% of patients with high contrast ultrasound. Approximately 7-15% of those will turn out to be malignant, 90% of which will be well differentiated thyroid cancer. Fortunately, the associated mortality rate is low (5-year survival rate of 98% in Canada).

The role of ^{131}I in the characterization of thyroid nodules is relatively limited, their investigation being mainly conducted by ultra-sound and fine needle aspiration (FNA). Nonetheless, in patients with multiples nodules and low TSH, an iodine thyroid scan may still be useful in some cases to identify ISO functioning or hypofunctionning nodules >1 cm to orient FNA.

Even though adequate surgery is the most important treatment variable influencing prognosis of thyroid cancer, radioactive iodine plays an important adjunctive role for many patients. In the past decade, the ATA and other medical associations involved in thyroid cancer treatment have focused on optimizing treatment of patients based on the risk of recurrence mainly, trying to avoid overtreatment. Risk of recurrence is assessed according to ATA 2009 Risk Stratification System included in those guidelines.

For ATA low-risk differentiated thyroid cancer (DTC), routine remnant ablation is not recommended, because to date, there is little evidence to suggest that RAI may improve disease-specific mortality in low-risk DTC patients, and there is some conflicting evidence

on effect on recurrence, with newer data using the ATA risk system suggesting the lack of a significant effect.

Role of iodine is more important in ATA intermediate-risk level DTC patients for which adjuvant therapy should be considered for example to achieve:

- improved overall survival for aggressive PTC histologies such as tall cell, diffuse sclerosing, and insular variants;

- improved overall survival in node-positive adult patients with PTC or pT3 node-negative PTC, in which the primary tumor is > 4 cm or there is evidence of microscopic extrathyroidal extension;

- there may be a benefit of adjuvant RAI treatment in improving overall and disease-specific
survival as well as disease-free survival in patients with nodal metastases aged ‡45 years.

Iodine is even more important in high-risk DTC patients where it is routinely recommended after total thyroidectomy for ATA. Notably, overall survival in patients with FTC with distant metastases more than doubled in patients receiving postsurgical RAI treatment.

The primary goal of postoperative administration of RAI after total thyroidectomy may include:

(i) RAI remnant ablation (to facilitate detection of recurrent disease and initial staging by tests such as Tg measurements or whole-body RAI scans),

(ii) RAI adjuvant therapy (intended to improve disease-free survival by theoretically destroying suspected, but unproven residual disease, especially in patients at increased risk of disease recurrence)

(iii) RAI therapy (intended to improve disease-specific and disease-free survival by treating persistent disease in higher risk patients).

Doses of radioactivity administered for treatments have been lowered significantly over the last few years to minimise the possibility of late complications.

Preparation for treatment and diagnostic imaging has been made easier as well. Typically, thyroxine, the replacement hormone post thyroidectomy had to be stopped for 3-4 weeks in order to enhance uptake of iodine by thyroid cancer cells, making the patient hypothyroid and ill. This process can be avoided by the administration of rhTSH during the days before treatment or imaging. The indications of this medication have been expanded and an increasing of authorities are now reimbursing it, improving greatly the quality of life of thyroid cancer patients. A low iodine diet (LID) for approximately 1–2 weeks (instead of 3-4 weeks advocated by some centers formerly) should be considered for patients undergoing RAI remnant ablation or treatment or imaging. Moreover, many centers now offer the possibility to avoid the hospitalization usually required by law after receiving high doses of iodine (>30 mci in Canada) after making sure that some basic requirements regarding protection from radiation are fulfilled so that nobody in the neighborhood receives undue radiation.

Of course, the role of whole-body iodine scan in the post operative period or during follow-up remains crucial. Post-operative diagnostic whole-body scan has been reported to yield information that could alter clinical management (such as altering disease status assessment) in 25%–53% of patients in some studies. However, one must keep the diagnostic dose as low as possible (1-3 mCi) to avoid stunning of thyroid residual or metastatic tissue and compromise ablation or treatment success. Alternatively, when available, ^{123}I can be used for diagnostic imaging to minimize risk of stunning. SPECT/CT, nowadays available in most nuclear medicine department can be a very useful adjunct to planar imaging to better localize abnormal foci of uptake.

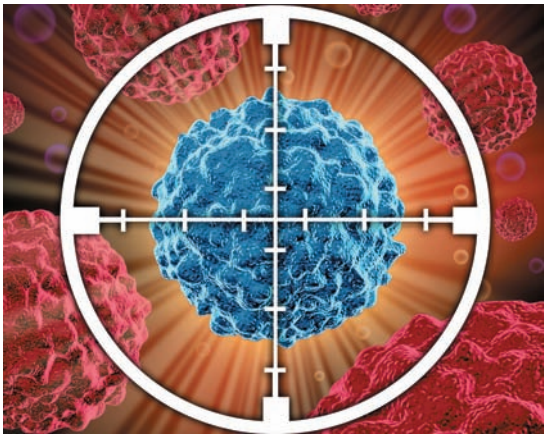
A diagnostic WBS may be indicated in three primary clinical settings:

(i) patients with abnormal uptake outside the thyroid bed on posttherapy WBS,

(ii) patients with poorly informative post ablation WBS because of large thyroid remnants with high uptake of 131I (>2% of the administered activity at the time of WBS) that may hamper the visualization of lower uptake in neck lymph nodes, and

(iii) patients with Tg antibodies, at risk of false-negative Tg measurement, even when neck US does not show any suspicious findings.

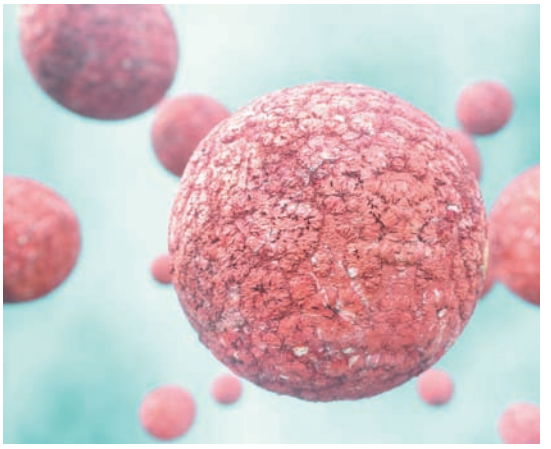
One should refer the complete ATA guidelines and other similar references for more details. Chances are that we might be able to celebrate the 100th anniversary of this theranostic precursor in a little less than 20 years! ■



" Even though adequate surgery is the most important treatment variable influencing prognosis of thyroid cancer, radioactive iodine plays an important adjunctive role for many patients. In the past decade, the ATA and other medical associations involved in thyroid cancer treatment have focused on optimizing treatment of patients based on the risk of recurrence mainly, trying to avoid overtreatment. "

LE CANCER DU SEIN

Khun Visith Keu, MD FRCPC
Service de médecine nucléaire
Professeur d'adjoint clinique - Université de Montréal et Université de Sherbrooke
Service de médecine nucléaire, département d'imagerie médicale
Centre intégré de santé et de service sociaux de Laval
Hôpital de la Cité-de-la-Santé, Centre Hospitalier Affilié à l'Université de Montréal



Introduction

Le cancer du sein est une maladie relativement fréquente avec une femme sur neuf (1 sur 9) qui sera diagnostiquée au cours de sa vie. Les cellules saines du sein subissent régulièrement des modifications en relation avec les hormones du corps de la femme. Certaines altérations du métabolisme auront des comportements différents pouvant engendrer une croissance de lésions non cancéreuses (communément appelées tumeurs bénignes), et malheureusement parfois, des lésions cancéreuses ou néoplasiques. La médecine nucléaire joue au rôle crucial dans l'investigation et le traitement du cancer du sein. En 2020, les examens demandés en médecine nucléaire étaient principalement la lymphoscintigraphie du ganglion sentinelle, la scintigraphie osseuse et la tomographie par émissions de positrons (TEP) au fluorodésoxyglucose (FDG).

Lymphoscintigraphie du ganglion sentinelle

Pour un cancer du sein localisé, la stadification de la maladie ganglionnaire aux aisselles est primordiale pour limiter l'étendue de la chirurgie et prévoir le champ de radiothérapie subséquente. La lymphoscintigraphie du ganglion sentinelle en médecine nucléaire est une technique simple, sécuritaire et facile à réaliser qui permet au chirurgien d'extraire le premier ganglion sur le réseau de drainage du parenchyme mammaire. Ce premier ganglion, appelé sentinelle, agit comme un filtre attrapant les cellules néoplasiques qui auront migré du site initial de la tumeur (**Figure 1**). Le produit radioactif injecté est détecté par une sonde ultrasensible à la radioactivité manipulée en salle d'opération. L'analyse étant réalisée dans les minutes suivant la résection du ganglion sentinelle, le chirurgien pourra prendre la décision de procéder ou non à une résection plus extensive au niveau de l'aisselle. Cette technique permet d'éviter des chirurgies non essentielles qui peuvent parfois engendrer un lymphœdème qui est un gonflement chronique du membre supérieur en raison de l'inefficacité du système lymphatique altéré à l'aisselle. Les études ont démontré que les risques de lymphœdème sont réduits de 20 % à 5 % en utilisant la lymphoscintigraphie du ganglion sentinelle. Cette technique est disponible dans la majorité des services de médecine nucléaire.

Scintigraphie osseuse

Lorsque le médecin suspecte une propagation de la maladie aux ganglions ou aux autres structures, la scintigraphie osseuse permet de faire une évaluation complète et rapide à l'ensemble du squelette. Les cellules cancéreuses qui s'implantent et qui se multiplient dans une structure osseuse engendra une métastase. Il s'agit alors d'un signe d'atteinte systémique où le plan de traitement diffère largement d'une atteinte locale au sein. La chimiothérapie ou l'immunothérapie sont des agents thérapeutiques puissants pour traiter le cancer, mais à la fois nocives pour les cellules saines d'où l'importance de bien évaluer l'étendue de la maladie pour personnaliser la quantité de chimiothérapie ou d'immunothérapie requise. Le produit radioactif injecté pour la scintigraphie osseuse se fixe aux structures phosphocalciques des os qui présentent un métabolisme plus élevé que la normale. Les foyers actifs sont alors considérés suspects pour des métastases. Par contre, plusieurs autres pathologies peuvent engendrer des images similaires telle qu'une infection, une fracture, un changement dégénératif, etc. Le spécialiste en médecine nucléaire est expérimenté pour différencier ces diverses maladies. Depuis une quinzaine d'années, les caméras de médecine nucléaire sont combinées avec une tomodensitométrie, communément appelée CT-SCAN, TACO ou TDM, qui permettent une meilleure localisation des foyers actifs en scintigraphie osseuse et de mieux préciser le diagnostic (**Figure 2**). En utilisant cette technique, l'efficacité de l'examen augmente de 70 à 90 % selon diverses études. Contrairement aux imageries conventionnelles en radiologie, l'avantage de la scintigraphie osseuse est la capacité de détecter des métastases à un stade précoce ce qui permet de traiter rapidement et d'augmenter les chances de guérison. Cet examen est également utile pour évaluer la réponse au traitement puisqu'il permet de documenter la normalisation des foyers actifs plus rapidement que les imageries radiologiques. La scintigraphie osseuse est un examen facile à réaliser, tout en étant sécuritaire sans risques pour les patientes atteintes d'insuffisance rénale.

TEP au FDG

Les cellules cancéreuses sont reconnues pour leur

capacité de se reproduire rapidement de façon désordonnée. Pour subvenir à cette croissance rapide, les tumeurs amplifient le métabolisme du sucre. La TEP au FDG exploite cette voie métabolique pour détecter les zones de cancer. Le FDG ou fluorodésoxyglucose est un analogue du sucre alimentaire. Plus la lésion est agressive, plus le FDG s'accumule. Cette modalité d'imagerie permet d'évaluer la propagation de la maladie aux ganglions et aux structures extra-ganglionnaires, comme les os, les poumons, le foie, les surrénales, etc. Elle est utilisée aussi pour l'évaluation de la réponse au traitement ou pour rechercher les sites à biopsier. Toutes images TEP au FDG sont combinées à une tomodensitométrie pour augmenter la certitude diagnostique et la localisation des anomalies (**Figure 3**). La réalisation de cet examen est simple, rapide et sécuritaire. Un jeûne d'environ quatre à six heures est nécessaire au préalable, mais une insuffisance rénale ou une allergie à l'iode ne sont pas des contre-indications. Bien que cette technique soit sensible pour détecter les métastases occultes (non identifiées par d'autres examens), la TEP au FDG est moins efficace pour le dépistage et moins appropriée sur le plan socio-économique.

De façon générale, la TEP au FDG peut documenter des métastases qui peuvent être non détectées par la scintigraphie osseuse, la tomodensitométrie (TDM) ou l'imagerie par résonance magnétique (IRM). Dans de rare cas, la TEP au FDG peut être faussement négative selon le type de cellules associées. Plusieurs organismes et sociétés savantes introduisent davantage cet examen précocement dans leur algorithme décisionnel pour le bilan d'extension de la maladie et de la réponse au traitement. Plusieurs études ont démontré la supériorité de la TEP au FDG pour prédire la réponse au traitement et établir le pronostic des patientes atteintes de la maladie.

Conclusion

Grâce aux avancées technologiques, le médecin spécialiste en médecine nucléaire devient un acteur de plus en plus important dans la prise en charge du cancer du sein. La lymphoscintigraphie du ganglion sentinelle et la scintigraphie osseuse sont disponibles dans la majorité des centres hospitaliers. Devant la nécessité d'un traitement ciblé pour améliorer la survie et réduire les effets secondaires, la TEP au FDG deviendra un outil incontournable pour la médecine personnalisée. La recherche pour le cancer du sein est très active actuellement. Plusieurs études et essais cliniques sont en cours avec de nouveaux produits radioactifs qui permettront de détecter plus précocement la maladie ou de mieux prédire la réponse aux traitements.

Pour plus d'informations sur la scintigraphie osseuse et la TEP au FDG, des vidéos éducatives sont disponibles sur le site de l'Association Canadienne de Médecine Nucléaire (ACMN) : http://canm-acmn.ca/infopourlepublic/~francais.

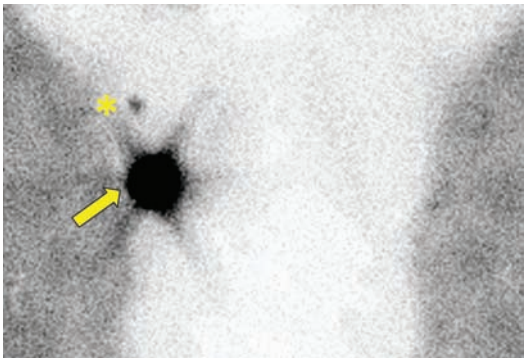


Figure 1 : Lymphoscintigraphie du ganglion sentinelle
L'image du thorax en incidence antérieure démontre le site d'injection au sein droit (flèche) et le ganglion sentinelle à l'aisselle droite (astérisque).

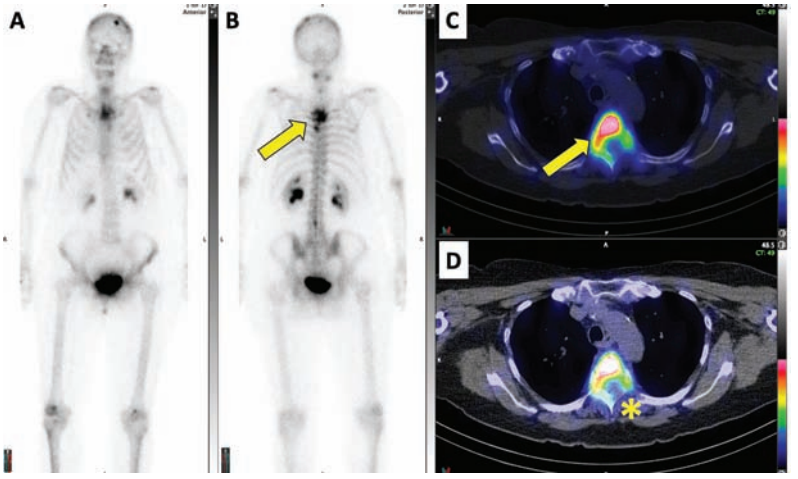


Figure 2 : Scintigraphie osseuse
Les images du crâne jusqu'aux mi-tibias (A et B) démontrent des métastases osseuses (flèche) au rachis thoracique haut et à l'os frontal gauche. Une étude 3D avec une tomodensitométrie localise la métastase osseuse la plus active à D4 (flèche dans la case C) et la métastase tissulaire qui a détruit l'arc postérieur de la vertèbre (astérisque dans la case D).

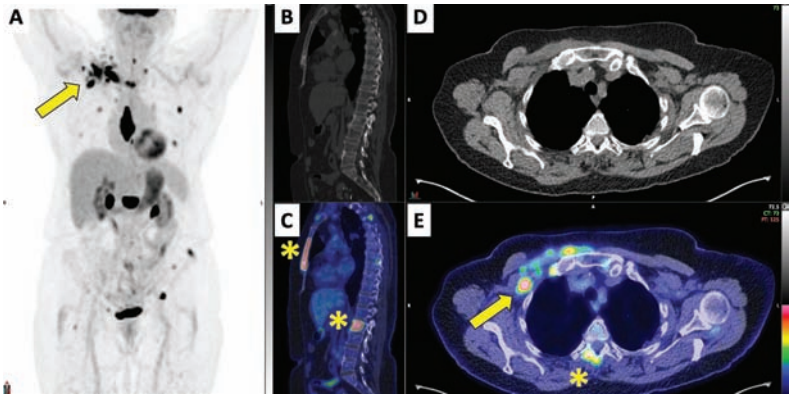


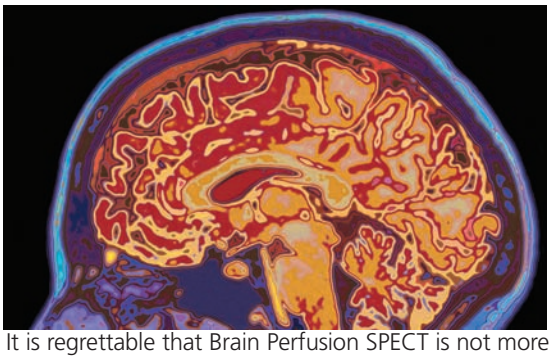
Figure 3 : TEP au FDG
L'image de représentation 3D (case A) démontre de multiples adénopathies métastatiques à l'aisselle droite (flèche dans les cases A et E), une infiltration tissulaire multifocale en rétroclaviculaire droite, de même que de multiples métastases osseuse (astérisque dans les cases C et E). Les cases B et D démontrent la composante de tomodensitométrie obtenue sur la même caméra TEP.

BRAIN SPECT IN HEAD INJURY

PHILIP COHEN
MD FRCP(C)
DIVISION HEAD,
NUCLEAR MEDICINE
LIONS GATE HOSPITAL
CLINICAL PROFESSOR
OF RADIOLOGY
UNIVERSITY OF
BRITISH COLUMIA,
CANADA

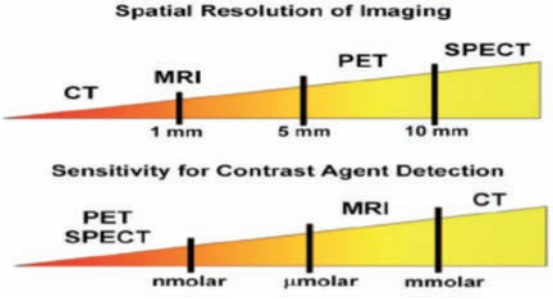
Following mild traumatic brain injury (mTBI) or concussion, most patients receive conventional imaging such as Computed Tomography (CT) or Magnetic Resonance Imaging (MRI). However very often these conventional imaging tests do not show changes despite the patients continuing to have significant physical symptoms, often quite dramatic mental symptoms and personality changes.

While Single Photon Emission Computed Tomography (SPECT) and Positron Tomography (PET) are known to be useful in head injuries, the use of nuclear medicine in head injuries to date is extremely limited in Canada. PET scanners are not widely available outside Quebec, and even in Quebec, are utilized primarily in scanning cancer patients. SPECT scanners are available in most Canadian hospitals of any size, and while not as sensitive or high resolution as PET scanners, are much less costly and easier to access because of the limited availability of F-18 FDG (Fluoro-Deoxyglucose) the main PET agent.



It is regrettable that Brain Perfusion SPECT is not more widely utilized. This is most likely for 3 main reasons. 1) CT and MRI produce excellent and high resolution anatomic images which most referring clinicians are trained to understand, and when positive, leave little doubt about the origin and nature of the head injury, 2) most referring clinicians are not exposed to SPECT perfusion images, and do not understand their role when the CT or MRI scans are negative, and 3) most nuclear medicine physicians have little experience with head trauma, and have been trained, if at all, only to interpret cross-sectional images similar to CT or MRI "slices', which can easily miss punctate or small regional perfusion abnormalities which are better appreciated on MIP or 3D volume-rendered images, or on functional quantitative SPECT representations compared to normal data bases.

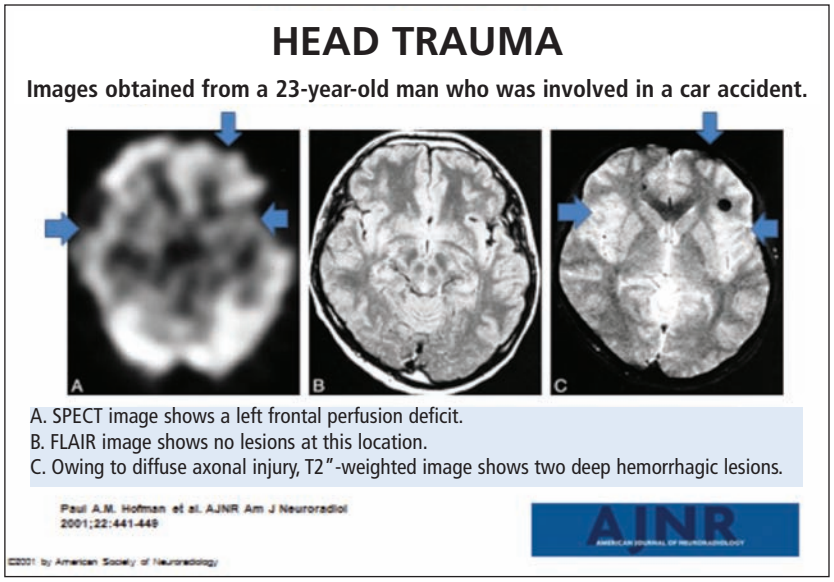
There is also little intuitive understanding by most physicians, that while Brain perfusion images are "blurry" compared to CT or MRI, they are much more "sensitive". CT and MRI have resolutions 10 times better than SPECT images (1 mm versus 1 cm), but SPECT and PET have contrast sensitivities 1000 times that of MRI and 1 million times that of CT.

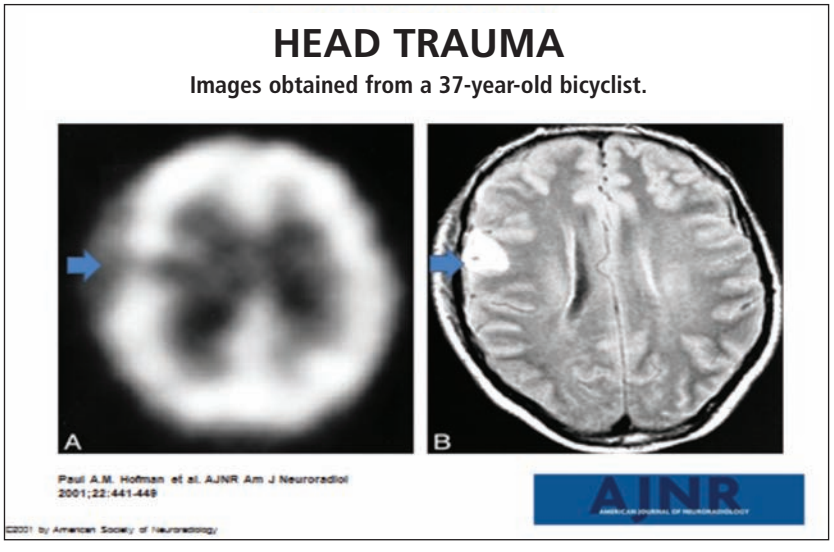


This exquisite sensitivity in contrast is readily observed in the **figure 1**.

An extensive 2014 literature in PLOS1 by Raji et al comparing SPECT to CT and MRI demonstrated Level IIA evidence (at least one non-randomized controlled trial) for the value of SPECT in TBI. Given its advantages over CT and MRI in the detection of mild TBI in numerous studies of adequate quality, and given its excellent negative predictive value, it may be an important second test in settings where CT or MRI are negative after a closed head injury with post-injury neurological or psychiatric symptoms. ■

Figure 1





Canon
CANON MEDICAL

Élargissez votre champ de vision

Aquilion Exceed LB

Contactez votre représentant local :
CMSCA-Inquiry@medical.canon

Une solution avancée en radio-oncologie.

Grâce à sa grande ouverture de 90 cm, l'Aquilion Exceed LB vous permet de positionner facilement vos patients avec une précision extraordinaire. Ses puissantes technologies d'imagerie basées sur l'IA et ses fonctions avancées spécifiques au traitement permettent un flux de travail efficace en radio-oncologie, sans compromis sur la position du patient, la qualité de l'image ou la reproductibilité.

CANON SYSTÈMES MÉDICAUX CANADA LIMITÉE
ca.medical.canon

Made For life

THE ROLE OF NUCLEAR MEDICINE IN DETECTION OF CARDIAC AMYLOIDOSIS

Raymond Taillefer
MD, FRCP, ABNM
Department of nuclear medicine, Hôpital du Haut-Richelieu,
Saint-Jean-sur-Richelieu, Québec
CISSS-Montérégie centre

Amyloidosis is a rare systemic disorder that is classified into several types. This is a group of diseases that are a consequence of abnormal protein deposits, called amyloid, in various tissues of the body. There are several types of amyloid proteins produced by the bone marrow. Depending on the structure of the particular amyloid, the abnormal protein can accumulate in an isolated tissue (localized amyloidosis) or can affect many organs or tissues (systemic amyloidosis). While the localized form of the disease can be less harmful, the systemic form can cause serious changes in almost every organs of the body. The most frequently involved organs are the kidneys, heart, skin, lungs, liver, spleen, nerves, tongue and digestive tract.

1- TYPES OF AMYLOIDOSIS

Systemic amyloidosis is usually classified into three major types that significantly differ from each other.

A- The most common type of systemic amyloidosis is **AL** amyloidosis (immunoglobulin **light** chain). The annual incidence of this for mis approximately 8-10 cases per million in North America. This form of amyloidosis results from an abnormality of the plasma cells in the bone marrow and is closely related to multiple myeloma. Although earlier onset may occur, the higher incidence is seen between the ages of 60 to 70 with nearly 70% being male patients.

B- AA amyloidosis, usually known as secondary amyloidosis is derived from an inflammatory protein serum **amyloid A** which occurs in association with chronic inflammatory disease such as chronic inflammatory bowel disease or rheumatic diseases.

C- Hereditary amyloidosis is caused by an abnormal gene. Although many genes can cause the disease, the most common type of hereditary amyloidosis is called **ATTR**. This form is caused by mutations in the transthyretin (**TTR**) gene. Transthyretin, a prealbumin, is an abundant protein produced by the liver and is a **trans**porter of **thy**roxine and **retin**ol. In its monomeric form, transthyretin is prone to misfold and gradually concentrate as amyloid deposits. The two main subtypes of ATTR amyloidosis are the mutant ATTR (ATTRm) and the wild-type ATTR (ATTRwt), previously described as senile amyloidosis.

2- CARDIAC AMYLOIDOSIS

The vast majority of cardiac amyloidosis is caused by one of the two proteins: light chain (AL) or transthyretin (ATTR). Age related amyloidosis (in which amyloid is derived from wild-type normal transthyretin) is a slowly progressive disease that affect the heart of elderly men.

" Cardiac amyloidosis is frequently misdiagnosed initially since its clinical presentation is similar to that of many other cardiac diseases. "

Cardiac amyloidosis is frequently misdiagnosed initially since its clinical presentation is similar to that of many other cardiac diseases. Cardiac manifestations of amyloidosis include heart failure and cardiac arrhythmias. Ventricular hypertrophy with inappropriately low electrical voltages on the electrocardiogram is clues to diagnosis. The AL amyloidosis is usually seen between the ages of 40 to 80 with an incidence in men and women almost equal and shows mild left ventricular hypertrophy. However, left ventricular hypertrophy can be significant in both ATTRwt and ATTRm amyloidosis. In these two forms, men are significantly more affected than women and the age of occurrence is between 65 to 95 years. for ATTRwt and 55 to 75 years. for ATTRm. ATTRwt form is quite underestimated since almost a quarter of elderly patients at autopsy has some degree of cardiac amyloid deposits. Approximately 3-4% among US African Americans have a common inherited mutation of the TTR gene.

3- PROGNOSIS AND DIAGNOSIS OF CARDIAC AMYLOIDOSIS

Mortality from amyloidosis remains high for patients with advanced cardiac involvement. Early detection with appropriate classification is crucial for a better treatment and prognosis. This is very important since the treatment will differ according to the type of amyloidosis. Prognosis in amyloidosis is mainly dependent on the degree of cardiac involvement. Although the prognosis is generally better in the ATTR form than in the AL form of the disease, both forms still show a high annual mortality rate. The treatment of AL amyloidosis has two goals: attempting to slow the progression of the disease by eliminating the clonal plasma cells and their production of abnormal light chains with chemotherapy and treating the organ dysfunction. On the contrary, chemotherapy has no role in the treatment of ATTR amyloidosis as it is not a malignant process. Several agents have been and are currently under investigation for the treatment of amyloidosis such as nonsteroidal anti-inflammatory drug (however anti-inflammatory drugs are relatively contraindicated in heart failure) or RNA interference medications which help reducing the production of transthyretin by the liver. In May 2019 the US Food and Drug Administration (FDA) approved Pfizer Inc's oral drug, Tafamidis, for ATTR amyloid cardiomyopathy. This agent has been previously approved in Europe and Japan for treatment of ATTRm amyloidosis polyneuropathy.

Definitive diagnosis of amyloidosis requires a tissue biopsy of the clinically involved organ. For cardiac amyloidosis an endomyocardial biopsy with special stainings will reveal the amyloid deposits and confirm the diagnosis. Other adjunctive laboratory tests will be also helpful to confirm the type of amyloidosis and monitor the disease response to treatment. Due to the rather "aggressive" nature of the myocardial biopsy, researches have been focused on non-invasive imaging methods to detect and differentiate the different types of amyloidosis. Echocardiography and MRI (magnetic resonance imaging) are very useful in identifying the morphological and functional status of the heart but cannot always make the distinction between the two types of cardiac amyloidosis. Recent scientific data showed that a nuclear medicine procedure could help to improve and differentiate the non-invasive diagnosis of cardiac amyloidosis: myocardial scintigraphy with 99mTc-Pyrophosphate.

4- MYOCARDIAL SCINTIGRAPHY

Recent scientific awareness about cardiac amyloidosis and its possible treatment renewed the interest in a nuclear medicine diagnostic test which is used since more than 50 years, bone scintigraphy. It is known since several decades that the radiotracers used in bone scintigraphy, 99mTc-Methylene Diphosphonate (99mTc-MDP) or 99mTc-Pyrophosphate (99mTc-PYP) show a high affinity for amyloid protein resulting in a diffuse myocardial uptake of the radiotracer in patients with cardiac amyloidosis. 99mTC-PYP has been shown to be the best agent in that purpose. Although myocardial increased uptake of 99mTC-PYP can be seen in different conditions such as an acute myocardial infarction or pericarditis, these conditions can be relatively easily differentiated from amyloidosis with simple clinical tests. Many studies have shown that 99mTc-PYP accumulate at various degrees in the heart of patients with ATTR amyloidosis but not in those with the AL type. Although the exact mechanisms of 99mTc-PYP uptake in ATTR cardiac amyloidosis (and the lower or no uptake in AL amyloidosis) are currently unknown, it is thought that this increased radiotracer uptake is related to the high calcium levels in the amyloid deposits of patients with ATTR cardiac amyloidosis. A distinct advantage of 99mTc-PYP myocardial imaging is its ability to specifically identify ATTR cardiac amyloidosis non-invasively.

No specific test preparation is required. This procedure is available in every department of nuclear medicine. This non-invasive procedure requires a single

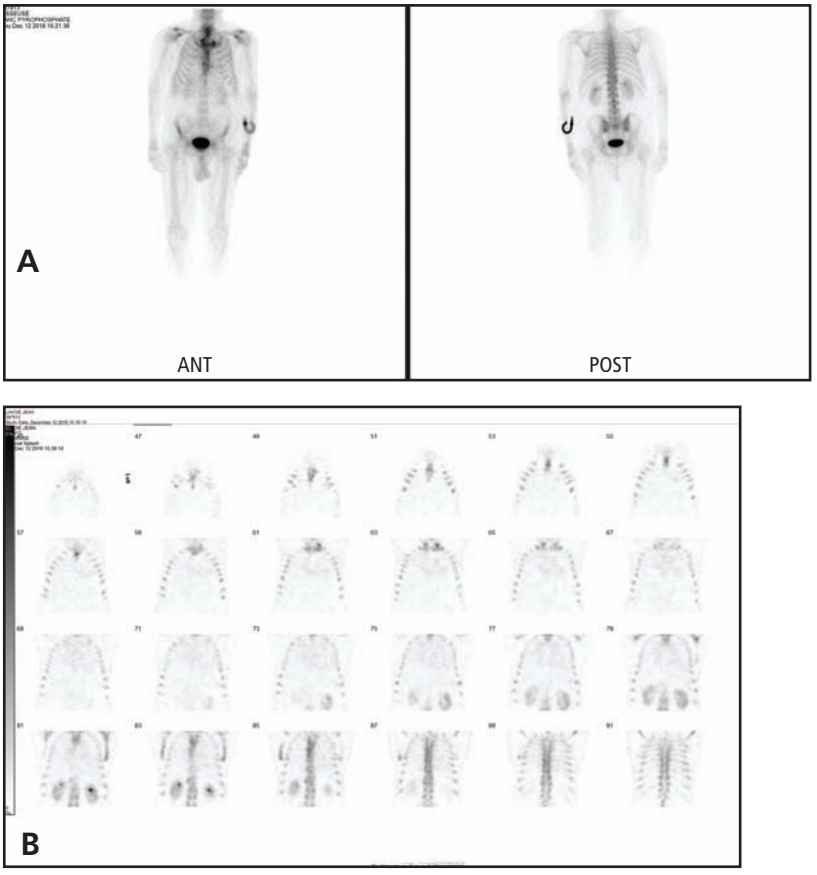


Figure 1
99mTc-PYP whole-body planar images (A) and SPECT images (B) in a patient with cardiac AL type of amyloidosis. There is no focalized increased cardiac uptake of the radiotracer and thus represents a normal finding. This study is interpreted as normal.

" Mortality from amyloidosis remains high for patients with advanced cardiac involvement. Early detection with appropriate classification is crucial for a better treatment and prognosis. "

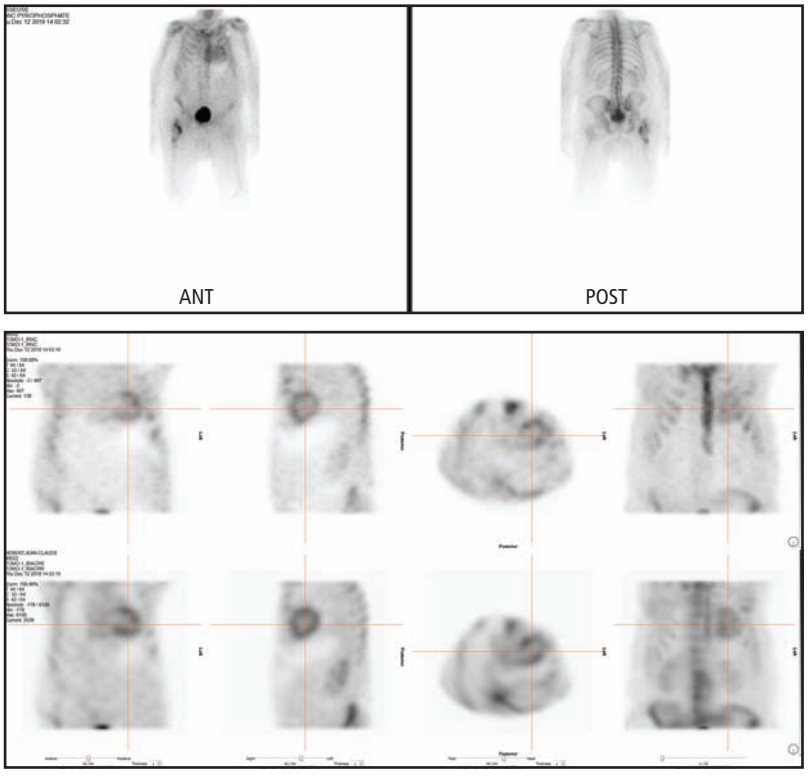


Figure 2
99mTc-PYP whole-body planar images (A) and SPECT images (B) in a patient with cardiac ATTR type of amyloidosis. Note the intense myocardial increased uptake which is well delineated in the SPECT study slices (arrows). This is a typical finding in ATTR cardiac amyloidosis.

intravenous injection of the radiotracer with no side effect. Three to four hours after the injection, planar whole-body images and SPECT study (Single Photon Emission Tomography) which consists of a gamma camera detecting the gamma rays emitted by the radiotracer from the heart and rotating around the patient (allowing for more precise localization of the radiotracer uptake) are obtained. The entire procedure lasts for approximately 45 minutes. SPECT imaging can help to evaluate the uptake of the radiotracer at the apex of the heart which is usually spared until the disease is very advanced. Quantitative or semi-quantitative analysis can be obtained from computer image analysis. This serves to categorize more objectively the degree of myocardial uptake which can be proportional to the degree of amyloid deposits into the myocardium.

" Recent scientific awareness about cardiac amyloidosis and its possible treatment renewed the interest in a nuclear medicine diagnostic test which is used since more than 50 years, bone scintigraphy. "

99mTc-PYP myocardial imaging is indicated in patients with heart failure and unexplained increase in left ventricular thickness, especially over the age of 60 years with preserved left ventricular ejection fraction. Other indications include the evaluation of cardiac involvement in individuals with known or suspected familial amyloidosis, diagnosis of cardiac ATTR in patients with MRI or echocardiography consistent with cardiac amyloidosis or in patients with suspected cardiac ATTR amyloidosis and contraindications to MRI such as renal insufficiency or implantable cardiac devices.

Other radiotracers are used in the non-invasive diagnosis of cardiac amyloidosis. European countries currently used in clinical practice a new radiotracer, 99mTc-DPD (99mTc-3,3-diphosphono-1,2-propanodicarboxylic acid) with very good results. Some authors have reported the use of 123 Iodine-mIBG (**m**eta **i**odobenzyl **g**uanidine). This radiotracer is used to evaluate the degree of innervation of the heart. Patients in the early stages of cardiac amyloidosis, especially those with ATTR type, show some degree of denervation and can be detected with 123Iodine-mIBG scintigraphy. It is hoped that more generalized use of this test would help identifying patients in the early stages of the disease, potentially improving the prognosis.

CONCLUSION

The paradigm of cardiac amyloidosis has markedly changed in the last decade. Better understanding of the disease, increased awareness of its incidence, marked improvements in both treatment and in diagnostic tools are modifying the actual medical approach of cardiac amyloidosis. Although 99mTc-PYP imaging is considered as an "old" procedure, its high sensitivity in diagnosing cardiac amyloidosis and its unique ability to differentiate ATTR and AL cardiac amyloidosis is recognized as an important tool in guiding patient management. Nuclear medicine can play a key role in this underdiagnosed disease. ■

GE Santé | GE Healthcare

Discovery MI Gen 2

La prochaine génération. Encore plus en vue. | Next generation. Even more in sight.

Une nouvelle génération de la première plateforme TEP/CT numérique au monde.
A new generation of the world's first digital PET/CT platform.

Détecteurs numériques
Conçu pour être évolutif de 15 cm FOV à 30 cm FOV[1]

Sensibilité la plus élevée
Conçu pour atteindre une sensibilité exceptionnelle par cm (cps/kBq/cm)[2]

Correction de mouvement
Le tout premier système numérique pour la gestion du mouvement respiratoire

Précision du SUV
Jusqu'à deux fois plus de précision dans la quantification (SUV_{moyen}) de la TEP avec Q.Clear

Digital detectors
Designed for scalability from 15 cm FOV up to 30 cm FOV[1]

Highest sensitivity
Engineered to achieve exceptional sensitivity per cm (cps/kBq/cm)[2]

Motion correction
First-ever digital respiratory motion management solution

SUV accuracy
Up to two times improvement in PET quantitation accuracy (SUV_{mean}) with Q.Clear

1. Travaux en cours optionnels. La configuration AFOV 30 cm n'est pas à vendre. Non approuvé par la FDA américaine ou tout autre organisme de réglementation mondial pour une mise sur le marché.
1. Optional works in progress. 30 cm AFOV configuration not for sale. Not approved by the U.S. FDA or any other global regulator for commercial availability.
2. Discovery MI Gen 2 a la sensibilité la plus élevée du marché selon NEMA, par rapport aux systèmes TEP/CT courants ayant un AFOV identique ou similaire (d'après le rapport 2019 de la division de l'information médicale d'IMV, les fabricants représentant plus de 90 % de la base installée aux États-Unis).
2. Discovery MI Gen 2 has the highest NEMA sensitivity in the market, comparing with common PET/CT systems with same or similar AFOV, (based on IMV's Medical Information Division's 2019 report as the manufacturers representing more than 90% of the US Installed Base).

JB00188CA

Banque Royale

Le Forfait privilège RBC : une offre inégalée à un coût très avantageux !

Comme **pharmacien** membre de la Fédération des pharmaciens du Québec (FPQ), vous pouvez bénéficier de l'un des plus avantageux forfaits de services bancaires du marché. Grâce à notre offre remarquable, vous économisez et obtenez d'intéressantes bonifications sur vos prêts.

La FPQ et RBC Banque Royale : un partenariat privilégié

RBC Banque Royale® entretient une relation d'affaires privilégiée avec la FPQ en offrant à ses membres un ensemble complet de services bancaires spécialement adapté aux **pharmaciens**.

Le Forfait bancaire privilège RBC : Petit prix. Grande valeur.

Le Forfait bancaire privilège RBC® vous en donne plus pour votre argent.

Forfait bancaire VIP RBC® : Obtenez une réduction sur les frais mensuels de ce forfait, soit une économie annuelle de 235 $. En plus de recevoir un service prioritaire, vous pouvez notamment effectuer un nombre illimité d'opérations, accéder aux Services bancaires mobiles[1] RBC, et choisir l'une de nos cartes de crédit de prestige sans frais annuels.

Carte Visa Infinite‡ Voyages^MC RBC : Cette carte vous donne la possibilité d'accumuler de précieux points RBC Récompenses® et de les échanger contre des billets d'avion pour le vol de votre choix, sur n'importe quelle compagnie aérienne, sans période d'interdiction ni restriction de sièges.

À titre de client élite, profitez d'avantages de voyage exclusifs tels que des surclassements gratuits (selon les disponibilités) et des tarifs privilégiés lorsque vous effectuez vos réservations. Qui plus est, vous pouvez compter sur la carte Visa Infinite Voyages pour vous fournir la couverture d'assurance dont vous avez besoin et voyager en toute tranquillité d'esprit.

Et ce n'est pas tout ! Conscients de la valeur de votre temps, nous vous invitons à tirer parti d'un service de conciergerie haut de gamme, une gracieuseté de Visa Infinite. Un simple appel téléphonique vous permet d'obtenir de l'aide en tout temps, où que vous soyez. Que ce soit pour organiser une sortie, réserver une bonne table, acheter des billets pour des événements spéciaux, la conciergerie Visa Infinite peut répondre à pratiquement toutes vos demandes.

Marge de crédit Royale® : Accédez à des fonds facilement et rapidement, grâce à une marge de crédit qui vous est offerte au taux préférentiel, soit le plus bas taux du marché.

Pour en savoir davantage sur nos solutions et services conçus pour répondre à vos besoins personnels :

Composez le 1 800 80 SANTÉ (1 800 807-2683).
Passez à la succursale la plus près de chez vous.

VPS102067 120769 (07/2018)

CANM
ACMN

The Canadian Association of Nuclear Medicine
Association canadienne de médecine nucléaire

Dr. François Lamoureux
President / Président

MOT DU PRÉSIDENT

C'est avec grand plaisir que je vous présente le nouveau conseil d'administration de l'Association canadienne de médecine nucléaire (CANM-ACMN). Bienvenue au docteur Salem Yuoness comme vice-président et aux docteurs Mark Byanton, Cheryl Lynn Jefford et Jonathan Boekhoud à titre de membres personnels. On remercie également les docteurs Daniel Levin, Denise Chan et Jeffrey Wagner pour leurs services au sein de l'Association, et on leur souhaite bon succès dans la suite de leurs activités professionnelles.

Par la même occasion, un merci tout particulier à madame Hélène Samson, qui a pris sa retraite. L'Association a été privilégiée de l'avoir eue comme directrice exécutive : une personne de grande honnêteté, de grande compétence, toujours disponible et d'une grande gentillesse. Hélène a vu naître l'Association, elle en fut un pilier incontournable, elle était l'amie de tous. Même si Hélène a pris sa retraite, elle demeurera des nôtres. En effet, le conseil d'administration l'a nommée membre honoraire à vie de l'Association. Merci Hélène d'avoir accepté de rester au sein de notre grande famille.

Monsieur Nicolas Rondeau Lapierre assume maintenant depuis le 1 mars 2021 le poste de directeur général. Bienvenue Nicolas. Nicolas connaît bien L'Association, de même que la plupart de nos partenaires tant de l'industrie que des organismes ou associations sœurs.

Nicolas a de plus une solide formation universitaire des milieux sociaux et des techniques du monde virtuel, la nouvelle réalité de l'Association et de tous nos membres et partenaires industriels. L'Association rapidement a pris le virage du virtuel et dans ce nouveau contexte, on a développé les outils nécessaires pour continuer à offrir sans faille de la formation de développement professionnel, soit sous forme de webinaires, de colloques, de réunions inter-associations ou en partenariat avec les industriels, le tout en virtuel.

L'ACMN a relevé le défi. Nous continuerons à faire connaître la plus-value de la Médecine nucléaire auprès des organismes accréditeurs, des gouvernements, du grand public, des industriels et des prescripteurs.

Devant le fulgurant développement de la Médecine nucléaire, tant en diagnostic qu'en traitement comme la théranostique, notre grand défi sera d'intéresser de jeunes médecins et de jeunes technologues à devenir médecins ou technologues en Médecine nucléaire.

L'ACMN travaille en continuelle synergie avec la plupart des associations ou sociétés de Médecine nucléaire à travers le monde, l'édition actuelle du magazine LePatient en est un vibrant témoignage.

Ensemble nous serons plus forts pour le plus grand bénéfice des patients.

François Lamoureux
Président

PRESIDENT'S WORD

It is my honour and privilege to present the new Canadian Association of Nuclear Medicine (CANM-ACMN)'s board of directors.

A warm welcome to Dr. Salem Yuoness, our new vice president and also to Dr. Mark Byanton, Dr. Cheryl Lynn Jefford, and Dr. Jonathan Boekhoud as members of the board. We would also like to thank Dr. Daniel Levin, Dr. Denise Chan, and Dr. Jeffrey Wagner for their service within the Association and we wish them good success in their future professional activities.

At the same time, a special thanks to Mrs. Hélène Samson who retired in early 2021. The association was privileged to have had Hélène as its executive director. She was a person of great honesty, great competence, and kindness. Hélène was there from the start of the association and was an essential pillar and overall a great friend. Even though Hélène has retired, she will remain with us and in fact, the board of directors has named her an honorary life member of the association. Thank you, Hélène, for agreeing to stay with our big family.

Nicolas Rondeau Lapierre has now assumed the position of Executive Director effective March 1, 2021. Welcome Nicolas.

Nicolas knows the association as well as most of our partners, both from the industry perspective but also from our sister organization and association. Nicolas has a solid academic background in business management and new digital technologies, the new reality of the association and of all our members and industrial partners.

The association quickly took the virtual turn and in this new pandemic context we developed the necessary tools to continue to offer flawless professional development training, either in the form of webinars, seminars, or inter-association meetings all in a virtual environment. I'm glad to say that our association rose to the challenge. We will continue to promote the added value of nuclear medicine to accreditation bodies, governments, the general public, manufacturers, and prescribers

Faced with the dazzling development of Nuclear Medicine both in diagnosis and in treatment, such as theranostics, our big challenge will be to interest young doctors and young technologists to become doctors or technologists in Nuclear Medicine.

The CANM works in continuous synergy with most nuclear medicine associations or societies around the world, the current edition of LePatient magazine is a vibrant testimony to this.

Together we will be stronger for the benefit of all patients.

François Lamoureux
President

CANM ACMN

The Canadian Association of Nuclear Medicine
Association canadienne de médecine nucléaire

BOARD OF DIRECTORS / CONSEIL D'ADMINISTRATION

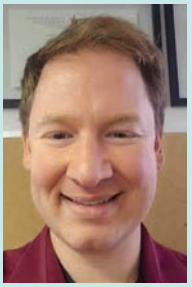
President,
Dr. François Lamoureux,
président

Past President,
Dr. Andrew Ross,
président sortant

Vice-President and Secretary-Treasurer
Dr. Salem Yuoness,
vice-président et secrétaire-trésorier

Member-at-Large,
Dr. Jean-Luc Urbain,
membre à titre personnel

Member-at-Large,
Dr. Christopher O'Brien,
membre à titre personnel



Member-at-Large,
Dr. Mark Bryanton,
membre à titre personnel

Member-at-Large,
Dr. Philip Cohen,
membre à titre personnel

Member-at-Large,
Dr. Norman Laurin,
membre à titre personnel

Member-at-Large,
Dr. Glenn Ollenberger,
membre à titre personnel

Member-at-Large,
Dr. Antoine Leblond,
membre à titre personnel

Member-at-Large,
Dr. Jonathan Abele,
membre à titre personnel

Member-at-Large,
Dr. Cheryl Lynn Jefford
membre à titre personnel

Member-at-Large,
Dr. Jonathan Boekhoud
membre à titre personnel

Member-at-Large, (Resident)
Dr. Peter Maliha
membre à titre personnel

THE CANM

✓ Its dedication to promote the **transfer of scientific bench discoveries** into molecular & personalized medical diagnostics and therapies.

✓ Its ability to **promote, develop and support** the use of medical isotopes **in the emerging countries**.

✓ Its proven commitment to educate and provide **high level training** to nuclear medicine professionnals from across the world, **particul-arly from emerging countries** in collaboration with the **Royal College of Canada**.

✓ **The Pangea** project.

THE PANGEA PROJECT

ePATIENT
NUCLEAR MEDICINE & MOLECULAR IMAGING

- Promoting nuclear medicine
- Education / Teaching around the world
- Continuous training

PANGEA
nmpangea.com

Nicolas Rondeau Lapierre

INFO CONTACT
General manager / Directeur général
Canadian Association of Nuclear Medicine /
Association canadienne de médecine nucléaire

canm@canm-acmn.ca
www.canm-acmn.ca
1.514.963.3269

CANM ACMN

CANM ACMN
The Canadian Association of Nuclear Medicine
Association canadienne de médecine nucléaire

CANM-ACMN ANNUEL SCIENTIFIC MEETING
Virtual 6 November 2021

CANM VIRTUAL CONFERENCE- APRIL 17, 9 AM - 4 PM ET
NEUROENDOCRINE TUMORS: THERANOSTICS AND PATIENT MANAGEMENT, A CANADIAN PERSPECTIVE

Colloque virtuel

AMSMNQ	24-25 avril 2021
SNMMI	12-16 juin 2021
EANM	20-23 octobre 2021
AMSMNQ Automnale	30 octobre 2021
AOCNMB AMMAN JORDANIE	5-7 NOVEMBRE 2021
WFNMB	Kyoto Japan 7-11 September 2022
ALASBIMN	Virtual: : 3-6 septembre 2021

SAVE IMPORTANT DATES - Virtual Sessions

The Canadian Association of Nuclear Medicine (CANM) is proud to announce a series of Webinars which are accredited, as well as a one-day virtual conference this Spring.

Please mark your calendar for the following 2021 Virtual Sessions:

Saturday, April 17, 2021 @ 9am ET
One-day virtual conference
Registration to come!
Deadline to Register: April 9, 2021
Offered to CANM Members and open to any others.
No inscription fee for this year.

Wednesday, May 19, 2021 @ 7-8 pm ET
Webinar: PET/CT PSMA: Pitfall & Artifacts
Registration to come!
Offered to CANM Members and open to any others. - Click here to join

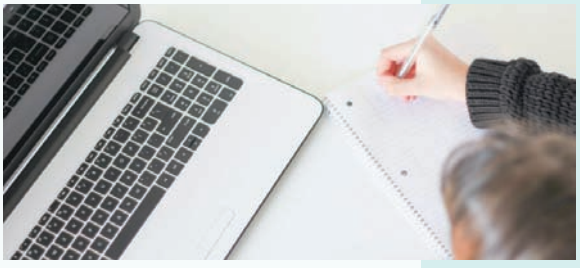
---

Wednesday, June 16, 2021 @ 7-8 pm ET
Webinar: Nuclear Imaging of Cardiac Sarcoidosis
Registration to come!
Offered to CANM Members - Click here to join

All virtual sessions mentioned above will be offered to all CANM members and sponsors free-of-charge.

More information to come about content, registration, and technicalities to be able to join the sessions.

In the meantime, please mark your calendar!



SISTER ORGANIZATIONS

SNMMI Society of Nuclear Medicine and Molecular Imaging · EANM European Association of Nuclear Medicine · World Federation of Nuclear Medicine and Biology · APES · ARCCNM · ASNC · ARSNM Arab Society of Nuclear Medicine · AOFNMB · IAEA International Atomic Energy Agency · alasbimn · South African Society of Nuclear Medicine · SFMN

CANM 2019-2020 SPONSORS

GOLD
Advanced Accelerator Applications, A Novartis Company
cyclomedica
GE
ISOLOGIC
JUBILANT DRAXIMAGE
Lantheus Medical Imaging

BRONZE+
CURIUM LIFE FORWARD
Pfizer
SIEMENS Healthineers

BRONZE
Bayer
HERMES MEDICAL SOLUTIONS

OTHERS
RCTEM
SPECTRUM DYNAMICS MEDICAL

Scotiabank-CMA Affinity Group

CANM ACMN

canm@canm-acmn.ca
www.canm-acmn.ca
1.514.963.3269

CANM ACMN
The Canadian Association of Nuclear Medicine
Association canadienne de médecine nucléaire

CANM Cardiac Amyloid PYP Imaging Guidelines
Exposé de position sur l'imagerie au PYP de l'amylose cardiaque de CANM





Document prepared by / Document préparé par
Jean-Luc Urbain, MD, PhD, Jonathan Richardson, CNMT, Andrew Ross, MD, Mehdi Khider, MD, Cigdem Akincioglu, MD

INTRODUCTION

Amyloidosis is a group of diseases in which normal or abnormal proteins breakdowns, known as amyloid fibrils, build up in tissue. Physicians have known about the anatomic and clinical effects of these proteins deposition for many centuries. Such have been described since at least 1639 when Nicolao Fontano reported a case of sago spleen in the journal Responsionum & Curationum Medicinalium. The term "amyloid" was coined in 1838 by Matthias Schleiden, a German botanist, to describe a normal amylaceous constituent of plants. There are about 30 different known types of amyloidosis related to genetic or acquired specific protein misfoldings. They are grouped into localized and systemic forms and their symptomatology depends on which organs are affected. The four most common systemic amyloidosis are the light chain (AL), inflammatory (AA), dialysis (Aβ2M), and hereditary and old age (ATTRwt) types.

The incidence of AL amyloidosis is about 3–13 per million people per year and of AA amyloidosis about 2 per million people per year with the majority onsetting between 55 and 60 years old. Diagnosis may be suspected when protein is found in the urine, organ enlargement is present, or polyneuropathy develops and is confirmed by tissue biopsy. Treatment is geared towards decreasing the amount of the involved protein. Without treatment the prognosis is quite bleak and the average life expectancy between 6 to 48 months.

CARDIAC AMYLOIDOSIS

Cardiac amyloidosis also known as stiff heart syndrome is a form of restrictive infiltrative cardiomyopathy that confers significant mortality. It can be inherited or familial. It is rare before the age of 40. While its incidence is similar in men and women, its prevalence is higher in men than in women. Accurate estimates of the incidence and prevalence of cardiac amyloidosis are lacking. Improved awareness and advances in imaging over the past 3 decades have shown that it is substantially underdiagnosed.

The vast majority of cardiac amyloidosis are of the acquired monoclonal immunoglobulin light chain (AL) type or the familial or mutation transthyretin (ATTR) type. Light chain (AL) amyloidosis refers to the misfolding of monoclonal light chains produced by plasma cells that

INTRODUCTION

L'amylose (ou la dégénérescence dite amyloïde) regroupe un ensemble de maladies caractérisées par des dégradations de protéines normales ou anormales, connues sous le nom de « fibrilles amyloïdes », qui s'infiltrent dans les tissus. Les médecins connaissent les effets anatomiques et cliniques de ces dépôts protéiques depuis des siècles. Ils ont été décrits comme tels depuis au moins 1639 alors que Nicolao Fontano signalait un cas de rate sagou dans le journal Responsionum & Curationum Medicinalium. C'est à un botaniste allemand du nom de Matthias Schleiden que revient la paternité du terme « amyloïde », terme qu'il a créé en 1838 pour décrire un composant amylacé normal des plantes. On recense quelque 30 types connus d'amylose attribuables à des repliements de protéines génétiques ou acquis. Les amyloses sont groupées sous les formes localisées et systémiques et leur symptomatologie dépend des organes touchés. Les quatre types d'amyloses systémiques les plus courantes sont à chaînes légères (AL), inflammatoires (AA), à bêta-2-microglobuline (sous dialyse) et héréditaires et séniles (ATTRwt ou ATTR sauvage).

L'incidence de l'amylose de type AL est de 3 à 13 par million par année tandis que celle de l'amylose de type AA est de 2 par million par année, la majorité des cas apparaissant entre 55 et 60 ans. On peut évoquer un diagnostic lorsque des protéines sont trouvées dans l'urine, qu'un grossissement de l'organe est observé ou qu'une polyneuropathie se développe et qu'elle est confirmée par une biopsie des tissus. Le traitement vise à faire baisser la quantité de protéines. Si cette maladie n'est pas traitée, son pronostic est plutôt sombre et laisse une espérance de vie moyenne de 6 à 48 mois.

AMYLOSE CARDIAQUE

L'amylose cardiaque, appelée aussi syndrome du cœur raide, est une forme de cardiomyopathie restrictive qui entraîne un taux de mortalité élevé. Elle peut être héréditaire ou familiale. Elle apparaît rarement avant 40 ans. Son incidence chez les hommes et chez les femmes est comparable, mais son taux de prévalence est plus élevé chez les hommes. Nous ne disposons pas d'estimations précises de l'incidence et de la prévalence de l'amylose cardiaque. Grâce à une meilleure connaissance du sujet et aux avancées en imagerie des trois dernières décennies, on peut penser que cette maladie est largement sous-diagnostiquée.

La vaste majorité des amyloses cardiaques sont celles à chaînes légères d'immunoglobulines monoclonales acquises (AL) ou l'amylose à transthyrétine familiale ou de mutation (ATTR). L'amylose à chaînes légères (AL) renvoie au repliement des chaînes légères monoclonales produites par les plasmocytes qui se déposent dans les organes. Dans l'amylose à transthyrétine (TTR), la protéine appelée

deposit in organs. In transthyretin amyloidosis, the transthyretin protein produced by the liver which transport thyroxine and retinol dissociates into monomers and misfolds with monomers and dimers and protofilaments depositing in various organs. The heart might be affected in up to 50 percent of patients with systemic light chain (AL) amyloidosis and ATTRwt might account for as many as 30% of patients with heart failure. The accumulation of amyloid fibrils in the myocardial interstitium increases the thickness and mass of the ventricular wall and results in progressive diastolic and systolic dysfunction. Amyloid deposition in the heart may occur in the atria, ventricles, perivascular space, valves and conduction system.

DIAGNOSIS OF CARDIAC AMYLOID

Cardiac symptomatology is nonspecific, and patients often present with heart failure such as dyspnea and leg edema. The key clinical features which heighten the suspicion of cardiac amyloid include without being limited to: established AL or ATTR diagnosis in non-cardiac organ, carpal tunnel syndrome, nephrotic syndrome, peripheral sensorimotor neuropathy and/or neuronal autonomic dysfunction, unexplained increased left ventricular wall thickness, preserved left ventricular ejection fraction with low flow aortic gradient aortic stenosis.

Challenges for the clinical diagnosis of cardiac amyloidosis are related to the relative rarity of the disease, the different potential origins of myocardial hypertrophy, the unfamiliarity with proper diagnostic algorithms, and the absence of definitive treatment.

The formal diagnosis of cardiac amyloid requires histological confirmation with an endomyocardial biopsy that demonstrates apple-green birefringence when stained with sulfate Alcian Blue or Congo Red and viewed with a polarizing microscope. Myocardial biopsy is invasive and although the risks of serious complications is limited it is performed in few centers. A combination of clinical, laboratory, electrocardiographic and imaging methods is commonly used instead.

In a patient with a known plasma cell dyscrasia and AL amyloidosis the combination of serum BNP (B-type natriuretic peptide) and troponin can be useful to stratify prognosis and guide treatment strategies. Low voltage, axis deviation, left ventricular hypertrophy criteria, pseudo infarction pattern T waves abnormalities, atrial fibrillation and other rhythm disturbances can be seen on the ECG

Albeit not necessarily specific, the echocardiographic hallmarks of cardiac amyloid include ventricular wall thickness, small left ventricular chamber volume, valve thickening, atrial enlargement and signs of elevated filling pressures with a restrictive diastolic filling. Speckle-tracking echocardiography and left ventricular longitudinal strain measurement by tissue Doppler have emerged as useful clinical tools for the identification of cardiac amyloidosis to differentiate the different forms of ventricular wall thickening. The relative preservation of apical strain and the segmental strain bulls-eye pattern can be a good indicator of cardiac amyloidosis.

Cardiovascular Magnetic Resonance has the intrinsic ability to characterize tissue particularly when enhance with gadolinium-based contrast agents. Late gadolinium enhancement of thickened left ventricular walls and documentation of expansion of the extracellular space can contribute to the diagnosis, monitor the amyloid fibrils load and treatment response.

Molecular Imaging of cardiac amyloid with PET amyloid tracers such as 18F-florbetapir, 18F-florbetaben and 11C-Pittsburgh B radiopharmaceuticals has been used to image and quantitate amyloid deposits in the heart. They appear to have high sensitivity and specificity. They are not widely available and expensive. Sympathetic denervation in cardiac amyloidosis has been demonstrated with Metaiodobenzylguanidine (MIBG) SPECT in patients with ATTR. It is an indirect nonspecific imaging marker and it is not recommended for clinical use.

transthyrétine produite par le foie qui transporte la thyroxine et le rétinol se dissocie en monomères et se replie avec les monomères et les dimères et les protofilaments se déposant dans divers organes. Le cœur pourrait être affecté chez plus de 50 % des patients atteints d'une amylose systémique à chaînes légères et une amylose de type ATTR pourrait toucher jusqu'à 30 % des patients atteints d'insuffisance cardiaque. L'accumulation de fibrilles amyloïdes dans l'interstitium myocardique accroît l'épaisseur et la masse de la paroi ventriculaire et entraîne un dysfonctionnement progressif diastolique et systolique. Les dépôts amyloïdes dans le cœur peuvent se loger dans les oreillettes, les ventricules, l'espace périvasculaire, les valves et le système de conduction.

DIAGNOSTIC D'AMYLOSE CARDIAQUE

La symptomatologie cardiaque est non spécifique. Les patients présentent souvent une insuffisance cardiaque causant une dyspnée ou un œdème des jambes. Les signes cliniques déterminants d'une amylose cardiaque soupçonnée sont notamment : diagnostic posé de AL ou ATTR dans un autre organe que le cœur, syndrome du canal carpien, syndrome néphrotique, neuropathie ou dysfonction autonomique neuronale, neuropathie sensorimotrice périphérique ou dystonies neurovégétatives, augmentation inexpliquée de l'épaisseur de la paroi du ventricule gauche à fraction d'éjection ventriculaire gauche préservée avec une sténose aortique à bas débit et bas gradient.

La difficulté à poser un diagnostic clinique de l'amylose cardiaque tient à sa rareté relative, aux différentes origines possibles de l'hypertrophie du myocarde, à la méconnaissance des algorithmes de diagnostic et à l'absence de traitement définitif.

Le diagnostic officiel d'une amylose cardiaque est posé au terme d'une confirmation histologique et d'une biopsie endomyocardique qui a montré une biréfringence vert pomme après avoir été colorée au sulfate bleu alcian ou rouge congo et examinée au microscope polarisant. La biopsie du myocarde est un examen invasif et, bien que les risques de graves complications soient faibles, très peu de centres pratiquent cet examen. On a plutôt recours à une combinaison de méthodes : examen clinique, tests de laboratoire, électrocardiographie et imagerie.

Chez un patient présentant une dyscrasie plasmocytaire connue et une amylose de type AL, la combinaison de sérum BNP (peptide natriurétique de type B) et de troponine peut être utile pour stratifier le pronostic et établir des stratégies de traitement. L'ECG peut montrer un faible voltage, une déviation axiale, des indices d'hypertrophie du ventricule gauche, des anomalies de l'onde T à l'aspect d'un pseudo-infarctus, de la fibrillation des oreillettes et autres perturbations du rythme.

Bien que n'étant pas nécessairement spécifiques, les caractéristiques à l'échocardiographie de l'amylose cardiaque sont l'épaisseur de la paroi ventriculaire, le faible volume de la chambre du ventricule gauche, l'épaisseur des valves, le grossissement des oreillettes et des signes de pressions de remplissage élevées combinées à un remplissage diastolique restreint. L'échocardiographie avec suivi des taches et la mesure de la déformation longitudinale du ventricule gauche par l'échocardiographie Doppler sont apparues comme des outils cliniques utiles pour différencier les différentes formes d'épaississement de la paroi ventriculaire afin de pouvoir se prononcer sur la présence d'amylose cardiaque. La préservation relative de la déformation de l'apex et la représentation en œil-de-bœuf de la déformation segmentaire sont aussi de bons indicateurs d'une amylose cardiaque.

L'imagerie par résonance magnétique cardiovasculaire a la capacité intrinsèque de caractériser les tissus, en particulier lorsqu'elle est rehaussée par des agents de contraste à base de gadolinium. Le rehaussement tardif induit par le gadolinium des parois ventriculaires gauches épaissies et la documentation de l'expansion de l'espace extracellulaire peuvent servir à établir le diagnostic, surveiller le dépôt de fibrilles amyloïdes et la réponse au traitement.

L'imagerie moléculaire de l'amylose cardiaque à l'aide de traceurs amyloïdes d'une TEP (tomographie à émission de positrons), tels que les produits pharmaceutiques 18F-florbétapir, 18F florbétaben et 11C-Pittsburgh B, a été utilisée pour reproduire en image et quantifier les dépôts amyloïdes dans le cœur. Ils semblent avoir une sensibilité et une spécificité élevée. Ils sont difficiles à obtenir et coûteux. La dénervation sympathique dans l'amylose cardiaque a été démontrée avec la tomographie monophotonique d'émission (SPECT) à la metaiodobenzylguanidine (MIBG) chez les patients atteints d'amylose de type ATTR. Il s'agit d'un traceur d'imagerie indirect non spécifique et il n'est pas recommandé pour usage clinique.

CARDIAC AMYLOID IMAGING WITH BONES TRACERS – PYROPHOSPHATE

Pyrophosphate is a ubiquitous metabolic byproduct of many intracellular processes found in most cells. Pyrophosphate acts as a potent inhibitor of calcification; it antagonizes the ability of inorganic phosphate to crystallize with calcium to form hydroxyapatite by occupying some of the inorganic phosphate sites on the surface of nascent growing hydroxyapatite crystals.

Radiolabeled biphosphonate derivatives such as ^{99m}Tc-bisphosphonate complexes, ^{99m}Tc-methylenediphosphonate (^{99m}Tc-MDP), and ^{99m}Tc-hydroxymethylenediphosphonate (^{99m}Tc-HMDP, are among avid bone seeking radiopharmaceuticals that have been used for many decades in nuclear medicine. They are all related to pyrophosphate binding to nascent hydroxyapatite crystals and reflecting calcium deposits and bone turnover. In soft tissues, their accumulation is thought to result from absorption on calcium salt surface.

Over the past decades, different bone tracers including 99mTcpyrophosphate (^{99m}Tc-PYP), ^{99m}Tc- HMDP) , and ^{99m}Tc-3,3-diphosphono-1,2-propanodicarboxylic acid (^{99m}Tc-DPD), have been used for the imaging of cardiac amyloidosis with ^{99m}TC PYP being the only compound approved by Health Canada for clinical use.

In a seminal article published in 1982 already, Wizenberg et al described the value of positive myocardial technetium-99m-pyrophosphate scintigraphy in the noninvasive diagnosis of cardiac amyloidosis. Falling into desuetude largely because of the absence of therapies cardiac nuclear imaging with PYP has witnessed a true renaissance with the emergence of new therapies.

In cardiac amyloidosis, Tc-99m pyrophosphate binds to microcalcifications associated with amyloid deposits in ATTR with high affinity, allowing early diagnosis of ATTR cardiac amyloidosis. Because it shows minimal affinity for amyloid deposits in AL cardiac amyloidosis, it allows distinction between the two types.

In addition to its high sensitivity and specificity above 90%, quantitative assessment of Tc-99mpyrrophospate uptake in ATTR cardiac amyloid disease uptake provides additional prognostic information on major adverse cardiac event (MACE)–free survival, increased acute heart failure, and mortality

PATIENTS SELECTION

Nuclear cardiac imaging with Tc-99m pyrophosphate is currently indicated in the following groups of patients:

- Individuals with heart failure and unexplained increase in left ventricular wall thickness.
- African-Americans/Canadians over the age of 60 years with heart failure, unexplained or with increased left ventricular wall thickness (>12 mm).
- Individuals over the age of 60 years with unexplained heart failure and preserved left ventricular ejection fraction.
- Individuals, especially elderly males, with unexplained neuropathy, bilateral carpal tunnel syndrome or atrial arrhythmias and signs/symptoms of heart failure.
- Evaluation of cardiac involvement in individuals with known or suspected familial amyloidosis.
- Individuals whose findings are suspicious for cardiac amyloidosis on cardiac magnetic resonance or echocardiography.

SCINTIGRAPHIC PROCEDURE

Considerations

Planar pyrophosphate imaging is simple and rapid to perform. Visual interpretation and quantitation of tracer uptake is straightforward. It has

IMAGERIE DE L'AMYLOSE CARDIAQUE AVEC TRACEURS OSSEUX – PYROPHOSPHATE

Le pyrophosphate est un sous-produit métabolique omniprésent dans de nombreux processus intracellulaires trouvés dans la plupart des cellules. Il agit comme un puissant inhibiteur de la calcification; il contrarie la capacité du phosphate inorganique à se cristalliser avec le calcium pour former de l'hydroxyapatite, vraisemblablement en occupant certains des sites de phosphate inorganique à la surface de cristaux d'hydroxyapatite embryonnaires en croissance.

Les dérivés du biphosphonate radiomarqués, tels que les complexes de ^{99m}Tc bisphosphonate, le ^{99m}Tc-methylenediphosphonate (^{99m}Tc-MDP) et le ^{99m}Tc-hydroxymethylenediphosphonate (99mTc-HMDP), sont parmi les substances radiopharmaceutiques ostéotropes avides utilisées depuis de nombreuses décennies en médecine nucléaire. Ils sont tous associés à la liaison du pyrophosphate aux cristaux d'hydroxyapatite embryonnaires et réfléchissent les dépôts de calcium et le renouvellement osseux. Dans les tissus mous, leur accumulation résulterait de l'absorption sur la surface de sel de calcium.

Au cours des dernières décennies, divers traceurs osseux, tels que le ^{99m}Tcpyrophosphate (^{99m}Tc PYP), ^{99m}Tc- HMDP) et l'acide ^{99m}Tc-3,3- diphosphono-1,2-propanodicarboxylique (^{99m}Tc DPD), ont été utilisés en imagerie de l'amylose cardiaque. Le seul composé approuvé par Santé Canada pour usage clinique est le ^{99m}Tc PYP.

Dans un article fondateur publié en 1982, Wizenberg et coll. décrivaient déjà la valeur de la scintigraphie du myocarde positive au technetium-99m-pyrophosphate dans le diagnostic non invasif de l'amylose cardiaque. Tombée en désuétude en raison surtout de l'absence de thérapies, l'imagerie nucléaire cardiaque avec la protéine jaune photoactive (« PYP ») a connu une vraie renaissance avec l'émergence de nouvelles thérapies.

Dans une amylose cardiaque, le Tc-99m pyrophosphate se lie, avec une affinité élevée, aux microcalcifications associées aux dépôts d'amyloïdes dans une ATTR, ce qui permet un diagnostic précoce de ce type d'amylose. Sa faible affinité pour les dépôts d'amyloïdes dans les amyloses cardiaques de type AL permet de distinguer les deux types.

En plus de son taux élevé de sensibilité et de spécificité dépassant 90 %, l'évaluation quantitative de l'absorption du Tc-99mpyrrophospate dans une amylose cardiaque de type ATTR apporte des données additionnelles quant au pronostic de survie sans événements cardiovasculaires majeurs (« MACE »), de l'aggravation de l'insuffisance cardiaque aigüe et de mortalité.

CHOIX DES PATIENTS

L'imagerie cardiaque nucléaire au Tc-99m pyrophosphate est indiquée pour les groupes de patients suivants :

- Personnes ayant une insuffisance cardiaque et une augmentation inexpliquée de l'épaisseur de la paroi ventriculaire gauche.
- Afro-Américains / Canadiens de plus de 60 ans ayant une insuffisance cardiaque inexpliquée ou une augmentation de l'épaisseur de la paroi du ventricule gauche (>12 mm).
- Personnes de plus de 60 ans ayant une insuffisance cardiaque à fraction d'éjection ventriculaire gauche préservée.
- Personnes, en particulier des hommes âgés, atteintes d'une neuropathie inexpliquée, du syndrome canal carpien bilatéral ou d'arythmies auriculaires et présentant des signes ou des symptômes d'insuffisance cardiaque.
- Personnes pour lesquelles une amylose familiale est connue ou évoquée pour évaluation d'un problème cardiaque.
- Personnes dont les résultats de résonnance magnétique cardiaque ou d'échocardiographie pourraient évoquer de l'amylose cardiaque.

PROCÉDURE DE SCINTIGRAPHIE

Éléments à considérer

L'imagerie planaire au pyrophosphate est simple et rapide. L'étape de l'interprétation visuelle et de l'analyse quantitative de l'absorption du traceur est simple. Cette technique s'est avérée efficace pour trouver l'amylose cardiaque provo-

been proven useful for the identification of ATTR cardiac amyloidosis with sensitivity and specificity above 90%.

However planar images for the diagnosis of cardiac amyloidosis have limitations. Notably:

a. They only allow a visual assessment and quantitative planar quantification of tracer uptake

b. They do not define regional differences in myocardial tracer deposition.

c. They do not account for tracer uptake unrelated to amyloidosis: calcified valves, mitral annulus calcification, calcified thrombus, pericardial calcification.

d. They may be impacted by tracer uptake in skeleton and blood pool activity.

SPECT imaging, particularly with CT attenuation and anatomic mapping, overcomes these limitations and determines the exact localization of tracer uptake. SPECT and particularly SPECT/CT images allow a more quantitative tracer uptake evaluation, the generation of polar maps of raw counts and the determination of relative tracer intensity. Apical sparing is important to detect as it impacts prognosis. Higher apical sparing ratios have been shown to be associated with a significantly better survival.

Based on our personal experience and the expert consensus recommendation for currently available guidelines (ASNC, EANM, SNMMI) we recommend the following, acquisition, processing and interpretation for the performance of Tc-99m-pyrrophosphate scintigraphic studies

Acquisition Procedure

Procedure	Parameters
Patient Preparation	None; no fasting required
Radiopharmaceutical	10-20 mCi of Tc-99m- Pyrrophosphate with dose gently guidelines in pediatric population
Administration	Intravenous injection
Time between injection and imaging	1 hr. for planar and SPECT/(CT) and delayed planar (and SPECT/(CT)) if needed and/or persistent blood pool activity
IMAGING PARAMETERS	
Collimators	Low Energy, high resolution
Energy Window	140 keV with 15-20% window
Matrix	64 x 64 minimum
Pixel Size	3.5 – 6.5 mm
Patient Position	Supine or sitting depending on the type of cameras used; arms above shoulders or supported
Field of view	At least cardiac or chest with optional whole body planar
PLANAR IMAGING PARAMETERS	
Views	Anterior, lateral and left anterior oblique
Image duration (count based)	750,000 counts
Magnification if needed	1.46
SPECT PARAMETERS	
Angular range	360 degrees
Detector configuration	180 degrees
ECG Gating	none
Views per detector	40
Time per stop	20 seconds
Magnification	1.0
Reconstruction	Filtered back projection or iterative reconstruction
(CT PARAMETERS)	
Equipment/Vendor based	CT for attenuation correction & anatomic mapping. Low-dose CT transmission scan (10 mA, 120 kVp, free tidal breathing) over the heart

quée par la transthyrétine (ATTR) avec un taux de sensibilité et de spécificité supérieur à 90 %.

Cependant, les images planaires ont des limites pour le diagnostic de l'amylose cardiaque, notamment ce qui suit :

a. Elles ne permettent qu'une vérification visuelle de l'absorption du traceur.

b. Elles ne définissent pas de différences régionales dans le dépôt du traceur myocardique.

c. Elles ne tiennent pas compte de l'absorption du traceur non liée à l'amylose : valves calcifiées, calcification de l'anneau mitral, thrombus calcifiés, calcification péricardique.

d. Elles peuvent être influencées par l'absorption du traceur dans les os et l'activité du pool sanguin.

L'imagerie SPECT (tomographie par émission à photon unique), en particulier avec la carte d'atténuation et la cartographie anatomique de la CT (tomodensitométrie), surmonte ces limites et détermine avec précision l'endroit où le traceur est absorbé. La SPECT et en particulier les images de SPECT/CT donnent une évaluation plus quantitative de l'absorption du traceur, génèrent des cartes polaires de données brutes et déterminent l'intensité relative du traceur. Il est important de détecter l'épargne apicale parce qu'elle a un effet sur le pronostic. Il a été démontré que des ratios d'épargne apicale plus élevés étaient associés à des résultats de survie significativement meilleurs.

En nous basant sur notre propre expérience et la recommandation consensuelle des experts concernant les lignes directrices actuellement disponibles (ASNC, AENM, SNMMI), nous recommandons l'approche suivante d'acquisition, de traitement des données et d'interprétation pour la réalisation d'études scintigraphiques au Tc-99m-pyrophosphate (PYP).

Procédure d'acquisition

Procédure	Paramètres
Préparation du patient	Aucun. État de jeûne non requis
Produit radiopharmaceutique	10-20 mCi de Tc-99m-Pyrrophosphate avec dose pour enfants selon les lignes directrices Image Gently
Administration	Injection intraveineuse
Intervalle entre l'injection et l'imagerie	1 heure pour le planaire et la SPECT/(CT) et 3 heures pour le planaire retardé optionnel et la SPECT/(CT) si l'activité du pool sanguin persiste
PARAMÈTRES D'IMAGERIE	
Collimateurs	Basse énergie, haute résolution
Fenêtre d'énergie	140 keV avec fenêtre de 15 ou 20 %
Matrice	64 x 64 minimum
Taille des pixels	3,5 – 6,5 mm
Position du patient	Sur le dos ou assis selon le type de caméra; bras au-dessus des épaules ou supportés
Champ visuel	Au moins le cœur ou le thorax avec plan de tout le corps en option
PARAMÈTRES DE L'IMAGERIE PLANAIRE	
Vues	Antérieure, latérale et oblique antérieure gauche
Durée image (comptage)	750 000
Agrandissement, si nécessaire	1,46
PARAMÈTRES DU SPECT	
Amplitude angulaire	360 degrés
Configuration des détecteurs	180 degrés
Synchronisation avec ECG	Aucune
Vues par détecteur	40
SPECTs d'arrêt	20 secondes
Agrandissement	1,0
Reconstruction	Rétroprojection filtrée ou reconstruction itérative
(PARAMÈTRES CT)	
Équipement/fournisseur	CT pour correction de l'atténuation et cartographie anatomique Scan dit de transmission avec CT à faible dose (10 mA, 120 kVp, respiration de marée sans contrainte ou normale) du cœur

Images Processing-Interpretation

On planar or spect images, a visual semiquantitative analysis assess the cardiac uptake relative to the ribs with a grade 0 exhibiting no uptake, a grade 1 showing uptake less than bone, a grade 2 where cardiac uptake is equal to bone uptake and a grade 3 with cardiac uptake greater than bone uptake.

Visual score

0: absent myocardial uptake
1: myocardial uptake < bone
2: myocardial uptake = bone
3: myocardial uptake > bone

Using this scoring system, the sensitivity for ATTR amyloid has been reported to be as high as >99%, while the specificity was 86%. Grade 2 or 3 tracer uptake on imaging, coupled with the absence of a monoclonal protein, had a specificity and positive predictive value for ATTR amyloidosis of 100%.

The Quantitative analysis of planar images involved the drawing of a region of interest (ROI) over the heart, copying and mirroring the region on the contralateral chest and the calculation of the heart-to-contralateral ratio mean counts per pixel.

Heart/Controlateral Ratio (H/CL)

$$\frac{\text{Heart ROI Total Counts}}{\text{Contralateral ROI Total Counts}}$$

Cardiac AL amyloidosis have a ratio that is consistently less than 1.5 while patients with clinical cardiac amyloid disease have a ratio of 1.5 or above on 1hr. post injection planar images.

Attention should be paid not to include extracardiac uptake in the cardiac ROI and the right ventricle on the contralateral chest when uptake is also present in that cavity. The greater the ratio the poorer the 5-year patient's survival.

Reporting

Parameters	Content
Patient Demographics	name, age, sex, ethnicity current problem/symptoms and relevant history reason for the test, date of study
Ancillary Tests	Labs results, EKG, prior imaging procedures, biopsy results if available
Nuclear Procedure Detail	Radiopharmaceutical dose Interval between IV injection and imaging Planar, SPECT, SPECT/CT protocol Reconstruction method
Images Findings	Image quality Visual interpretation Grading score Quantitative ratio
Images Ancillary findings	Abnormal Uptake outside the heart if any Abnormal CT Findings if any
Impression	Normal/abnormal study Suggestive/not suggestive/equivocal for cardiac ATTR Recommend additional evaluation as appropriate

Traitement et interprétation des images

Sur des images planaires, une analyse visuelle semi-quantitative évalue l'absorption par le cœur par rapport aux côtes, le grade 0 montrant qu'il n'y a pas d'absorption par le cœur, le grade 1 montrant une absorption par le cœur plus faible que par les os, le grade 2 où l'absorption par le cœur est égale à celle par les os, et le grade 3 où l'absorption par le cœur est supérieure à celle par les os.

Gradation visuelle

0 : pas d'absorption par le myocarde
1 : absorption par le myocarde < à celle des os
2 : absorption par le myocarde = à celle des os
3 : absorption par le myocarde > à celle des os

Selon cette échelle de gradation, le taux de sensibilité pour l'amylose de type ATTR constaté a atteint plus de 99 %, alors que le taux de spécificité était de 86 %. L'absorption du traceur de grade 2 ou 3 sur imagerie, jumelée à l'absence de protéines monoclonales, a montré une spécificité et une valeur prédictive positive au regard de l'amylose de type ATTR de 100 %.

L'analyse quantitative des images planaires a nécessité le dessin d'une région d'intérêt sur le cœur, la copie et la reproduction miroir de la région sur le thorax controlatéral, et le calcul des comptes moyens par pixel du ratio cœur controlatéral (C/CL).

Ratio : Cœur/Controlatéral (C/CL)

$$\frac{\text{Compte total de la région d'intérêt du cœur}}{\text{Compte total de la région d'intérêt du controlatéral}}$$

L'amylose cardiaque de type AL présente un ratio toujours inférieur à 1,5 tandis que pour les patients atteints d'une amylose cardiaque clinique le ratio est de 1,5 ou plus.

Il faut prendre soin de ne pas inclure l'absorption en dehors du cœur dans la région d'intérêt du cœur et le ventricule droit sur le thorax contralatéral si l'absorption est présente dans cette cavité. Plus le ratio est élevé, plus faibles sont les chances de survie de 5 ans pour le patient.

Compte rendu

Paramètre	Contenu
Données démographiques du patient	Nom, âge, sexe, origine ethnique Problèmes ou symptômes courants et antécédents pertinents Justification du test Date de l'étude
Examens complémentaires	Résultats de laboratoire, ECG, imageries antérieures, résultats de biopsie, le cas échéant
Détails de la procédure nucléaire	Dose radiopharmaceutique Intervalle entre l'injection par voie intraveineuse et l'imagerie Protocole – images planaires, SPECT, SPECT/CT Méthode de reconstruction
Résultats des images	Qualité des images Interprétation visuelle Détermination du grade Ratio quantitatif
Résultats complémentaires des images	Absorption anormale en dehors du cœur, le cas échéant Résultats de CT anormaux, le cas échéant
Impression	Étude normal/anormal Évocateur/non évocateur/équivoque pour l'amylose cardiaque de type ATTR Recommander une évaluation additionnelle, le cas échéant

PROGNOSIS-TREATMENT

The presence and severity of amyloid cardiomyopathy is the major factor influencing prognosis of affected subjects. Management of cardiac amyloidosis is best performed in specialized centers, or at least in consultation with such a center. Treatment requires a twofold approach: management of cardiac-related complications due to amyloid deposition (which is similar regardless of the specific type of amyloid) and treatment of the underlying disease to suppress new amyloid formation (which is targeted for each specific form).

In ATTR, disease progression can be slowed or prevented by novel TTR-targeted therapies. Inotersen and patisiran are TTR RNA silencing agents that prevent the hepatic production of TTR protein. Inotersen is an antisense oligonucleotide and patisiran is a small interfering RNA molecule. Both agents have been studied in phase III clinical trials involving ambulatory patients with hATTR and polyneuropathy symptoms. Tafamidis is an oral TTR stabilizer that binds to TTR tetramers in circulation and prevents their breakdown into unstable amyloidogenic monomers.
In the Transthyretin Cardiomyopathy Clinical Trial (ATTR-ACT), Over 30 months, tafamidis was associated with a 32% reduction in mortality and a 30% reduction in cardiovascular hospitalization.

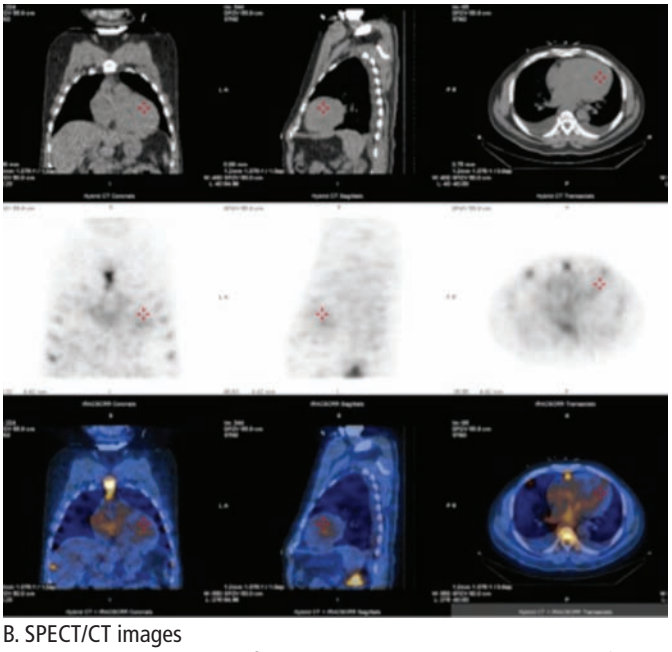
FIGURES

Figure 1. No evidence for Tc99m-PYP uptake

A. Planar Images

Left lat. and ant. Images showing no significant uptake at the level of the heart

Score: 0
Ratio: H/CL (total counts)= 41542/42316 = 0.98



B. SPECT/CT images
SPECT/CT images showing faint uptake in the ventricular cavities (blood pool)

PRONOSTIC TRAITEMENT

La présence et la sévérité de la cardiomyopathie amyloïde sont les facteurs déterminants du pronostic des sujets affectés. La prise en charge d'une amylose cardiaque se fait dans des centres spécialisés ou à tout le moins en consultation auprès de tels centres. Le traitement comporte deux volets : la gestion des complications cardiaques causées par le dépôt amyloïde (assez semblable pour tous les types d'amylose) et le traitement de la maladie sous jacente pour supprimer toute nouvelle formation d'amyloïde (ciblé selon la forme).

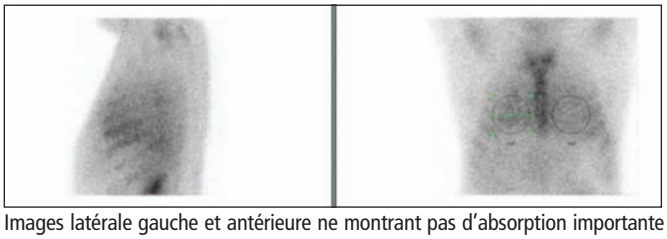
Dans le type ATTR, il est possible de ralentir ou de prévenir la progression de la maladie par de nouvelles thérapies ciblées sur la TTR. L'inotersen et le patisiran sont des agents silencieux de l'ARN (acide ribonucléique) de la TTR qui préviennent la production de la protéine TTR. L'inotersen est un oligonucléotide antisens et le patisiran est une petite molécule qui s'appuie sur l'ARN interférent. Ces deux agents ont passé la phase 3 des essais cliniques avec des patients ambulatoires atteints de la forme héréditaire d'ATTR et présentant des symptômes de polyneuropathie. Le tafamidis est un stabilisateur de la TTR administré par voie orale qui se lie aux tétramères de la TTR en circulation et prévient leur dégradation en monomères amyloïdogéniques instables.

Dans l'essai clinique Transthyretin Cardiomyopathy Clinical Trial (ATTR-ACT), qui s'est déroulé sur une période 30 mois, le tafamidis a été associé à une baisse de 32 % de la mortalité et de 30 % des hospitalisations d'origine cardiovasculaire.

FIGURES

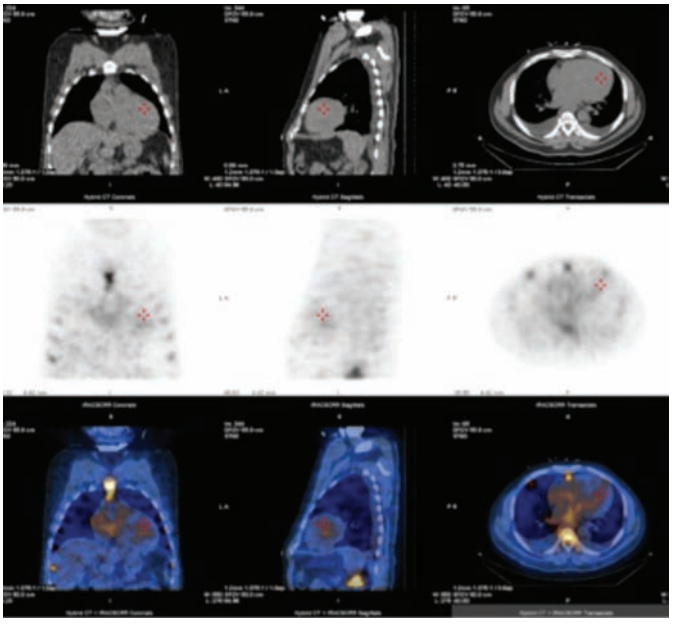
Figure 1. Pas de signe d'absorption de Tc99m-PYP

A. Images planaires



Images latérale gauche et antérieure ne montrant pas d'absorption importante par le cœur

Grade : 0
Ratio : C/CL (compte total) = 41542/42316 = 0,98



B. Images SPECT/CT
Images SPECT/CT montrant une faible absorption dans les cavités ventriculaires (pool sanguin)

Figure 2. left ventricle Tc99m-PYP uptake

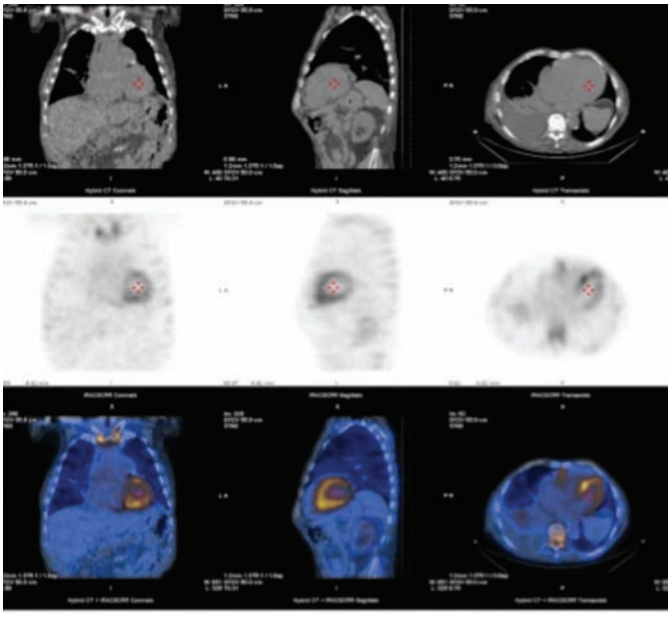
A. Planar Images

Left lat. And ant. images showing uptake at the level of the left ventricular walls.

Score: 3

Ratio: H/CL (total counts)= 66611/45750 = 1.45

B. SPECT/CT Images



SPECT/CT Images showing uptake to the left ventricular walls, particularly the septum.

Figure 2. Absorption du Tc99m-PYP par le ventricule gauche

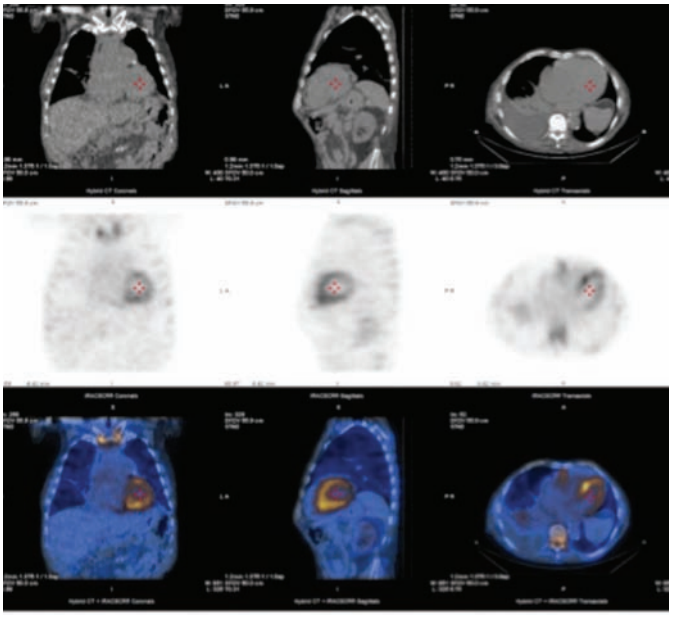
A. Images planaires

Images latérale gauche et antérieure montrant l'absorption au niveau des parois du ventricule gauche

Grade : 3

Ratio : C/CL (compte total)= 66611/45750 = 1,45

B. Images SPECT/CT



Images SPECT/CT montrant l'absorption sur les parois du ventricule gauche, en particulier le septum

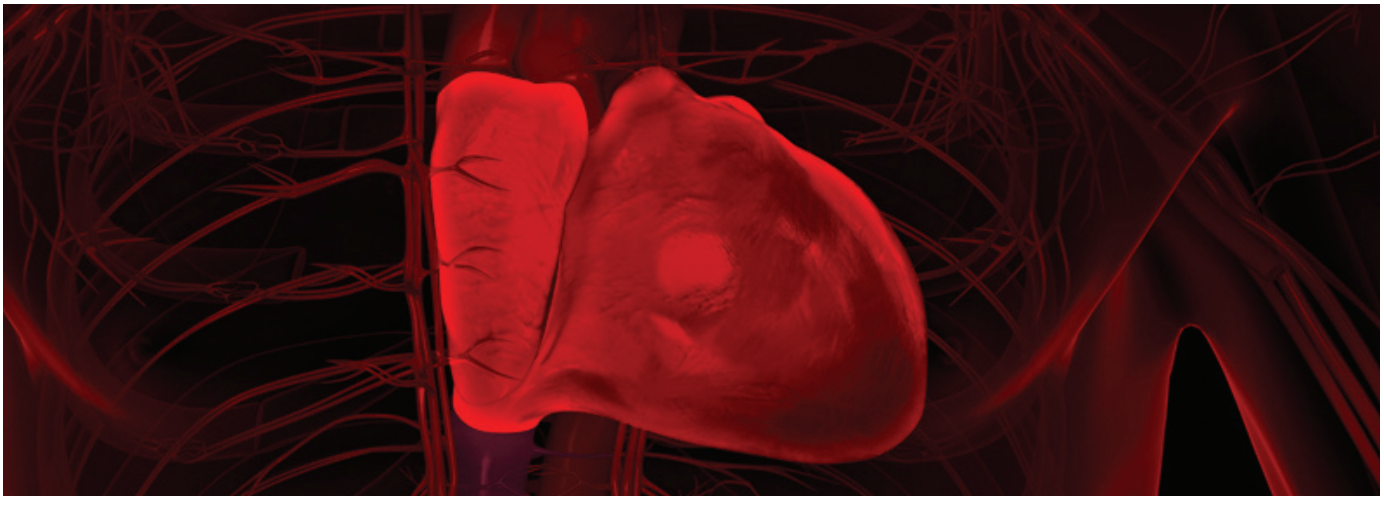
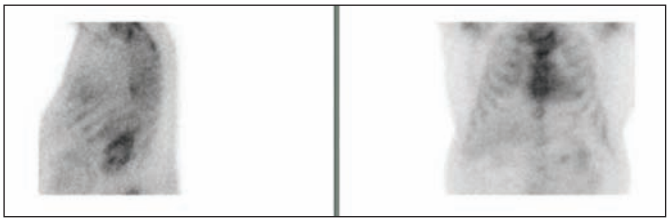


Figure 3. Blood Pool Activity

A. Planar Images

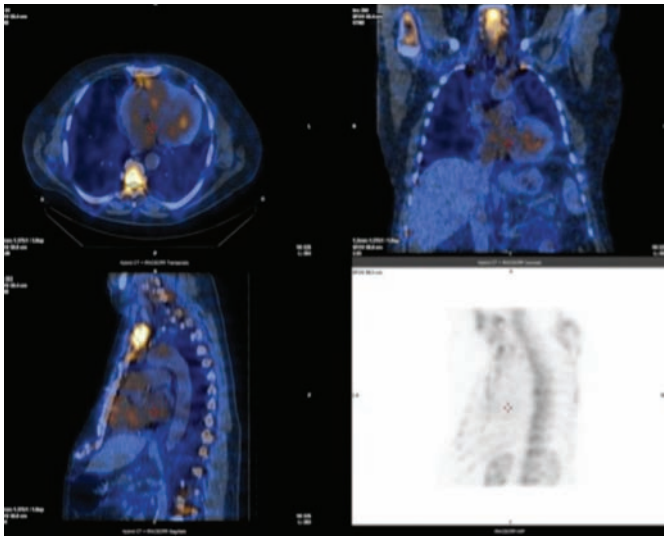


Left lat. And ant. images showing mild uptake at the level of the left ventricle.

Score: 2

Ratio: H/CL (total counts)= 56754/42882 = 1.3

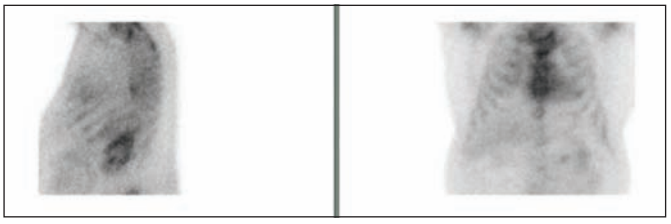
B. SPECT/CT Images



SPECT/CT Images showing no uptake to the left ventricular walls; there is mild to moderate uptake at the level of the ventricular cavities reflecting blood pool activity.

Figure 3. Activité du pool sanguin

A. Images planaires

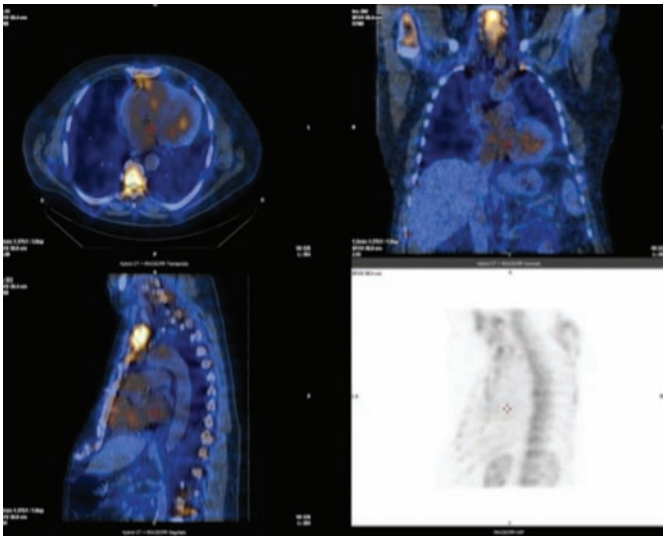


Images latérale gauche et antérieure montrant une légère absorption au niveau du ventricule gauche

Grade : 2

Ratio : C/CL (compte total)= 56754/42882 = 1,3

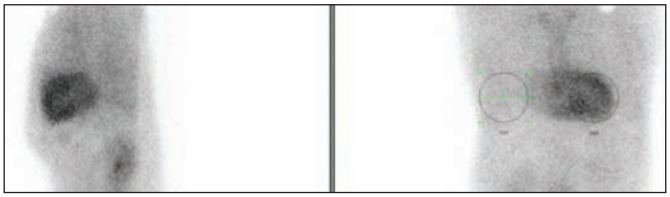
B. Images SPECT/CT



Images SPECT/CT ne montrant aucune absorption dans les parois du ventricule gauche; l'absorption est de légère à modérée au niveau des cavités ventriculaires reflétant l'activité du pool sanguin

Figure 4. LV + RV tc-99m-PYP Uptake

A. Planar Images

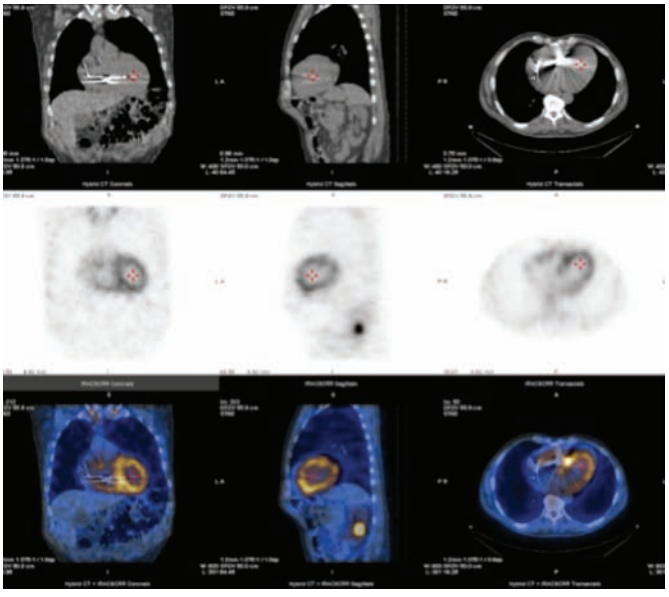


Left lat. and ant. Images showing uptake in both ventricles; there was also uptake in both atria (not shown here).

Score: 3

Ratio: H/CL (total counts)= 82466/37882 = 2.17

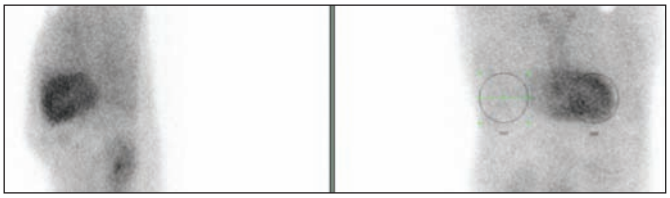
B. SPECT/CT Images



SPECT/CT images show significant uptake in both ventricles and faint uptake in the atria.

Figure 4. Absorption du tc-99m-PYP dans les ventricules gauche et droit

A. Images planaires

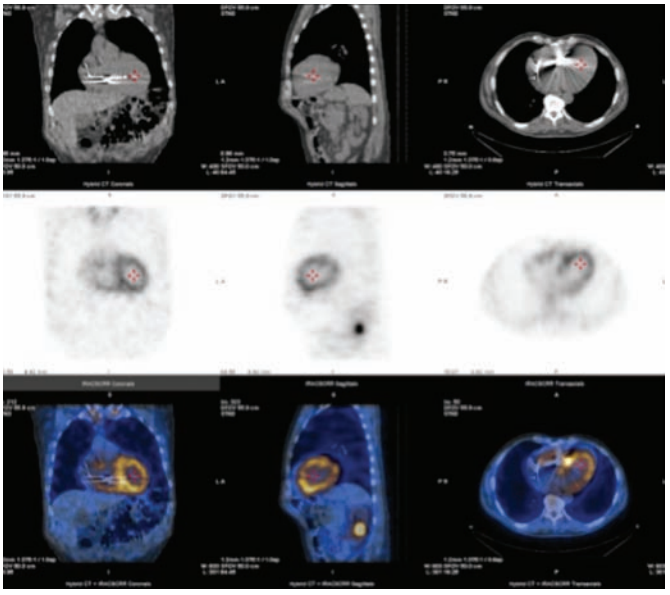


Images latérale gauche et antérieure montrant l'absorption dans les deux ventricules; il y avait aussi de l'absorption dans les deux oreillettes (non montré ici)

Grade : 3

Ratio : H/CL (compte total)= 82466/37882 = 2,17

B. Images SPECT/CT



Images SPECT/CT montrant une absorption importante dans les deux ventricules et une absorption légère dans les oreillettes

REFERENCES / SOURCES DE RÉFÉRENCES

Historical Review. Amyloidosis: a convoluted story, Mayo Foundation. British Journal of Haematology, 2001, 114, 529±538

Epidemiology of Cardiac Amyloidosis–Associated Heart Failure Hospitalizations
Among Fee-for-Service Medicare Beneficiaries in the United States, Lauren G. Gilstrap & al. Circ Heart Fail. 2019;12:e005407.

Cardiac amyloidosis: A comprehensive review, Michal Fikrle at al. ScienceDirect, Cor et Vasa
Volume 55, Issue 1, February 2013, Pages e60-e75

Expert consensus recommendations (ASNC/AHA/ASE/EANM/HFSA/ISA/SCMR/SNMMI) for multimodality imaging in cardiac amyloidosis: part 1 of 2—evidence base and standardized methods of imaging. J Nucl Cardiol. 2019 Dec;26(6):2065-2123. Part 2 of 2-Diagnostic criteria and appropriate utilization J Nucl Cardiol 2020 Apr;27(2):659-673.

Nonbiopsy Diagnosis of Cardiac Transthyretin Amyloidosis. Gillmore JD et al. Circulation 2016; 133: 2404-12.

Multicenter Study of Planar Technetium 99m Pyrophosphate Cardiac Imaging: Predicting Survival for Patients With ATTR Cardiac Amyloidosis. Castano A et al. JAMA Cardiology 2016; 1: 880-889.

Prognostic utility of the Perugini grading of 99mTc-DPD scintigraphy in transthyretin (ATTR) amyloidosis and its relationship with skeletal muscle and soft tissue amyloid. Hutt D. et al.
Eur Heart J Cardiovasc Imaging 2017 Dec 1;18(12):1344-1350.


abbvie
AbbVie a terminé l'acquisition d'Allergan. Plus que jamais, nous sommes positionnés pour stimuler les percées de demain tout en aidant les gens à vivre mieux aujourd'hui.
abbvie.ca
Innover pour demain.
Transformer des vies aujourd'hui.
Allergan fait maintenant partie d'AbbVie
Normes de la publicité
Services d'approbation
normespub.ca/infologo
CA-ABBV-200092

ASSOCIATION DES MÉDECINS SPÉCIALISTES EN MÉDECINE NUCLÉAIRE DU QUÉBEC

Dr. Norman Laurin
Président

Je suis très heureux de vous présenter le nouveau comité exécutif de l'Association des Médecins Spécialistes en Médecine Nucléaire du Québec (AMSMNQ). La présence d'une première femme au sein du comité était attendue depuis longtemps. C'est chose faite avec l'arrivée de Dre Karine Provost. Les défis posés par la pandémie de COVID-19 sont gigantesques, et ensemble nous serons en meilleure posture pour les affronter. Je ne me souviens pas d'une telle période d'effervescence en médecine nucléaire au Québec. Nous avons lieu d'être optimistes, malgré les défis importants auxquels nous faisons face. D'abord le déploiement de la TEP a été un succès dont nous pouvons être fiers. Avec 22 appareils en fonction (hormis ceux du privé et ceux dédiés à la recherche), le Québec est le chef de file au Canada pour le financement public de la TEP. L'arrivée de nouveaux traceurs (TEP et non TEP) homologués par Santé Canada a élargi l'investigation pour plusieurs pathologies. Nous sommes à l'aube d'une révolution en théranostique pour les tumeurs neuro-endocrines et pour le cancer de la prostate. Les nouveaux appareils TEP vont permettre une résolution anatomique, une productivité et une amélioration notable de la dosimétrie. Presque toutes les caméras à scintillation vendues au Québec sont des caméras hybrides SPECT-TDM, ce qui confirme l'adoption de l'imagerie hybride par nos membres et les médecins référents. Bref, beaucoup d'éléments positifs. Parmi nos plus grands défis, on doit mentionner la pénurie de technologues en médecine nucléaire, la complexité de l'approbation des radiopharmaceutiques par Santé Canada (nouveaux et anciens), et la pérennité du financement public du système de santé universel dont jouissent tous les Canadiens. La situation des finances publiques qui se sont détériorées avec la pandémie nous préoccupe beaucoup car elle aura nécessairement un impact sur le financement du système de santé. L'AMSMNQ va continuer de collaborer avec l'Association Canadienne de Médecine Nucléaire (ACMN/CANM) dans plusieurs dossiers, dont celui de la certification des spécialistes en médecine nucléaire par le Collège Royal, l'élaboration des guides de bonne utilisation des examens de médecine nucléaire, et le développement de la théranostique.

Je n'ai aucun doute que chacun d'entre nous saura se consacrer à l'avancement de la médecine nucléaire et à la défense de nos patients. Ensemble, nous sommes capables du meilleur.

I am very happy to present to you the new executive committee of the Association des Médecins Spécialistes en Médecine Nucléaire du Québec (AMSMNQ). The presence of a first woman on the committee was long overdue. We are proud to announce the arrival of Dr. Karine Provost. The challenges posed by the COVID-19 pandemic are enormous, and together we will be in a better position to face them. I do not remember such a period of effervescence in nuclear medicine in Quebec. We have reason to be optimistic, despite the significant challenges we face. First, the deployment of PET was a success of which we can be proud. With 22 devices in operation (except those for the private sector and those dedicated to research), Quebec is the leader in Canada for public financing of PET. The arrival of new tracers (PET and non-PET) approved by Health Canada has broadened the investigation for several pathologies. We are on the cusp of a theranostics revolution for neuroendocrine tumors and prostate cancer. The new PET devices will allow anatomical resolution, productivity and a significant improvement in dosimetry. Almost all scintillation cameras sold in Quebec are hybrid SPECT-TDM cameras, which confirms the adoption of hybrid imaging by our members and referring physicians. In short, a lot of positive things. Among our greatest challenges are the shortage of nuclear medicine technologists, the complexity of Health Canada approval of radiopharmaceuticals (new and old), and the sustainability of public funding for the universal health care system enjoyed by all Canadians. The situation of public finances, which deteriorated with the pandemic, is of great concern to us because it will necessarily have an impact on the financing of the health system. The AMSMNQ will continue to collaborate with the Canadian Association of Nuclear Medicine (ACMN / CANM) on several issues, including the certification of nuclear medicine specialists by the Royal College, the development of guides for the proper use of nuclear medicine exams and the development of theranostics.

I have no doubt that each of us will be dedicated to the advancement of nuclear medicine and to the defense of our patients. Together, we are capable of the best.

AMSMNQ

ASSOCIATION DES MÉDECINS SPÉCIALISTES EN MÉDECINE NUCLÉAIRE DU QUÉBEC

AMSMNQ

L'IMAGERIE PERSONNALISÉE PAR LA MÉDECINE NUCLÉAIRE

« La mission du comité de développement professionnel continu (DPC) de l'Association des médecins spécialistes en médecine nucléaire du Québec (AMSNMQ) est de soutenir les médecins nucléistes à acquérir et à préserver leur expertise médicale, ainsi qu'à améliorer leurs compétences de collaboration et de communication dans le but de prioriser la qualité des soins aux patients. »

COMITÉ EXÉCUTIF

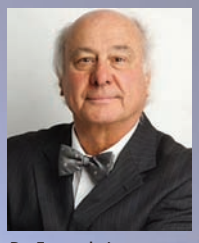
Dr. Norman Laurin
Président

Dr. Frédéric Arsenault
Secrétaire

Dr. Karine Provost
Conseillière

Dr. Anthony Ciarollo
Trésorier

Dr. Éric Turcotte
Conseillier



Dr. Francois Lamoureux
Président sortant (invité)

ORGANISATIONS

ACOMEN • American Society of Nuclear Cardiology • Association Canadienne de Médecine Nucléaire • Association Chinoise de Médecine Nucléaire • British Nuclear Medecine Society • Cancer de la Thyroïde Canada • Commission Canadienne de Sureté Nucléaire • Collège des Médecins du Québec • Collège Royal des Médecins et Chirurgiens du Canada • European Association of Nuclear Medecine • Fédération de Médecins Spécialistes du Québec • Fondation Canadienne de la Thyroïde • International Atomic Energy Agency • Pubmed • Société Française de Médecine Nucléaire et d'Imagerie Moléculaire • Society of Nuclear Medecine • Société Canadienne du Cancer • Université McGill • Université de Montréal • Université de Sherbrooke • World Federation of Nuclear Medicine and Biology

PARTENAIRES

Hermes Medical Solutions • Lantheus • Siemens Santé Limitée • GE Molecular Healthcare • Curium • Jubilant-DraxImage • Isologic • Philips • Segami • Cyclomedica • Financières des Professionnels • Sogemec

NOUS JOINDRE

Madame Michèle Laviolette
Directrice administrative

Téléphone : (514) 350-5133 ou 1-(800)-561-0703
Télécopieur : (514) 350 -5151
Courriel : amsmnq@fmsq.org

2, Complexe Desjardins, porte 3000
C.P. 216 , succursale Desjardins
Montréal (Québec) Canada H5B 1G8

AMSMNQ

medecinenucleaire.com
www.facebook.com/AMSMNQ/

S'UNIR POUR LE BIEN-ÊTRE DES AÎNÉS

Un nouveau modèle de rôles cliniques interdisciplinaires en dysphagie CHU de Québec-Université Laval

Entrevue par Fadwa Lapierre

Équipe du projet pilote

De trois à sept aînés sur 10 auront des signes de dysphagie au cours de leur vie. Loin d'être pris à la légère, les troubles de déglutition entraînent le chamboulement des repas, la complication de la prise de médicaments ou encore des risques de malnutrition, de déshydratation et d'étouffement. Le CHU de Québec a fait le pari de rebrasser les cartes pour améliorer les services offerts à ces patients.

« Le patient avait de la difficulté à arrimer tous ses suivis et devait répéter les mêmes examens, parfois invasifs, explique Stéphane Tremblay, directeur des services multidisciplinaires. On a pris le taureau par les cornes pour mieux définir les champs de pratique et les interventions des professionnels. L'objectif est de rendre ça plus simple et efficace pour le patient. »

Une révision des pratiques a permis de prioriser les rôles complémentaires des professionnels, et d'éviter les tensions au sein des équipes. Les orthophonistes, ergothérapeutes et nutritionnistes travaillent de pair à la clinique de dysphagie, entourée de médecins, d'infirmières et de préposés.

« Le patient n'a pas envie d'ouvrir trois fois la bouche pour se faire examiner, image M. Tremblay. On l'a mis au centre de nos priorités. 21 cliniciens ont participé à des travaux de quatre mois d'expérimentation. C'est extraordinaire ce qui s'est passé ! Ils se sont engagés dans ce processus interdisciplinaire pour résoudre les problématiques, en passant outre leurs avantages intraprofessionnels ou corporatifs, pour le bien-être des patients. » Ce dernier souligne que les bienfaits de cette méthode se sont vite imposés, entre autres, moins d'examens invasifs, des hospitalisations écourtées et une diminution de l'anxiété.

Stéphane Tremblay

Ce changement est délicat, il faut respecter l'expertise professionnelle de chacun. D'ailleurs, les ordres professionnels ont été consultés. Les équipes se sont mobilisées. 360 patients avec des signes de dysphagie ont été évalués avec la vision tripartite des orthophonistes, ergothérapeutes et nutritionnistes, sous les conseils des agentes de développement des pratiques professionnelles et d'une coordonnatrice en collaboration professionnelle. Une psychologue spécialisée a aussi été mise à contribution.

L'initiative a permis de développer une trajectoire simplifiée et harmonisée pour les patients : l'évaluation des prérequis à l'alimentation, l'évaluation au chevet, l'observation du repas, la détermination du plan de traitement, le suivi, la réévaluation et l'évaluation instrumentale. Tous les acteurs utilisent les mêmes outils informatifs en simultanée, facilitant leur prise en charge.

Selon le directeur des services multidisciplinaires du CHU de Québec, il n'existe actuellement aucun autre modèle de pratique interdisciplinaire intégré pour la dysphagie adulte faisant consensus au pays. À la suite du succès du projet-pilote, les 21 cliniciens ont formé une centaine de leurs collègues au CHU. Les relations de travail ont été renforcies, l'organisation est plus performante, sans oublier le patient qui en sort grand gagnant.

« Le projet a été présenté aux 17 établissements de la santé du Québec et du Nouveau-Brunswick, on sent un engouement. Le transfert des connaissances est en cours. Ce modèle est aussi exportable chez d'autres professionnels. Oui c'est audacieux, mais c'est l'exemple parfait qu'en prenant le temps de réévaluer nos pratiques, définir nos rôles et responsabilités vis-à-vis le patient, notre réseau de la santé peut être grandement amélioré », affirme positivement Stéphane Tremblay. ■

Équipe de développement du projet

LE COULOIR DE LA RÉADAPTATION

Par : Fadwa Lapierre

Chaque jour, environ 55 Québécois sont victimes d'un accident cardio-vasculaire qui bousculera leur vie. De nombreux défis sont à surmonter dès le séjour à l'hôpital. Le 13e étage du pavillon D du CHUM n'a rien de banal ; l'histoire d'un couloir transformé en piste d'entraînement pour les patients.

« Après un AVC, les patients passent 75 % de leur temps dans leur lit d'hôpital, inactif, sans interaction cognitive. C'est pourtant le moment le plus important pour bouger, communiquer, être stimulé, c'est essentiel pour récupérer », explique Dre Cécile Odier, neurologue vasculaire.

Inspirée par le concept d'environnement enrichi et les parcours fréquents dans les parcs suisses, son pays d'origine, l'idée a germé dans la tête de la chercheure. Le déménagement au nouvel hôpital a retardé son déploiement.

« C'était une opportunité de s'approprier les grands corridors du CHUM, raconte Judlène Joltéus, infirmière clinicienne. Cet espace immense était vu comme un défaut, il fallait en prendre avantage. S'en servir pour l'empowerment du patient, un jour à la fois, un pas à la fois, une sortie à la fois, une station à la fois. »

Le parcours Locomotive travaille le corps et l'esprit avec des affiches et de chouettes caricatures, dessinées par nul autre que le créatif Jean-Pierre Coallier, patient ayant lui-même subi un AVC en 2009. À travers les stimuli et les exercices, le patient apprend sur sa condition et débute sa réhabilitation.

« Lorsque quelqu'un a un AVC, toute la famille est touchée, rappelle Dre Odier. Les proches deviennent des alliés et nous aident à motiver le patient en comprenant mieux sa réalité. Même les préposés qui font marcher les patients vont utiliser les caricatures. Ce sont des outils simples qui font partie de la réadaptation, autant qu'une heure de physiothérapie. »

Tableau : Séquelles AVC

10 % récupèrent entièrement
25 % récupèrent avec légère invalidité
40 % présentent une invalidité importante
10 % conservent des séquelles graves nécessitant des soins à long terme
15 % décèdent

Source : Fondation des maladies du cœur et de l'AVC, 2015

Le parcours a été créé en étroite collaboration avec des patients qui ont contribué à toutes les étapes du projet. C'est même une patiente qui travaille pour une agence publicitaire qui a eu l'idée du nom Locomotive, qui fait penser à la neurologie. L'équipe est d'ailleurs très touchée d'avoir remporté le Prix du Patient.

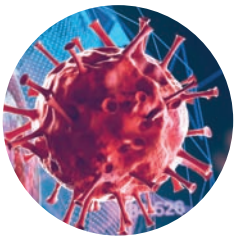
« Je dis à la blague que tout l'hôpital est impliqué, mais ce n'est pas loin de la réalité, c'est une soixantaine de personnes de huit directions différentes. Tout le monde a travaillé pour vulgariser l'information, ils étaient tellement enthousiastes qu'il fallait prioriser les phases », souligne Mme Joltéus qui agit comme pilier transdisciplinaire.

Le projet n'est pas très coûteux, mais tout est calculé, du lavage du marquage au sol, à l'approbation de ce qui est accroché sur les murs, aux pastilles distancées. Le résultat : un environnement stimulant et mobilisateur ! La preuve que l'hôpital peut se réinventer grâce aux convictions et aux efforts d'une équipe.

La réussite du parcours intéresse d'autres centres de réadaptation. Le CHUM souhaite aussi en créer pour les unités de neurochirurgie et de gynéco-oncologie. L'équipe n'a pas fini de rêver et souhaite se servir des nouvelles technologies pour aider le patient, avec une baladodiffusion et peut-être même la réalité virtuelle !

*L'équipe interdisciplinaire est composée de : une infirmière clinicienne experte dans la trajectoire de soins AVC (Judlène Joltéus), une neurologue vasculaire (Dre Céline Odier), une physiothérapeute dédiée à l'unité d'AVC (Marie-Andrée Desjardins) ainsi qu'une conseillère senior en soins spécialisés et en recherche clinique (Line Beaudet) et deux patients partenaires (Serge Gareau, Danièle Henrichon). Ergothérapeutes, nutritionnistes, orthophonistes, spécialistes de communication, spécialiste en arts visuels, une psychologue et une sexologue complètent l'équipe.

EN RENFORT POUR SAUVER DES VIES



Brigade d'agents de prévention et de contrôle des infections, Direction régionale de santé publique, CIUSSS du Centre-Sud de l'île de Montréal

Par : Fadwa Lapierre

Le printemps dernier marquera à tout jamais le personnel soignant. La COVID-19 avait frappé, c'était l'hécatombe dans nos CHSLD et autres résidences pour aînés. Zone froide, chaude, contagion, on faisait face à l'inconnu. Un groupe s'est relevé les manches et est venu prêter main-forte au réseau de la santé fortement ébranlé.

« J'ai pris un congé sans solde de la Croix-Rouge, il fallait agir tout de suite et proposer des solutions pour soutenir les établissements, se remémore Dre Marie Munoz-Bertrand. On a travaillé fort pour créer un modèle agile, en continuité avec les CIUSS de Montréal. On a construit l'avion en plein vol. »

Avec sa complice Anne Landry, chef d'équipe, les deux femmes qui ont de l'expérience en international ont monté une brigade le temps de le dire. Le jour suivant, elles passaient déjà des entrevues, il n'y avait pas une minute à perdre, les éclosions sévissaient, les morts s'additionnaient.

« On a fait appel majoritairement à des médecins formés à l'étranger. Plusieurs avaient mené des combats contre l'Ebola et le choléra, ils ont des connaissances en crise sanitaire. Tout le monde s'est relevé les manches pour aider les milieux des aînés vulnérables, relate fièrement Mme Landry. Avec leur expertise, ils se sont sentis utiles, certains étaient chauffeurs de taxi, préposés aux bénéficiaires, c'est l'occasion de leur partager une expérience terrain. On est devenu une véritable famille. »

La brigade c'est une trentaine d'agents provenant d'une vingtaine de pays et parlant 15 langues. Ils sont spécialisés en chirurgie, santé publique, communication ou encore gériatrie. Ils ont fait plus de 2000 visites au sein de 305 milieux de vie différents munis de trousses de préparation et de gestion des éclosions. Ils soutiennent les établissements en éclosion et biosécurité (création de zones, d'espace d'habillage, etc.) de façon personnalisée.

Ces milieux d'hébergements sont complexes et il faut analyser chaque secteur pour contrôler les risques de contagion, de l'ascenseur, à l'accueil, à la sécurité, à la gestion, au service alimentaire… Au début, l'arrivée de la brigade suscitait la méfiance, mais une relation de confiance s'est bâtie et les gens ont vite compris que leur but n'était pas de jouer à la police, mais de les outiller dans l'objectif commun d'éviter les éclosions par de bonnes pratiques. C'est une approche transversale, tous ont un rôle à jouer.

Le projet a même aidé les communautés religieuses, laissées à elles-mêmes durant la crise, et pourtant vulnérables au coronavirus. Une sœur-médecin en transit entre deux missions s'est jointe à l'aventure !

« On s'est adapté à l'évolution de la pandémie. En très peu de temps, on a réussi à positionner la brigade, prouver son utilité et sécuriser la pérennité du projet. Les cas de COVID-19 sont généralement contenus. On voit concrètement l'effet de la prévention », note Dre Munoz-Bertrand qui souligne le soutien extraordinaire reçu par les CIUSS.

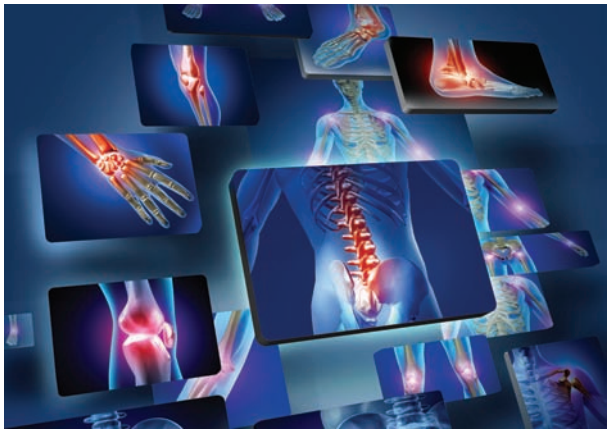
La brigade pourrait aussi être indispensable dans d'autres circonstances comme des éclosions de grippe ou de gastro-entérite. La formation continue se poursuit. Certains agents profitent de cette expérience concrète dans le réseau de la santé pour se réorienter.

L'équipe comprend également des conseillères en soins infirmiers, des infirmières cliniciennes, des médecins-conseils et des agents de planification, programmation et recherche. « C'est un projet très mobilisateur, à l'interne, tout le monde a embarqué, même si cela s'ajoutait aux responsabilités du quotidien. Chaque jour, on constate les retombées positives », s'exclame Mme Landry qui espère que le modèle soit repris à travers la province. ■

S'ATTAQUER AUX LISTES D'ATTENTES

Amélioration des pratiques en réadaptation ambulatoires CISSS de la Montérégie-Ouest

Entrevue par Fadwa Lapierre



Les listes d'attentes interminables de physiothérapie ont des conséquences majeures pour les gens en souffrance. La douleur chronique, on ne la souhaiterait pas à notre pire ennemi ! Une équipe ingénieuse de la Montérégie-Ouest a pris ce problème en main.

« La clientèle chirurgicale monopolisait à 80 % le temps des intervenants, dénote Stéphane Dubuc, directeur des services multidisciplinaires, de la recherche et de l'enseignement universitaire. Pour les autres, il y avait un défi d'accessibilité immense, on parlait de délais en termes d'années. Attendre pour un traitement a énormément d'impacts sur la vie quotidienne. En douleur, les patients sont moins actifs, vivent de l'anxiété, s'absentent du travail et s'isolent. » Le physiothérapeute de formation était également préoccupé par la consommation problématique d'opioïdes de ces patients, qui faute de solutions, tentent de soulager temporairement leur douleur.

L'équipe interdisciplinaire de la clinique de réadaptation (les différents professionnels de la santé, accompagnés de la directrice adjointe - volet opérations, coordonnateurs, assistants-chefs physiothérapeutes, conseillère-cadre à l'Innovation et au développement des outils cliniques et agentes de planification, de programmation et de recherche) a travaillé de pair pour dorénavant desservir une clientèle négligée.

Ils ont réévalué chacune de leurs pratiques et les ont mises à jour avec la récente littérature. Les orientations de traitements sont axées sur une autonomisation du patient. « On ne réduit pas la qualité des soins, mais plutôt la fréquence et la présence des interventions, précise M. Dubuc. Il y a une prise en charge préopératoire où l'on enseigne aux patients les programmes d'exercices et s'en suit un suivi étroit. »

Les patients qui ont subi des chirurgies du genou et de la hanche demeurent prioritaires, mais par cette nouvelle approche, ils sont impliqués dans leur plan de traitement avec des objectifs clairs. Les soins s'adaptent à leur aisance à effectuer les exercices à la maison et à l'évolution de leur réadaptation. Grâce à ces changements, les listes d'attente ont été épurées sans l'ajout de nouveaux effectifs.

« C'est impressionnant, on est passé d'une liste d'attente de plusieurs années à moins de trois mois, se réjouit Stéphane Dubuc. Tout le monde est confronté à la pénurie de main-d'œuvre, mais ajouter des ressources n'est pas toujours la meilleure solution. Il faut oser analyser les situations différemment. L'équipe a fait preuve d'humilité et d'ouverture pour revoir ses pratiques dans l'objectif d'améliorer la vie des patients. »

La clientèle non chirurgicale, plus particulièrement pour les troubles musculosquelettiques à risque de chronicisation, était un peu laissée à elle-même. Une prise en charge d'une équipe interdisciplinaire (médecin, infirmière clinicienne, physiothérapeute, ergothérapeute, kinésiologue, psychologue) vient changer la donne. Leur expertise est mise à contribution pour intervenir de façon très adaptée à chacun des cas.

Pour les gens souffrant de douleurs persistantes, des ateliers de groupe sont offerts, on partage nos expériences, apprend l'autogestion des symptômes, etc.

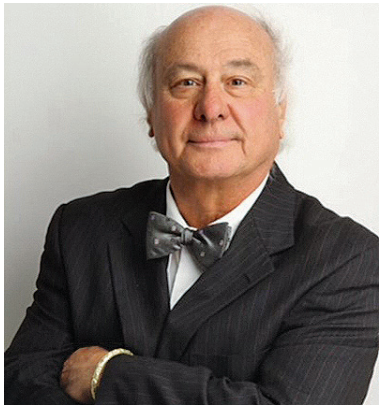
Le projet suscite l'intérêt, des médecins souhaitent qu'il soit étendu à l'ensemble du territoire. Le RUISSS McGill et le Ministère de la Santé et des Services sociaux se penchent sur les exemples de trajectoires de services, particulièrement intéressés par les alternatives de consommation d'opioïdes.

« On a donné de l'espoir, c'est ce qui me rend le plus fier, souligne le directeur des services multidisciplinaires, de la recherche et de l'enseignement universitaire. La douleur chronique n'est pas sans issue. Lorsqu'on est bien outillé et soutenu, ça fait une différence énorme. » ■

DSMREU
Prev-Action
Usagere-Partenaire
CISSSMO
Anne-Marie Breton,
Pascale Maillette,
Vanessa Prévost,
Nadia Paquin
(En ordre de gauche à droite)

DSMREU
Prev-Action
Equipe Réadaptation
CISSSMO
Manuel Campeau,
Pascale Maillette,
Daniel Gingras
(Rangée arrière,
de gauche à droite)
Noémie Joseph-Blais,
Karine Cervera,
Nadia Paquin (Rangée
avant, de gauche à droite)

ENTREVUE AVEC LE DR. FRANCOIS LAMOUREUX



François Lamoureux,
B.A., M.D., M.Sc., L.M.C.C., C.S.P.Q., F.R.C.P.C., Professeur agrégé de clinique département de médecine nucléaire, radiologie et radiothérapie de la faculté de médecine de l'Université de Montréal.

Actuellement membre actif depuis juillet 2017 dans le service de médecine nucléaire de l'hôpital de Val D'Or Québec Canada.

Président de l'Association Canadienne de Médecine Nucléaire depuis 2019. www.CANM-ACMN.ca

Vous êtes le président de L'ASSOCIATION CANADIENNE DE MÉDECINE NUCLÉAIRE. Pourriez-vous décrire brièvement le rôle de la CANM-ACMN en Médecine nucléaire?

L'ACMN représente les médecins nucléistes du Canada ayant adhéré à l'association. Elle a comme principaux objectifs :

a) contribuer à l'éducation continue de ses membres;

b) promouvoir et faire connaître la PLUS VALUE de la Médecine nucléaire;

c) représenter ses membres auprès des gouvernements et de ses entités;

d) participer en partenariat avec l'AIEA et le Collège Royal du Canada, entre autres, à l'éducation et au transfert de connaissances sur la scène internationale avec une attention toute particulière au niveau des pays émergents ou en voie de développement; et

e) assurer un partenariat continuel avec les partenaires industriels pour le développement et l'approbation par les instances décisionnelles de nouveaux radiotraceurs et de nouveaux détecteurs tant en diagnostique qu'en théranostique.

D'après vous, quels ont été les trois plus importants changements que vous avez constatés dans le monde de la Médecine nucléaire au cours des cinq dernières années?

a) La mise en marché de nouveaux détecteurs extrêmement performants en technologie SPECT-TDM et TEP-TDM;

b) le développement de nombreux nouveaux radiotraceurs; et

c) l'application de plus en plus à grande échelle de la théranostique et de l'utilisation de nouveaux radiotraceurs à des fins thérapeutiques.

Comment voyez-vous l'évolution de la Médecine nucléaire au cours des cinq prochaines années?

La Médecine nucléaire entre dans une phase de développement exponentiel tant dans sa dimension diagnostique que thérapeutique. Son apport clinique modifiera plusieurs schémas d'investigation et de traitements. Le médecin nucléiste travaille et travaillera de plus en plus en étroite collaboration avec les médecins traitants dans un contexte de médecine personnalisée.

Comment voyez-vous la formation des résidents et des technologues en Médecine nucléaire au cours des cinq prochaines années?

Comme partenaires essentiels et irremplaçables dans toute unité de Médecine nucléaire, les résidents et les technologues ont et auront plus que jamais à continuellement maîtriser ces nouveaux radiotraceurs, équipements de plus en plus sophistiqués et toujours à la fine pointe de la technologie. Ils seront continuellement en formation continue eux aussi pour le plus grand bénéfice des patients. Ce seront toujours des partenaires un peu exceptionnels et avides de nouveaux défis. Des gens un peu uniques.

Comme président de la CANM-ACMN quel est votre plus grand souhait pour la spécialité de la Médecine nucléaire?

Devant cette croissance accélérée et exponentielle de la Médecine nucléaire, de pouvoir maintenir en nombre et en même qualité le nombre de nucléistes, de technologues, de radio-chimistes et de physiciens nucléaires. ■

CANM ACMN
The Canadian Association of Nuclear Medicine
Association canadienne de médecine nucléaire

www.canm-acmn.ca

HERMES
MEDICAL
SOLUTIONS

Prochaine génération de médecine nucléaire

LA PLATEFORME LOGICIELLE DE DEMAIN POUR LES BESOINS CLINIQUES D'AUJOURD'HUI

www.hermesmedical.com - info@hermesmedical.com

INTERVIEW WITH DR. JEAN LUC URBAIN

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

Since January 1st, 2021 and for 2 years you will be assuming the Presidency of the World Federation of Nuclear Medicine and Biology (WFNMB). Could you describe the role of the WFNMB in the field of Nuclear Medicine!

The WFNMB aims to run an extensive on-site and on-line educational programs for emerging countries. The WFNMB works with member societies (please see attached list of current member societies) to offer education, products and information to help individual nuclear physicians stay current and provide the best possible nuclear medicine practice to the public. To achieve these goals, the WFNMB works very closely with the World Health Organization (WHO), the International Atomic Energy Agency (IAEA) and the main Regional Associations and Societies of Nuclear Medicine from across the globe (SNMMI, EANM, AOFNMB, ARCCNM, ALASBIMN, AANM, ANZSNM and ARSNM) and provide the best possible nuclear medicine practice to the public.

What have been the most important changes that you have seen in the field of Nuclear Medicine over the last five years!

The lack of concerted efforts in research and development of new radio-pharmaceuticals in the last part of the 20th century created a climate of uncertainty about the field of nuclear medicine at the eve of the 21st century. In a very interesting and remarkable turn of events, the development of diagnostic and therapeutic radiopharmaceuticals based on diseases genotypes and phenotypes and so-called isotopes pairs (Nuclear Theranostics) have triggered a true renaissance of the field of Nuclear Medicine.

How do you see the field of Nuclear Medicine evolving during the next five years!

Through their exquisite sensitivity and specificity, Nuclear Theranostics (like for example Ga68, Cu64, Lu177 Dotatate, Ga68, F18, Lu177 PSMA, F18 Estradiol and its upcoming cognate therapy) have the potentials of becoming the new holy grail of nuclear medicine. In combination with hybrid imagers (SPECT/CT, PET/CT and PET/MR) they will undoubtfully play a major role in precision medicine by significantly improving patient disease management, particularly but not exclusively in oncology. I personally feel that there has never been a time to be actively practicing Nuclear Medicine. From a mainly diagnostic specialty we have now the opportunity to be intimately part of the diagnostic and treatment of various disease in a co-management approach with our colleagues from other specialty.

How do you see the training of residents and technologists in our Nuclear Medicine training programs!

Nuclear Medicine is now a fully integrated diagnostic and therapeutic specialty. The practice of nuclear medicine requires knowledge in chemistry, biology, physics, genetics, genomics and other related omics, complex (hybrid) imaging equipment and radio-pharmacy along with an in depth understanding of patients diseases and management, the health care system and health care economics. The needs for this type of complex knowledge, experience and expertise represents an unique opportunity for medical school and nuclear medicine centers to adapt their curriculum and practice to the 21st century precision medicine, patient centered and responsible socio economic era.

As president of the WFNMB, what is your greatest wish for the specialty of Nuclear Medicine!

As President of the WFNMB, I will work tirelessly with the elected Secretary General and Treasurer, the World Health Organization (WHO), the International Atomic Energy Agency (IAEA), the Health and Nuclear Medicine Authorities from across the globe, all national Nuclear Medicine Societies and Association and the Nuclear Medicine Industry to (1) secure the supply of and access to Medical Isotopes, (2) develop NM educational tools accessible to the Nuclear Medicine Communities, Patients and Referring Physicians from around the world, (3) make sure that the Nuclear Medicine Association/Societies from the emerging countries benefit from the work of the WFNMB and the regional NM Associations/Societies, and (4) promote the field of Diagnostic and Therapeutic Nuclear Medicine across the globe, particularly in the underserved countrie■

WORLD FEDERATION OF NUCLEAR MEDICINE AND BIOLOGY

www.wfnmb.org

TECHNEGAS™
FUNCTIONAL LUNG IMAGING

BENEFITS
V/Q SPECT TECHNEGAS™

Proven diagnostic accuracy
with high sensitivity and specificity [1]

Minimally invasive
aiding patients's confort and compliance [2]

Detects subsegmental
Pulmonary Embolism (PE) [3]

Low radiation burden
26-36 times less absorbed dose to breast of females [4]

Technegas™ has minimal exclusion criteria and may be administered to most patients[4-6] including:
Renal impaired | Contrast allergy | Diabetics
Chronic Obstructive Pulmonary Disease (COPD) | Critically ill
Pregnant

V/Q SPECT TECHNEGAS™
IN NUCLEAR GUIDELINES

The EANM Guidelines[7] strongly recommend ventilation-perfusion single photon emission computed tomography (V/Q SPECT) as it allows the diagnosis of PE with accuracy even in the presence of COPD and pneumonia.

The CANM Guidelines[8] consider Technegas™ as the agent of choice in COPD population because it has less central airway deposition, better peripheral penetration and it does not wash away quickly as traditional aerosols. Only a few breaths are sufficient to achieve an adequate amount of activity in the lungs, reducing time and personnel exposure.

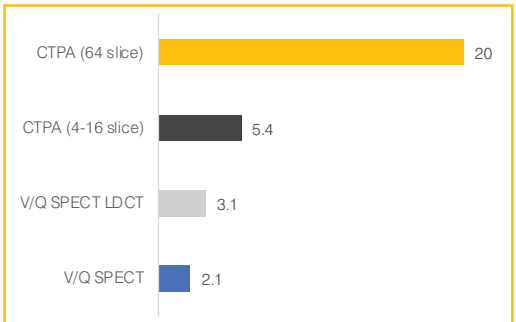


Table 1: Radiation exposure [8] (mSv)
(adapted from CANM guidelines, 2018)

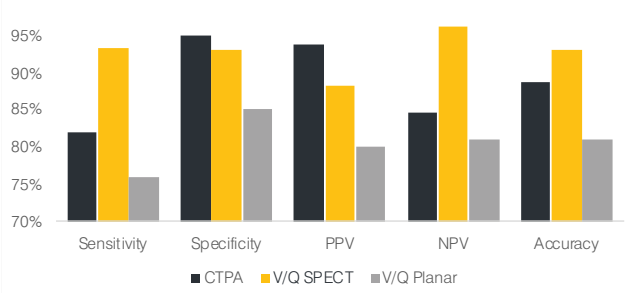


Table 2: Diagnostic ability of CTPA, V/Q SPECT and V/Q Planar to detect PE (adapted from Hess et al, 2016)

All PE's should have a final control 3 months after diagnosis to assess final reperfusion and to benefit from the availability of a baseline exam in case of recurrent symptoms. Low radiation exposure allows repeated studies (*table 1*).

With the uptake in SPECT imaging, V/Q SPECT results are seen as being superior to planar imaging and computed tomography (CTPA) when comparing sensitivity, negative predictive value and accuracy (*table 2*).[1]

Therefore, in situations of acute PE, chronic PE, pregnancy, paediatrics and the COPD population, V/Q SPECT can be considered as a first-line investigation due to its high sensitivity and specificity, low radiation and no adverse reactions.[8]

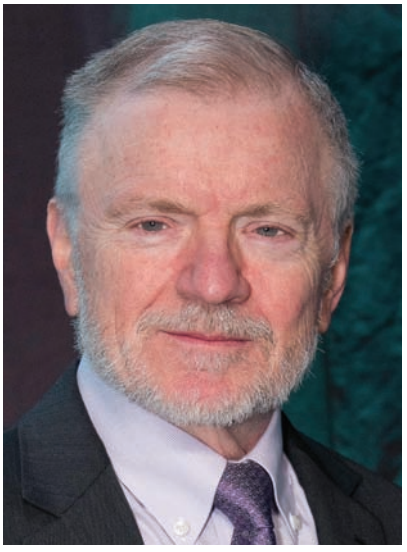
CLICK HERE TO LEARN HOW TO PERFORM A V/Q SPECT STUDY WITH TECHNEGAS™

References

1. Hess S, et al. Semin Thromb Hemost 2016; 42: 833–845
2. Sánchez-Crespo A, et al. Nucl Med Commun 2008; 29(2): 173-177
3. Grüning T, et al. Clin Imaging 2014; 38(6): 831-835
4. Isidoro J, et al. Phys Med 2017; 41: 93-96
5. Miles S, et al. Chest 2009; 136: 1546-1553
6. Nasr A, et al. EC Pulmon and Respir Medicine 2017; 4(3): 85-91
7. Bajc M, et al. Eur J Nucl Med Mol Imaging 46, 2429–2451
8. Leblanc M , et al. CANM Guidelines 2018; published Nov 2018

Technegas™ is not yet available for sale in the USA.
Last revision (A4): v.2.1 (14/Apr/2021)
For more information please visit **www.cyclomedica.ca** or email **technegas.sales@cyclomedica.ca**

cyclomedica



INTERVIEW WITH DR. ALAN PACKARD

Dr. Alan Packard
Ph.D Boston Children's Hospital
Harvard University, MA
USA

You are the president of the SOCIETY OF NUCLEAR MEDICINE AND MOLECULAR IMAGING (SNMMI). Could you succinctly describe the role of the SNMMI in the field of Nuclear Medicine?

I think SNMMI has several important roles in the field of Nuclear Medicine. Perhaps the most important role of SNMMI is to be a strong advocate for the field. This includes reaching out to the general public, patients, referring physicians, hospital administrators, and government agencies to ensure that as many people as possible understand the many important contributions of nuclear medicine to patient health. Another important role is education. SNMMI provides a wide range of educational opportunities for all our members, from physicians, scientists and pharmacists to our technologists. Our role in education also extends to ensuring the people entering the field are well-equipped to meet the challenges of rapidly evolving technology, particularly in the area of radiopharmaceutical therapy. A third role is providing a forum for the presentation and discussion of the many exciting advances in our field, ranging from the physics and engineering underlying the new whole-body PET camera, new approaches to radionuclide production, innovative radiochemistry that provides access to novel tracers, and the FDA approval of new diagnostic and therapeutic radiopharmaceuticals that are changing the field more rapidly than at any time in the past 30 or more years.

What have been the three most important changes that you have seen in the field of Nuclear Medicine over the last five years?

The challenge to answering this question is limiting it to only 3 changes! I would say the first change is the FDA approval of new theranostic pairs such as Ga-68- and Lu-177-labeled octreotide for the diagnosis and treatment of neuroendocrine tumors a few years ago. And similar agents for prostate cancer are right around the corner. I think the second change is the development of new imaging technologies. It started with PET/CT, which of course was more than 5 years ago, but more recently we have seen exciting advances in PET/MRI, SPECT/CT, and whole-body PET. The third change is probably the increased interest in alpha-emitters in radionuclide therapy. Several research groups have been interested in using alpha emitters for radionuclide therapy for decades, but it seems that the success of beta-emitters such as Lu-177 has reinvigorated interest in alpha emitters.

How do you see the field of Nuclear Medicine evolving during the next five years?

I think I'll start by falling back on one of my favorite quotes by Yogi Berra: "It's tough to make predictions, especially about the future." That being said, based on what's in the pipeline, I expect that we'll continue to see new diagnostic and therapeutic agents introduced during the next 5 years. Hopefully somewhere in that pipeline is a therapeutic radiopharmaceutical for glioblastoma. It seems like a great opportunity, but it's also a huge challenge. Personally, I'd like to see a research cyclotron that requires minimal infrastructure compared to currently available systems so that I can do ^{18}F chemistry without having to rely on someone else to make the ^{18}F for me. Finally, it's going to be interesting to see how the question of individualized patient dosimetry evolves for radiopharmaceutical therapy. I think we're currently on the leading edge of realizing the full capabilities of radiopharmaceutical therapy, and it's going to be exciting to see how it evolves over the next 5-10 years.

How do you see the training of residents and technologists in our Nuclear Medicine programs changing?

In one sense, I don't think training is going to change that much from what it has been: Our goal has been to prepare our trainees to excel in this field, and I don't think that goal is going to change. That being said, there are obviously going to be changes in content, the most obvious being a greater emphasis on radionuclide therapy now that the radionuclide therapy is expanding well beyond using ^{131}I to treat thyroid disease. The corollary to that is that we're going to have to make sure that our trainees are well prepared to interact with patients, since they're now going to actually be treating patients. One other change is, I hope, an increased emphasis on wellness. Among the many things that COVID-19 has taught us is that we need to improve our ability to deal with the many stresses that we encounter on a day-to-day basis, whether we're technologists, scientists, or physicians.

As president of the SNMMI, what is the greatest wish for the specialty of Nuclear Medicine?

My greatest wish for Nuclear Medicine is that we could find a way to increase our visibility, to the general public, to patients, and even to referring physicians. Most people know about CT and MRI scans, but many fewer people know about PET and SPECT imaging or radionuclide therapy. People are very excited when they learn what we can do, both diagnostically and therapeutically, but I continue to be surprised by how few people know that we even exist, let alone how exciting some of recent developments in the field are and how much these developments can improve patient outcome. ■

SNMMI SOCIETY OF NUCLEAR MEDICINE AND MOLECULAR IMAGING

www.snmmi.org

INTERVIEW WITH DR. MOHAMAD B. HAIDAR

You are the president of the ARAB SOCIETY OF NUCLEAR MEDICINE (ARSNM). Could you succinctly describe the role of the ASNM in the field of Nuclear Medicine?

The Arab Society of Nuclear Medicine (ARSNM) plays an important role in the advancement and the development of nuclear medicine in the Arab world. One of its most important goals is to create a system that includes different nuclear medicine societies and communities in the region. This offers the nuclear medicine physicians and technicians the opportunity to experience the development of this field in other regions.

It facilitates the collaboration and partnership between local and international nuclear medicine communities, research institutions and associated medical personnel in the Arab world and across the globe to share and spread new achievements in this field. As stated above, ARSNM encourages the exposure of the medical personnel to the different training programs and technologies in various regions.

Furthermore, it also aims to increase the exposure of the Arab medical personnel to other communities in the world such as the Canadian associations of Nuclear Medicine.

ARSNM also aims to increase the knowledge and awareness about this promising field in medicine. It goes about this by upholding conferences, research, and lectures. Consequently, it aims to create a common curriculum for nuclear medicine that encompasses the different nuclear medicine communities in the Arab world.

What have been the three most important changes that you have seen in the field of Nuclear Medicine over the last five years?

The advancements in the nuclear medicine field can be mainly categorized into Diagnostics and Theranostics.

In diagnostics:

- Introduction of PET CT and SPECT CT scan in the field of nuclear medicine in oncology and neurology. This has led to an increase in the conferences and educational activities dedicated for PET/CT scan notability in oncology.
- Introduction of new radiotracers in the region such as Gallium PSMA, F-Dopa, C- methionine indicated for the early diagnosis of Prostate cancer, brain tumors and Parkinson's disease.
- Introduction of PET-MRI notably for childhood neurology tumors.

In theranostics:

- Introduction of theranostics in some countries of the Arab world that target neuroendocrine tumors and prostate cancers such as in American University of Beirut Medical Center (AUBMC) in Lebanon and King Hussein Cancer Center in Jordan.
- Introduction of Actinium-PSMA for Prostate cancer notably in Lebanon and Kuwait

***Dr. Mohamad Haidar**, Associate Professor of Clinical Specialty American University of Beirut, Faculty of Medicine and Medical Center Diagnostic Radiology*

How do you see the field of Nuclear Medicine evolving during the next five years?

I suppose that the future of nuclear medicine will be mainly in the oncology field given the advancements in the radionucleotide targeted therapy that seen in prostate, neuroendocrine and brain tumors. Moreover, the future of nuclear medicine in neurology is evolving as well. As the advancements are promising in early detection of Alzheimer's disease and hopefully early treatment by targeted therapy.

How do you see the training of residents and technologists in our Nuclear Medicine training programs?

In collaboration with the International Atomic Energy Agency (IAEA), residency and fellowship programs are being implemented, and some Arab countries adopted these programs such as American university of Beirut, Lebanon.

Regarding the technicians who play a very crucial role in this field, their technical and technological trainings have been established few years ago in collaboration with IAEA. I hope the cooperation between Canadian Association of nuclear medicine and ARSNM will open a new road for training and education. Furthermore, increase the bilateral scientific exchange throughout conferences and training program.

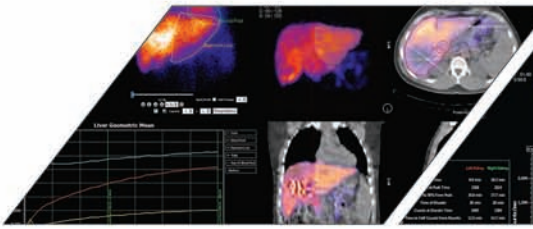
As president of the ARSNM, what is your greatest wish for the specialty of Nuclear Medicine?

I wish great future for the specialists in nuclear medicine in collaboration with oncologists, haematologists, endocrinologists, neurologists, and other therapy specialists to detect and treat disease at the early stages using theranostic to enhance the use of target therapy.

ARSNM
ARAB SOCIETY OF NUCLEAR MEDICINE

www.arsnm.com

HERMES MEDICAL SOLUTIONS

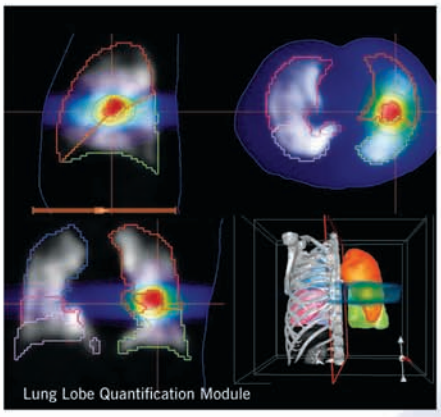


ENTERPRISE CLASS SOLUTIONS FOR MOLECULAR IMAGING

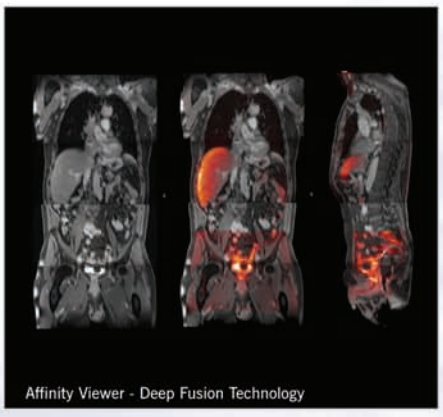
With more than 40 years of recognition for Clinical Excellence and innovation in Molecular Imaging, HERMES delivers Enterprise Class systems and software for integrating, visualizing, processing, reporting and archiving imaging data from different imaging modalities and devices within Molecular Imaging and Radiology. HERMES solutions are empowering physicians by enabling faster and more accurate diagnosis and treatment of patients, thereby improving patient outcomes and increasing efficiency. HERMES leadership within Molecular Imaging has been built on leading technological innovation, financial stability, and historical success. HERMES is committed to the continuous development of cutting-edge accessible software solutions for clinical environments, academic institutions and industry partners. HERMES will continue to offer its customers and proSPECTive clients, the most comprehensive Enterprise Molecular Imaging solutions available for diagnosis and treatment planning as healthcare moves into the new frontiers of Precision Medicine.

DISPLAYED BY HERMES™

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



Lung Lobe Quantification Module



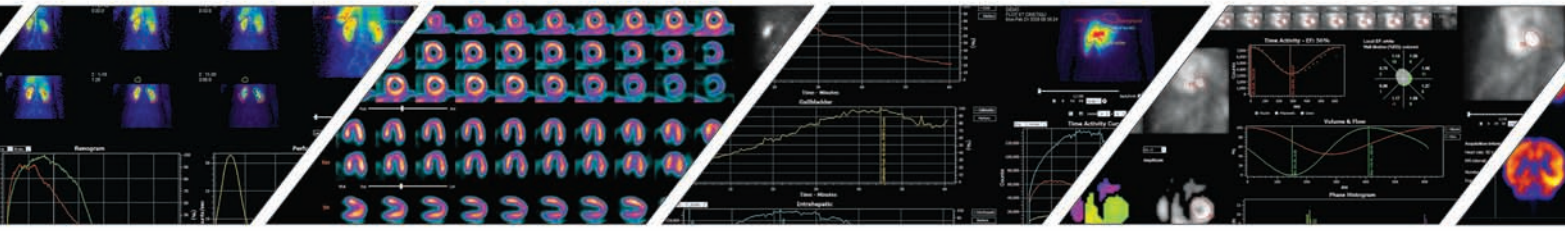
Affinity Viewer - Deep Fusion Technology

With crucial input from customers around the world, nuclear medicine pioneers, the HERMES R&D team has developed Hybrid Viewer PDR™ and Affinity Viewer: A unique and user-friendly software suite 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 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.

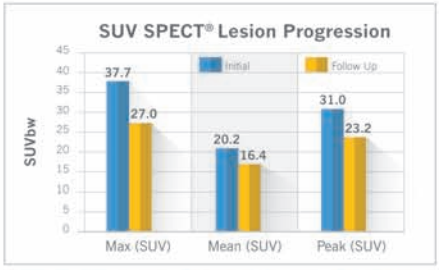
CONNECTED BY HERMES™

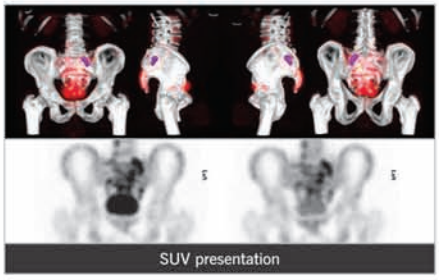
From the early days of nuclear medicine, quantification has been a key aspect; self-defining the practice and at the same time distinguishing from other imaging modalities. The arrival of Positron Emission Tomography (PET and its SUV scale) certainly contributed to advances in the field, but the essence of nuclear medicine still remains the 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.



RECONSTRUCTED BY HERMES™

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.





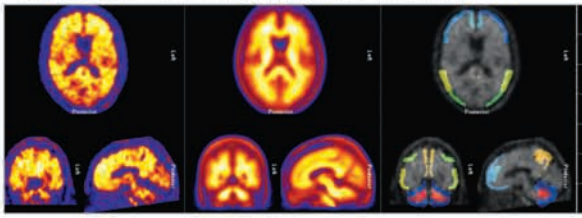
SUV presentation

Combined with attenuation correction from a hybrid SPECT-CT scanner or SPECT-only camera (utilizing an independent CT) and a Monte Carlo-modeled scatter correction, HERMES SUV SPECT® brings SPECT-CT scanners from any manufacturer to the next level.

QUANTIFIED BY HERMES™

Mostly used for teaching purposes or display modelling, 3D applications 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.

HERMES BRASS™ Quantification with NeuraCeq™ from Isologic



Region Name	SUVr (Z)
Average SUVr	1.65 (2.13)
L Frontal Ctx	1.52 (2.92)
R Frontal Ctx	1.68 (4.24)
L Ant Cingulate	2.15 (5.50)
R Ant Cingulate	2.31 (5.12)
L Occipital Ctx	1.30 (1.00)

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. The market debut of NeuraCeq™, recently approved by Health Canada and commercialized by Isologic, synergizes HERMES efforts in assisting nuclear medicine physicians 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. This Isologic-HERMES partnership facilitates the utilization of the renown BRASS™ (Brain Registration & Analysis Software Suite) application, appearing in more than 350 scientific publications and presentations around the world and validated with over 2 million patients.

POWERED BY HERMES™

HERMES VNM™ includes HERMES VNA (Vendor-Neutral Archive) combined with the power of a complete clinical medical imaging platform, tailor-made for multi-vendor sites/multi-facilities integration. HERMES provides cost effective solutions worldwide from enterprise-wide architecture & infrastructure to storage, reading, analysis and processing services on its systems or via HERMES cloud, TeleHERMES™.

SUPPORTED BY HERMES™

HERMES provides its expertise by employing a solid team, dedicated to quantitative molecular imaging Worldwide. Company offices are located in Sweden, the United Kingdom, China, the United States and Canada.

ENTREVUE AVEC LE DR. NORMAN LAURIN

Dr. Norman Laurin
MD Médecine Nucléaire
CISSS Mauricie-Centre, Québec, Canada

Vous êtes le président de L'ASSOCIATION DES MÉDECINS SPÉCIALISTES EN MÉDECINE NUCLÉAIRE DU QUÉBEC (AMSMNQ). Pourriez-vous décrire brièvement le rôle de l'AMSMNQ en Médecine Nucléaire?

L'AMSMNQ regroupe l'ensemble des médecins spécialistes en médecine nucléaire du Québec. Tous nos membres sont détenteurs d'un diplôme du Collège des Médecins du Québec et du Collège Royal du Canada en Médecine Nucléaire. L'AMSMNQ est une des 35 associations de médecins spécialistes du Québec, regroupées à l'intérieur de la Fédération des Médecins Spécialistes du Québec (FMSQ) qui compte plus de 10000 membres. Le Québec est la province canadienne dans laquelle la présence et l'utilisation de la médecine nucléaire est la plus forte. La mission de l'AMSMNQ se décline en 4 volets :

- Promouvoir les conditions de pratique de ses membres
- Encourager et soutenir le développement professionnel continu de ses membres
- Participer à l'élaboration de guides d'utilisation ou documents de réflexion sur des sujets d'intérêt pour la médecine nucléaire, incluant la participation aux activités des organisations scientifiques
- Promouvoir la médecine nucléaire auprès des autres intervenants de la santé et auprès du grand public.

D'après vous quels ont été les trois plus importants changements que vous avez constatés dans le monde de la Médecine Nucléaire au cours des cinq dernières années?

Le déploiement exceptionnel de la TEP, l'adoption presqu'universelle de l'imagerie hybride en tomographique monophotonique (SPECT-TDM) et l'arrivée de nouveaux radiopharmaceutiques ont marqués les 5-10 dernières années. Le Québec compte 21 appareils TEP-TDM financés entièrement par le système public, qui ont effectués en 2020 plus de 50000 examens et la progression est constante. L'imagerie SPECT-TDM a permis une spécificité diagnostique nettement supérieure pour des examens et des radiotraceurs utilisés parfois depuis 40-50 ans mais dont la valeur est multipliée par une localisation et une caractérisation anatomique supérieure lorsque que combiné à une TDM. L'approbation des nouveaux radiotraceurs (Rubidium-82 en cardiologie, DOTATATE marqué au Gallium-68 ou au Lutétium-177, ioflupane-iode 123, Florbetapir marqué au Fluor-18) ouvre des voies diagnostiques et thérapeutiques impossibles il y a seulement quelques années.

Comment voyez-vous l'évolution de la Médecine Nucléaire au cours des cinq prochaines années?

Nous poursuivrons les développements entamés au cours des dernières années, et nous verrons l'approbation de nouveaux traceurs pour l'imagerie TEP des cancers de la prostate et ultimement leur thérapie par radio-isotopes métabolisés. Cette branche de la médecine nucléaire se nomme la théranostique, car elle combine le volet à la fois diagnostique et thérapeutique des radiopharmaceutiques utilisés en médecine nucléaire. La thérapie deviendra une part importante du travail de certains spécialistes en médecine nucléaire, bien au-delà de ce que nous avons connu avec l'iode-131 pour les cancers de la thyroïde. Elle accaparera aussi une part importante de budgets de radio-isotopes. J'ai bon espoir que d'autres traceurs TEP seront approuvés en cardiologie nucléaire, en imagerie des tumeurs neuroendocrines et peut-être en neurologie.

Comment voyez-vous la formation des résidents et des technologues en Médecine Nucléaire au cours des cinq prochaines années?

La formation des médecins spécialistes en médecine nucléaire est assurée au Québec dans 3 milieux universitaires : celui de l'Université de Montréal, celui de l'Université McGill et celui de l'Université de Sherbrooke. Tous sont reconnus comme des leaders exceptionnels dans leur communauté et comme des centres de formation et de recherche de haut niveau. Je suis rassuré de ce côté. Nous faisons cependant face à une grave pénurie de technologues en médecine nucléaire qui risque de compromettre à court ou moyen terme l'accessibilité aux soins. Nous travaillons de concert avec le Collège Ahuntsic du Québec (qui assure la formation de nos technologues) afin de trouver des solutions.

Comme président de L'AMSMNQ quel est votre plus grand souhait pour la spécialité de la Médecine Nucléaire?

J'ai de grandes inquiétudes quant à la pérennité du système public de santé dans la période post pandémique, face aux énormes dépenses encourues pour juguler le virus de la COVID-

19 et ses conséquences sanitaires. La tentation sera forte de pour le législateur de limiter voire réduire les dépenses en santé pour équilibrer les finances publiques. Nous avons connu dans le passé des scénarios similaires avec parfois des conséquences regrettables. J'espère que nous aurons appris de nos erreurs. Il nous faut à court et moyen terme régler le problème de la pénurie de technologues si ont veut continuer de prodiguer les soins auxquels les québécois et les canadiens sont en droit de s'attendre. Finalement, je rêve d'un environnement règlementaire simplifié, qui permettrait de faire approuver rapidement et à peu de frais les radiopharmaceutiques innovants qui ont déjà été approuvés par les organismes règlementaires américains ou européens. J'entrevois un futur exceptionnel pour la médecine nucléaire et l'imagerie moléculaire. C'est une des portes d'entrées vers la médecine personnalisée, un terme un peu galvaudé mais qui veut dire au fond : le bon traitement, pour le bon patient, au bon moment!

AMSMNQ

www.medecinenucleaire.com

INTERVIEW WITH DR. DANIEL BADGER

You are the president of the AUSTRALIAN AND NEW ZEALAND SOCIETY OF NUCLEAR MEDICINE (ANZSNM). Could you succinctly describe the role of the ANZSNM in the field of Nuclear Medicine?

The ANZSNM's role is to support all professionals working in the field of Nuclear Medicine in Australia and New Zealand. This involves providing guidelines, training, education, professional development, professional standards, but more than that, we are also a community of mutual support. We also liaise with Government agencies on matters relating to Nuclear Medicine: funding, training and infrastructure. We organise an annual scientific meeting in April/May each year - http://www.anzsnmconference.com/ANZSNM2021/ Join us online this May!

What have been the three most important changes that you have seen in the field of Nuclear Medicine over the last five years?

- The biggest change has been radionuclide therapy agents becoming part of normal /first line care for cancer treatment.
- PET is so useful and beneficial. We now can declare that PET is no longer special, it should be available in every major hospital.
- Theranostics – Seeing exactly what we are targeting with our therapy, and being able to look at treatment response makes a huge difference to patient outcomes.

How do you see the field of Nuclear Medicine evolving during the next five years?

The introduction of new targeted therapeutic agents that work on more cancers will mean a shift from a majority of diagnostic imaging to a majority of therapeutic procedures.

How do you see the training of residents and technologists in our Nuclear Medicine training programs?

They will need to focus a lot more on therapy. As a physicist working a lot in radiation protection, I'm aware that radionuclides used therapeutically carries higher risks for patients and staff, and sometimes we can become complacent due to being used to handling low risk radioactive materials used for diagnostic imaging. Therapy requires a much higher standard of radiation safety and preparation, and this starts with training programs.

Dr. Daniel Badger
MD University of Adelaide, South Australia

As president of the ANZSNM, what is your greatest wish for the speciality of Nuclear Medicine?

My greatest wish is that all the different professions and geographically separated groups can work together in harmony to do much more than any single group could achieve alone.

AUSTRALIAN AND NEW ZEALAND SOCIETY OF NUCLEAR MEDICINE

www.anzsnm.org.au

INTERVIEW WITH DR. MARK TULCHINSKY

Dr. Mark Tulchinsky
Md Nuclear Medicine, PennState Hershey Medical Center
Pensylvania, USA

You are the president of the AMERICAN COLLEGE OF NUCLEAR MEDICINE (ACNM). Could you succinctly describe the role of the ACNM in the field of Nuclear Medicine?

The name of our organization describes its primary role quite well – to represent, further develop, and advocate for the American practice of Nuclear Medicine. Beyond the name, it is our commitment to the wholistic approach to the cutting-edge science and a deeply compassionate humanity that define us.

What have been the three most important changes that you have seen in the field of Nuclear Medicine over the last five years?

The field is propelled by incredible advances in technology and biochemical sciences that are changing the landscape of our field. The leading change is our widening armamentarium of radiopharmaceuticals to fight oncological diseases. As an example, we are currently preparing in the United States to incorporate PSMA-based radiopharmaceutical therapy into our practices. The second major change is based on a relatively recent acceleration of diagnostic radiopharmaceuticals approved for clinical use in the United States. It is very obvious that both fronts in our progress align on the central theme – oncological diagnosis and therapy. We have always had those two key passions within our field, that is therapy and diagnostics. It has been the fact of our practice that our diagnostic work has been much more plentiful as compared to our contributions to therapy. The future may be much more balance whereby therapy involvement grows faster and catches up with our already busy diagnostic work. The recent practice in imaging and computational technology enabled our third major change, ability to fuse the two above-mentioned major changes into this third one – a theranostics-based paradigm for taming and, hopefully, in certain cases defeating some of the advanced oncological diseases!

How do you see the field of Nuclear Medicine evolving during the next five years?

It is only logical to extrapolate from the three major changes what are our expectations for the future. The field must evolve to accommodate our expanding role in therapy. You can expect a greater time spent consulting patients who will be referred for therapy, as well as accommodating new responsibilities of taking care of these patients during their follow-up. Our facilities will have to be better set-up not only for the administration of therapeutic infusions but also for routine follow-up clinical visits. Our skills in interviewing patients and performing physical examination will have to be up-to the task. At the same time, we will have to renew our commitment to serve the patients' clinical needs by being more active in the inter-specialty community of our colleagues, participating in developing multi-specialty guidelines. Our scope of knowledge will have to expand to include understanding of the alternative therapeutic options to what we have to offer vis a vis Theranostic Nuclear Medicine. Indeed, the field is changing and evolving from the classical Nuclear Medicine to Theranostic Nuclear Medicine!

How do you see the training of residents and technologists in our Nuclear Medicine training programs?

As the field undergoes the major changes just outlined, it should be mirrored by the major changes in the training of our younger colleagues. The scope of our knowledge will have to grow, and training curriculum will reflect this expansion. The length of training may also need to be re-evaluated to allow for acquisition of new knowledge and skill sets. The ACNM leadership will be engaged closely with these deliberations along with other organizations.

As the president of ACNM, what is your greatest wish for the specialty of Nuclear Medicine?

My dear colleague and friend, François, the answer to your final question of this interview may be the greatest surprise for you. Undoubtedly, you could have predicted all my prior answers, but unlikely this one! My greatest wish is that all my colleagues wake up tomorrow discovering that they too have this incredible gift of boundless passion, enthusiasm, and activism in support of the Nuclear Medicine specialty that you have admirably exhibited over decades in Québec! It should be an easy to realize wish, and it come true would accelerate and assure the success of Theranostic Nuclear Medicine! ■

ACNM

www.snmmi.org/ACNM

TECHNEGAS™

IMAGERIE PULMONAIRE FONCTIONNELLE

AVANTAGES
V/Q SPECT TECHNEGAS™

Précision de diagnostic prouvée
avec une sensibilité et une spécificité élevées [1]

Minimalement invasif
aide au confort et à la collaboration des patients [2]

Détection sous-segmentaire
de l'embolie pulmonaire (EP) [3]

Faible radiation
26 à 36 fois moins de dose absorbée au sein chez les femmes [4]

Technegas™ a des critères d'exclusion minimaux et peut être administré à la plupart des patients[4-6], y compris:
Insuffisance rénale | Allergie aux agents de contraste | Diabète
Maladie pulmonaire obstructive chronique (MPOC) | Gravement malade
Femme enceinte

V/Q SPECT TECHNEGAS™ ET LES RECOMMANDATIONS EN MÉDECINE NUCLÉAIRE

Les recommandations de l'EANM[7] conseillent fortement la tomographie par émission de photons pour les études pulmonaires de ventilation-perfusion (V/Q SPECT) car elle permet le diagnostic de l'EP avec précision, même en présence de MPOC et de pneumonie.

Les recommandations du CANM[8] considèrent Technegas™ comme l'agent de choix chez les patients souffrant de MPOC puisqu'il y a moins de dépôts dans les voies aériennes centrales, une meilleure pénétration périphérique et il ne s'élimine pas aussi rapidement que les aérosols traditionnels. Seulement quelques respirations sont suffisantes pour atteindre une quantité adéquate d'activité dans les poumons, ce qui réduit le temps de la procédure et l'exposition du personnel.

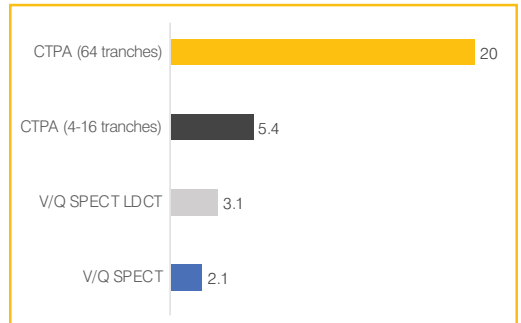


Tableau 1: Exposition à la radiation [8] (mSv)
(adapté des recommandations du CANM, 2018)

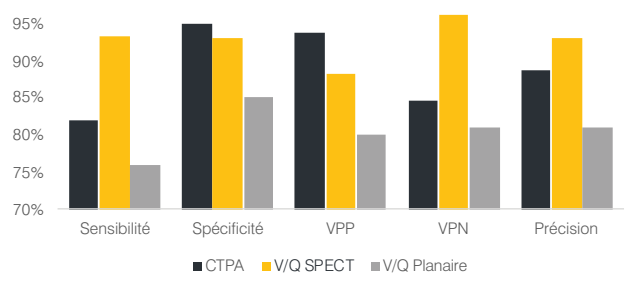


Tableau 2: Performances diagnostiques des différentes modalités à détecter l'EP (adapté de Hess et al, 2016)

Toutes les EP doivent avoir un contrôle final 3 mois après le diagnostic afin d'évaluer la reperfusion finale et pour bénéficier de la disponibilité d'un examen de base en cas de symptômes récurrents. Une faible exposition à la radiation permet des études répétées (tableau 1).

Avec l'adoption de l'imagerie SPECT, les résultats V/Q SPECT sont considérés comme supérieurs à l'imagerie planaire et à la tomodensitométrie (CTPA) lorsque l'on compare la sensibilité, la valeur prédictive négative et la précision de ces examens (tableau 2).[1]

Par conséquent, dans les situations d'EP aiguës, d'EP chroniques, de grossesse, de pédiatrie et de patients MPOC, l'imagerie V/Q SPECT peut être considérée comme une investigation de première ligne en raison de sa sensibilité et de sa spécificité élevées, de sa faible radiation et de l'absence d'effets indésirables.[8]

CLIQUEZ ICI AFIN D'EN APPRENDRE DAVANTAGE SUR LA PROCÉDURE V/Q SPECT AVEC TECHNEGAS™

Références

1. Hess S, et al. Semin Thromb Hemost 2016; 42: 833–845
2. Sánchez-Crespo A, et al. Nucl Med Commun 2008; 29(2): 173-177
3. Grüning T, et al. Clin Imaging 2014; 38(6): 831-835
4. Isidoro J, et al. Phys Med 2017; 41: 93-96
5. Miles S, et al. Chest 2009; 136: 1546-1553
6. Nasr A, et al. EC Pulmon and Respir Medicine 2017; 4(3): 85-91
7. Bajc M, et al. Eur J Nucl Med Mol Imaging 46, 2429–2451
8. Leblanc M , et al. CANM Guidelines 2018; publié Nov 2018

Technegas™ n'est pas encore disponible à la vente aux États-Unis.
Dernière révision (A4): v.2.1 (14/avr/2021)
Pour plus d'informations, veuillez visiter **www.cyclomedica.ca** ou envoyer un courriel à **technegas.sales@cyclomedica.ca**

cyclomedica

INTERVIEW WITH DR. ZVI BAR-SEVER

Dr. Zvi Bar-Sever, MD
President of the Israeli Society of Nuclear Medicine
Department of Nuclear Medicine
Schneider Children's Medical Center
Sackler Faculty of Medicine
Tel-Aviv University

You are the president of the Israeli Society of Nuclear Medicine. Could you succinctly describe the role of the SNMMI in the field of Nuclear Medicine?

The Israeli Society of Nuclear Medicine is part of the Israeli Medical Association. It sets up the national scientific and professional standards in the field of Nuclear Medicine. It is responsible for the residency program in collaboration with the scientific council of the Israeli Medical Association and sets up the residency curriculum and board examinations. The society acts as an advisor to the ministry of health in matters related to nuclear medicine diagnostics and therapy.

What have been the 3 most important changes that you have seen in the field of Nuclear Medicine over the last five years?

The field of nuclear medicine is rapidly changing and evolving. Among the most important changes that occurred over the last 5 years, I would mention the clinical incorporation of PSMA diagnostics and therapy in prostate cancer, Incorporation of "digital" PET scanners and the introduction of Whole body PET scanning.

How do you see the field of Nuclear Medicine evolving during the next five years?

I believe the field of SPECT will take a major leap forward with CZT detectors replacing the conventional NaI detectors allowing fasters scans, improved spatial and energy resolutions and maintaining optimal diagnostic capabilities with significantly lower radiopharmaceutical activities. SPECT/CT will continue to evolve and "whole body SPECT/CT" scans will be common practice. This will allow absolute quantification of tracer concentrations. The gap between PET and conventional nuclear medicine will be reduced. The PET domain will advance mainly due to the shift to digital detectors and the incorporation of whole body PET cameras. The field of theranostics will continue to advance with new indications and tracers increasing the impact of our specialty on patient care.

How do you see the training of residents and technologists in our Nuclear Medicine programs changing?

Training programs for residents and technologists should be updated to supply adequate knowledge in multi-modality imaging for NM physicians and technologists. It is pertinent that future NM professionals are well trained and confident in the execution and interpretation of these studies without the need to rely on support from the radiology departments. Training in advanced NM techniques should not compromise adequate training and knowledge in the less shiny applications of conventional nuclear medicine such skeletal renal pulmonary and GI scintigraphy. These studies remain important and affect the lives of millions.

As president of the SNMMI, what is the greatest wish for the specialty of Nuclear Medicine?

My greatest wish for the specialty of nuclear medicine is that it will maintain its autonomous status as a stand-alone medical specialty, separate from radiology. This will ensure the best development of our specialty in all aspects especially in therapy. I also wish nuclear medicine applications would increase their impact on patient management, especially in non-oncological fields. For example, in the fields of neurology and psychiatry there are numerous radio-pharmaceuticals with great potential for investigating brain physiology and metabolism. Most of them are used in research protocols while clinical practice utilizes only a handful. ■

איגוד ישראלי לרפואה גרעינית
Israeli Society of Nuclear Medicine

www.eanm.org

ISOLOGIC
Innovative Radiopharmaceuticals

Trusted Quality Care

As the leading Canadian Positron Emitting Radiopharmaceutical (PERs) manufacturer and Single Photon Emitting Computed Tomography (SPECT) radiopharmaceutical manufacturer and distributor, ISOLOGIC is committed to ensuring that the Canadian healthcare community continues to obtain a reliable and efficient radiopharmaceutical supply.

+ Ethics and Integrity
+ Collaboration
+ Passion
+ Customer Focus
+ Innovation
+ Excellence

Over 99% of service reliability

24•7 365

Radiopharmaceutical experts working 24-7/365

Absolute best radiopharmaceutical agents available

isologicradiopharm.ca

WE DELIVER BETTER DIAGNOSTIC TOOLS FOR THE HIGHEST QUALITY CARE

DORVAL (Head Office)
11215 Ch de la Côte-de-Liesse
Dorval QC H9P 1B1
514 636.4711

MONTREAL
1855 32e Avenue
Lachine QC H8T 3J1
514 636.5552

QUEBEC CITY
2655 Dalton Street
Quebec QC G1P 3S8
418 650.1855

TORONTO
Sunnybrook Hospital
2075 Bayview Avenue
Toronto ON M4N 3M5
416 480.6100

OTTAWA
1053 Carling Avenue
Suite F156
Ottawa ON K1Y 4E9
613 761.5370

BURLINGTON
5450 Harvester Road
Burlington ON L7L 5N5
905 333.1789

VANCOUVER
899 West 12th Avenue
Vancouver BC V5Z 1M9
604 875.5085

ENTREVUE AVEC LE DR. CHRISTOPHER O'BRIEN

Christopher O'Brien MDCM; FRCPC
President, OANM
MD Nuclear Medicine Brantford General Hospital
Ontario, Canada

The Ontario Association of Nuclear Medicine (OANM) is a voluntary organization created 20 years ago to represent the viewpoint and interests of the Nuclear Medicine Specialists of Ontario. The OANM is independent of the Ontario Medical Association (OMA) Section on Nuclear Medicine but works in conjunction with the Section as needed.

This independence allows the Nuclear Medicine specialists to have a voice separate from the OMA which has a perspective which is more global encompassing all physicians, rather than a more specialty focused agenda. A small specialty such as Nuclear Medicine can be lost within this larger group. In addition, the OANM viewpoint does not have to be authorized by the OMA. Representatives of the OANM are Board members of the Ontario Specialist Association as well as the Canadian Association of Nuclear Medicine.

Challenges facing the Nuclear Medicine Speciality in Ontario:

LACK OF ROYAL COLLEGE CERTIFICATION REQUIREMENT:

Ontario is the only Province in Canada that does require Royal College Training and Certification in Nuclear Medicine in order to practice the speciality. There are approximately 150 physicians practicing Nuclear Medicine in Ontario but only around 80 are Royal College trained and certified Nuclear Medicine Specialists.

This does raise questions of quality and competence with regards to the supervision and reporting of Nuclear Medicine Diagnostic and Therapeutic procedures in Ontario. In addition, this creates a problem for Nuclear Medicine specialists to find employment in Ontario.

BARRIERS TO THE FUNDING OF APPROVED MEDICAL ISOTOPES FOR SPECT IMAGING:

Though Health Canada has approved medical isotopes such as Octreotide and DAT the province of Ontario has not funded these procedures. In addition, the Province of Ontario has not made funding adjustments for medical isotopes since 1989 in any significant way. Thus, many procedures approved by the government are done at a loss. As an example, a white blood cell scan is done at a loss of over 1000.00$ Canadian for each study. This limits access for this study for the patients of Ontario where many centers cannot even offer the procedure due to the negative financial impact.

BARRIERS TO ACCESS FOR SPECT/CT IMAGING:

There are approximately 100 Nuclear Medicine departments in Ontario with around 60 departments Hospital based and 40 departments associated with free standing clinics called Independent Healthcare Facilities (IHF). All departments are publicly funded with no private patient pay centers.

The government does not generally allow CT technology in the IHFs, nor does it fund the CT component of SPECT/CT either in Hospitals of IHF departments. Thus, over 99% of all SPECT/CT installations are Hospital based and essentially no SPECT/CT units in IHFs even though approximately 40% of all Nuclear Medicine procedures are done in IHFs.

Thus, patients undergoing Nuclear Medicine procedures in IHFs may not be obtaining the highest standards of Nuclear Medicine practice. In addition, due to lack of CT funding for Hospital bases SPECT/CT not all Hospital based departments may be able to offer state of the art Nuclear Medicine procedures either.

This situation results in a non -uniform standard of practice for Nuclear Medicine across the province.

BARRIERS TO PET/CT ACCESS AND PET ISOTOPES:

Ontario has a population of approximately 12 million people. To service this population Ontario has 20 PET/CT units but due to government restrictions performs 1.6 exams per 1000 population with a total of 23,564 studies done 2018/2019. In the same year, the Province of Quebec, which has a population of around 8 million and 20 PET/CT units performed 67,849 studies or roughly eight exams per 1000 population.

In Ontario only FDG and Rubidium are funded for diagnosis and only Lutetium- DOTATATE and Radium 223 for therapy. In addition, only specific indications are allowed. Once again, even though Health Canada has approved other medical isotopes for PET the government has not funded these.

Though patient access to PET is improving Ontario remains far behind in the standard of practice found throughout the world.

OANM POSITION:

1: Royal College certification as a Nuclear Medicine specialist becomes the minimum requirement to supervise and perform/interpret Nuclear Medicine diagnostic and therapeutic procedures. This would ensure that patients have access to a uniform educational standard across the Province.

2: The government allow SPECT/CT to be positioned in IHFs and that funding becomes available for SPECT/CT procedures in both Hospitals and IHFs. This would ensure that all Ontario patients have access to what has become a standard of care. In addition, there should be at least 1 SPECT/CT unit in each department.

3: There needs to be a streamlined process whereby Health Canada approved isotopes and equipment be incorporated and funded into the practice of Nuclear Medicine in Ontario.

I doubt that the situation in Ontario is a unique situation. I hope that the Nuclear Medicine community around the world can come to a consensus regarding standardization of Nuclear Medicine with regards to education standards, equipment, and medical isotope availability and use.

The OANM is very willing to work with organizations around the world to make this hope a reality. ■

OANM

INTERVIEW DR. JULIANO JULIO CERCI

YOU ARE THE PRESIDENT OF THE *LA ASSOCIATION LATINOAMERICANA DE SOCIEDADES DE BIOLOGIA Y MEDICINA NUCLEAR* (ALASBIMN). Could you succinctly describe the role of the ALASBIMN in the field of Nuclear Medicine?

Our role and mission is to improve human health by advancing nuclear medicine in Latin America. With more than 2,500 nuclear medicine physicians, ALSBIMN represents the interests of nuclear and molecular imaging professionals, all of whom are committed to the advancement of the field.

What has been the three most important changes that you have seen in the field of Nuclear Medicine over the last years?

The grow in theranostics is for sure the most important aspect of NM in the recent years.

The grown in PET/CT equipment in LA, with a near 15% growth/year.

The grown in SPECT/CT equipment in LA.

In all these 3 aspects, there are still many challenges in terms of access, regulation and reimbursement that the region is fighting to overcome.

How do you see the field of Nuclear Medicine evolving during the next five years?

To grow in a sustainable path, not only in numbers of equipment, number of services, nut mainly getting more and more accessible in the daily practice. I can see that nuclear medicine technology will become more available and more present as an integral part of the standard of care for patients.

Juliano Julio Cerci

How do you see the training of residents and technologists in our Nuclear Medicine training programs?

Formal education and continuing education is a big challenge. We still face many asymmetries in the education aspects with many opportunities to increase the quality of our team.

As president of the ALASBIMN, what is your greatest wish for the specialty of nuclear medicine?

Not only mine, but our ALSBIMN board vision is to promote the value of nuclear medicine in the region, and to ensure that nuclear medicine technology becomes an integral part of the standard of care for patient diagnosis, treatment and therapy. ■

alasbimn
ASOCIACIÓN LATINOAMERICANA DE SOCIEDADES DE BIOLOGÍA Y MEDICINA NUCLEAR

www.alasbimn.net

ENTREVUE AVEC LE DR. FLORENT CACHIN

Dr. Florent Cachin
Md Médecine Nucléaire
Centre Lutte Contre le Cancer J.Perrin
Clermont-Ferrand, France

Vous êtes le président de LA SOCIÉTÉ FRANCAISE DE MÉDECINE NUCLÉAIRE (SFMN). Pourriez-vous décrire brièvement le rôle de la SFMN en Médecine nucléaire?

Forte de plus de 718 adhérents dont 643 médecins nucléaires ou internes, la SFMN est une association à but non lucratif dont la mission principale est la promotion de la Médecine nucléaire. Elle est un des interlocuteurs majeurs du ministère de la Santé pour toute évolution réglementaire de notre spécialité. Elle est aussi très souvent en lien avec l'Autorité de Sécurité nucléaire au travers d'actions communes formalisées par un accord cadre. En tant que société savante, la SFMN traite des aspects scientifiques de la spécialité, en s'appuyant sur un grand nombre de groupes de travail organisés autour de pathologies d'organes (cardiologie, neurologie, oncologie, endocrinologie, ostéo-articulaire…) ou de thématiques particulières (biologie, médicaments radiopharmaceutiques (MRP), intelligence artificielle, francophonie). Ces groupes de travail sont sollicités par les tutelles pour leur expertise. Leur production scientifique est de très haut niveau avec, en particulier, la publication de recommandations très appréciées par les médecins nucléaires. La SFMN organise la formation continue des médecins nucléaires, les journées francophones de médecine nucléaire (congrès annuel) et plusieurs séminaires durant l'année. Enfin, la SFMN a publié des recommandations de prises en charge de patients atteints de COVID-19, action qui fut très appréciée par les médecins nucléaires.

D'après vous, quels ont été les trois plus importants changements que vous avez constatés dans le monde de la Médecine nucléaire au cours des cinq dernières années?

C'est avec fierté que nous pouvons regarder ces cinq dernières années ! La Médecine nucléaire s'est installée comme un acteur majeur de l'imagerie, en particulier en oncologie. Le médecin nucléaire a investi les réunions de concertation multidisciplinaire, nos examens étant devenus un des éléments majeurs de la prise en charge des patients. L'arrivée récente de nouveaux traceurs fut encore une preuve du dynamisme de la Médecine nucléaire. Ceci s'est traduit sur le terrain par une progression très importante (>10 % par an) du nombre d'examen FDG-TEP réalisés par an. Le succès de la 18-FDG TEP-TDM a ainsi bénéficié à l'ensemble de la médecine nucléaire, notre spécialité étant regardée différemment par les autres confrères.

Comment voyez-vous l'évolution de la Médecine nucléaire au cours des cinq prochaines années?

J'anticipe une profonde mutation de notre spécialité ! Elle tient en deux idées : « Radiothérapie Interne Vectorisée » et « intelligence artificielle ». L'arrivée du Lu1777-PSMA pour le traitement du cancer de la prostate va considérablement modifier notre métier. Le nombre de patients à traiter, potentiellement très élevé, va imposer une restructuration des services de Médecine nucléaire, à la fois sur les aspects d'aménagement des locaux, de parcours de soins et de ressources humaines. C'est ici un défi majeur que nous devons relever, et assumer cette mutation devrait aussi s'accompagner de l'arrivée de laboratoires pharmaceutiques de type « big pharma » ayant des possibilités et souhaits d'investissement jusqu'ici non connus dans notre spécialité.

L'intelligence artificielle est une avancée technologique dont les applications sont très larges, particulièrement en santé. Les logiciels d'aide au diagnostic en Médecine nucléaire commencent à être proposés en France. Ils seront forcément d'une aide précieuse en facilitant les interprétations et en augmentant la productivité du médecin nucléaire. Ils provoqueront forcements des interrogations sur les politiques de recrutements des structures de soins. Il faut noter que le médecin nucléaire, de par sa formation initiale très transversale, en physique, mathématique et traitement d'image, est probablement l'un des spécialistes les plus aptes à saisir l'importance de cette révolution et à se l'approprier en clinique et recherche.

Comment voyez-vous la formation des résidents et des technologues en Médecine nucléaire au cours des cinq prochaines années?

La formation des internes est actuellement d'une durée de quatre ans. Une demande d'augmenter la formation à cinq ans avait été proposée lors de la précédente réforme des maquettes de formation (2019) mais a été refusée. Cette augmentation paraît fortement souhaitable pour renforcer la formation en oncologie, radiothérapie interne et intelligence artificielle et répondre ainsi aux nouveaux défis.

La formation des manipulateurs en électroradiologie permet en France l'accès aux métiers de manipulateurs dans les services de médecine nucléaire, radiothérapie, radiologie et électrographie. Elle a intégré récemment les formations universitaires, le diplôme donnant ainsi le grade de licence. Les meilleurs étudiants peuvent continuer leur formation en Master. La possibilité de créer des formations complémentaires en dosimétrie nucléaire est en cours de réflexion.

Comme président de la SFMN, quel est votre plus grand souhait pour la spécialité de la Médecine nucléaire?

La Médecine nucléaire est une spécialité très dynamique en perpétuelle mutation et en très forte croissance. Elle aiguise certains appétits, d'autres spécialités souhaiteraient s'approprier notre offre de soins et nos technologies. Je souhaite ainsi une médecine nucléaire indépendante, solidaire et apte à relever les défis de demain !

Société Française de Médecine Nucléaire et imagerie moléculaire
SFMN

www.sfmn.org

ISOLOGIC
Radiopharmaceutiques Novateurs

Soins de qualité fiable

En tant que chef de file canadien de la production et distribution de produits SPECT et PREP, ISOLOGIC est engagé a ce que le milieu des soins de la santé canadien dispose en tout temps d'un approvisionnement fiable et efficace des produits radiopharmaceutiques.

+ Éthique et intégrité
+ Collaboration
+ Passion
+ Approche client
+ Innovation
+ Excellence

Plus de 99% de taux de fiabilité du service

24·7 365

Experts en radiopharmaceutiques accessibles 24-7/365

Les meilleurs agents en radiopharmaceutiques dans le domaine

isologicradiopharm.ca

NOUS PROCURONS LES MEILLEURS OUTILS DIAGNOSTIQUES POUR L'ATTEINTE DES PLUS HAUTES NORMES DE QUALITÉ

DORVAL (siège social)
11215, Ch. de la Côte-de-Liesse
Dorval QC H9P 1B1
514 636.4711

MONTRÉAL
1855, 32e Avenue
Lachine QC H8T 3J1
514 636.5552

VILLE DE QUÉBEC
2655, rue Dalton
Québec QC G1P 3S8
418 650.1855

TORONTO
Hôpital Sunnybrook
2075, Bayview Avenue
Toronto ON M4N 3M5
416 480.6100

OTTAWA
1053, Carling Avenue
Bureau F156
Ottawa ON K1Y 4E9
613 761.5370

BURLINGTON
5450, Harvester Road
Burlington ON L7L 5N5
905 333.1789

VANCOUVER
899, West 12th Avenue
Vancouver C.-B. V5Z 1M9
604 875.5085

PRODUCT INDICATIONS AND CLINICAL USES: Myoview™ (Kit for the Preparation of Technetium Tc-99m Tetrofosmin Injection) is indicated for scintigraphic imaging of the myocardium following separate administrations under stress (exercise and/or pharmacologic) and resting conditions in patients with known or suspected coronary artery disease. It is useful in the delineation of regions of reversible myocardial ischemia in the presence or absence of infarcted myocardium. Dipyridamole-induced pharmacologic stress may be used as an alternative to exercise in patients who cannot exercise adequately.

Important Safety Information About Myoview

CONTRAINDICATIONS: None known. **WARNINGS**: In studying patients with known or suspected coronary artery disease, care should be taken to ensure continuous cardiac monitoring and the availability of emergency cardiac treatment. Myoview is not recommended for use in patients with known hypersensitivity to tetrofosmin. Severe hypersensitivity reactions and anaphylactoid reactions have been reported for Myoview. The contents of the vial of Myoview are intended for use only in the preparation of technetium Tc-99m tetrofosmin injection and are NOT to be administered directly to the patient. Pharmacologic induction of cardiovascular stress may be associated with serious adverse events such as myocardial infarction, arrhythmia, hypotension, bronchoconstriction, and cerebrovascular events. Caution should be used when dipyridamole-induced pharmacologic stress is selected as an alternative to exercise; it should be used when indicated and in accordance with the Product Monograph and instructions for dipyridamole (Persantine®). **PRECAUTIONS – General:** Allergic reactions and anaphylaxis may occur with Myoview. Technetium Tc-99m tetrofosmin injection, like other radioactive drugs must be handled with care, and appropriate safety measures should be used to minimize radiation exposure to clinical personnel. The contents of the kit are not radioactive. However, after sodium pertechnetate Tc-99m is added, adequate shielding of the final preparation must be maintained to minimize radiation exposure to occupational workers and patients. Care should also be taken to minimize radiation exposure to patients, consistent with proper patient management. To minimize radiation dose to the bladder, patients should be encouraged to void when the examination is completed and as often thereafter as possible. Adequate hydration should be encouraged to permit frequent voiding. The Tc-99m labeling reactions involved depend on maintaining the tin (stannous ion) in the reduced state. Therefore, sodium pertechnetate Tc-99m-containing oxidants should not be employed. Radiopharmaceuticals should be used only by those practitioners who are appropriately qualified in the use of radioactive, prescribed substances in or on humans. The components of the reagent vial are sterile and nonpyrogenic. It is essential that the user follows the directions carefully and adheres to strict aseptic technique. **Drug Interactions:** Drug interactions were not noted and were not studied in clinical studies in which Myoview was administered to patients receiving concomitant medication. Drugs such as beta-blockers, calcium channel blockers, and nitrates may influence myocardial function and blood flow. The effects of such drugs on imaging results are not known. **Carcinogenesis, Mutagenesis, Impairment of Fertility:** Studies have not been conducted to evaluate carcinogenic potential or effects on fertility. Tetrofosmin sulphosalicylate was not mutagenic *in vitro* in the Ames test, mouse lymphoma, or human lymphocyte tests, nor was it clastogenic *in vivo* in the mouse micronucleus test. **Use in Pregnancy:** Since adequate reproduction studies have not been performed in animals to determine whether this drug affects fertility in males or females, has teratogenic potential, or has adverse effects on the fetus, this radiopharmaceutical preparation should not be administered to pregnant women unless it is considered that the benefits to be gained outweigh the potential hazards. **Nursing Mothers:** Technetium Tc-99m pertechnetate can be excreted in human milk. Where an assessment of the risk-to-benefit ratio suggests the use of this product in lactating mothers, formula feeding should be substituted for breastfeeding. **Pediatric Use:** Adequate studies do not exist to support the use of this radiopharmaceutical in children. **ADVERSE REACTIONS:** The following events were noted in less than 1% of study patients: Angina, hypertension, torsades de pointes, flushing, vomiting, abdominal pain/discomfort, cutaneous allergy, hypotension, dyspnea, metallic taste, burning of mouth, smelling something, abnormal vision. There was a low incidence (less than 4%) of a transient and clinically insignificant rise in white blood cell counts following administration of the agent. **Postmarketing:** Adverse reactions included hypersensitivity, anaphylactic or anaphylactoid shock, anaphylactic or anaphylactoid reaction, taste alteration, dizziness, tachycardia, chest pain, hypotension, dyspnea, bronchospasm, throat tightness, coughing, nausea, vomiting, abdominal pain, urticaria, pruritus, rash, erythema, and angioedema.

Prior to Myoview administration, please read the full Product Monograph, which is available by calling 1 800 654 0118 (option 2, then option 3).

To report SUSPECTED ADVERSE REACTIONS, contact GE Healthcare at 1 800 654 0118 (option 2, then option 1), or email canadainfo@ge.com to request an adverse events form, or fax a request for a form to 905 847 5849. Adverse reactions can also be reported to Health Canada as follows:

- Online at www.healthcanada.gc.ca/medeffect
- By calling 1 866 234 2345 (toll-free)
- By completing a Canada Vigilance Reporting Form and sending it by:
  - Fax to 1 866 678 6789 (toll-free)
  - Mail to Canada Vigilance Program, Health Canada, Postal Locator 0701E Ottawa, ON K1A 0K9
- Postage-paid labels and the Canada Vigilance Reporting Form are available at www.healthcanada.gc.ca/medeffect

MYOVIEW™

(Kit for the Preparation of
Technetium Tc99m Tetrofosmin Injection)

October 2020 JB00042CA

GE Healthcare

When speed matters

Early cardiac imaging

- With Myoview you can begin to acquire diagnostic information as soon as 15 minutes after injection*[1]

*Per the Product Monograph for Myoview, SPECT imaging may begin 15 minutes following administraton of the agent.

Efficient kit preparation time[1]

- Myoview does not need to be boiled and cooled, which can save time before patient administration

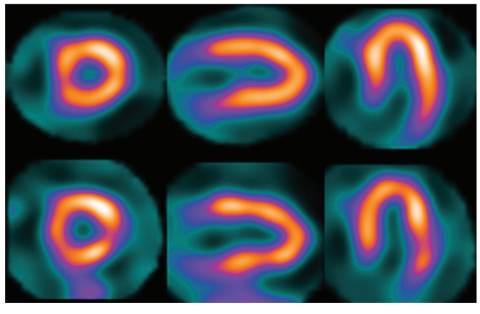
Longer post-reconstituted shelf life

- Myoview's post-reconstituted shelf life is 12 hours[1]

Myoview's biodistribution may help to provide shorter study and wait times, and may result in fewer repeat scans[2]

In a prospective study by Ravizzini:

- Myoview demonstrated significantly shorter completion time for both rest studies and total study time[2]
- Patients receiving Myoview required fewer repeat scans due to extra cardiac activity[2]



MYOVIEW™
(Kit for the Preparation of Technetium Tc99m Tetrofosmin Injection)

References: 1. Myoview [product monograph], February 12, 2018 (revised August 21, 2019), Control No. 211075.
2. Ravizzini GC, Hanson MW, Shaw LK, et al. Efficiency comparison between 99m Tc-tetrofosmin and 99m Tc-sestamibi myocardial perfusion studies. *Nucl Med Comm.* 2002;23:203-208.

MPI, myocardial perfusion imaging; **SPECT,** single-photon emission computed tomography.

HERMES
MEDICAL
SOLUTIONS

Next Generation Nuclear Medicine

NEXT GENERATION SOFTWARE FOR TODAY'S CLINICAL CHALLENGES

www.hermesmedical.com - info@hermesmedical.com