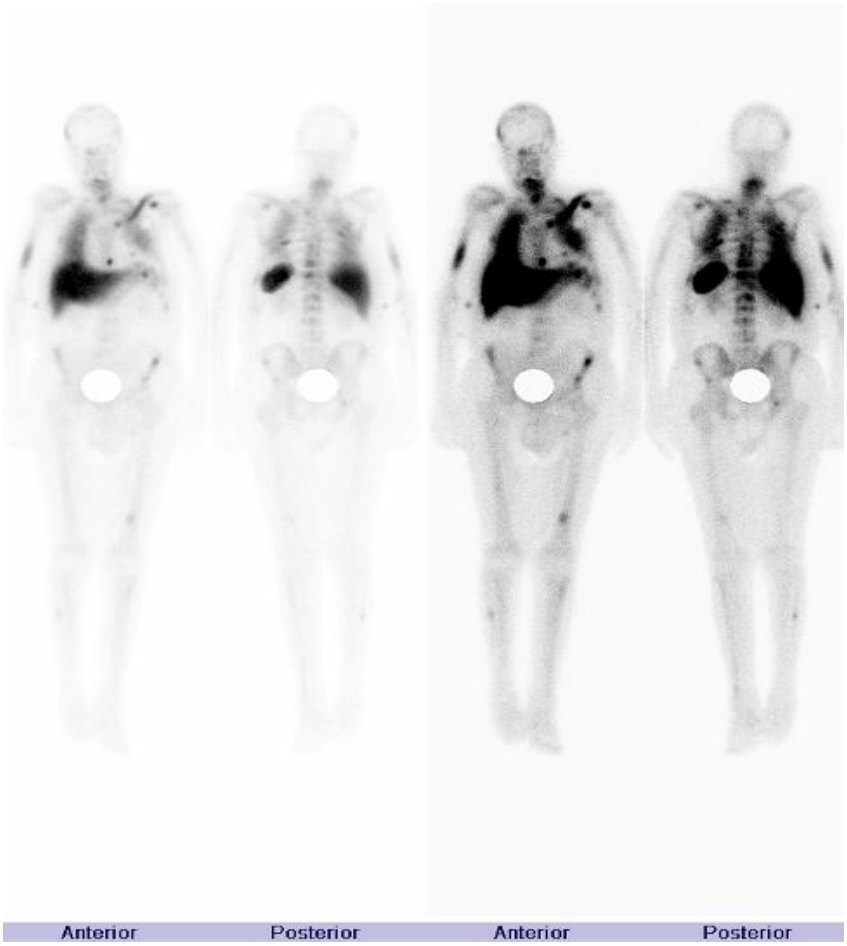
seasonal rains

RURAL ALLIANCE IN NUCLEAR SCINTIGRAPHY

AUTUMN/WINTER EDITION 2011



The official half-yearly newsletter of the Rural Alliance In Nuclear Scintigraphy

www.rains.asn.au

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Introduction

The Australian health care system has been described or defined by the 'inverse care law'; those Australians in the most need of health services receive the least. This might equally reflect life for rural Nuclear Medicine professionals; those with the greatest need for support and representation actually have the least. It is true that the rural Nuclear Medicine professional develops unique skills and capabilities not generally manifest in metropolitan counterparts; an evolutionary adaptation ('survival of the fittest'). Despite these attributes, rural Nuclear Medicine professionals are confronted with professional isolation that fosters a number of inequities:

- Professional representation at state and federal level.
- Accreditation and continuing professional development (CPD).
- Diffusion of innovation, technology and techniques.
- Support for training, leave (illness or recreation) and workload.
- Career development pathways.

RAINS aims to quench the thirst of rural Australia left parched by professional under representation.

RAINS Committee

Matt Ayers – President
Pete Tually – Vice-President
Chris Skilton – Secretary
Sarah Davey – Treasurer
Nathan Cassidy
Tuesday Cole
Russell Pearce

From the Editor

It is with great pleasure that on behalf of the executive and editorial committees of the Rural Alliance in Nuclear Scintigraphy, I bring to you the Autumn 2011 edition of Seasonal RAINS online journal.

It is the intent of RAINS for all nuclear medicine practitioners to come together and make a contribution to the ongoing development of our profession. Seasonal RAINS is just one avenue for us to exchange, to share our experiences and enhance our knowledge in a rapidly changing medical environment with our peers.

I urge you, the reader, to contemplate making a contribution to this journal at some stage during your professional career, so that your peers can appreciate the diversity in our ways of performing procedures, engaging in research, and reviewing medical literature as just a few examples.

Being the first time as editor of Seasonal RAINS, I would greatly appreciate any feedback so that I too can learn from this experience.

A new section I would like to introduce as a pilot is "Letters to the Editor". This section will allow you to ask how others perform a procedure, or let us know your opinion on a particular subject. Send it to seasonal@rains.asn.au .
We'll see how it goes.

Sit back and enjoy Seasonal RAINS.

Cheers,

Nathan Cassidy

Don't forget about the conference in November!
http://www.rains.asn.au/Rains2011/2011%20program%20MRS%20v5.pdf

Start Collecting Your CPD Points With RAINS Now!

Purpose of RAINS

The purpose of RAINS is to offer a support network for rural and remote Nuclear Medicine professionals. The support network aims to engage with and develop strategies to overcome the unique professional difficulties encountered in rural and remote Australia.

RAINS does not stand as an alternative to ANZSNM state branch membership, but as an adjunct to it.

RAINS offers a seamless representation of rural and remote Nuclear Medicine professionals. That is, RAINS is a single unified group of individuals with common needs and philosophy. There are neither state borders nor division between the private and public sectors nor delineation based on corporate ownership. RAINS does respect and honour commercial in-confidence and intellectual property rights.

Vision

Equitable provision of representation and professional opportunities for rural and remote Nuclear Medicine professionals. Strategic networking and support to foster professional development, continuing education and collaborative solutions to issues of isolation. Recognition and exploitation of distinctive competencies of rural practitioners.

Building A Future For Rural Nuclear Medicine

RAINS Core Values

- Innovate, adapt, overcome.
- Be committed, meet our commitments.
- Perform beyond industry norms.
- Invest in our work, invest in ourselves.
- Improve, continually. Embrace innovation, embrace challenge.
- Support CPD.
- Demand equity for rural Australia.
- Offer support, ask for support.
- Exploit strengths, overcome weaknesses.

RAINS Mission

- Provide a voice and representation
- Overcome barriers to CPD
- Promote equity of service provision
- Undertake research on rural issues
- Respect issues of commercial in-confidence BUT remove borders on core rural activities
- Highlight and exploit the distinctive competencies of the rural Nuclear Medicine professionals
- Provide a network for support and collaboration
- Integrate student clinical placements
- Lobby professional bodies on rural issues
- Promote Nuclear Medicine services in the rural health sector
- Inform and lobby, where appropriate, legislative and regulatory processes impacting on rural Nuclear Medicine

Membership

Membership to RAINS is open to those Nuclear Medicine professionals sharing the needs and philosophies characteristic of rural Australia; underpinned by "professional, social and cultural isolation". To that end, membership is open to those Nuclear Medicine professionals employed in a Nuclear Medicine practice that satisfies any one of the following criteria:

1. Practice located in a centre that the Federal Government Rural, Regional and Metropolitan Area (RRMA) classification deems either rural or remote.
2. Practice located in a centre that is more than 200 km from the state capital.
3. Practice located in a centre that is more than 100 km from nearest other nuclear medicine practice.

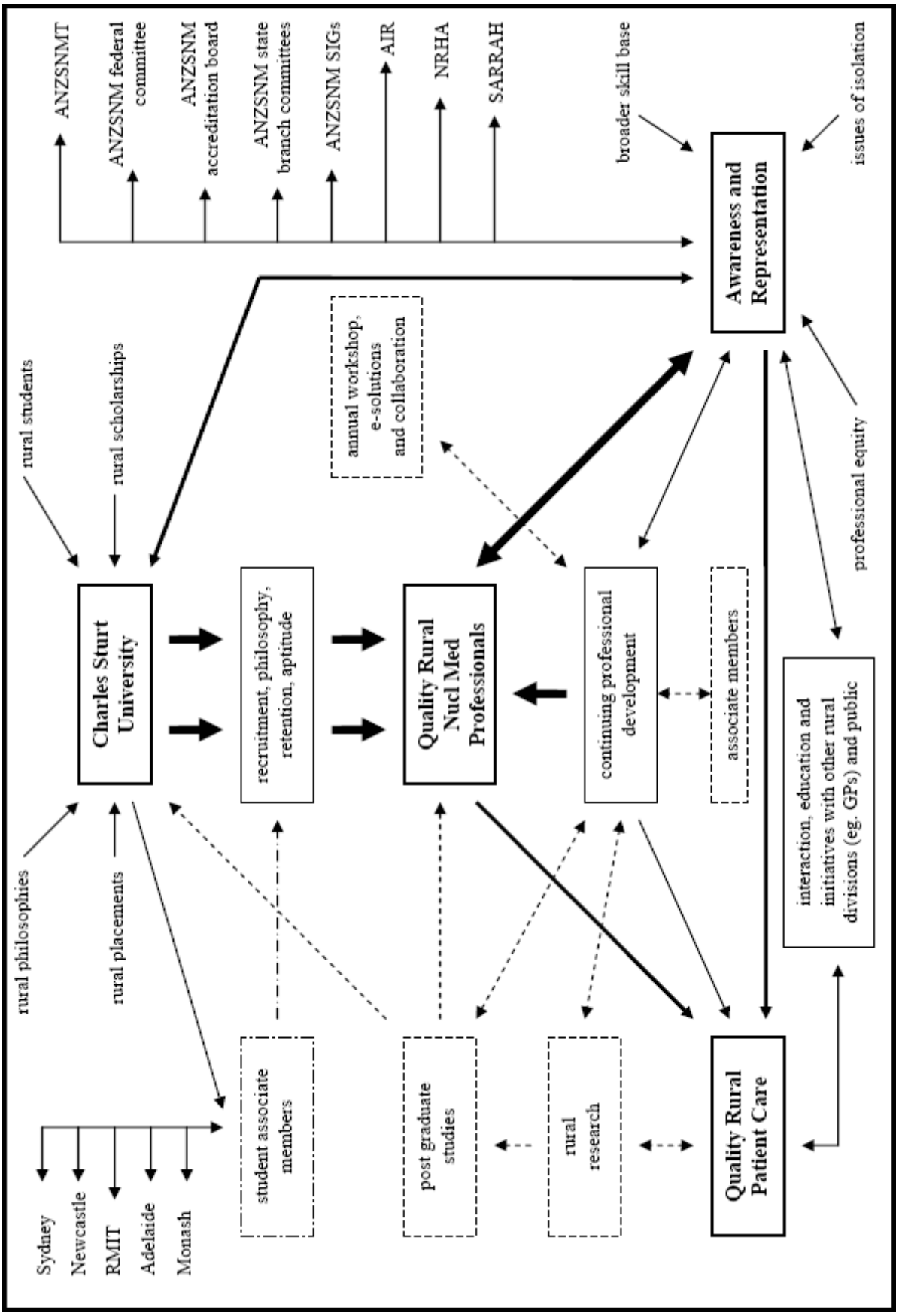
Associate membership to RAINS is open to:

1. Students not actively employed in Nuclear Medicine who are undertaking undergraduate or post graduate studies in Nuclear Medicine at any Australian university and who come from a RRMA classified rural or remote centre.
2. Nuclear Medicine professionals employed in a Nuclear Medicine centre that does not meet the criteria for ordinary membership but who believe issues of professional isolation have a deleterious impact on professional development. Examples of such isolation include, but are not limited to; academics, researchers, company representatives and regional isolation with a small Nuclear Medicine network (e.g. Newcastle, Central Coast, Gold Coast).

Membership entitlements include, but are not limited to:

- Newsletter (electronic)
- Networking (eg. research, problem solving, reduce professional isolation)
- CPD activities (e-journal club, e-grand rounds, conferences)
- Representation
- Support
- Full voting rights (ordinary members only)

Flow Chart of RAINS Activity



President's Report

Welcome to another year of RAINS, our 5th year running. Apologies from all of the RAINS management committee and the newsletter editorial board for the delay since our last edition. Our thoughts and well wishes go out to all of our colleagues in their rural communities who have been affected by this spate of natural disasters. There were times over this summer when I thought "RAINS" may not have been the most appropriate acronym.

There are a few important announcements for members:

- CPD continues to be a key focus for RAINS, however it remains quite difficult to produce an informative newsletter without contributions from the members. Thus we have decided to award an annual "RAINS Newsletter prize" for the best CPD article submitted to the newsletter. More details are included under "call for submissions".
- 2011 CPD conference is not to be missed. It will be held in Sydney again this year, at the Stamford at North Ryde. We had such a positive response and feedback from the 2010 conference. A lot of our rural and regional members found the central metropolitan location a convenient "half-way" point, and also gave them the opportunity to mix with their "city cousins". The conference is to be held on the 12th and 13th of November, more details are included in this newsletter.
- We are pleased to announce the 2011 RAINS conference as the official patron of the Rural Radpharm award. A big thank you to the ANZSNM for their co-operation in arranging this. We will include the official rules of entry from the society.
- Keep an eye on the RAINS website (rains.asn.au). We have included a section on "how to write CPD articles". This is a straight forward way to earn extra points for yourself and to help other members gain as well.

I would like to welcome all of our new members to RAINS, and again encourage everyone to participate in article reviews, interesting images and cases. The ongoing success of our Seasonal RAINS will require contributions from the broader membership. See you in Sydney!

Matt Ayers

CAPITAL SENSITIVITY - UPDATE

The RAINS committee has been engaged with Department of Health Ageing (DOHA) and the Australian Diagnostic Imaging Association in an effort to highlight the potential impact the new capital sensitivity measures may have on rural nuclear medicine departments.

As many of you may be aware DOHA determined that as of 1 July 2011, Medicare benefits for nuclear medicine services provided on scanning equipment older than 10 years will be reduced by 50%. Providers were advised they may be able extend the life of their equipment by 5 years if they undertake upgrades supplied and certified by vendors of nuclear medicine equipment. At a meeting held in Sydney in October last year, the First Assistant Secretary of the Medicare benefits division, Richard Bartlett, told members of the diagnostic imaging industry that the purpose of the new measure was about improving the quality of diagnostic imaging services and also about ensuring the Government does not continue to rebate services where the capital costs of the imaging equipment had been fully depreciated.

The RAINS committee formally wrote to the Federal Minister for Health and Ageing, The Hon Nicola Roxon, in early February expressing our concern that many sites will not be economically viable if forced to replace existing equipment where they currently provide important medical services. Many rural nuclear medicine centres are significantly more expensive to operate compared to departments operating in the metropolitan environment as they are exposed to much higher costs associated with radioisotope delivery, travel for specialists and increased maintenance fees.

We stressed that there was confusion at all levels of the industry regarding what actually constituted an "upgrade". We advised that nuclear medicine is a mature technology and whilst computer hardware and processing software has advanced over the years, the detector technology of the actual scanner has not significantly altered. Whilst we all would like to see the latest machines operating in regional sites it is often not commercially possible and we argued that the important issue is to ensure that the quality of the equipment is optimal and that the performance of the scanner meets the manufacturer's specifications.

Later that month I met with the Director of the Diagnostic Imaging section, and her team, in Canberra to further discuss the issues surrounding nuclear medicine. This meeting was followed up with a detailed letter from RAINS regarding our modality's existing stringent performance standards and submitted that rather than an arbitrary 'Date of Manufacture' (DOM) limit we recommended that a 'Date of Technology' criteria was more appropriate. We sent them a copy of the well establishes guidelines regarding quality for nuclear imaging that presently exist within our society (published by ANZSNM).

On 11 May, DOHA sent out a letter to all practices advising that the capital sensitivity measure will be;

"implemented in two phases. This will allow for initial arrangements from 1 July 2011 to 30 June 2012, which will allow for further analysis and consultation to underpin the final arrangements that will apply from 1 July 2012".

"These implementation arrangements will help to ensure that there is careful consideration of the issues associated with the age of equipment and what constitutes an upgrade across the different modalities. This is the best way to meet the goals of the measure and guard against unintended consequences, such as practices replacing good equipment or reduced patient access to quality diagnostic imaging services."

Exemptions from the rule do apply and this information can be obtained at http://www.health.gov.au/capitalsensitivity in the FAQ section. Sites that are located in the Australian Standard Geographical

Classification (ASGC) Remoteness Area 3, 4 or 5 do not need to apply for an exemption. Those in ASGC 2 whose equipment is "aged" need to apply to DOHA before 29 July for consideration of an exemption from the measure during the initial period. These practices must have;

- *Equipment that is operated on a sporadic or rare basis (i.e. low service volumes), and which provides crucial patient access to diagnostic imaging services; AND*
- *Equipment that exceeds the maximum extended life age by less than three years and which has documentation (i.e. service records) confirming that it has been well maintained over its working life.*

Sites can locate their "remoteness" at http://www.doctorconnect.gov.au/internet/otd/Publishing.nsf/Content/Locator

DOHA advises that it will work with stakeholders to develop standards to determine what constitutes an upgrade in order to be granted a 5 year extension. This will be made available in early 2012 and RAINS will continue to offer our assistance in this matter.

Given that there are myriad of upgrade possibilities to consider, we are concerned that this process may become a huge burden not only to the nuclear medicine profession but also to DOHA. For example, many practices maintain systems that are DOM mid 1990's and acquire great image quality from the gamma head but are interfaced to modern acquisition systems and 'share' the processing computer with another gamma camera. Moreover, some practices use pinhole collimation on the older heads which may not be available on new equipment. What happens to the rebates for thyroid studies acquired on these machines? Other examples relate to situations where part of a bone scan (the vascular phase) is imaged on the old system and the delayed phase part is acquired on a new system. How are these billed? What happens with telemedicine where a single, centralised current processing unit is used to analyse data from two or more older units? There are many examples where problems may arise and the committee urges members to contact the president, Matt Ayers, with any concerns that relate to your specific circumstances.

RAINS endorses quality in nuclear medical imaging and supports all reasonable steps to ensure high standards are maintained however we would ask DOHA to be mindful of the special considerations which relate to rural centres.
Regards,

Pete Tually
Vice President

RADPHARM Case Presentation Award Rules

(Reviewed March 1999; Revised June 2008; Approved 10th July 2008)

1. The **RADPHARM Technologist Case Presentation Award,** hereafter termed the ***Award***, will be held in conjunction with the Annual Scientific Meeting (ASM) of the Australian and New Zealand Society of Nuclear Medicine (ANZSNM), hereafter termed the Society.

2. Entries to the Award will be Nuclear Technologists employed within the field of Nuclear Medicine. Such entries will have been financial members of the Society for at least 6 months at the time of presentation at the ANZSNM ASM. Students undertaking an approved course of study in Nuclear Medicine are eligible to enter.

3. The Award will be made for an **Oral Case Presentation of a single (One (1)) patient's study(s) performed within the Nuclear Medicine workplace**.

4. The Award comprises two (2) parts. An initial ***Sponsorship*** (part 1) will be made to the winning entrant in the Home State. The ***Award*** (Part 2) will be made at the Technologist Symposium of the ASM.

4.1 Previous State Winners may submit and present further case studies, however, they will be ineligible to become the State Winning Entrant for a period of two years.

5. Entrants to Part I and Part 2 of the Award must present their case study in the same year, the case unchanged in the intervening period.

6. PART l. Sponsorship

6.1 Entries for the Award are to present an oral case study in their Home State or in New Zealand (NZ) or at a prearranged Rural site. The *Home* State/NZ/Rural site shall be the region in which:

a) the entrant is employed/studying in the field of Nuclear Medicine and,
b) where the case study was obtained.

6.2 The Home States in Australia shall be deemed one of the following:

a) NSW
b) QLD
c) SA (including NT)
d) ACT
e) VIC (including Tasmania)
f) WA

6.3 The **Rural entrant must fulfil *one (1)* of the following eligibility criteria**:

a) employed in a department in an RRMA (Rural Remote Metropolitan Area) classified rural or remote area (see Appendix A)
b) a department more than 200km from their state capital
c) a department more than 100km from any other Nuclear Medicine Department
d) a department more than 200km from their relevant branch meeting.

6.4 Entrants to the Award are to present to the State/NZ Branch representative of the ANZSNM Technologist Group (ANZSNMT) a signed statement, countersigned by the department head indicating the extent of assistance received during the course of the case study work. In the case of a video presentation this statement should also confirm that the presentation was performed in accordance with the Rules and that the video has not been edited.

6.5 The winner of the State/NZ/Rural sponsoring will be required to provide this statement to the Hon. Secretary ANZSNMT on submission of the abstract to Part 2 of the Award.

6.6 Entrants to the Award {Part l and 2}, are to present their case study in a maximum of ten (10) minutes. The total presentation time will be divided as:

a) oral case presentation -7 minutes (maximum)
b) question time -3 minutes (maximum)

6.7 The State Branch/NZ Branch representative of the ANZSNMT will organise a venue and time for the presentation of case by entries to the Award, in the year prior to the ASM of the Society each year. Entrants to the Award who are normally located remotely from the presentation venue may submit a video presentation, performed before an audience of professional healthcare colleagues, to be viewed by the audience and judges at the presentation meeting. The current entrant will be available via telephone link to answer questions from the presentation meeting.

6.8 Judges for the State/NZ sponsorships shall determine the winning case presentation. The home State/NZ/Rural entrant awarded the sponsorship shall be termed a National or NZ finalist.

6.9 The State/NZ/Rural sponsorships shall be Judged by a panel of three (3) Nuclear Medicine Technologists. The panel will be nominated by the State Branch representative of the ANZSNMT. The panel must include the

nominated State representative of the ANZSNMT. All panel members are to be full financial members of the
Society, and eligible for accreditation. Where possible the judging panel should not be drawn from the same
workplace/department as any entry to the award.
6.10 If there is only one case presentation within a State/NZ/Rural, the case study must be presented to a panel of
three (3) Nuclear Medicine Technologists at a presentation night or Branch meeting. The panel of judges must
judge whether the presentation is worthy and hence eligible for the Sponsorship. If judged to be unworthy, there
will be no winner from that Home State or NZ.
6.11 The National and NZ finalist will be sponsored by RADPHARM/GMS for full registration to attend the
Technologist Symposium of the ASM, to present their winning case study. Winners of Part 1 Sponsorship are the
only entrant to Part 2 of the Award.

7. PART 2 The Award

7.1 National and NZ finalists must submit an abstract of their winning case presentation for the Technologist
Symposium as with any paper. Submission of abstract must be in accordance with the requirements of the ASM.
7.2 The audience will be informed that the presentation is an entry for the **RADPHARM Technologist Case
Presentation Award**
7.3 The Award will be judged by a panel of seven (7) Nuclear Medicine Technologist representatives, each
nominated by their State/NZ Branch representative of the ANZSNMT. The judging panel must not be drawn from
the same department/workplace as entry to the Award.
8. The Sponsorship and the Award will be decided on the following criteria with value specified,
a) - Originality
b) - Presentation
c) - Content (Correlative Investigations may be used.)
d) - Interest/Value of paper to Nuclear Medicine
e) - Contribution of Nuclear Medicine to patient management.
9. The **RADPHARM Technologist Case Presentation Award** will be presented at the conclusion of the
Conference.
10. The recipient of the Award should provide to the ANZSNMT Honorary Secretary, an appropriate summary of
the case study presentation for publication in the ANZSNM Journal.

Created By: ANZSNM TSIG Committee
Updated: June 2008
Version: 1.5
Approved: 10th July 2008
3

APPENDIX A:

The Rural, Remote and Metropolitan Area (RRMA) classification was developed in 1994 by the Department of
Primary Industries and Energy, and the then Department of Human Services and Health, which is now the
Australian Institute of Health and Welfare. (1)
Seven (7) categories are included in this classification – 2 metropolitan, 3 rural and 2 remote. The classification is
based on Statistical Local Areas (SLA) and allocates each SLA in Australia to a category based primarily on
population numbers and an index of remoteness. The index is used to allocate non-metropolitan SLAs to either the
rural or remote zone.

Zone Category

Metropolitan zone M1 Capital cities
M2 Other metropolitan centres (urban population > 100,000)
Rural zone R1 Large rural centres (urban centre population 25,000 – 99,999)
R2 Small rural centres (urban centre population 10,000 – 24,999)
R3 Other rural areas (urban centre population < 10,000)
Remote zone Rem1 Remote centres (urban centre population > 4,999)
Rem2 Other remote areas (urban centre population < 5,000)
The RADPHARM award eligibility criteria refers only to the Rural and remote classification zones.

Reference:
1. http://www.aihw.gov.au/ruralhealth/methodology/rrma.cfm

RADPHARM ENTRANT

APPLICATION FORM

Name: _____

Institution: _____

Abstract Title:

_____

_____

Authors:

_____

_____

_____

State / Category:

⌂ NSW ⌂ VIC (inc Tas) ⌂ Qld ⌂ SA (inc NT)

⌂ WA ⌂ ACT ⌂ Rural*

I _____ state that this case study entry for the Radpharm

Award has been prepared with the assistance of the above listed authors and the approval

of the department head**.

Entrant Name: _____ *Signature:* _____

Dept Head Name: _____ *Signature:* _____

Return Completed Form To: State TSIG Representative

Contact details available on website http://www.anzsnm.org.au

* The Rural entrant must fulfil one (1) of the following eligibility criteria:

a) employed in a department in an RRMA (Rural Remote Metropolitan Area) classified rural or remote area (see Appendix A)

b) a department more than 200km from their state capital

c) a department more than 100km from any other Nuclear Medicine Department

d) a department more than 200km from their relevant branch meeting.

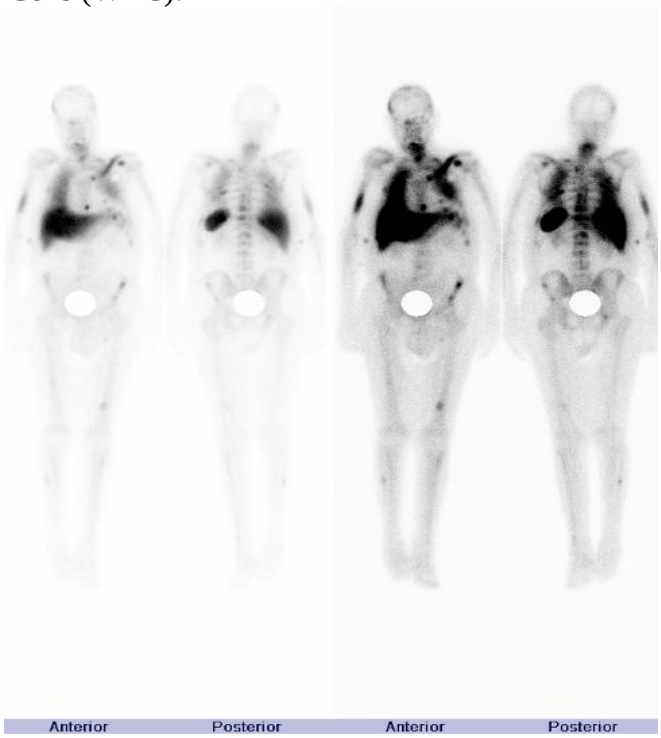
(http://www.aihw.gov.au/ruralhealth/methodology/rrma.cfm)

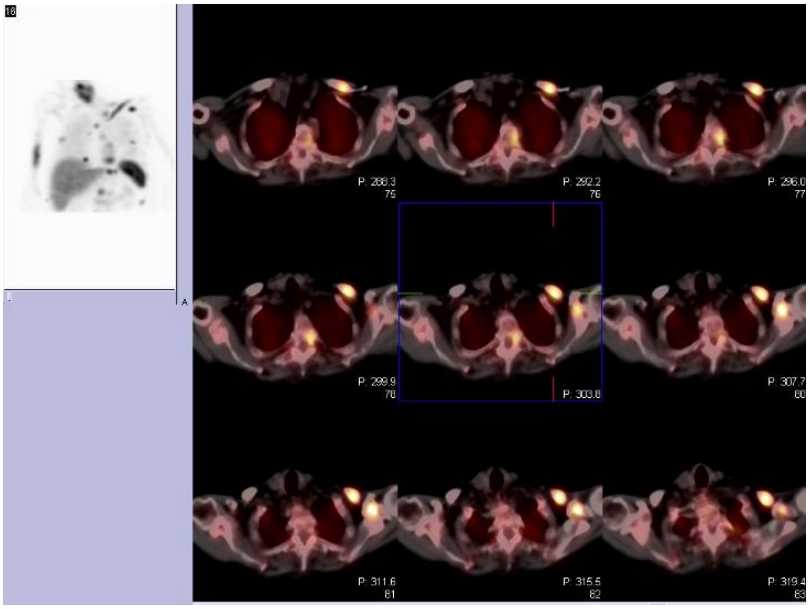
** This can be the Chief Nuclear Medicine Technologist or Director of Nuclear Medicine from the department in which the case study was performed

What The...?

By Reuben SMITH
Regional Imaging Gippsland

83yr old male patient with a history of metastatic prostate cancer present with pyrexia of unknown origin. The patient was administered with 1000MBq of 99mTc Stannous Colloid labelled White Blood Cells (WBC).





Wholebody and SPECT/CT images of the thorax were acquired at four hours post tracer injection.

Answer Page 14

Send your 'What The …… ?' image, solution and author details to seasonal@rains.asn.au

Key Dates: Deadline for submission of CPD articles toward the RAINS Newsletter - **31st of August 2011**, 5:00pm AEST (Australian Eastern Standard Time)

"CALL FOR SUBMISSIONS"

The RAINS organising committee is kindly inviting all parties for the submission of CPD articles toward the RAINS newsletters.

An annual RAINS Newsletter prize has been established.

RAINS is working to recognise and support excellence within the Rural Nuclear Medicine community by offering an award for the best CPD article submitted to the RAINS newsletter. This prize will be awarded to the best judged contributor/CPD article submitted to the RAINS newsletter.

The prize winner will receive free registration to the upcoming RAINS integrative Imaging Symposium, to be held in Sydney on the 12th and 13th of November 2011.

What The...? Answer:

By Reuben SMITH

Localisation of 99mTc labelled WBC into the metastatic bone lesions of the patient.

This occurrence has been documented by several journals with findings that radionuclide labelled WBC will uptake into lymphoma masses, soft tissue tumours and bone metastasis[1, 2]. The mechanism of this incidence has been speculated on but is not fully understood. The following factors have been considered:

- High blood pool activity to cancer sites and slow tracer disappearance from the blood[1, 2].
- Due to 'aseptic pyrexia' inflammation/infection of cancer site or necrotises of cancerous tissue[2].
- Related to immunologic activity caused by fever or stress[1].

Studies undertaken with patients who had known cancer but no infection underwent WBC imaging which showed that 34% had positive scans from localisation in cancerous tissues[2], essentially causing false positives. Concluding this interpretation of labelled WBC scans for patients with known lymphoma masses, soft tissue tumours and bone metastasis, undesired localisation into these cancerous areas should be taken into account.

Reference:

1. Roedler, "Multifocal Skeletal Uptake of labelled Leukocytes: Infection vs Tumor Metastasis", *The Journal of Nuclear Medicine*, 1990, Vol: 31, Pg: 1543-1547.
2. Lamki, Kasi, "Localization of Indium-111 Leukocytes in Non-infected Neoplasm's", *The Journal of Nuclear Medicine*, 1988, Vol: 29, Pg: 1921-1926.

2010 Integrative Imaging Symposium Report

The Stamford Grand Hotel was the staging ground for the annual RAINS Integrative Imaging Symposium. An attendance by colleagues from the Rural Alliance in Nuclear Scintigraphy, Charles Sturt and Macquarie Universities resulted in one of the largest gatherings of delegates in the medical imaging field. The focus was on the cross-disciplinary nature of modern imaging centres and the subsequent development of new imaging procedures. A series of lectures, presentations, discussions and workshops stimulated and challenged our delegates over a two day programme. In total, 210 delegates attended from a variety of medical imaging backgrounds and a number of local referring clinicians.

Topics included: PET/CT, PET/MRI, novel nuclides in Neuro PET, neurological radiology, advances in hybrid imaging systems, nuclear cardiology, trauma imaging, cardiac MRI and CT, sentinel node and breast imaging, MRI and PET in Parkinson's and Dementia imaging, and DVT imaging. These topics were presented by some of the most highly respected and published experts in Australia: Prof. Chris Rowe, Prof.Steve Miekel, Prof.Hosan Kiat, Prof. John Magnussen, Prof Robert Howman-Giles, Prof. Martin Berry, A/Prof Andrew Katsifis and the list goes on. Needless to say that the work presented was impressive and our delegates had the opportunity to interact with our very own home-grown experts. The opportunity to engage in multi-disciplinary exchanges of ideas and learning was time well spent by our delegates.

Some of the highlights included: a tour of Macquarie Medical Imaging and CycloPet (cyclotron) located on the grounds of the new Macquarie University Hospital. Between the two all aspects of medical imaging are covered including the use of contrast enhanced diagnostic CT in PET and SPECT, and the fusion of MRI images with PET and SPECT. Delegates had discussions with staff and discovered that this centre fostered a collaborative/holistic approach to medical imaging, diagnosis and reporting.

Delegates enjoyed fabulous buffet meals at the Stamford during the day and were entertained in the evening at the conference dinner making this the perfect balance between cognitive learning and social networking with like-minded professionals. Don't miss out on the next Integrative Imaging Symposium to be held at the same location on November 12th and 13th 2011. Get your registrations in as early as possible as this will prove to be a popular event.

We would like to take this opportunity to thank with gratitude our sponsors:

Platinum Sponsors: Cyclopharm, GE Healthcare, Macquarie Medical Imaging
Gold Sponsors: Macquarie University Hospital
Silver Sponsor: Covidien
Bronze Sponsors: InMed, GMS, ARI
Speaker Sponsors: Global Diagnostics, Cardiac Health Institute, Primary Health Care.

Marko Trifunovic BAppSci, MEd
Head of Nuclear Medicine & PET

MACQUARIE MEDICAL IMAGING

Continuing Professional Development

Peritoneal Leak Study

Robert Magill
PRP Diagnostic Imaging- Woy Woy Nuclear Medicine

Abstract

A case study investigation into the role that nuclear medicine plays in the detection of Peritoneal Leaks. The patient is on Continuous Ambulatory Peritoneal Dialysis, has end stage Renal Disease secondary to Systemic Lupus Erythemetosus with known pleural effusion, thus a causative factor needs to be determined. A review is also made comparing Scintigraphic techniques as opposed to CT Peritoneography.

Introduction

The ability of nuclear medicine to provide non-invasive, highly sensitive functional imaging is reinforced by this case. It exhibits how adaptive the field of nuclear medicine can be in order to achieve a diagnosis – in this case, to determine whether a peritoneal leak, through a defect in the hemi-diaphragm, is the cause of the pleural effusion. Alternative causes for the effusion cannot be ignored, hence the patients known condition of systemic lupus erythematosus (SLE), will also be investigated.

Background

This rare case of pleural effusion, involved a 34 year-old woman who presented to the department on continuous ambulatory peritoneal dialysis for end-stage renal failure. She had known pleural effusion, with an unknown cause. The role of nuclear medicine was to determine whether the dialysis fluid was being transmitted from the peritoneum into the pleural space.

The presence of a diaphragmatic hernia would allow fluids from within the peritoneal cavity to actively leak into the pleural space, resulting in a pleural effusion. Diaphragmatic hernias are typically congenital (1:2200-5000 live births, *Lucile Packard Children's Hospital*) and are often discovered incidentally, unless the case is extreme. This type of defect can easily be diagnosed on a plain x-ray, CT or MRI; however in this case, these imaging modalities are limited to only that diagnosis. The role of nuclear medicine in regards to this patient is of a much higher importance.

This study is designed to assess effect that a diaphragmatic hernia has on the peritoneal dialysis treatment, for end-stage renal failure.

The concept of dialysis is based on the diffusion of solutes across a semi-permeable membrane; which is the highly vascular peritoneal lining of the cavity, in this case. The dialysate, which is high in glucose and amino acids, is infused into the peritoneal cavity through an abdominal catheter, allowing the exchange of waste to occur over several hours. Once complete the dialysate and waste is removed from the cavity through the catheter. *Peritoneal dialysis- A treatment option,* (2010)

An alternative form of dialysis treatment is haemodialysis, which is based on the same principle of diffusion of solutes across a membrane. Blood is transferred from within the patient, via an AV fistula, and is filtered through an external machine fitted with an artificial membrane before returning to the patient's bloodstream. *Kidney foundation Australia, (2011)*

Table 1

Peritoneal dialysis	Haemodialysis
Pros	Pros
- Able to be done at home - No expensive machine - Retains renal function - Patient is able to travel	- Can be done in case of Peritoneal leak - Less Frequent - Used more in less able patients
Cons	Cons
- Inherent infection at site of catheter and peritonitis - Bloating/fullness - Cannot be done if patient has had abdominal surgery	- Expensive machine - More difficult to plan travel - Multiple hospital visits - Arterial venous fistula access complications

Shahub (2006) Table1. Peritoneal dialysis in contrast to haemodialysis.

In the case of this patient, she preferred the option of peritoneal dialysis over haemodialysis as it allowed her more freedom to travel around, it better retained her kidney function and she generally felt more familiar with that process. So in order to ensure continued safe peritoneal dialysis, it was necessary to determine whether a diaphragmatic hernia was causing leakage of the dialysate into the pleural cavity.

Pathology

The pathology being investigated is a peritoneal leak, which would therefore lead to the conclusion that there is a defect in the peritoneal lining of the hemi-diaphragm. The cause of a hernia or the defect can be congenital or surgical. For this reason, it is important that it is understood what effect a diaphragmatic hernia can have on a patient undergoing peritoneal dialysis.

A result of a peritoneal leak in this case is a pleural effusion, which is a collection of fluid between the inner and outer pleura and can easily be seen on a chest radiograph. The many causes include pulmonary emboli, hypothyroidism, pneumonia, cancers, connective tissue disorders, rheumatoid arthritis amongst others. Symptoms experienced by a patient was pleural effusion are non-specific and may include shortness of breath on exertion, fatigue, sternal pain and pain on inspiration/coughing. Prognosis is usually positive if the diagnosis is made early and treated properly. If left undiagnosed complications such as chest infections, difficulty laying flat, low oxygen saturation or collapsed lungs may result, and if left untreated, the outcome could be fatal. *Cleveland clinic (2010)*

The biggest concern for this patient is what is causing her pleural effusion – SLE or a peritoneal leak. Under normal circumstances, a diaphragmatic defect would be of little consequence, however in this instance where the patient is regularly filling her peritoneal cavity with dialysis fluid, a defect would introduce complications. The difference in pressure between the pleural and peritoneal cavities would cause passive movement of fluid from the high-pressure region to the lower-pressure region – thus filling the pleural space with dialysate. This potential complication will inevitably alter the patients' management.

After presenting with a pleural effusion, the initial method of treatment was a thoracentesis or drainage providing the patient with symptomatic relief. *A.D.A.M, (2010).* Pathology results of the drained fluid showed high levels of glucose, raising suspicions further as to the cause being PD fluid. Further investigation was required to definitely diagnose PD as the cause; however as a precaution she was switched to haemodialysis to continue her treatment, against her original wishes.

Imaging

The patient was then referred to nuclear medicine to undergo a peritoneal leak study. Being a rare nuclear medicine study, a protocol was formulated within the department with input from physicians, technologists and nurses in order to create the most appropriate imaging parameters. Once organised, the preparation for the test involved liaising with the renal unit of the hospital to ensure warm dialysate and a nurse would be available at the time. The patient was offered the opportunity to perform the dialysis on herself for the test, which she agreed to.

The patient was instructed to begin dialysis as she normally would and once the infusion had begun, 180MBq of ^{99m}Tc-MAA was added to the dialysate and the infusion continued. Upon completion dynamic imaging immediately, the patient was supine. The protocol was as follows:

Energy window- 140KeV 20%
Initial dynamic 15 minutes at 1min/frame
Matrix- 128x128
On completion of the dynamic phase planar images were taken
Statics 5 minutes – Anterior, Posterior, lateral, obliques
Matrix- 256x256

Planar images were taken every 30 mins post initial infusion. In between each image set the patient was asked to move around, stand up and walk in order to recreate any condition in which the peritoneal leak may occur. Imaging continued until a result was seen. A delayed post drain image was also completed.

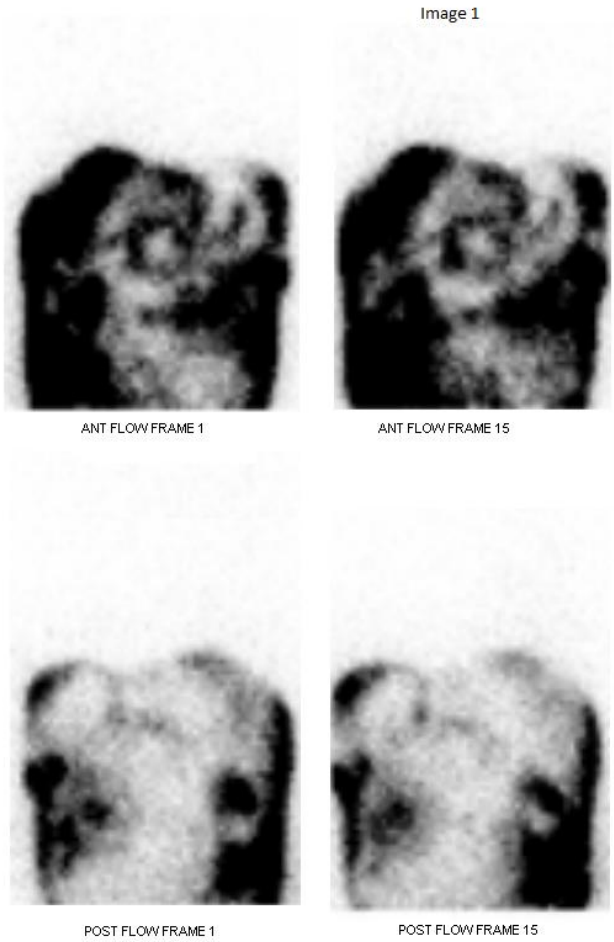


Image1. Post-infusion first and final images of the dynamic series, Anterior and Posterior. There is normal intraperitoneal distribution of radiotracer.

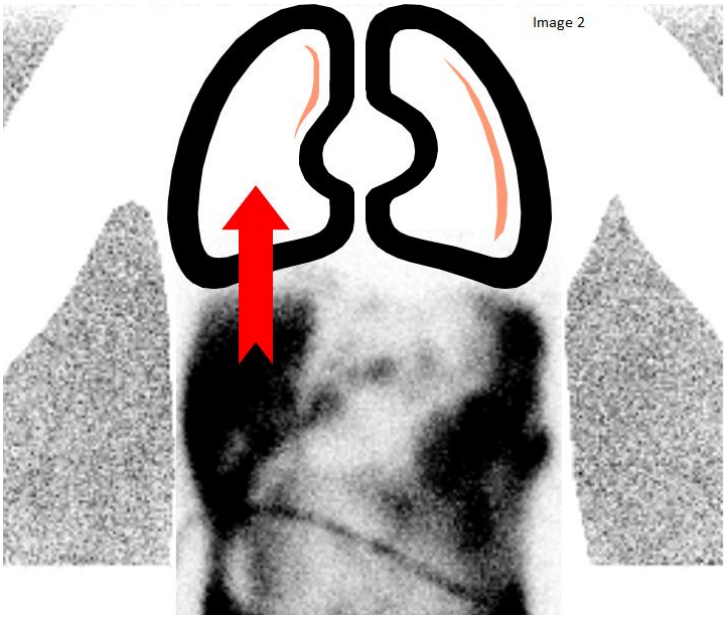


Image 2. Anterior transmission image using a cobalt sheet source. The created lung fields and the arrow indicates what would occur in the case of a peritoneal leak.

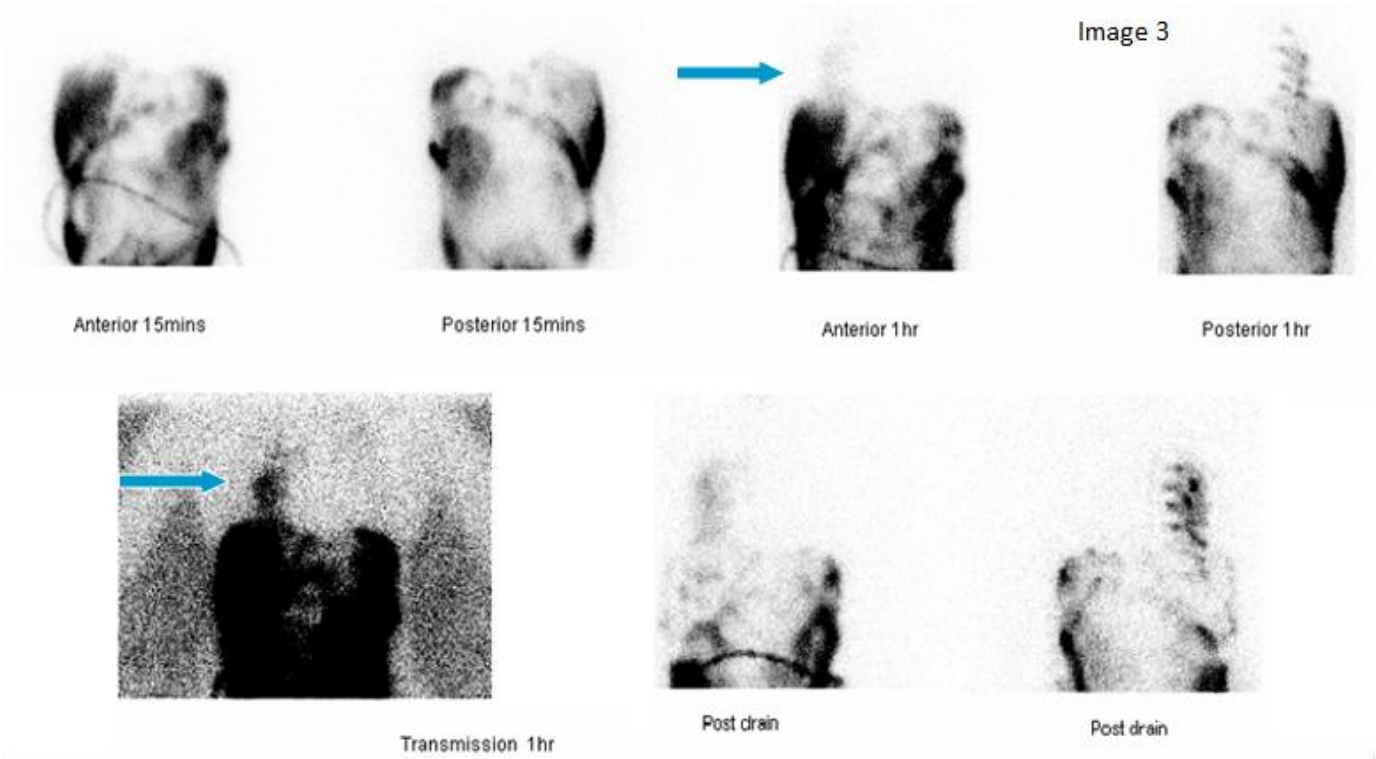


Image 3. Planar imaging done at 15 minutes, 60 minutes, anterior transmission image and a post drain image. The 15 minute image is normal and there is no activity seen in the lung fields. The one hour image clearly indicates that there is in fact a peritoneal leak and that the dialysate along with the isotope is shunting to an area of lower pressure, in this case the pleural space.

Diagnosis

From the peritoneal leak study the patient was diagnosed with a peritoneal-pleural leak. Based on this outcome the patient continued on haemodialysis to prevent any further pleural effusions. The patient was offered two potential treatment options to repair the defect: surgery to physically repair the hernia or to give the peritoneal lining time to rest in order for it to repair itself. The patient chose the latter. The patient for six weeks remained on haemodialysis when a subsequent peritoneal leak study was performed. The images still showed activity within the lung fields implying the defect had not healed. At this point the patient was then booked for surgery to repair the defect.

Efficacy

Nuclear medicine has played an essential role in determining the cause of a pleural effusion in a complicated case and altering a patient's management in order to prevent the effusion from recurring.

CT peritoneography is the infusion of a contrast medium (meglumine diatrizoate) along with the dialysate into the peritoneal cavity. According to a study conducted by *Hollett* (1992) 48 patients underwent the peritoneograghy and there was no record of any patients having an adverse reaction to the contrast material. In the study, a mixture of the contrast and dialysate was infused and the patient was encouraged to move around and a CT scan was completed one hour post infusion. Although this is reassuring evidence in regards to adverse reactions, this was only a very small sample of patients.

From the reviews of multiple publications, nuclear medicine peritoneal leak studies have altered patient's management in many cases. In comparison to CT peritoneography scintigraphic peritoneal leak studies offer more flexibility in that the imaging is captured in real time. For instance, you can observe the dynamic movement of the dialysate, and use this to determine the rate at which the leak occurs. This is particularly helpful if the patient is having multiple studies because a comparison can be made between times which the leak started within the acquisition. Additionally, you are able to image continually if a leak is not seen immediately. According to *walker* (1988), in one particular case a leak was not seen until 20 hours after the beginning of the infusion. With CT scanning this is not possible, due to adherent risk of multiple exposures to high levels of radiation. Furthermore, there is a higher risk that a patient will have an adverse reaction to contrast rather than ^{99m}Tc-MAA or other colloid equivalent.

The average effective dose of one chest CT scan is 7mSv (ACR, 2010). This is a relatively large effective dose, especially if multiple studies are required. With limited scintigraphic peritoneal leak studies completed, an accurate effective dose measurement for this study is difficult to determine, although it can be assumed that there would certainly be a significantly lower exposure than that of CT; especially taking into consideration that most of the dialysate is drained post-imaging.

Walker (1988) also makes reference to using methylene blue in conjunction with contrast. This particular method not only can be irritation to the patient, it will also require surgical exploration to be accurate. This then becomes a much more invasive test.

Based on the clinical question being asked in this particular case, the pleural effusion was caused by a peritoneal leak. The question has been adequately answered non-invasively and with a very low radiation burden. In this respect it is an effective study and does not require state of the art SPECT or SPECT/CT camera to acquire the clinical answer. However, a SPECT/CT could possibly add the anatomical detail to this study, which may add a degree of certainty if surgical intervention is expected.

Conclusion

Nuclear medicine has proven to be a positive modality in the diagnosis of a peritoneal leak, which in this case was the cause of pleural effusion which ultimately leads to the change in the patients' management from peritoneal dialysis to haemodialysis.

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  (http://www.lpch.org/DiseaseHealthInfo/HealthLibrary/digest/diaphrag.html) [online]
- Radiation Exposure in X-ray and CT Examinations (2010)
  http://www.radiologyinfo.org/en/safety/index.cfm?pg=sfty_xray [online]

Continuing Professional Development – Question and Answer Sheet

Article title: Peritoneal Leak Study
Your name: _____
RAINS Member Number: _____
Answer the following questions and return the completed sheet to:

RAINS
PO Box U102
Charles Sturt University
Wagga Wagga NSW 2678

or

seasonal@rains.asn.au

1) What Radiopharmaceutical was used to determine the peritoneal leak?

2) What does SLE stand for?

3) What are 2 advantages of Scintigraphic PL study over CT Peritoneography?

4) What is the patient preparation?

5) What are the treatment options for the patient in this case?

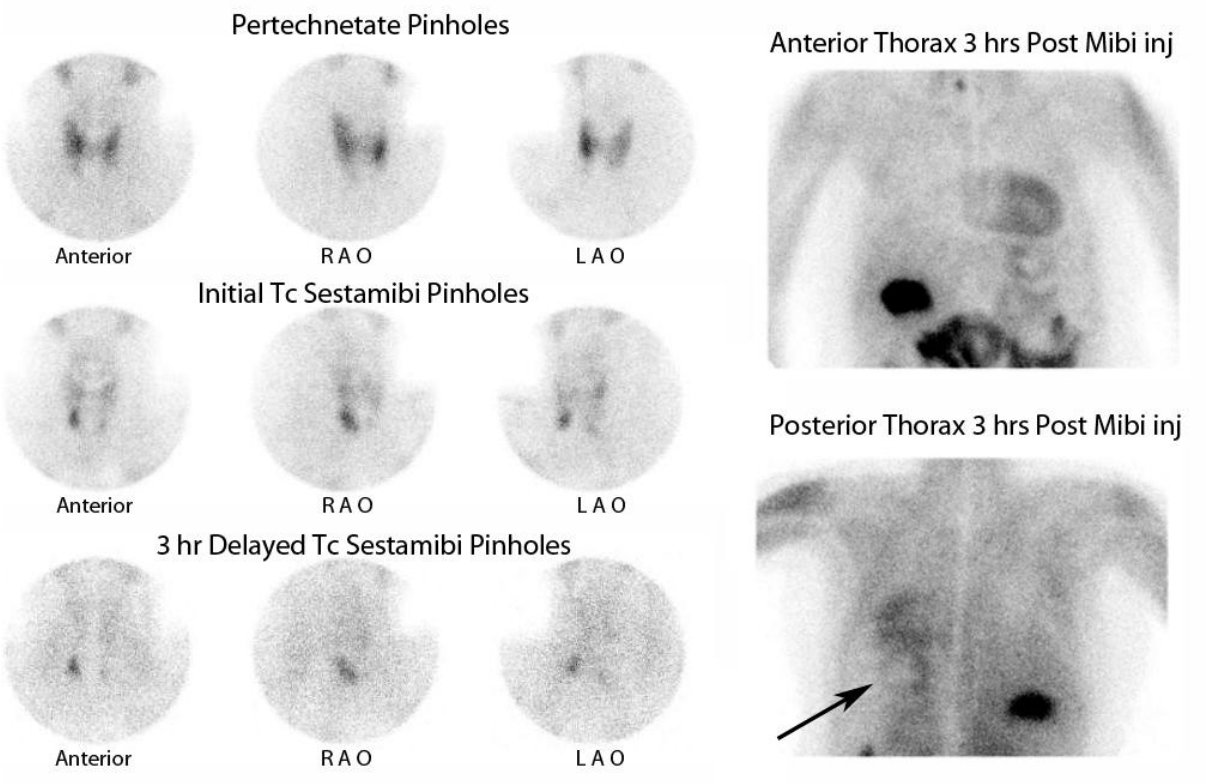
6) What is haemodialysis?

7) What is peritoneal dialysis?

Another "What The....?

By Russell Pearce
PRP Diagnostic Imaging

During a Sestamibi Parathyroid scan, an area of abnormal activity was noted in the left posterior lower thorax. What is the pathology?



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Letters to the Editor

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MULTIMODALITY Conference
Jupiter's Casino,
Townsville

2011, AUGUST 26TH - 28TH

The Queensland Branch of the Australian Institute of Radiology invites all MRP's to attend a weekend conference hosted at the multi-award winning Jupiter's Casino (conference room rates available).

The program includes combined and individual modality sessions (radiotherapy, radiology, MRI, mammography, ultrasound, nuclear medicine).

Registration includes:
Friday welcome drinks – Rock Pool Cafe
Black Tie 3 course dinner dance – Museum of Tropical Queensland
Conference lunches & refreshments

Call for Abstracts: All modality's welcome
Final submission date 30th June 2011
Submit to Hana Grigg: hana_grigg@health.qld.gov.au

For more information and registration…
http://www.air.asn.au/files/00_Homepage/02_EventsCalendar/003_QLD_Multimodality_Conf_Aug2011_1.pdf or call AIR Events Department: 03 9419 3336 or Annette Cotter

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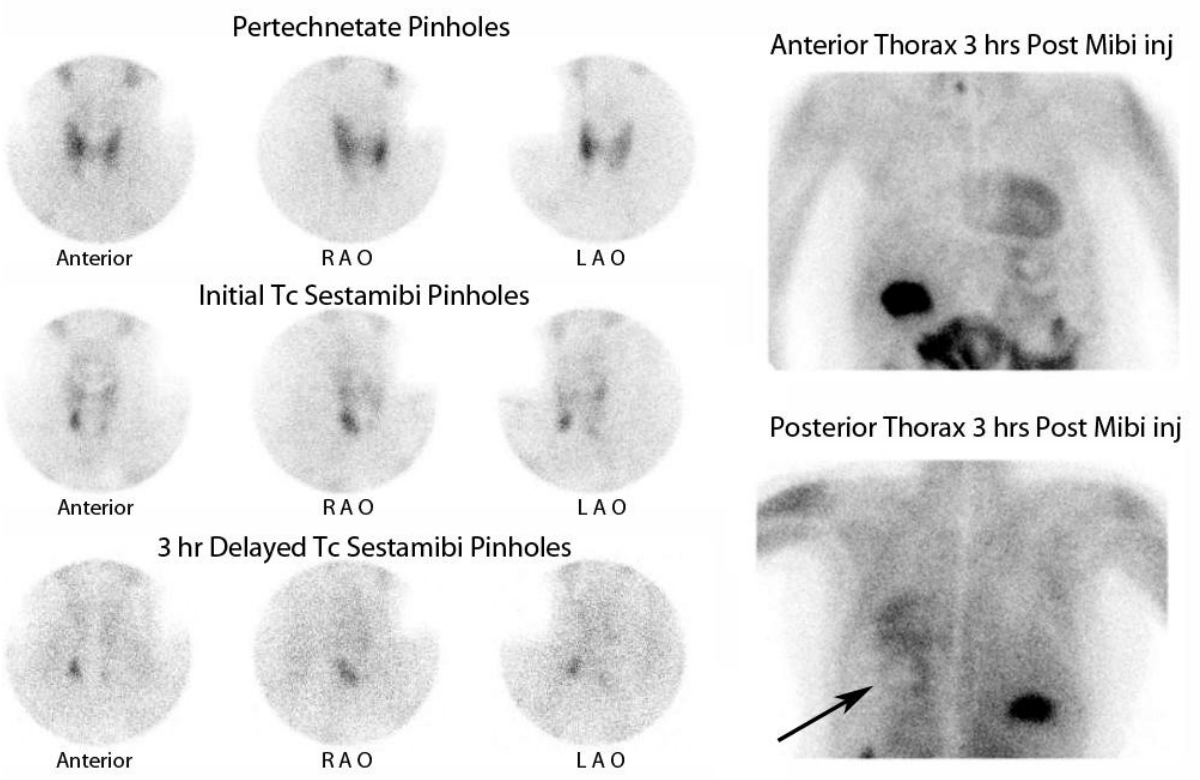
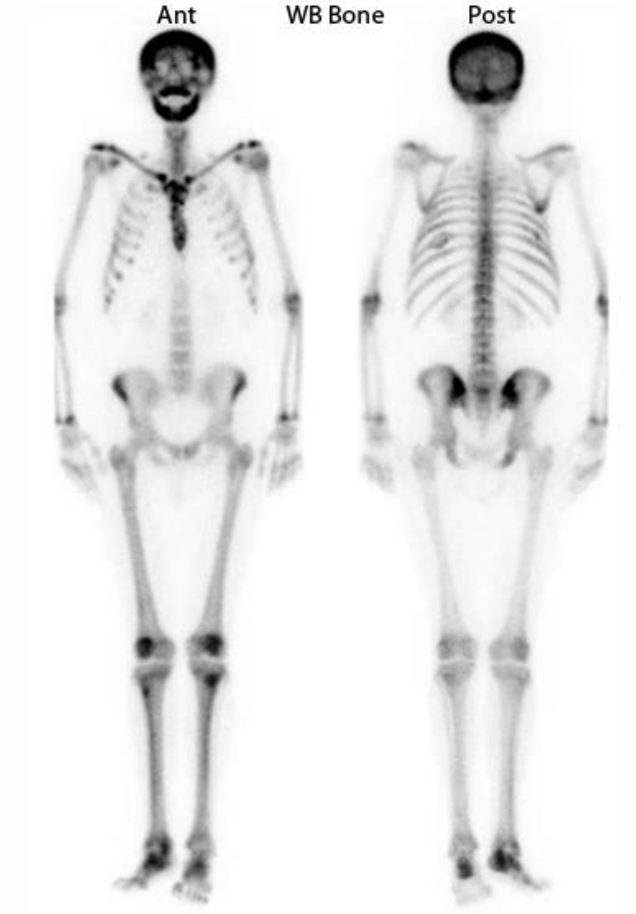
What the…….? Solution

By Russell Pearce





Clinical History:
Severe hyperparathyroidism. Markedly elevated PTH level (>100). Chronic kidney disease on haemodialysis. Assess for parathyroid adenoma.

Findings:
Combined Tc-99m pertechnetate and sestamibi parathyroid imaging was acquired with planar, pinhole and SPECT tomographic imaging. Prominent early accentuation of sestamibi tracer accumulation immediately posterior to the lower pole of the right thyroid lobe persists on delayed phase imaging. A much less prominent but distinct left inferior parathyroid sestamibi-avid focus is demonstrated. Physiologic wash-out of diffuse mildly heterogeneous thyroid sestamibi tracer accumulation is noted. Heterogeneous, predominantly circumferential low level posterior left 8th rib sestamibi accumulation corresponds to a corticated expansile, irregularly-marginated, lytic lesion on CT. Multiple lytic bone lesions are shown in the vertebral column including the left T4 transverse process and lamina and extensively in the proximal right humerus, with respectively low level and minimal/absent sestamibi avidity. Diffuse sestamibi uptake is noted elsewhere in the visualised skeleton. Irregularity overlying the lower left ribs on planar imaging is non-specific, noting superimposed bowel tracer excretion. Concentrated activity overlying the right upper quadrant probably reflects persistent gall bladder visualisation.

CONCLUSION:

1. Large right inferior parathyroid adenoma. Smaller left inferior parathyroid adenoma/hyperplasia.
2. Suspected multiple osteoclastomas / Brown tumours, including the proximal right humerus and posterior left 8th rib. Dedicated CT and bone scan correlation is recommended to exclude malignant lesions.

Bone Scan CONCLUSION:

1. Diffusely increased activity throughout the skeleton consistent with metabolic bone disease.
2. There is some distortion of the normal appearance of the posterior part of the left 8th rib corresponding to the site of tumour. Metabolic activity in this region is very similar to that in the adjacent bone.
3. There is very limited literature available regarding bone scintigraphy in the context of hyperparathyroidism and brown tumours. Some studies report similar changes to that noted on the current images. Metastatic involvement at these sites is considered less likely. Limited studies have noted that sestamibi uptake in these tumours will decrease following therapy for hyperparathyroidism and this may be of use as a means of follow-up.

Brown Tumour Brown tumours are tumours of bone that arise in settings of excess osteoclast activity, such as hyperparathyroidism, and consist of fibrous tissue, woven bone and supporting vasculature, but no matrix. They are radiolucent on x-ray. The osteoclasts consume the trabecular bone that osteoblasts lay down and this front of reparative bone deposition followed by additional reabsorption can expand beyond the usual shape of the bone, involving the periosteum thus causing bone pain. The characteristic brown colouration results from hemosiderin deposition into the osteolytic cysts.

The Doctor of Health Science

Introduction
The Doctor of Health Science (DHlthSc) at CSU is a professional doctorate that allows candidates to pursue a research higher degree of the same standard as the PhD but within a structure that is aimed at improving professional practice. Specifically, it offers a research based approach for provision of solutions relevant to the professions and industry.

Professional doctorates aim to provide a tool for advanced research enabling candidates to contribute in a significant way to the knowledge and practice in their profession or discipline area. Consequently, candidates enrolled in professional doctorates tend to be more intrinsically motivated aiming to improve professional practice and enhance job satisfaction.

Course Structure
The DHlthSc is offered by part-time distance education mode and is composed of coursework and an applied research/professional component. Student's progress through the research/professional component of the DHlthSc is monitored by the requirement that students complete subjects in sequence thus meeting pre-defined milestones. The applied research/investigation allows students to develop a research question or topic for investigation by conducting an intensive literature review, critique and reflecting on their professional practices.

The DHlthSc culminates in a professional portfolio (including an exegesis), which integrates the research/investigation within their professional practice. The professional portfolio incorporates reports, papers and publications prepared throughout the course with an exegesis to link the results back to the profession and professional practice, and original question on which the research or investigation is based. The professional portfolio with exegesis is subjected to external examination in accordance with University regulations.

The duration of the DHlthSc is the equivalent of 4.5 years part time enrolment.

Enrolment Pattern
HSC700 Research Critique and Publication
HSC701 Reflective Practice in Health Science
HSC702 Proposal For Applied Research
HSC703 Research Project and Report 64 Points
HSC704 Health Science Portfolio / Exegesis

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Admission Requirements
For admission to the DHlthSc applicants would need to demonstrate that they:

- are working in an appropriate field within, or relevant to, the Health Professions and can demonstrate they have the opportunity and facilities to complete the applied research/investigation components of the course; and
- have had a minimum of five years of relevant professional and/or vocational experience (with relevance being determined by the DHlthSc Course Coordinator in conjunction with the proposed principal supervisor); and
- normally hold a Masters degree or equivalent (by coursework) in an approved area of Health Sciences, with credit grades or above in all subjects undertaken.

Course Aims and Objectives
The DHlthSc promotes an advanced, critical reflection on professional practice in the health sciences and aims to:

- provide opportunity for the candidates to continue lifelong learning in keeping with the university's mission statement;
- satisfy the educational needs of professionals working in or aspiring to work in the most senior tiers of the health sciences and related sectors;
- promote the acquisition of advanced analytical and problem solving skills and conceptual insights that enhance the capacity of the candidate to undertake positions of significant responsibility in the health sciences;
- encourage excellence in scholarship and focused research within the candidates discipline area.

Course Coordinator
Dr Janelle Wheat
Senior Lecturer, Faculty of Science
Telephone: 61 2 69332750
Email: jwheat@csu.edu.au

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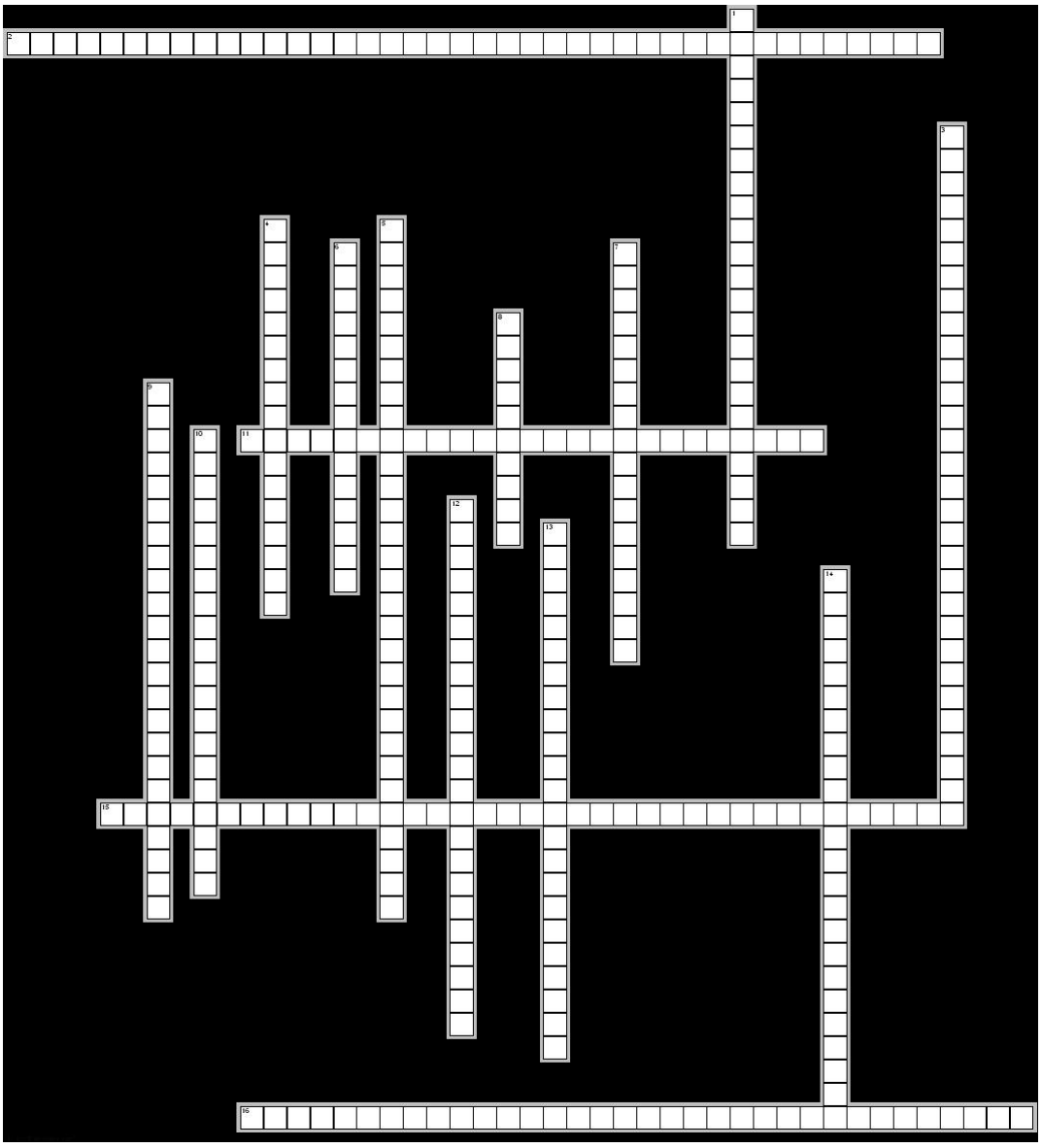
CROSSWORD – ABBREVIATIONS USED IN NUCLEAR MEDCINE
SPACES CAN BE USED FOR MORE THAN ONE WORD ANSWERS
By PRP IMAGING - CUMBERLAND



ACROSS	DOWN
(2) DISH	(1) MIBG
(11)PSA	(3) HMPAO
(15) SONK	(4) ECG
(16) DTPA	(5) CCK
	(6) HDP
	(7) IDA
	(8) PR
	(9) MDP
	(10) ALP
	(12) MAA
	(13) DMSA
	(14) MAG3

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Seasonal RAINS is a newsletter with four issues per year. Issues will be sent to RAINS members during Winter, Spring, Summer and Autumn.

Seasonal RAINS will accept a number of types of submissions. All work must be written in English and submitted in Microsoft Word. All submission must be accompanied by a cover letter (email is sufficient) indicating the type of submission, details of authors and departments, contact details of the corresponding author and a statement indicating that the submission is not subject to copyright elsewhere.

All submissions will be reviewed for appropriateness and accuracy (where relevant). Inclusion in Seasonal RAINS remains the discretion of the editorial board. Preference will be given to submissions consistent with the philosophy and purpose of RAINS.

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300-500 word limit.

Interesting Image

1 JPG image and 300 word limit case presentation.

What The … ?

1 JPG image and 100 word limit solution.

News and Events

Summary of recent or upcoming events. Update RAINS member achievements; publication, conference presentation or scholarship.

Book Review

Review of a recently released nuclear medicine text. Minimum of 1 page.

E-Journal Club

20-30 minute power point presentation of a relevant journal article in Nuclear Medicine. Submissions should include written text and discussion for each slide plus 10 test questions.

E-Grand Rounds

Submit a 20-30 minute review summary and presentation (power point) of one or more clinical cases. Content should include patient history, scan methodology, other imaging procedures, relevant technical information, final report and patient outcomes. Submissions should include written text and discussion for each slide plus 10 test questions.

In-Service Education

Seminars should be submitted as power point presentations with audio narration. Audio recordings should be embedded in the power point presentation (not linked) using a radio quality setting (22kHz, 16 bit, mono). Ensure sound quality is suitable for circulation. Valuable presentation might only be included if narration is re-recorded. Accepted presentations will be included on the RAINS CPD in-service CD. All presentations should be accompanied by 10 review questions. Presentations should be sent by mail to: The Editor, PO Box U102, CSU, Wagga Wagga, 2678.

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Submissions should provide an educational review of an area of interest. The reviews should be well researched and present all valid perspectives. CPD articles may be accepted after review by the editorial board. Alternatively, the submission may be accepted with some suggested revision or deemed not suitable for the purpose intended (CPD). All submission must adhere to the guidelines provided by the *Journal of Nuclear Medicine Technology*; available on the SNM web site (www.snm.org).

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