diagnosis was published back in 2011, the lung SPECT component only described 3 cases and all used $^{81m}$Krypton as the ventilation agent [see “The Crucible” 5: #3, August 2012].

The plan is to make www.spectlung.com a valuable reference library, a ‘Go To’ site, to find comparative cases to those that might have been giving you difficulties, or simply to teach newer Physicians the skills of image interpretation. By simply clicking on a few (3 or more) patient history items of the 66 listed, case studies will be displayed that will hopefully help you in your decisions. The library currently has only 26 studies, but we urge all who wish to enhance the knowledge of SPECT V/Q as a diagnostic tool of great value, to contribute further studies. It would be especially helpful to submit cases in which you were wrong, if you have the courage to do so. That way others can hopefully learn from mistakes as well. There is the option of being identified or not – your choice.

Quantitative SPECT a sensitive marker for early COPD.

As foreshadowed in the last ‘Crucible’, the Swedish group from Linköping University have just published the results of a pilot trial of their quantitative SPECT ventilation imaging using Technegas, showing how sensitive their technique is in classifying COPD. [Does quantitative lung SPECT detect lung abnormalities earlier than lung function tests? Results of a pilot study Norberg P, Persson HL, Schmekel B, et al. EJNMMI Research 2014, 4:39 http://www.ejnmmires.com/content/4/1/39].

“Fourteen healthy subjects without documented lung disease or respiratory symptoms, and two patients with documented airway disease, inhaled on average approximately 90 MBq $^{99m}$Tc-Technegas immediately prior to the 20-min SPECT acquisition. Variation in activity uptake between subjects was compensated for in resulting CV values. The area under the compensated CV density curve (AUC), for CV values greater than a threshold value CVT, AUC(CV > CVT), was used as the measure of ventilation heterogeneity.

“Results: Patients with lung function abnormalities, according to lung function tests, generated higher AUC(CV > 20%) values compared to healthy subjects (p = 0.006). Strong linear correlations with the AUC(CV > 20%) values were found for age (p = 0.006) and height (p = 0.001). These demonstrated that ventilation heterogeneities increased with age and that they depend on lung size. Strong linear correlations were found for the lung function value related to indices of airway closure/air trapping, residual volume/total lung capacity (RV/TLC; p = 0.009), and diffusion capacity of the lung for carbon monoxide adjusted for haemoglobin concentration in the blood (DLCOc; p = 0.009), a value partly related to supposed ventilation/perfusion mismatch. These findings support the association between conventional lung function tests and the AUC(CV > 20%) value.

Conclusions: Among the healthy subjects, there is a group with increased AUC(CV > 20%) values, but with normal lung function tests, which implies...
that it might be possible to differentiate ventilation heterogeneities earlier in a disease process than by lung function tests.”

**Economic Analyses in Nuclear Imaging procedures**

A recent editorial in the European Journal of Nuclear Medicine and Molecular Imaging carried some timely advice to clinicians to promote the economic benefits to flow from introducing new diagnostic measures. [Demonstrating the benefits of clinical nuclear imaging: is it time to add economic analysis? Høilund-Carlsen PF, Gerke O & Vach W. Eur J Nucl Med Mol Imaging (2014) 41:1720–1722.]

Although the paper focused on one example, the economic consequences of adding SPECT/CT to a standard sentinel lymph node excision (SLNE) procedure in patients with cutaneous malignant melanoma, the authors strongly encouraged this approach for other procedures. “We urge clinical nuclear and molecular imagers to take up the baton and follow the example of Stoffels and co-workers to include whenever possible CEs [cost effective analyses] or other relevant economic analyses in the assessment of new diagnostic imaging methods.”

**Safe management of PE patients diagnosed with V/Q SPECT.**

[Le Roux P-Y, Palard X, Robin P, et al. Safety of ventilation/perfusion single photon emission computed tomography for pulmonary embolism diagnosis Eur J Nucl Med Mol Imaging (2014) 41:1957–1964] Although this single centre study of 393 patients and run over two years, employed 85mKr as the ventilation agent, their imaging and reporting protocols followed the European Association Guidelines for V/Q scintigraphy. They found the “prevalence of PE was 28 %. V/Q SPECT was positive for PE in 110 patients (28 %) and negative in 283 patients (72 %). Of the 110 patients with a positive V/Q SPECT, 78 (71 %) had at least one additional imaging test (computed tomography pulmonary angiography or ultrasound) and the diagnosis of PE was eventually excluded in one patient. Of the 283 patients with a negative V/Q SPECT, 74 (26 %) patients had another test. The diagnosis of PE was finally retained in one patient and excluded in 282 patients. The 3-month thromboembolic risk in the patients not treated with anticoagulants was 1/262: 0.38 % (95 % confidence interval 0.07–2.13).” Although they recognised the limitations of a single centre study, they point out it was run within the normal day-to-day operations of the department using whoever among their 8 Physicians was on call. They were able to conclude: “A diagnostic management including V/Q SPECT interpreted with a diagnostic cut-off of one segmental or two sub-segmental mismatches appears safe to exclude PE.”

**EANM Congress, Gothenburg, Sweden October 18-22.**

There were a total of 6 presentation abstracts, posters and oral, published in preparation for this year’s congress that would be of direct interest to our newsletter readers. They are summarised below.

[P701 Haddock B, Hambak Hovind P. Effects of imaging resolution and count density on diagnostic quality of SPECT ventilation/perfusion ]

This study compares a high-resolution imaging protocol (LEHR with 128 x 128) with the EANM recommended low-resolution imaging protocol on the precision in diagnosing patients. Ten patients were scanned using a high-resolution imaging protocol and another ten were scanned using a low-resolution imaging protocol. Three physicians scored the ventilation and perfusion images on a scale from 1-5 for: resolution, tissue contrast, hotspot artefacts and diagnostic quality. They were also asked to write a diagnosis with comments for each patient as per usual standards for the department and to rate the certainty of their diagnosis on a scale of 1-5…

**Conclusion** There was no improvement in the clinical quality of ventilation/ perfusion SPECT images by using a higher resolution acquisition. Count density was found to be of primary importance.


We studied 30 patients (25 women) with mean age 63 (20-80) y/o, with suspected PH that were referred for PE diagnosis. The diagnosis of suspected PH was established by results of echocardiography, V/P scan and angioCT. We obtained initial V/P planar scintigraphy (V/P scan) with 99mTc-aerosol (Technegas) and 99mTc-MAA, assessing ventilation-perfusion mismatch. Final PH diagnosis was established after follow up (24-36 months). In patients with suspected PH, the V/P scan is an accurate diagnostic tool in the initial screening to detect PE, to establish the correct treatment and to assess evolution during follow up. We found high concordance between the results of V/P scan and angioCT to diagnose PE, and also high correlation with the final diagnosis. The high negative predictive value of the V/P scan allows to exclude PE with high security in patients with suspected PH.


We compared diagnostic accuracy achieved by using the software-tool Hybrid Lung™ (Hermes Medical Solutions, Sweden) with those of “conventional” side by side reading of ventilation and perfusion SPECT-studies . Conclusions Experienced physicians don’t benefit or only insignificantly from the use of a software-tool, that calculates V/P-mismatches. However if inexperienced readers use the software, the diagnostic accuracy increases. Images generated by automated calculation of V/P-mismatches are easy to read and this tool helps to standardize and objectify the detection of V/P-mismatches and the diagnosis of PE.

[OP563 Begic A, Opankovic E, Hadziredzepovic A, et al. Impact of ancillary findings in patients with suspect-
ed pulmonary embolism] 331 consecutive patients with clinically suspected PE were examined. Patients were classified according to V/P SPECT pattern such as normal, PE, pneumonia, chronic obstructive pulmonary disease (COPD), left heart failure (LHF) or tumor. Patients were followed up clinically and by other laboratory tests. This study shows high prevalence of other cardiopulmonary diseases among patients suspected with PE that might be identified by V/P SPECT. V/P SPECT ancillary findings can clarify patients’ symptoms and might have impact on treatment.

[OP564 Olsson B, Jögi J, Hindorf C, Bajc M. V/P SPECT in pregnant women with suspected pulmonary embolism] During the 5 year period (2009 -2013) 127 pregnant women were examined with V/P SPECT due to suspected PE (mean age 30 yrs, range 18-48). This study showed that the prevalence of PE among pregnant women is low (9%), which emphasizes the need for low radiation doses. The radiation exposure from V/P SPECT is low, both for foetus and the patient. A ventilation study is important to clarify patient symptom.

[OP565 Ibañez-Bravo S, Banzo I, Quirce-Pisano R, et al. Contribution of V/Q SPECT lung scan in patient with high probability of pulmonary embolism in comparison to computed tomography pulmonary angiography] The aim of this study was to evaluate the V/Q SPECT lung scan in patients with high clinical probability of PE, in comparison to computed tomography pulmonary angiography (CTPA). Prospective study in 56 consecutive patients with high clinical probability of PE (Wells score >3 and elevated D-dimer serum levels.) All patients underwent V/Q SPECT lung scan and CTPA. Technegas and 99mTc-MAA were used for ventilation and perfusion, respectively. Conclusions These data suggest that V/Q SPECT lung scan has a clinical usefulness for PE diagnosis in patients with high clinical probability of PE and negative CTPA.

Bill Burch
14-Sep-14

---

**COMMENT**

Dear Readers,

This is the final edition of the ‘Crucible’ for the year so I would like to bring a number of significant events to your attention.

Firstly, Bill Burch’s précis of papers and issues related to Technegas provides a summary and reference for a number of publications related to Technegas which have recently appeared. Of particular interest is the increasing number of citations for the use of Technegas in the imaging of respiratory morbidities. It is not that long ago that Technegas was only considered when a patient was suspected of having a Pulmonary Embolism. The papers reviewed in this edition describe the emerging value of Technegas in SPECT imaging of C.O.P.D. and its potential in other respiratory co-morbidities.

Also, as mentioned in Bill’s review, Cyclomedica has revamped its Spectlung website to make it an interactive and educational website. The objective is to make it a ‘go to’ website when an unusual case presents for a reference in the hope that a similar set of scans and clinical notes will assist in your diagnosis. For this to work and become more valuable we are relying upon your input. If you have interesting, unusual, difficult cases, whether called accurately or not, which you feel might assist other physicians in making the correct diagnosis or not making the same mistake, we urge you submit them for addition to the clinical data base. Details of the website appear in this issue and how you can contribute is also outlined.

We have also recently made available a SPECT lung map to make localising suspected P.E. a little bit easier (see the Teaching Aids and Reference Material section on page 5). I would like to thank Professor Marika Bajc from Lund University hospital in Sweden and Doctor Bill Burch for their efforts in bringing this project together. Please get in touch if you would like us to send you any of this material.

Technegas is going from strength to strength. After so many years being regarded as a diagnostic tool in the detection of Pulmonary Embolism, V/Q SPECT has widened the diagnostic door for the use of Technegas to its ‘potential’ use in a number of respiratory co-morbidities. While more work and validation is required the initial results look extremely promising. I would, therefore, exhort any sites still performing Planar imaging with Technegas to switch to V/Q SPECT. As with anything new or different, there will be that initial period of uncertainty, but I can assure you that the effort will be worthwhile.

Cyclomedica is also working on a number of products which we believe will be of significant value to nuclear medicine practices world-wide. A merry and safe Christmas to all and a prosperous 2015.

Charles Buttigieg
Asia-Pacific Marketing & Sales Mgr
Cyclomedica

---

[Image of Charles Buttigieg]
CASE STUDIES

In our quest for new Case Studies to add to the reference library contained in our spectlung.com website we recently received this file which is an excellent example of the type of informative material we seek. If you or your department have similar Case Studies that will improve the variety and therefore the knowledge base of our online library then please get in touch.

42 yo male with multi trauma injury, day 2 post spinal fixation T6-T10, sinus tachycardia; old LVH and new T–inversion; Negative CTPA 1 day ago for major PE.

Diagnosis: matching defect in the posterior right lower lobe and left lung base corresponding with consolidation but a mismatched defect in the right middle lobe which with hindsight and fusing with the CTPA, we were able to identify at least 2 PEs.

Dr. Aurora Poon  
Dept of Molecular Imaging and Therapy  
Austin Hospital  
145 Studley Road  
Heidelberg  
Victoria 3084 Australia  
aurora.poon@ausrin.org.au
1) Pulmonary Embolism
This 32 page booklet has been put together with the input of your colleagues and provides a great deal of information on effective diagnosis of P.E.

2) Algorithm card
A fully referenced, pocket size algorithm for diagnosing P.E.

3) SPECT Lung Map Kit
Comes with Lung template film to aid diagnosis.

4) Wall Chart
Diagnosing P.E. and reconstructing planar images from SPECT.

Have you visited - www.spectlung.com

The information source for all aspects of lung imaging including Case Study examples of PE detection, Literature, Imaging Issues, Diagnostic Options, GP Info and Links to other sites.

Submit Case Studies
To make spectlung.com a truly useful reference library we are seeking interesting, unusual Case Studies. Help us build this resource.

Send your files and images or inquiries to - casestudies@spectlung.com

Medical Information and Adverse Reaction Reporting
Cyclomedica provide distributor and customer support with medical information queries on the products.
Customers are advised to initially contact their local distributor, or they may contact Cyclomedica Australia direct using the contact details below.
If you wish to report an adverse reaction to the product this can be done using the same contacts details.

Telephone +61 (0)2 9541 0411
Facsimile +61 (0)2 9543 0960 or Email: vigilance@cyclomedica.com.au

TEACHING AIDS AND REFERENCE MATERIAL
Don’t forget, we have many teaching aids which your department may find of value:

TECH TIPS

1) During my regular service trips over the past few months I’ve noted on several occasions that the three pin connections on the mains plug are loose. This is usually the result of the generator power lead being removed by pulling on the lead not the plug. It is inadvisable to do this. Please be aware that you should always remove the mains connection by pulling the plug and NOT the lead.

2) Contacts are not being replaced every 50 burns as prompted by the generator. This is important to maintain optimal Technegas generator functionality. If it is not convenient at the time of prompting owing to work demands, the contacts should be replaced as soon as possible thereafter.

3) Over time the trolley wheels accumulate hair, dust and waste restricting free wheel movement. If you notice that this is happening it is a good idea to remove it before too much accumulates making movement difficult and cleaning a tougher chore.

4) If your department is missing user manuals or any relevant Technegas Generator information please get in contact so the items can be replaced. You never know when a source of reference might be needed.

Richard F Gotch
Global Service Manager.
Cyclomedica Australia P/L.
Mobile +61 (0) 418 203 629
TechnegasPLUS

Best agent for V/Q SPECT

- Proven diagnostic accuracy - especially in presence of COPD
- Almost 4 million studies performed in 53 countries
- No exclusion criteria; neonates to frail-aged
- 1-3 breaths for full dose
- Non invasive
- Low radiation burden compared with CTPA*

Posijet

Total control - the power, convenience and precision of bulk dose operations

- Load one bulk FDG dose - Minimal exposure to patient or operator
- Completely manoeuvrable - move to the patient
- Internal power - no need for power points
- Draws up patient dose for injection - exact dosage

Connects to patient records - Completely current files

- Patient dosage printout - Stays with patient for confirmation
- Step by step touch screen - Added safety in operation
- Manual injection - Added assurance of cannula placement

Ask About Posijet

Contact your nearest office -

ASIA / PACIFIC / STH AFRICA - Cyclomedica Australia - sales@cyclomedica.com.au Ph: + 61 2 9541 0411 Fx: + 61 2 9543 0960
Contact - Charles Buttigieg Ph: + 61 2 9541 0411 M: +61 (0)418 285 048 E: cbuttigieg@cyclomedica.com.au

EUROPE / MIDDLE EAST / NTH AFRICA - Contact Mr Bjorn Altmann - info@technegas.de Ph: +49 (0) 5341 550802 Fx: +49 (0) 5341 55803

CANADA - Cyclomedica Canada - lynn.mclauchlin@cyclomedica.ca Ph: +1 905 319 9610 Fx: +1 905 319 0497
Contact - Lynn McLauchlin Ph: +1905 690 0345 Fx: +1905 690 0553

LATIN AMERICA - Cyclomedica Latin America - mlema@cyclomedica.com.ar Ph: +54 11 4585 9172 Fx: +54 11 4586 0251
Contact - Martin Lema Ph: + 54 911 5174 1639

GERMANY - Cyclomedica Germany - info@technegas.de Ph: +49 (0) 5341 550802 Fx: +49 (0) 5341 55803 Contact - Bjorn Altmann

* About 1/7th of breast tissue exposure