

Vale – Rod Browitt

April 5, 1940 – May 18, 2006

Our dear friend and Research team colleague, Rodney James Browitt has died after a long and painful battle with Cancer, aged 66.

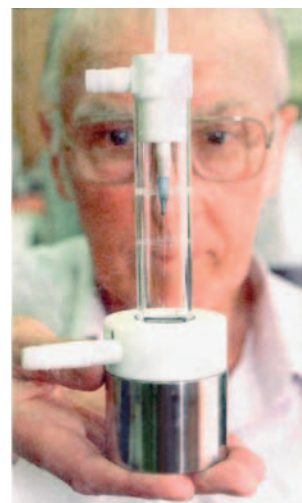
Rod was the greatest natural experimental scientist I have had the privilege of knowing, with no formal University qualifications or academic training. He was absolutely meticulous about taking very detailed notes of every observation in each experiment he performed –tests he called them -, and he would worry about something he did not understand until he could devise an experiment to pinpoint what was going on.

Rod just loved every minute of his laboratory life, often taking bits of “junk” home to his shed to continue ‘playing’ with it towards some new discovery. Wherever he worked and interacted with people,

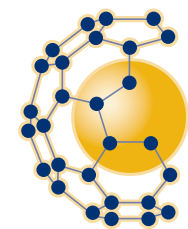
Rod was universally loved for his knowledge, willingness to help others, and his infectious good humour. He has informally mentored several young people in science, enhancing and guiding their natural curiosity for discovery. Rod Browitt was the pivot around which the research team swung as we grew and diversified into testing new ideas in animals, and finally humans. Yet equally he recognised the need to be just as diligent and thorough with the routine measurements for QC and related purposes required by the Company.

It is entirely fitting that the Australian National University has now named our laboratory the “Browitt Nanoparticle Research Laboratory” in his honour.

Bill Burch



Rod Browitt and his “Precipitron”



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Hospital name: Hospital San Juan de Dios
City: San Jose
Country: Costa Rica
Vitamedical distributor in Costa Rica: Elvatron S.A.

Hi David, how are you doing?

I'm in Costa Rica since yesterday, and will fly back tomorrow. Let me tell you that the people at the Hospital San Juan de Dios are really excited about Technegas, I installed it yesterday, teach some maintenance stuff to our distributor here (Elvatron) and today, I gave the usage training, we did 3 volunteers, and the image quality was exceptional (as usual!!).

These people will use 1 PAS per patient, and they are very happy with the price of our disposables. The expected number of patients yearly is around 200 without Tgas so I guess this number will grow up with Tgas.

Tomorrow morning, I'll be visiting 2 more hospitals with Nuclear Medicine departments (there are only 3 hospitals with NM in Costa Rica right now), the other 2 are the Calderon Guardia Hospital and the Mexico Hospital.

Hopfully we will sell another one, but statistics are statistics, right now... we have 33.33% of the marketshare!! Ja Ja!!!

Ok my friend, hope to have more good news soon.

Take care

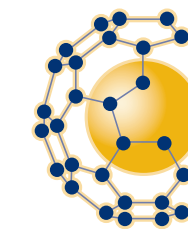
Martin

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VITA Medical Newsletter

Issue 2 July 2006



In this edition of Vita News we explore the issue of tissue radiation burden. Our contributors explore the effect of V/Q lung imaging and CT imaging in the diagnosis of Pulmonary Embolism. Bill Burch's review also highlights the favourable comparison of V/Q SPECT versus CTPA. Is there anyone left out there who thinks that PIOPEP I or PIOPEP II retains much relevance these days?

A big thanks to the authors of this edition's "Case Report" for kindly agreeing to allow reprinting of their original work. Potter, Kyriou and Cook from the Radiological Protection Centre at St Georges Hospital in London, compared the radiation burden of V/Q scanning and CTPA on the maternal breast tissue in the diagnosis of Pulmonary Embolism. Their results and conclusions make for sober thought.

Vita Medical Limited has changed its name to Vita Medical Australia Pty Limited. Vita took the opportunity at the recent ANZSNM to relaunch Technegas PLUS. A great deal of interest was generated by the physical presence of the new generator. I would like to take this opportunity to encourage all Technegas users to consider upgrading to the Technegas PLUS generator. Any generators ten or more years old should be upgraded and we are offering lucrative

opportunities to encourage this. The "end of life" generators will become expensive and time consuming to repair as Vita shifts to full production of Technegas PLUS.

I included a note from our South American colleague, Mr Martin Lema on his success in Costa Rica lest we forget that Technegas is a truly international product. I shall include a note from our Canadian colleagues in a future issue. This market has been a truly remarkable success story. As Vita Medical Australia P/L pursues FDA approval to market in the USA, stories such as these provide one small step for Vita but a giant leap for Technegas.

Charles F Buttigieg



Literature Review

V/Q with SPECT – the best screening test for PE

The well known possible consequences of missing a diagnosis of PE, can and does often lead to over investigation for the condition. In the early days of clinical trials of Technegas in Canberra, we began to get increasing referrals of young women, smokers taking oral contraception, for a V/Q study from one GP. They were all normal studies, and I recall a discussion with one patient who said she had been playing tennis and strained a muscle in her back, but was referred in for the V/Q. It transpired that the GP had previously missed a PE in a patient who dropped dead soon after leaving the surgery. Such an enhanced sensitivity to the diagnosis and sometimes completely inappropriate referrals are hardly surprising, and many referring Physicians must have similar stories to cloud their better judgement in times of doubt over PE. This is why firstly, the possible diagnosis of PE should be treated as urgent, and secondly, a V/Q SPECT study should be recognised as the clear test of choice currently to make that differential diagnosis.

A ventilation-perfusion SPECT study should be the definitive screening test for pulmonary embolism (a) because increasing peer reviewed evidence points to

at least equivalent sensitivity and specificity as any other imaging modality and (b) because there are no contraindications for the patient as even comatose and uncooperative patients may be examined, compared with up to 15% failure in radiological contrast study referrals. Also, from the patient's point of view it is far less invasive – how many of your patients with pleuritic chest pain cannot do a deep inspiration or hold their breath at all? – and the time from referral to report can be under an hour. By contrast a report in Radiology (2005;237(1):329-37) by Jones and Wittram concludes that the two major causes of indeterminism in 237 of 3612 patients undergoing CTPA for PE are motion artefacts and poor contrast enhancement. Clearly where a Nuclear Medicine service is not provided as part of the clinical 'gatekeeper' in Emergency Departments, then Radiological imaging such as CTPA is substituted; although that niggling 15% combined with a considerably larger radiation dose, especially to the female breast, should encourage mechanisms for bringing V/Q SPECT into the 'on-call' suite of procedures.

PE remains a problematic diagnosis

A search of 'Medline' for 'pulmonary & embolism & diagnosis*' over the last year returned 443 papers in the peer reviewed literature, an overwhelming testimony to the seriousness taken of making the diagnosis and the total lack of overall consensus. Yet the literature is replete with comparisons between radiological and V/Q imaging to give an automatic bias towards Radiology. As an example, a meta-analysis by Hayashino et al (Radiology, 2005; 234:740-8) of 12 publications finds that "helical CT has greater discriminatory power than V-P scanning with normal and/or near normal threshold to exclude PE, while helical CT and V-P scanning with high probability threshold had similar discriminatory power in the diagnosis of PE". But they were comparing planar V/Q from 1985-2003, with CT from 1990-2003. This large volume of literature will be trawled in detail for a report next time. Obviously, a simple blood test like the D-dimer would be everyone's ideal screen – if it were infallible or nearly so. Ten of some 49 abstracts reviewed so far gave varying degrees of support for the value of the

D-dimer. A report particularly critical of the value of D-dimer was presented at the Australian Nuclear Medicine meeting recently by Nadesapillai et al. The authors analysed a large cohort of patients referred in for PE to find no correlation between D-dimer and V/Q against the clinical diagnosis over a three month follow up.

The revamped Technegas website at the ANU is attracting increasing numbers of visitors (>8000 since October 2004), with many pages being downloaded, and although it has several authors' contributions, I would encourage anyone with an interesting case study or anything else of value to our community to send it along. The URL is <http://jcsmr.anu.edu.au/technegas> and you will find the contact e-mail there as well. If anyone has the time to look for obscure Technegas references, a "Google" search on the word will return over 5,000 'hits'.

Bill Burch



Bill Burch has retained an Honorary Visiting Fellowship at the John Curtin School of Medical Research within Australian National University since 1976. His background includes stints in Antarctica in geophysics, radiotherapy, and nuclear medicine in Melbourne, the U.K. and Canberra where from 1976 to 1984 he began his quest to find good ventilation agent. He "stumbled" upon Technegas and has been its champion ever since.

Case Report -

Comparison of the radiation dose to the breast during CT pulmonary angiography and lung perfusion scanning. Implications for the diagnosis of pulmonary embolism in pregnancy.

KC Potter, J Kyriou, JV Cook. St. Helier Hospital, Carshalton. "The Radiological Protection Centre, St. George's Hospital, London"

Abstract

Although pulmonary embolus is a significant cause of death during pregnancy, most pregnant women who are investigated for suspected pulmonary embolism have negative imaging. In our institution, of 50 pregnant women investigated for suspected pulmonary embolism, only 2 had diagnostically positive imaging. CTPA gives a significantly lower foetal dose than Tc-99m perfusion scanning (risk of induced childhood malignancy is <1/million following CTPA and 1/280,000 following a Tc-99m perfusion scan). Therefore CTPA has become the investigation of choice during pregnancy despite having a higher maternal effective dose (2mSv) than perfusion scanning (0.6mSv).

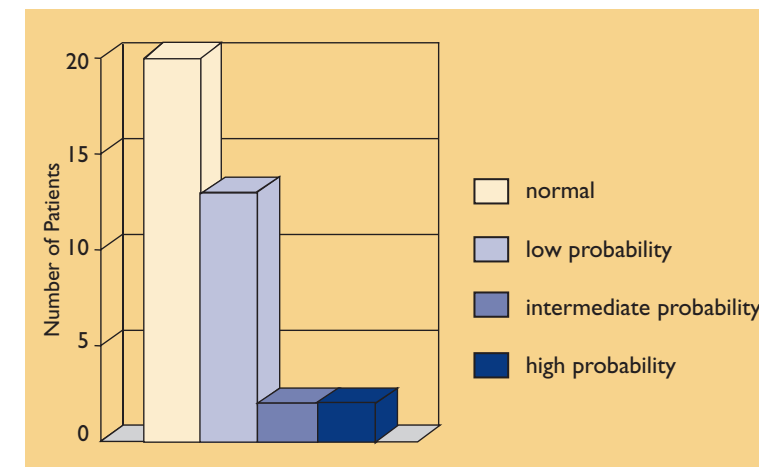
We investigated the radiation dose given to the maternal breasts during CTPA and perfusion scanning. The breast dose from CTPA (10mGy) is nearly 40 times higher than from a perfusion scan (0.28mGy). Younger women are considered to be more at risk of radiation induced breast malignancy than the older screening population. It is also of concern that the proliferating breast in pregnancy is likely to be more radiosensitive.

These factors should be taken into account when consenting the mother for diagnostic imaging and Tc-99m perfusion scans may still be the investigation of choice in those with a family history of breast cancer or those who have had previous studies.

Introduction

Pulmonary embolism has an increased incidence during pregnancy and in the post-natal period. It is the leading direct cause of maternal deaths. On average, 10 women per year die in the UK from pulmonary embolism during pregnancy and in the post-natal period (1). It is therefore important to diagnose and treat this condition.

However the majority of women presenting with symptoms suggestive of pulmonary embolism do not prove to have a positive diagnosis. Any imaging of suspected pulmonary embolism in pregnancy must be justified and the method of investigation selected according to the balance of risk to the mother and the foetus. Investigation of pulmonary embolus normally includes clinical assessment, d dimer levels, doppler US of the deep leg veins and Tc99m perfusion lung scans or CT pulmonary angiography.



Results of 37 pregnant patient's perfusion scans

Audit

We audited the pregnant women with suspected pulmonary embolism referred for Tc99m perfusion scanning in our institution over a 5 year period from 1998-2003. Over this period, 37 pregnant patients were investigated. Only 5.5% (2 patients) had high probability imaging and were anticoagulated. This is comparable to a larger published series where only 3.3% of pregnant patients being investigated with perfusion scanning yielded positive results(2). Only 30% of the patients we audited had undergone prior doppler ultrasound of their deep leg veins. Should this investigation be positive, the patient's chest symptoms can reasonably be assumed to be due to a pulmonary embolism. Anticoagulation can therefore normally be instituted without further imaging. To minimise radiation exposure to pregnant patients, our protocol now strictly includes bilateral deep leg vein doppler ultrasound prior to further investigation.

Dose Implications

As the foetus is particularly sensitive to radiation, exposure should be minimised whilst addressing the health needs of the mother. Recently, CTPA has become the investigation of choice for suspected pulmonary embolism in pregnancy. This is because the radiation dose imparted to the foetus is lower than during a perfusion scan. However the maternal radiation dose is higher.

When performing perfusion scans during pregnancy, a lower dose of Tc99m (50MBq) is given compared with our standard protocol (100 MBq). This gives a maternal effective dose of 0.6mSv. The corresponding foetal dose is 0.12mGy. The CTPA protocol we use gives a maternal effective dose more than 3 times higher at 2mSv, but a very low foetal dose of 0.01 mGy (see table 1). The calculated risk of childhood malignancy for the foetus is 1 in 280 000 for a perfusion scan, but <1 in 1 000,000 following a CTPA.

However, during a CTPA, the breasts are directly exposed. This is reflected in the relatively high dose they receive during these studies (10mGy). During a perfusion scan the breast dose is much smaller (0.28mGy). Breasts are known to be particularly radiosensitive and the proliferating breast in pregnancy would be expected to be at a higher risk.

Table 1

Breast, In-utero Dose and Effective Doses from ^{99m}Tc MAA Perfusion and CTPA Scans

Organ	Absorbed Dose from 50MBq ^{99m} Tc MAA ¹ Perfusion Scan (mGy)	Absorbed Dose from CTPA Scan ² (mGy)
Breast	0.28	10.13
Uterus	0.12	0.01
Effective Dose	0.60 mSv ³	2.01 mSv

¹ V/Q scan doses were calculated using the coefficients given in ICRP53 (6) for a standard adult.

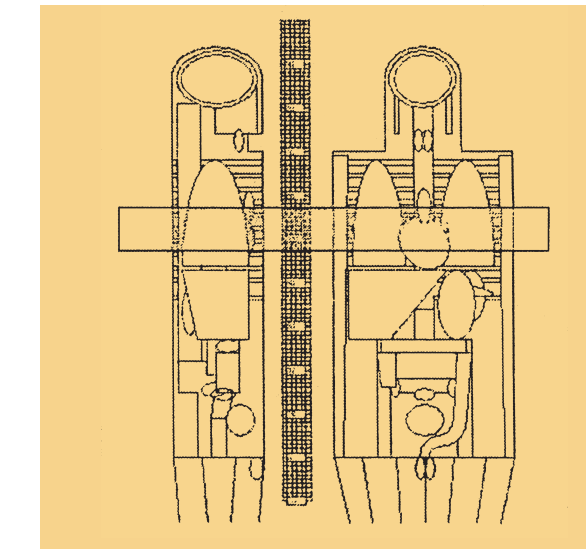
² CTPA doses were calculated using the ImPACT CT Patient Dosimetry Calculator (version 0.99v) (7) for a standard adult phantom.

³ Quantity specified in ICRP53 (6) is Effective Dose Equivalent.

Diagram showing extent of CTPA scan on mathematical phantom taken from the ImPACT CT Patient Dosimetry Calculator version 0.99v (3).

The scan factors were: 120 kV, 240 mA, 0.75 s per rotation, 3mm slice width, pitch = 1.5.

We are unaware of any previous studies specifically documenting the risk to the pregnant breast. However, exposure of the breast to ionising radiation in younger women has been shown to impart an increased breast cancer risk than that observed in older women undergoing screening mammography (see table 2). Exposure to radiation in younger life is known to give a higher life time risk.



The pubertal breast has been shown to have a higher risk of developing a malignancy following scoliosis monitoring with plain radiographs during childhood and adolescence. The US Scoliosis Cohort Study (4) of 5,466 women (each received an average of 25 spinal radiographs) found that they had a 70% higher risk of developing breast cancer than those not exposed. There were 77 cancers in the study group compared to 46 expected from US mortality rates.

Shielding of the breasts could also be considered. In-plane bismuth breast shields have been shown to decrease the dose to the breast by 28% during CT examinations of the chest and abdomen in paediatric patients. No significant alteration in image quality was perceptible (5).



Table 2
Risk of breast Cancer from exposure to Ionising Radiation as a function of age at exposure

Age	Total Breast Cancers Induced per Million Women per mGy
25 - 29	18.4
30 - 34	18.2
35 - 39	17.8
40 - 44	16.6
45 - 49	15.0
50 - 54	13.2
55 - 59	11.5
60 - 64	9.4

Reproduced from J Law and K Faulkner, BJR 74 (2001), 1121-1127 (ref 3)

Conclusion

This high radiation dose to the maternal breasts during CTPA has not been highlighted before to our knowledge. Whilst CTPA may remain the investigation of choice in pregnancy because of the very low foetal dose, the much higher maternal breast dose should be considered in patients who have a family history of breast cancer or who have undergone repeated investigations for pulmonary embolism in the past.

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