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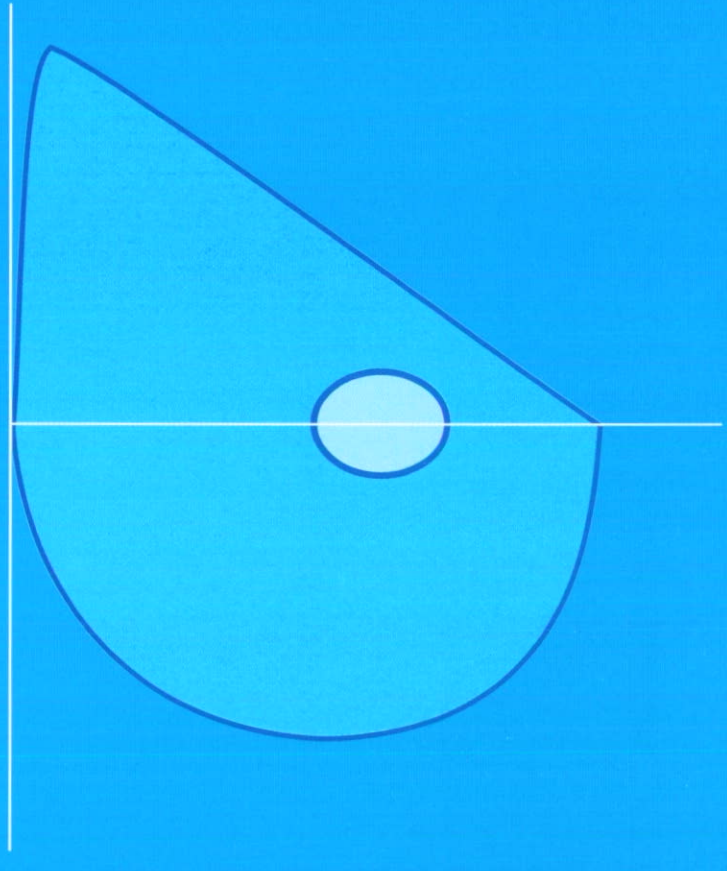
Inspire



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The Official Journal of the Association for Respiratory Technology & Physiology

Inspire

The Official Journal of The Association for Respiratory Technology and Physiology

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BURSARY INFORMATION

Bursaries are available to ARTP members, which can be used to support attendance at National ARTP, BTS or STS meetings. Other relevant respiratory meetings or approved training courses will also be considered. Bursaries are available to student, associate and full ARTP members of any grade. They can be used for partial or total funding of registration, travel and accommodation costs for the whole or part of the meeting/course. All bursaries are considered by the ARTP Executive Committee on the reason for the request and the commitment to an article for *Inspire*.
For further details or an application form please contact: **Gill Butcher (Bursary Secretary), Cardiorespiratory Unit, Queen's Hospital Burton, Belvedere Road, Burton on Trent, DE13 0RB. Tel: 01283 566333 Ext 5334 or via e-mail: bursary@artp.org.uk**

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FIRST WORD

Welcome to the summer edition of Inspire. There have been a few delays with workloads, holidays, IT problems etc etc (the usual sorry excuses) but finally ….

When you have finished reading, the journal may just be thick enough to provide a useful personal fan to use in our air conditionedless lung function departments. Hot debate on the forum as to what working temperatures are acceptable and when Heads of Department should be sending their staff home ….. we should be so lucky as to work for Alan!! Perhaps air conditioning should now be included in the "essential requirements for a lab" discussions … I can't remember this being mentioned at the Annual Conference workshops!

Now that registration is taking place for the ARTP Annual Conference 2004 don't forget that four bursaries of £200 are available to help members with registration costs. For an application form please contact me on bursary@artp.org.uk or telephone 01283 566333 Ext 5334.

The next edition of Inspire is planned for December so please send any articles or other items for inclusion to me by November 7th.

Gill Butcher, Cardiorespiratory Unit, Queen's Hospital Burton, Belvedere Road, Burton on Trent DE13 0RB. Tel 01283 566333 Ext 5334 Email inspire@artp.org.uk

CONTENTS

ARTP UPDATE

QA Scheme Pilot

Several of the regional network groups are gearing up to run the Inter-laboratory Quality Assurance Scheme, some of you may already have received the paperwork for the Phase 1 questionnaire. The QA leads from the network groups met in Birmingham on 3rd Sept to go through the protocols for Phase 2 and the spreadsheets to record the data collected before going out to do the laboratory visits. If you think you are missing out on being involved in the scheme contact your regional group facilitator (contact details can be found on the website).

Website

The ARTP website is now split into 'Public Access' and 'Members' Only' areas. The 'Members Only' area password has been changed to the one printed on the 2003/4 membership cards so if you haven't paid your subs you won't be able to access the additional material!

If you have any (own copyright) material (photos, clipart etc) that you would like to add to the gallery for all members to access and use please send it to me via email.

Another area where you can help is by submitting useful website links – send the URL and a line or two describing the site; quite often it is sufficient to copy and paste the first part of the website blurb. While using the Web links myself the other day I found a couple that didn't work because they had moved! Either people are not using these pages (admittedly the listings aren't extensive at the moment) or they aren't telling me that there are problems. If you notice any errors or problems please report them (preferably with a solution) so I can rectify them.

Forum

The email forum has been getting lively lately! Currently circulating to 281 email addresses and hitting an all time high of 189 messages in July (most of them serious!). Despite the odd moments of silliness I believe all participants benefit greatly whether just by venting their spleen, dumping their knowledge onto the group or just lurking, listening and learning along the way. 'I strongly suggest that you make sure someone in your department monitors the Forum. There are many important national maters on the horizon about which ARTP will need quick feedback; for example, if your department has an interest in sleep you were recently asked to register it via poll@artp.org.uk.' By the way, the offer is still open for a volunteer to summarise the forum conversations into a regular column in Inspire for those members who are under-endowed in the email department.

Survey

The survey is still falling short of 100% coverage and we are in urgent need of compiling accurate data to present to the DoH and other interested parties. With the current plethora of national initiatives – Workforce Planning, Agenda for Change, State Registration etc it is vital that we have an accurate picture of the profession to be able to fight our corner. I'll be circulating a list of labs we haven't heard from to the regional network groups so that they can chase up those that are missing. Please make sure you return your data asap.

Keith Butterfield
webmaster@artp.org.uk

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Flyers and mailshots will also be distributed via the ARTP e-mail forum

ARTP HANDBOOKS

New handbooks will be available shortly. Price £65 to ARTP members, £80 to non-members.
Contact Jackie Hutchinson ARTP Administrator to order
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DATES FOR YOUR DIARY

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Conference programme and registration forms now available.

Contact: ARTP Conference Administration Tel: 0121 241 1611

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THE ANNUAL CONGRESS OF THE EUROPEAN RESPIRATORY SOCIETY

27th September to 1st October 2003, Vienna

Website www.ersnet.org

BRITISH SLEEP SOCIETY ANNUAL SCIENTIFIC MEETING

14th to 16th September 2003, Robinson College, Cambridge

Email: bssoffice@huntingdon52.freeserve.co.uk

www.sleeping.org.ul

BSS Office, PO Box 247, Colne, Huntingdon PE28 3UZ

CASE STUDY – EXTRINSIC ALLERGIC ALVEOLITIS

Myriam Jackson

Grantham and District Hospital, United Lincolnshire Hospitals NHS Trust.

"Extrinsic Allergic Alveolitis is caused by a person inhaling fine particles of organic material to which they develop sensitising antibodies" (Walter and Talbot 1996). The dust particles must be 5 microns or smaller to get into the alveoli (CCOHS 1998).

Repeated attacks will destroy respiratory tissue leading to chronic spreading fibrosis. A 'honeycomb' appearance may be seen on chest X-rays, because some unaffected bronchioles might dilate in compensation. The effect of this is severe respiratory embarrassment which if not treated could cause respiratory failure and right heart failure (Govan, MacFarland and Callender 1995).

CASE REPORT:

The patient, a 43 year-old man, employed by a local car dealership as the servicing and parts manager, was considered to be fit and healthy until July 1996 when he became increasingly short of breath.

In August the patient attended his General Practitioner's surgery. His symptoms were attributed to lower respiratory tract infection. The patient was prescribed a course of Ceporex antibiotics. After a month the symptoms had not improved, so a further course of antibiotics was prescribed, this time Distaclor.

Three months after the initial symptom presentation, the patient was no better. He returned to the G.P's surgery. A different doctor saw the patient on this occasion. The G.P. examined the patient's chest and heard scattered crepitations throughout the lungs. The G.P. prescribed Prednisolone and arranged for the patient to attend the local hospital for a chest X-ray.

The chest X-ray was reported as showing diffuse, hazy shadowing throughout both lung fields with loss of definition on many of the pulmonary vessels. The radiologist questioned if the patient kept pets as he suspected "an active Alveolitis" and suggested that the patient be referred to the consultant chest physician.

The G.P. recalled the patient. When questioned the patient confirmed that he had a dog and cockatiels. The G.P. made an urgent referral to the chest physician.

The patient was seen at the local hospital in the respiratory physician's outpatient clinic (eleven days after receipt of the referral). The patient confirmed that, although he had kept birds for ten years, he had acquired a new cockatiel in June 1996. Shortly after the new arrival the patient's symptoms began.

On examination the patient was short of breath and complained of a tight feeling in his chest, which limited his walking to ten metres. The clinician requested another chest X-ray, and blood samples (full blood cell count, Urea and Electrolyte levels, Coagulation screening, lipid screening and avian precipitins screening) that day. The consultant requested urgent appointments be made for the patient to attend for high resolution chest CT and Lung Functions.

The consultant felt that the patient could be suffering from either Extrinsic Allergic Alveolitis or Psittacosis. It was important to establish which of these conditions the patient was suffering from, as the treatments would not be the same. Extrinsic Allergic Alveolitis could require steroids depending on the severity of the symptoms, whereas Psittacosis would require antibiotic treatment such as tetracycline (CCOHS 1998).

The patient continued to take the prescribed Prednisolone (50mg daily for 5 days and then slowly reduce the dose) until he was seen again in outpatients.

The patient attended the Medical Physics Department the following week for Lung Function testing (spirometry, transfer factor and lung volumes).

On arrival, the patient was obviously short of breath, and found the walk to the lung function laboratory difficult (approximately 25m from the waiting room). He was questioned carefully to ensure he was the correct patient. He confirmed that he had not used bronchodilators prior to attending. He was a non-smoker and, as the appointment was in the morning, he had not eaten a large meal or consumed any alcohol prior to his arrival. The patient was weighed (119kg) and measured (190cm) for use in calculating reference values (European Community Coal Steel 1983 version).

The lung function equipment used was MedGraphics 1070. Relaxed and forced vital capacities (flow volume loops) are assessed with a pneumotach. Transfer factor (single breath hold) is assessed by gas chromatography of mixed gases containing Neon for alveolar volume and Carbon Monoxide for transfer factor. Lung volumes are assessed by nitrogen washout.

The nitrogen washout procedure calculates lung volume by assuming an initial concentration of nitrogen in the lungs, removing the nitrogen by 'washing it out' with pure oxygen, measuring the volume of air expired during 'washout' and measuring nitrogen concentration in that volume to determine the actual volume of the lungs.

(See next page for Table of Lung Function Results)

The lung function was reported as: *Spirometry is suggestive of a restrictive ventilatory defect. Transfer factor is moderately reduced (assuming the patient has a normal haemoglobin level). Lung volumes are reduced which would confirm a restrictive ventilatory defect. The findings would be consistent with Extrinsic Allergic Alveolitis.*

The patient returned to the outpatients department three weeks after the initial consultation, where he received the results of the various tests undertaken.

Table of the Lung Function results obtained on the initial visit.

11 November 1996	Actual	Predicted	% predicted
Lung Mechanics			
FVC (L)	4.04	5.63	72
FEV_1 (L)	3.51	4.55	77
FEV_1/FVC (%)	87	80	
PEF (L/sec)	10.25	10.13	101
Lung Volumes			
SVC (L)	4.04	5.89	69
ERV (L)	0.68	1.41	48
FRC(N2) (L)	2.6	3.78	68
RV (N2) (L)	1.92	2.21	87
TLC (N2) (L)	5.96	8.26	72
Lung Diffusion			
DLCO ($mmolmin^{-1}kPa^{-1}$)	5.75	12.2	46
Kco ($mmolmin^{-1}kPa^{-1}L^{-1}$)	0.99	1.51	66
Alveolar Volume (L)	5.82	7.95	73

Radiology Report:

The high definition C.T. scan of the patient's chest showed *"extensive ground glass shadowing in both lung fields and in all zones with a fine nodular background. There are geographical areas of darker attenuation, which probably represent normal lung. The appearances were consistent with an extensive alveolytic process such as Extrinsic Allergic Alveolitis"* (Maddison 1998).

Avian Precipitins Report

Budgerigar serum antibodies not detected
Budgerigar faeces antibodies positive (+)
Budgerigar feather antibodies positive (+)

Pigeon serum antibodies not detected
Pigeon faeces antibodies positive (+)
Pigeon feather antibodies positive (+)

Avian antibodies IFAT positive 1/20

Low levels of antibody are present and are evidence of immunological exposure and sensitisation. Higher levels are more commonly associated with the clinical condition but are not exclusive.

The patient was told that the results of all the tests would indicate that he was suffering from Extrinsic Allergic Alveolits. He was advised never to keep birds again. At this time the patient consented to a bronchoscopy with alveolar lavage and trans bronchial lung biopsy.

Results obtained from the:-

Bronchial Wash cytology

Macro: 18 ml pale pink slightly cloudy fluid
Micro: branchial lavage cytology, smears containing bronchial epithelial cells, macrophages, lymphocytes and polymorphs. No malignant cells are seen.

Differencial count = Lymphocytes 70%
Polymorphs 14%
Macrophages 16%

Bronchial Biopsy

Macro: two pieces of pale tissue (each 0.3 cm maximal dimension)

Micro: Bronchial wall and underlying lung parenchyma including alveolar spaces. There is thickening of the alveolar walls with infiltrates by chronic inflammatory cells including lymphocytes and plasma cells. Within some alveolar spaces there are macrophages and there is hyperplasia of alveolar lung cells. Occasional multinucleate giant cells are seen but nor granulomas are identified. No vasculitis is seen. Features are consistent with extrinsic allergic Alveolitis although other cause of Alveolitis need to be considered in the deferential diagnosis. There is not evidence of sarcoidosis.

Bronchial Lavage Analysis

Total cell count 0.94 x 10^9L^{-1}

Normal range (0.14-0.20)		*CD3+ cells 69.00%*
Lymphocytes 71%	*(5.5-8.1)*	*CD4+ cells 52.00%*
Alveolar Macrophages 17%	*(91-94.2)*	*CD8+ cells 16.00%*
Neutrophils 8.0%	*(0-1)*	
Eosinophils 2%	*(0)*	*CD4/CD8 ratio 3.2*
		(Normal range 1.4-2.2)

The drug therapy was reviewed and he continued on Prednisolone, reducing the amount gradually over a period of one month.

Lung Function testing was repeated one month after the initial study, using the same equipment. The results showed significant improvement in all areas.

Table of the Lung Function results obtained on the second visit.

17 December 1996	Actual	Predicted	% predicted
Lung Mechanics			
FVC (L)	5.18	5.51	94
FEV_1 (L)	4.35	4.46	98
$FEV_1$1/FVC (%)	84	80	
FEF max (L/sec)	12.30	10.01	123
Lung Volumes			
SVC (L)	5.36	5.76	93
ERV (L)	1.12	1.40	80
FRC(N2) (L)	2.37	3.73	64
RV (N2) (L)	1.25	2.18	57
TLC (N2) (L)	6.62	8.10	82
Diffusion			
DLCO (mmolmin-1kPa-1)	10.00	12.24	82
KCO (mmolmin-1kPa-1L-1)	1.7	1.51	112
Alveolar Volume (L)	5.88	7.95	74

The patient attended outpatients quarterly for the first year, reducing to biannually for a year and then annually for two years. Prior to each attendance the patient undertook lung function testing and chest radiography.

The patient improved dramatically after commencement of high dose steroid treatment and following that the results remained fairly consistent throughout the period of testing. There was a slight drop in FEV1 and FVC noted on the last visit, which the consultant felt was a result of the patient having gained 20kg in weight from when he first attended.

The oral steroid drug therapy was reviewed at each outpatient visit. The initial amount was 50mg of Prednisolone at the outset in November 1996, which reduced gradually to 5mg Prednisolone on alternate days by March 1997. The amount continued to reduce until finally the patient no longer took oral steroids by the end of April 1997.

FOLLOW-UP

Whilst still attending the chest clinic, in early 1998 the patient complained of pain in his right hip. When the patient's hip was X-rayed it was reported as having appearances consistent with avascular necrosis. It was felt that the most likely cause of the necrosis had been the high steroid therapy treatment for the Extrinsic Allergic Alveolitis. The chest physician referred the patient to an orthopaedic surgeon.

By July 1998 the necrosis had caused significant collapse of the femoral head. The orthopaedic consultant felt that re-vascularation was not an option. Thus the patient was entered onto the waiting list for total hip replacement surgery.

The hip replacement was carried out in December 1998. Post surgical findings showed that the femoral head had typical upper pole segmental avascular necrosis, which had lead to a 5mm collapse in this region.

The patient was discharged from the care of the chest physician in July 2000, as it was deemed that the patient had been successfully treated for Extrinsic Allergic Alveolits. In this respect the patient remains well to this day. The patient keeps his distance from all birds.

However, he is still under the care of the orthopaedic consultant as he has continuing problems with his legs and lower lumbar spine.

References:

CCOHS (Canadian Centre For Occupational Health and Safety) 1998 Extrinsic Allergic Alviolitis.
www.ccohs.ca/oshanswers/diseases/alveolitis

CCOHS (Canadian Centre For Occupational Health and Safety) 1998 Psittacosis:
www.ccohs.ca/oshanswers/diseses/psittacosis

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Maddison I (1998) Extrinsic Allergic Alveolits
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Walter J B and Talbot I C (1996) Walter and Isreal General Pathology London: Churchill Livingston.

NATIONAL ISSUES

On 2nd July 2003, Brendan Cooper and Keith Butterfield attended a conference at Chester Racecourse, representing Respiratory Physiology. The meeting was organised by the Department of Health and was titled 'Have You Enough Healthcare Scientists for Effective Healthcare Delivery?' The conference was attended by a wide variety of stakeholders from key DoH personnel through trust HR and management representatives to the many professional bodies in healthcare science.

This article summarises the proceedings and the take home messages.

The conference's aim was to explore how to improve workforce planning for each, and all, of the Healthcare Science specialities. The main presentations were given by Tim Sands, Branch Head, Human Resources Directorate, Workforce Development, DoH; Andrew Foster, Director of Human Resources, DoH; Sue Hill, Chief Scientific Officer, DoH; Bill Sang, Chief Executive Cumbria and Lancashire WDC and Workforce Numbers Advisory Board Representative and Judy Curzon, Associate Dean, Head of the Workforce Review Team. There were also two breakout workshop sessions to discuss specific questions in more detail.

It was admitted that during the 1990s workforce planning in the NHS more-or-less fell down, which is why we find ourselves today with such shortages in medical and nursing staff that extra effort is having to be put in to make up shortfalls in the numbers required to maintain, and expand, services. Fairly intensive work has gone in to developing strategies to increase numbers in the aforementioned areas and the Department of Health now realises that the same measures need extending to cover Healthcare Science and Allied Health Professionals and to get away from the old system of 'Olive and Joan are retiring next year so we'll need to recruit someone to replace them' to a more strategic and planned approach.

Data were presented which showed that there was an increase of 58,000 staff in 2002 in the NHS as a whole. It is intended to increase the number of Healthcare Scientists by 30,000 over the period 2001 to 2008 (this data from the 2002 spending review). Data were also presented demonstrating that, on top of the 30% percent increase over three years in the NHS budget announced in 2000, in real terms the NHS spend will have increased 3-fold by 2008 (97/98 £34.7bn to 07/08 £90.2bn) but then so will the workload. The methods used in the past to close the gap between supply and demand are; improving retention, increasing productivity and changing the skill mix (by training staff up, and down, the skills escalator). It can be seen how the extension of regulation, Agenda For Change and National Occupational Standards fit in with NHS plans to modernise the workforce to improve the effective delivery of services. It is apparent that the DoH is expecting some efficiency improvements by cascading tasks down the skills escalator (as has already been done by delegating tasks such as simple spirometry and ECG's to ATO's) but HCS representatives made it clear that 'dumbing down' the role of the healthcare scientist is not a solution.

The Workforce Development Confederations (WDC's) are forecasting an increase of 4,450 training places in healthcare science (ie not Doctors or Nurses), however it is pure guesswork how many of these training places will actually end up as posts in Physiological Science (as opposed to the other strands of healthcare science, ie. Life or Physical). The purpose of this conference was to focus on the healthcare science requirements and guide decisions in that area.

The same workforce review team which was set up to develop the strategy for dealing with shortfalls in medical posts is now looking at adapting the lessons learnt during that exercise to improving the shortfall in healthcare science.

Sue Hill's presentation acknowledged that the previously mentioned estimates of numbers were likely to be an underestimate of what is needed. Department of Health figures for the number of staff working in clinical physiology are known to be inaccurate. For example, according to 2002's survey there are 4,018 qualified staff in the UK, we know from our own figures that there are approximately 900 working in respiratory physiology alone (though this may include an unknown number working across disciplines in joint cardio-respiratory labs). The RCCP estimates about 7500 work in clinical physiology though this is not a firm figure either. The Workforce Development Confederations will be guiding the Human Resource Departments in trusts to collect mandatory data on healthcare scientists in a uniform manner, via the new electronic staff record, and one of the functions of the workshops was to determine what grades actually work in each of the different disciplines that make up physiological science and to collect/verify the information on the different disciplines that was already available.

Money and capacity for training and CPD, at both local and national level, were raised as issues that need to be addressed (for example, how can a single-handed department provide a clinical service AND train students?). The NHS University may be able to help in providing e-learning opportunities for work-based training. It was highlighted that WDCs need to have a more national strategy to support HCS services so another possible result of the conference could be the introduction of National Co-ordination for the Healthcare Science Workforce - at the moment individual WDC's make their own decisions leading to inconsistencies between the educational provision in different regions.

It is reassuring that, at last, the 'powers that be' are consulting and listening to the HCS staff who can give the feedback that has plainly been missing to inform the DoH on the staffing and service needs for the future. Everyone is aware that HCS departments are under incredible pressure and there seems to be a clear intention to follow through this initial conference with more consultation, which can only be a good thing!

ADVERTISEMENT

A MINERS COPD STORY

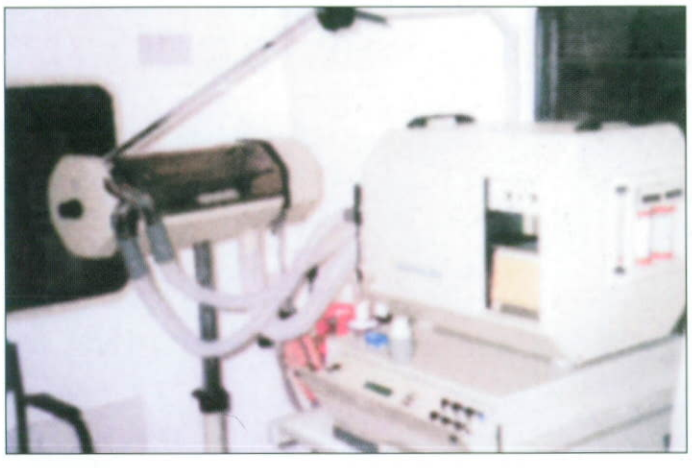
As the coal industry was being wound down during the latter part of last century, the government of the day assumed responsibility for, and took the liabilities of, British Coal on 1st January 1998, under the terms of the Coal Industry Act of 1994. British Coal had been taken to court in 1996 under two separate group litigations, both of which were supported by the mining unions, and was found negligent in relation to lung disease in 1998. A judgment enabled miners and their families to claim compensation for bronchitis and emphysema. The claim was thus against the British Government and as a result the Department of Trade and Industry was tasked with administering the claim through various contractors.

During the autumn of 1999, Morgan Medical was invited to tender for the supply of Pulmonary Function equipment to be used in testing the then estimated 80,000 potential claimants. Having been successful with our bid a number of Pulmolab TT-501's (more affectionately known as Benchmarks) were supplied and a project team under the management of Roy Kernaghan set up to administer the operational requirements of providing support and service. Delivery of instruments commenced in December 1999 to South Wales and Sheffield and continued apace during the first half of 2000

By the end of 2000 thirty instruments had been installed at various sites throughout the country, ranging from Scotland to Wales to Kent. To the end of September 2000, 944 claimants had been tested, but with the roll out of further instruments and training courses the pace continued until testing of at least 2500 claimants per month was achieved. An excellent rapport has been built up with the respiratory technicians, yielding high percentages of instrument usage and minimal down time.

During 2001 further instruments were delivered, bringing the total to 37. The project had well and truly bedded in but continual improvements are always sought. E-mail links were established between the various sites and the company call centre, and extensive use of faxed symptoms and direct telephone communication helped to reduce down time.

A decision was taken in early 2001 by the DTI to provide mobile testing of claimants, and as a result Morgan Medical was awarded a contract to develop and provide a mobile service for 2 instruments. The Winnebago is a unique vehicle built on a GM chassis that has been adapted to house a purpose built laboratory with a Pulmolab TT501, a doctor's office complete with examination couch, and a reception area with administrative facilities. A second vehicle arrived later in the spring. The Winnebago's or Mobile Test Units (MTU's) as we now know them, became operational in late summer 2001 with the first venue being South Shields, Tyne and Wear. To date the Mobile Test Units have visited 39 locations throughout the UK ranging from St. Austell in Cornwall to Coldstream in the Scottish Borders and everywhere in between.



It is reported in headline statistics that since testing commenced in early 2000, over 126,000 full lung function tests have been completed, 66,000 claims have been settled with a total of £631 million compensation and we have some way to go. A final date has now been set by which ex-miners must register their claim and the latest estimates indicate that the original 80,000 claimants has risen to 330,000. It is difficult to accurately predict at this stage when testing will be eventually completed, but it has been estimated that there may be 2 –3 years further work to complete the claim procedure. And what then? Morgan Medical and in particular the project team are actively seeking employment for one or more of the MTU's. Do you have a requirement? This could be anything from a long waiting list, a requirement to carry out building alterations without a reduction in service, to providing a temporary respiratory service while new buildings are completed.

If you have such a requirement, contact either Kevin Budd, General Manager or Roy Kernaghan, Operations Manager DTI Project at Morgan Medical Limited. We will be pleased to hear from you.

"ARTP Executive Committee do not neccessarily support the statements, opinions and views expressed in this advertising article."

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- ❑ Medisoft Pulmonary Function Test Systems — Static & dynamic spirometry, exercise testing and body plethysmography.
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- ❑ MB3 Dosimeter from Markos Mefar — Ideal for use with our spirometers to form a Bronchial Provocation study system.
- ❑ ComPAS & ScreenStar — PC based spirometry system from Morgan Scientific Inc.
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- ❑ Spiroguard 2800 — Anti-bacterial filters for Medisoft, Fukuda Sangyo and other PFT systems.
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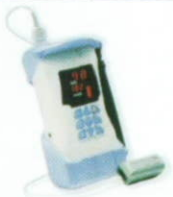

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3401 Oximeter with built in printer

3402 Digital oximeter with alarms & sleep study mode

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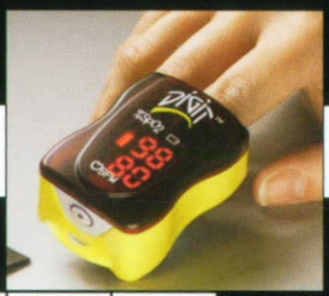

8400 Capnograph - handheld with optional oximetry

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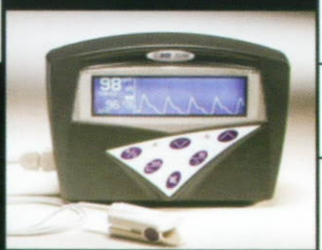

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3404-000 Digital Oximeter - waveform & optional ECG

9004 Capnograph - optional oximetry / Fi02 & sleep study model

LET PULMOLINK PROVIDE THE ANSWERS!

ON THE BLOWER

By Alan Moore, Brendan Cooper and Nigel Clayton

Five Star Contract Five Star Service

Radiometer have always been regarded as providing outstanding service in comparison to their competitors. Indeed Radiometer recently received a Gold Award for service. However, there isn't a company in existence who can get it right 100% of the time. When something does go wrong, it sets you looking at the problem and wondering why it happened to you. I'm genuinely sorry to have to write this about Radiometer but when something like this goes wrong, I think our members need to know what can go wrong even with the very best of companies. Firstly I will describe the problem in detail and then go on to describe the silver lining that may b

that was fitted was not new at all. It was taken from a demonstration machine in the back of another service engineer's car on the Friday evening and sent via TNT to our service engineer. Simply, the two service engineers didn't give the customer good service by going the extra mile and meeting up to hand over the component and going on to fix the problem properly. What I do not understand is that why did the service force take the only component that could have fixed the problem out of circulation by handing it over to TNT's custody for 4 days. Brilliant!

So what does Radiometer's (or any other companies) 5 star contract actually mean? Well, they have a 24 hour manned

ere is always someone there competition merely direct forget about you. So, after l return your call within 2 the engineer normally calls uarantee is that an engineer gh if it is outside 9:00 – 5:00, ave to pay extra but all reat so far.

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t me about any blood gas

rs to undertake PM visits at he day before a bank holiday

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has a reputation for good or two members of a service t company's previous good

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ite within 8 working hours of y average time to site visit ours.

PROVISIONAL PROGRAMME

ARTP Annual Conference

THURSDAY 29 JANUARY 2004

18:30	Keynote Speaker
19:15	ARTP Open Forum
19:45	Manufacturer's Reception

FRIDAY 30 JANUARY 2004

Plenary Session - Respiratory Exercise Testing Session

09:45	Breath by Breath Exercise Testing
10:10	Traditional Exercise Testing
10:25	The Future of Comprehensive Exercise Testing
11:00	**Refreshments & Poster Viewing**

Plenary Session - Blood Gas Testing

11:30	Physiology of Blood Gases
11:55	Methods of Measuring Blood Gases
12:20	Interpretation & Clinical Applications
12:45 - 13:45	**Lunch & Poster Viewing**
13:00 - 13:40	**Lunchtime Workshops**

1. Practical Exercise Equipment
2. Practical Blood Gas Analysis
3. Blood Gas Sampling

Simultaneous Sessions

Respiratory Technology

14:00	Which CPAP
14:25	Alternative Treatments for OSA
14:50	Advances in Respiratory Measurement

Respiratory Physiology

14:00	Control of Ventilation
14:25	Advances in Lung Mechanics
14:50	Advances in Gas Exchange
15:15	**Refreshments & Poster Viewing**
15:45	Guest Lecture
19:00	Drinks Reception & Gala Dinner

SATURDAY 31 JANUARY 2004

09:00	**AGM**

Poster Session

Plenary Session - Update on Lung Diseases

11:30	Sarcoidosis
11:55	Connective Tissue Diseases
12:20	Obliterative Bronchiolitis
12:45	**Close of meeting**

For further information please contact:

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202 Meany Hill Road
Sutton Coldfield
West Midlands B72 1JX
United Kingdom
Tel/Fax: +44 121 241 1611
Email: admin@artp.org.uk
Website: www.artp.org.uk

- All parts used from an engineer's stock on any one day are logged back to the company immediately after a service call. These parts are then replenished in an innovative way. The engineer always leaves his car parked on the driveway of his home or outside on the road – he never puts it in a garage. The company employ a specialised courier service who also have a spare set of keys for the engineer's vehicle. The courier turns up at the engineer's house during the evening or night, opens the vehicle, replenishes the used parts and then locks the vehicle again. Stupidly simple but highly effective. (Sounds like a good target for car crime – but maybe that's just the Scouser in me! BC)
- For parts which an engineer does not normally carry, these are guaranteed to be available to the engineer from a central warehouse via a courier service within 4 hours. Frequently, the part will be sent directly to the customer and arrives before the engineer does to fit it.
- As a significant part of the engineer's salary, they receive a bonus payment for each first time fix. If they have to return to fix a problem, then they lose their bonus for that call. This tends to concentrate the mind of the engineer and the first time fix rate within the big players in the industry is 98 – 99%.

I have spent some time in discussion with the Radiometer management since this incident. I have to say that I have been very impressed with the manner in which not only my local representative, Susie Boden, has dealt with this issue but also I'm greatly impressed by the Regional Sales Manager, Andrew Meredith. I cannot however be complimentary about the service division. I've discussed the business machines philosophy with Andrew and he gave me an undertaking that he would take these ideas back to Radiometer to see what could be done in terms of replenishing service engineer stock, making many more parts readily available and possibly the concept of the first time fix bonus or salary component for the Radiometer team.

The manufacturers liaison committee will keep you posted on developments and, be sure, we'll be talking to other companies in the not too distant future about some of these ideas. We hope the wider lung function manufacturer's take lessons from this tale.

Finally, having submitted the entire text of this article to Andrew Meredith, Regional Sales Manager at Radiometer prior to publication, I received a message back from Andrew that the Managing Director has decided not to respond at this time but reserves the right to respond in the future. AM

SMED enter the filter market.

Selwyn Sher at SMED now has a quality filter available which currently fits Morgan, Jaeger, SensorMedics systems and Vitalograph wedge bellows. Selwyn advises me that he is working to make the filters fit other systems including

MediSoft (Pulmolink), other Vitalograph models and the other various offerings in the Spirometry market.

Filter specification is equally impressive as competitors and pricing is keen with a flexible approach to standing orders and delivery schedules.

As an innovative approach to customer requirements, for those of you who fall victim to the insanity of the Infection Control Nurses brigade, SMED also sell the filter with a disposable nose clip in the packet for an extra 10 pence – a pretty good deal really.

AM

Domiciliary Oxygen Therapy Services

Many of us regard the systems in place for the provision of domiciliary oxygen as shambolic and inappropriate. Some patients get LTOT assessments properly, the majority don't with GP's handing out cylinder prescriptions and O2 concentrator orders at more or less random. Now for the good news ... and the bad, but first the full announcement made by the Department of Health on 12th June. I reproduce this here in full so that the DOH thinking can be seen.

"In 1999, the Department of Health asked the Royal College of Physicians to lead a multidisciplinary working party to device new clinical guidelines for the use of domiciliary oxygen. Although the working party's terms of reference precluded making specific recommendations about alterations in service provision, a number of the guidelines had implications for the content of the existing domiciliary oxygen service and for the way in which the service is delivered. It was clear, therefore, that this vital resource – that has seen only one significant change, the introduction of oxygen concentrators, in the past fifty years – had become out of date, both in terms of the service offered to patients and its cost effectiveness. It was against this background that Lord Hunt directed that a review of the domiciliary oxygen service should take place.

This review is now complete and we are ready to move forward to create a modernised and integrated service for the provision of domiciliary oxygen.

At present domiciliary oxygen is ordered for patients by general practitioners. The service consists principally of the provision of oxygen either from large cylinders supplied by community pharmacies, or delivered by way of an oxygen concentrator, installed in the patient's home by a contractor.

The modern, integrated service that is proposed represents a considerable advance on this organisational and service model.

The new model will transfer responsibility for ordering oxygen for long term oxygen therapy from general practitioners to specialist consultants in hospital. This will relieve general practitioners of the bureaucratic burden of writing prescriptions, effectively on the direction of hospital doctors. (Patients who need long term oxygen will invariably have had their needs assessed by hospital staff). The hospital consultant will decide, in discussion with the patient, what the patient's needs for oxygen are. For example, many patients would benefit from having oxygen available in a form that allows them greater freedom of movement both in and outside the home than is possible with large cylinders or oxygen concentrators. General practitioners will continue to be able to prescribe oxygen for patients who need small amounts of oxygen.

Once the hospital consultant or general practitioner has discussed and determined the patient's need for oxygen, it will be the responsibility of contractors to work closely with the patient and decide what technology (i.e. what type and method of oxygen supply) will best suit the patient's therapeutic need, and to provide it. These specialist contractors will be well placed to keep pace with developments in the technical aspects of service delivery, so patients will benefit from advances in technology as they are developed.

Thus the modernised integrated service represents a sensible division of responsibility in the provision of domiciliary oxygen services. It places clinical responsibility for assessing oxygen need with doctors and places technical decisions on the best and most up to date method of delivery with service contractors.

Over the next few months a specification for the provision of integrated service will be drawn up. Contractors will be invited to tender against this specification and contracts will be let. It is expected that the integrated service will be fully operational early in 2005. The current arrangements for the provision of domiciliary oxygen will continue as at present to cover this transitional period."

Now, this all sounds great. The DOH seems to be suffering from an atypical case of common sense. But, hang on a minute! How many patients out there have oxygen prescribed by GP's without any kind of assessment? Nice and easy now for the GP to say to the hospital "my patient needs/is on oxygen, please assess/review and sort". Where is the money coming from to pay for the increase in workload on the respiratory consultants and, of course, ourselves who will no doubt be performing hundreds of additional LTOT assessments each year? We have to be careful here. If we're not, then we will end up with larger waiting lists and no additional resources to cope with LTOT assessments. I suggest you start raising a forecast increase in workload from 2004 onwards in your business planning processes which normally starts as early as September the year before; i.e. now. If you don't do this, you are likely to end up with a big problem in 2005. Things that start off as well intentioned, which no doubt the DOH initiative is, have a habit of going very wrong.

AM

Placebo inhalers

There are likely to be changes in the way the drug manufacturers give away placebo inhaler devices because they have been recommended to be "single use items". A meeting was organised by Glaxo Smith Kline to bring representatives from leading respiratory professions and training centres together to discuss the topic .

Basically, GSK have decided, or their lawyers have decided, that because of the infinitesimal risk of a patient catching an infection from a MDI, that placebo MDIs should be single patient use only. They are recommending this "from advice from the MDA" and make this decision on the basis that if the postman/person slips on ice on your footpath and injures him/herself it is his/her problem. However, if you put salt down to break up the ice (depression of the cryoscopic constant, etc.) and (s)he slips and gets injured, you as the property owner are liable. (Who said the law was an ass?)

I pointed out to GSK at the end of the meeting that it was a shame that a leading British scientific company could not provide adequate funding to set up some research studies around infection control and actually analyse the risk properly. (We didn't allow GSK to attend the actual meeting, although they did provide a surprisingly knowledgeable dictation person.)

Of course one implication for this move is that other companies who produce more expensive breath-actuated inhaler devices will have to produce more costly placebo devices in larger numbers.

We recommended that the issue be sent to the BTS Standards of Care Committee (Which ARTP feeds into via ARTP/BTS Liaison Committee) for a national statement to be made.

The risk is very small. However, this is a problem that could be answered with a bit of sensible research rather than legal knee-jerk reaction.

GSK have put the responsibility on you and your Trust to carry the risk. On the limited evidence available, I would personally carry on cleaning the placebo devices in accordance with best practice. Whether each Trust will accept this when the see the "single use only" label remains to be seen.

ARTP have yet to agree a stance on this, but will await the outcome of discussions with the BTS before issuing any policy. Let's hope common sense prevails in the meantime.

Product News

Sullivan VPAP3

ResMed have just launched the Sullivan VPAP 3 in the UK. This device is designed to act as an auto-titration device, but with the option of an on-board oximeter to put all the data together. The software is slightly improved, but produces similar reports to the VPAP S/T. Prices are close to the older model as well. As with the whole Sullivan range, humidifiers can be bought that are integrated into the unit quite neatly. Our local rep tries to convince me it is a beautiful piece of kit, but quite honestly it's just another lump of plastic on the outside like the rest! At least it's better than the "melted welly" that Respironics used to make!

BC

The new Medica blood gas and electrolyte analyser

Protech Medical have built a reputation for supplying consumables for all types of blood gas analyser. In June Protech Medical announced that they are to supply the Medica "Easy Stat" blood gas and electrolyte analyser. Launched for the first time in the UK, this lightweight portable analyser is claimed to be virtually maintenance free and features a self contained reagent pack and maintenance free electrodes. Protech claim that it is ideal for small to medium size work loads (1-75 samples per day) and that it is one of the lowest cost to purchase, run and maintain available today.

Protech Medical have also announced that they now supply the aspiration adapters used on AVL ONMI and Bayer 800 series analysers.

NC

Pocket Wright Peak Flow Meter

Single patient use only products are being prompted by many manufacturers in an attempt to get us to spend more and more of our ever decreasing budgets. Ferraris CardioRespiratory have jumped on the cross infection band wagon by promoting the Pocket Peak Wright Scale. This is a single patient peak flow meter and is available in standard and low flow ranges. At only £3.92 (including VAT and delivery) it is probably one of the cheapest, single patient units on the market today.

NC

Micro Medical Respiratory Pressure Meter

Micro Medical now supply a new device capable of measuring Maximum Inspiratory and Expiratory Mouth Pressure (MIP/MEP) together with Sniff Nasal Inspiratory Pressure (SNIP). Optional Puma software is available to display the pressure wave forms and includes a patient database to allow trending of results and overlaying of previously measured pressure curves.

NC

Linde Medical none invasive PCO_2 and SpO_2 monitor

Transcutaneous monitors have been around for many years. Linde Medical Sensors have produced the first system to allow non invasive simultaneous monitoring of PCO_2, SpO_2 and pulse rate through a single earlobe sensor. The Tosca monitor is slightly different to other transcutaneous monitors in that it features a Stow-Severinghaus type PCO_2 electrode combined with a SpO_2 pulse oximetry probe. Optional software is available for data analysis, which in my opinion should be thrown in free of charge with a system costing in excess of £6,000.

Having recently purchased the first of these systems to be sold in the UK, our first impressions have been very favourable. It is simple to use, featuring automatic calibration, adjustable alarm settings for high/low CO_2/O_2 and screen trend data. We cannot comment on the quality of the "optional" software as this has not yet arrived in the country. It had better be good at a cost of £570!!

The Tosca monitor is currently being distributed by Artemis Ltd.

NC

Morgan Medical

Morgan Medical has recently announced the arrival of MDAS-Rp MDAS is the standard software for the Benchmark TT501, the Transflow Test and the traditional TT range. MDAS is a powerful software package capable of supplying all required lung function measurements. MDAS-Rp has been designed to enhance the limited reporting of the dos based MDAS.

MDAS-Rp adds a serial reporting option for the data collected over the years. It allows you the ability to design your own style reports including an ARTP recommended style report that shows the standardized residuals. The report format can be e-mailed to consultants and viewed by a windows viewer. Serial reporting gives both graphical and numerical display of the major parameters and enables analysis of patient data and any trend that may occur over time.

MDAS-Rp also allows for statistical analysis by counting how many tests are performed during a set time period. It also enables you to see which technician has been testing patients and for which consultants.

If you are interested in seeing MDAS-$_{Rp}$, give Morgan Medical a call on 01634 266301 for a free demonstration CD.

Morgan Medical has also announced the launch of their new website. Morgan Medical invites you to take a spin through a new look, user-friendly website at www.morganmedical.co.uk. It features easy access to the company profile, together with a brief insight into the company news, products and services that are available. You can even gain support, book training and make contact on-line, along with some of the most frequently asked questions

NC

Don't forget, if you have any problems regarding equipment malfunction, quality control/ calibration, service response times, software issues etc. please feel free to voice your opinions off the forum so that we don't get sued.

Please contact the Manufacturers Liaison Committee direct at Watchdog@artp.org.uk. We will then be able to collate this information including verification of accuracy before commencing on an appropriate course of action.

To all registrations

THANK-YOU

From the Registration Council for Clinical Physiologists

Your support is about to count!

The Registration Council for Clinical Physiologists Update - June 2003

I promised in February to update you all with our progress and I am going to start from where we left off

Next Steps (February '03)	Action
RCCP to make the case for Statutory Regulation of Clinical Physiologists on receipt of the new documentation from HPC	√ Petition for SR delivered to HPC *
* RCCP Petition to be heard at HPC meeting October 2003	
Ballot practitioners in Clinical Physiology	√ 2783 Yes 8 No
Encourage potential registrants to apply to RCCP	√ 8 % increase
Continue to operate the voluntary register until we have successfully achieved State Registration	√ Ongoing
Encourage the development, support and monitoring of the new accredited Clinical Physiology and Audiology BSc (Hons) degrees	√ 5 new providers accredited 4 new providers in process
Carry out activities such as promotion of State Registration	√ Ongoing
ALL PRACTITIONERS –need to participate in these activities as far as possible	√ CP's writing to MPs etc. to enlist support for public consultation process

RCCP NEWS

It has often been stated that this is going to happen and hopefully this update will make it real for all practitioners in the field of Clinical Physiology.

We will all be entering a new pay system soon via Agenda for Change where all State Registered practitioners appear at first glance to be on a similar pay band. We will therefore all want to be recognised as registerable independent practitioners within Clinical Physiology. It will certainly be a lot easier for those of us who are on the voluntary register to simply transfer to the State Register.

In particularly can I make another plea for those of you who need to enter the register via the grandparenting route to do so now. It will save you both money and stress as the HPC system will be both more complex and more expensive.

Do not be put off by other members within Clinical Physiology who migh discourage you. Each application is made in the strictest confidence, Mud-ged on its merit and 1 want to emphasise we want to be inclusive not exclusive.

Anne Burge, Hon. Chair of RCCP (10.6.03)

The RCCP Council would like to extend its thanks, on your behalf, to Anne Burge who has worked tirelessly in order to prepare the submission for the HPC. Anne has given her time unstintingly not only throughout her Bank Holidays but also at weekends and late into many evenings. Without her vision, drive commitment and enthusiasm we would have struggled to produce the very professional document which has now been submitted.

The work is by no means over, but we think it appropriate at this time to thank Anne publicly for her work above and beyond the demands of Chairmanship of RCCP.

Department of Health Meeting: State Registration of Health Care Science Groups.

The Department of Health (DoH) called a meeting of all aspirant groups within Health Care Science and invited members of Health Professions Council (HPC) to attend. The purpose of this was two-fold:

1. to inform all groups of the process for statutory regulation for Health Care Science (HCS) groups
2. to ascertain the state of readiness of each group to present a petition to HPC.

DoH & HPC made it clear HCS will need to be regulated in a large group and that further work would be needed to determine what shape this will take. All 18 aspirant groups including RCCP were invited to make presentations to demonstrate their state of readiness for regulation.

The DoH outlined current plans for regulation of new groups. Public consultation is planned and parliamentary time is now in place to enable 2 new groups to be regulated next year (2004), the Operating Department Practitioners (ODPs) and Clinical Psychologists. (*Both of these groups have recently been successful in petitioning HPC and are awaiting the necessary legislation to be put in place by the DoH).* The 3rd group will be HCS (the parliamentary time is already in place for this) and this, we have been told, will happen by **1st January 2005.** Each aspirant group within HCS will be required to put together a petition demonstrating they meet the HPC criteria in exactly the same way as ODPs and Psychologists.

Following this process we were informed by the DoH that RCCP were one of the 3 groups presently ready to progress to the next stage and further meetings have since been held with both DoH and HPC.

PETITION

To meet the October deadline members of Council, representing all disciplines, faced a frantic 5 weeks putting together the petition, to demonstrate that we meet the criteria set by HPC. I can't emphasis enough what hard work this has been and how grateful we should all be to members of Council [and members of all the Professional Bodies RCCP represents] for their dedication in collecting all the evidence and information required of them on our behalf. This process was helped considerably by several bank holidays being interspaced during this time which were, of necessity, donated to the cause. Having achieved our objective we delivered the petition to HPC on Monday 2nd June.

We now also have a date at which this will be presented to an HPC Council meeting. That is **8th October 2003.** The decision as to whether we are successful with our bid should be made at the meeting.

HOW LONG DO YOU WAIT AFTER SALBUTAMOL?

J.R. Heath, Pulmonary Function Laboratory,
Southampton General Hospital

INTRODUCTION

The BTS and the ARTP (1) have recommended that, when testing the response to salbutamol, 20 minutes should be allowed for the drug to take effect, though without justifying this recommendation. Our laboratory has always used a 5 minute interval. Since leaving the patients to wait a further quarter of an hour before re-testing would have a serious effect on the efficiency of our laboratory it was decided to collect data during our normal work to shed light on the time course of the salbutamol response.

METHODS

Patients on whom a response to salbutamol was requested were given 2.5 mg of nebulised salbutamol. Three forced blows were then performed at 5, 6.5 and 8 minutes after the nebuliser was empty. The only departure from our normal practice here was to wait for a defined period of 90 seconds between blows rather than waiting a minute, or longer if the patient was not ready to perform another blow.

Data was accepted for analysis if the Spirometry was considered to be reliable and if the highest post-salbutamol FEV_1 was at least 160 ml greather than the highest pre-salbutamol value.

RESULTS

The mean pre-salbutamol values for the 20 patients studied were:

FEV_1 1.68 l (s.d. 0.53), FVC 3.06 l (+/- 0.59), MEF_{50} 1.10 ls^{-1} (+/- 0.74). Two of the post-salbutamol values for FVC and three of the values for MEF_{50} were excluded from the analysis.

Changes from baseline were:

FEV_1 MINS	5	6.5	8
N	20	20	20
MEAN	0.218	0.254	0.255
S.E.M.	0.037	0.043	0.047
FVC			
N	19	19	20
MEAN	0.280	0.291	0.312
S.E.M.	0.051	0.075	0.067
MEF_{50}			
N	19	19	19
MEAN	0.246	0.259	0.452
S.E.M.	0.051	0.085	0.104

There is no clear trend with time in the changes in FEV_1 or FVC, but there is an apparent increase in MEF_{50} over the 3 minutes.

The differences between 5 and 8 minute values were:

FEV_1	+ 0.036	s.d. 0.101	paired t 0.361	(N=20)
FVC	+ 0.056	s.d. 0.100	paired t 0.519	(N=19)
MEF_{50}	+ 0.071	s.d. 0.136	paired t 0.520	(N=18)

None of these increases is significant by paired t test.

DISCUSSION

There is no further significant increase in FEV_1 and FVC between 5 and 8 minutes post-nebuliser. This finding is to be expected from the work of Choo-Kang *et al.* (2) and Riding *et al.* (3), who found that although the peak increase in FEV_1 and FVC occurred about an hour after a salbutamol inhaler, more than half the increase was seen at 1 minute and about 80% (according to their graphs) by 5 or 6 minutes.

If only FEV_1 and FVC are considered, then there appears to be no advantage in waiting more than 5 minutes before re-testing, particularly if this time is taken from when the nebuliser is empty, at least 10 minutes in total from the start of administration.

The results do suggest that MEF50 might continue to increase with time. It is worth noting that some of the original studies of salbutamol using SGAW used a much longer time interval before re-testing. SGAW, like MEF_{50}, is more sensitive (but much less reproducible) than FEV_1.

REFERENCES

1. ARTP 1999. *Practical handbook of respiratory function testing.* ARTP & Prontaprint. 234 pp

2. Choo-Kang, Y.F.J., W.T. Simpson & I.W.H. Grant, 1969. Controlled comparison of the Bronchodilator effects of three beta-adrenergic stimulant drugs administered by inhalation to patients with asthma. *British Medical Journal* **2**:287

3. Riding, W.D., P Dinda & S.S. Chatterjee, 1970. The Bronchodilator and cardiac effects of 5 pressure-packed aerosols in asthma. *British Journal of Diseases of the Chest* **64**:37

ERS conference, Stockholm, Sweden September 2002

Bursary article by Fiona Buchanan

My abstract entitled Pulse Transit Time: Comparison to Polysomnographic Studies was accepted for discussion at the European Respiratory Society meeting this year in Stockholm.

The session was called 'Airway obstruction measurement (FOT-NEP); sleep and lung sound analysis' which was chaired by Dr. A. Kendrick (Fig 1) (Bristol, UK) and E. Oostveen (Edegem, Netherlands).

Fig. 1

The chairman relaxing in traditional Swedish manner – vodka on ice!

Pulse Transit Time (PTT) is an alternative technique to using full polysomnography, and giving potentially a simpler method. Whilst the original technique has been demonstrated to work in principle, the newer version of equipment (RM-60; DeVilbiss UK) has not been formally validated in field tests.

What is Pulse Transit Time?

Pulse Transit Time is the time taken for the pressure wave created by a heartbeat to be transmitted from the heart to the periphery (Fig 2). It is usually measured from the R wave on the electrocardiogram to the pulse wave arrival at the finger, using an oximeter. Pulse transit time is inversely proportional to blood pressure so an increase in BP will give a reduction in PTT and a decrease in BP will give an increase in PTT.

In addition, the falls in blood pressure that occur with inspiration (pulsus paradoxus) correspond to rises (lengthening) in pulse transit time. In awake, normal subjects, the size of these inspiratory rises in pulse transit time significantly correlate with the degree of inspiratory effort. A close relationship has been demonstrated between the increase in oesophageal pressure (P_{oes}) that provides a guide to changes in pleural pressure, and a progressive rise in the amplitude of PTT oscillations. In comparison studies of Poes to PTT and arousal, the results have been mixed with varying sensitivities and specificities.

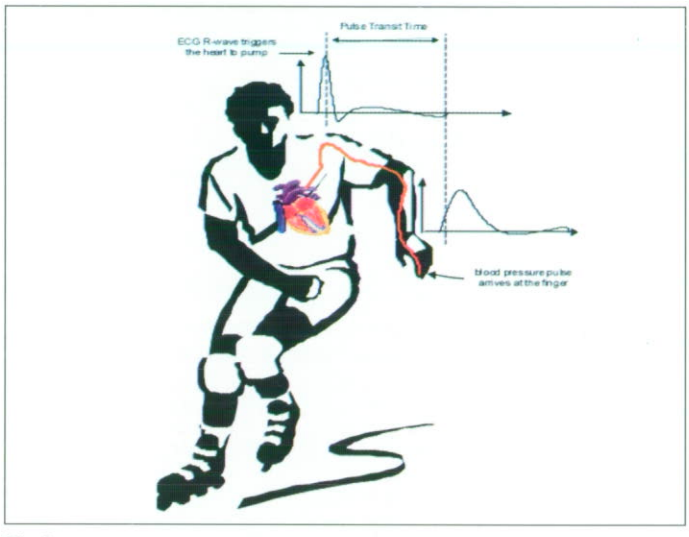

Fig 2.

Schematic diagram of the Pulse Transit Time measurement. From the peak of the R-wave on the ECG to the time the blood pressure pulse arrives at the finger is measured as the PTT.

Apnoeic events are often accompanied by shifts in heart rate and a rise in blood pressure (Fig 3). Pulse Transit Time is related to arousals, as observed from standard electroencephalography (EEG). It is also known that there is blood pressure rises associated with arousals caused by sleep related respiratory events. In essence, PTT is a continuous non-invasive monitoring analogue of blood pressure.

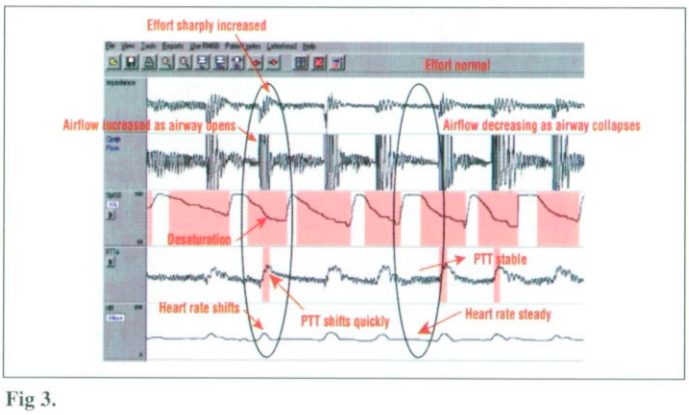

Fig 3.

Relationship of apnoeic events and changes in heart rate and pulse transit time. During the apnoea, where there is a decrease in airflow both the heart rate and the pulse transit time remain steady. At the termination of the apnoea, where there is a sharp increase in effort, there is a sharp rise in heart rate and in pulse transit time.

Errors in PTT Measurement

The measurement of PTT is not perfect. Movement artifact and signal quality, especially for SPO2 make estimation of PTT difficult. The quality of the ECG trace is similarly important, as a clear R-wave is needed to then compare with the pulse wave from the pulse oximeter recording. Good positioning and skin contact are therefore essential to improve the quality of the signal. One other major problem

with the ECG is the presence of Arrhythmias.

Analysis of the data therefore should be by a trained clinical physiologist who is experienced in analyzing such data and can decide whether each reported PTT event and heart rate shift is acceptable. Depending purely on what the computer analysis program decides is events is not acceptable, rather they should be used as a guide to the presence of such events.

The Study

The aim of the study was to determine the relationships between arousals from standard EEG and data obtained from simultaneous recordings of Pulse Transit Time.

Methods

Seventeen patients with suspected obstructive sleep apnoea were referred for full polysomnography as part of their clinical assessment. Patients were admitted to a single bedroom fore the night at around 20:00 and set up with the sleep assessment equipment. Signed consent to participate in the study was obtained, and the study was approved by the UBHT ethics committee.

Simultaneous recordings from full polysomnography (Jaeger SleepLab 1000e) and of the PTT device (Fig 4) were obtained over the single night in a sleep laboratory. Patients were allowed to go to bed when they wished, and were woken at 06:30 the following morning.

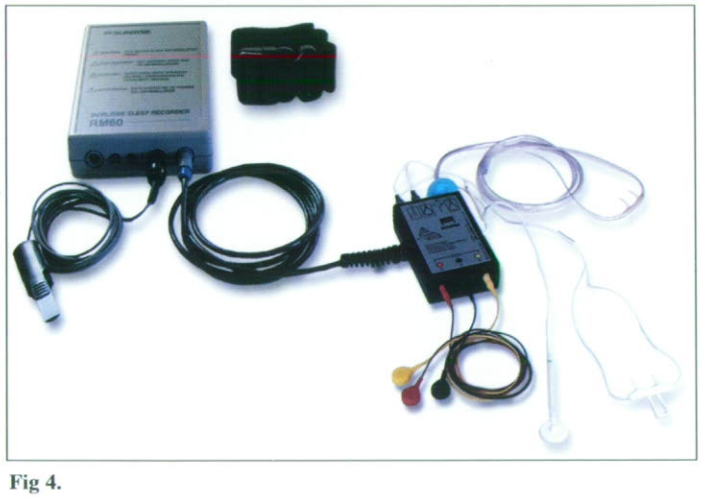

Fig 4.

The RM-60 Pulse Transit Time System. The main box (top left) stores the data from the recordings and has the connections for the pulse oximeter probe and the patient yoke. This yoke contains inputs for ECG, tracheal sound and nasal-oral airflow measurements. The bands at the top are used to record thoraco-abdominal movement.

All analysis was by the author and all events manually scored over 30s epochs. The polysomnography was scored using Rechtschaffen & Kales, whilst arousals scored according to American Sleep Disorders Association (ASDA) criteria. Respiratory events – apnoeas and hypopnoeas were manually scored using standard criteria. PTT and HRS were scored using the interactive software with the RM60.

Data are presented as mean ± SEM. Regression analysis was applied to the relationships of PTT against arousal index (Arousals/hour) and the Apnoea-Hypopnoea Index. Multiple regression analysis was applied to the data to determine the interaction of the variables

Results

The polysomnography and PTT studies were analysed over equal periods of 5.6 ± 0.5 hr. The results are summarized in Fig 5

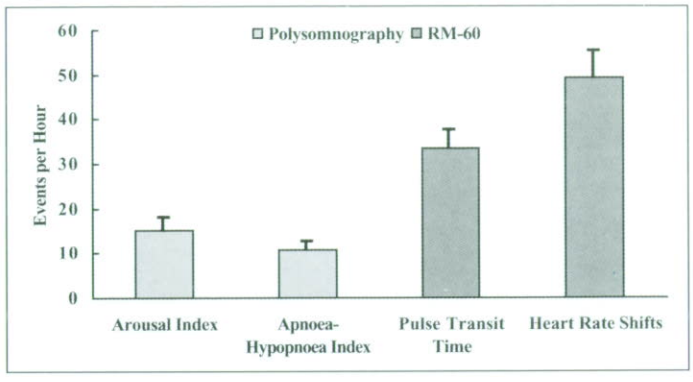

Fig 5.

The mean ± SEM for events from the full polysomnography and from Pulse Transit Time

There were no significant correlations between PTT and Arousals per hour or the apnoea-hypopnoea index (Fig 6). Multiple regression analysis showed the inter-relationships of the data ($r2 = 0.61$, $p = 0.005$) –

$$PTT/hr = 8.11 - 0.064AI + 0.409HRS/hr + 0.582AHI$$

Conclusions

Pulse Transit Time and Heart Rate Shifts provide a simple surrogate marker of the combined effects of apnoeas, hypopnoeas and arousals obtained from full polysomnography. Further work is required to evaluate this technique as well as determining the usefulness of PTT to predict response to CPAP.

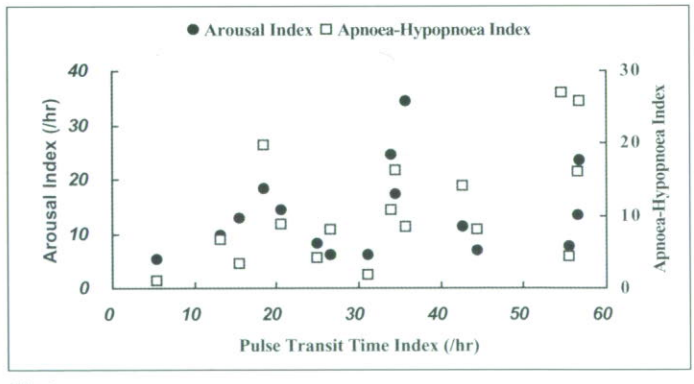

Fig 6.

The relationships between Arousal Index and Apnoea-Hypopnoea Index to Pulse Transit Time. Although the relationships were not significant, there was a general trend between the PTT and the indices obtained from the full polysomnography studies.

References

1. Smith RP, et al. Pulse Transit Time: an appraisal of potential clinical applications Thorax 1999:54: 452-458.

Acknowledgements

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