114. Lung function today and tomorrow II

P1203

Static lung volumes in lung transplant recipients with bronchiolitis obliterans syndrome

Therese Small[1], Christopher Ward[2], James Lordan[1], Andrew Fisher[2], Paul Corris[2], John Gibson[2]. *[1]Sir William Leech Centre for Lung Research, Freeman Hospital, Newcastle upon Tyne, United Kingdom; [2]Institute of Cellular Medicine, Newcastle University, Newcastle upon Tyne, United Kingdom*

The bronchiolitis obliterans syndrome (BOS), post lung transplantation, is defined and monitored by FEV1. Progressive pulmonary hyperinflation may accompany airway obstruction in BOS and assessing hyperinflation might give a more sensitive signal. However, after single lung transplantation (SLT), for chronic airway disease, the native hyperinflated native lung might compromise interpretation of lung volume measurements. We therefore compared plethysmographic lung volumes, including inspiratory capacity (IC), at the time of diagnosis of BOS in 2 groups of patients: post SLT and post sequential single lung transplantation (SSLT).
We studied 32 patients: 11 SLT (9 COPD; 2 OB) and 21 SSLT (6 COPD; 1 OB; 14 cystic fibrosis). The SSLT group were significantly younger (median 38 v. 54 years).

	FEV1 % pred	VC % pred	TLC % pred	FRC % pred	FRC/TLC	IC litres	IC/VC
SLT median	52.8	72.8	121	156	0.72	1.64	0.77
SLT range	30.5–64.1	51.4–88.2	90.9–179.0	102–175	0.62–0.81	0.93–3.49	0.45–0.95
SSLT median	63.3	82.6	89.9	101	0.63	2.0	0.60
SSLT range	32.1–101.0	52.2–110.0	53.9–124.0	72.8–164.0	0.51–0.77	0.90–3.29	0.39–0.79
p	0.002	0.055	0.0003	< 0.0100	0.01	0.116	0.02

The SLT group had larger TLC and FRC, while IC was similar in the two groups and, as a proportion of VC, was actually greater in the SLT group.
IC was relatively well preserved in the SLT patients with early BOS, despite the presence of a hyperinflated native lung. Longitudinal lung volume measurements might usefully evaluate the progress of BOS in both SLT and SSLT recipients.

P1204

Postoperative predicting value of lung function in patients with lung cancer – Fortune-telling or reality? Evaluation after surgical treatment

Monika Franczuk, Jerzy Usiekniewicz, Piotr M. Rudzinski, Stefan Wesolowski, Tadeusz M. Orlowski. *Lung Fuction Lab, Thoracosurgery Department, Research Institute for Tb and Lung Diseases, Warsaw, Poland*

Lung function testing is important tool of the evaluation patients with lung cancer, candidates for surgical treatment. Based on the scope of the planned resection and the result of bronchofiberoscopy there is possible to calculate the expected postoperative value of lung function (ppoFEV1, ppoDLCO), but reliability of such estimation is still under discussion. The aim of the study was to evaluate lung function in the postoperative out-patient observation and compliance with the predictions.
The analysis included 42 operated pts (mean age 64,3±8,8 yrs, 23 M) who underwent spirometry before resection and after 3 and 6 months during the out-patient follow-up. The people undergoing additional chemotherapy and/or radiotherapy were excluded from the assessment.
Lobectomy was performed in 39 pts (28 upper, 11 lower one), pneumonectomy in 3 pts. Mean FEV1 value before surgery and 3 and 6 months after was 2,36±0,49 L (88,0±18,3%), 1,79±0,45 L (67,2±18,6%) and 1,84±0,47 L (68,9±18,1%) respectively. The significant correlation between ppoFEV1 (1.93±0.55 L, 73.1±18.3%) and measured values was revealed, amounting to 0,72 and 0,76 respectively for the study in 3 and 6 months after surgery. Detailed analysis showed that the correlation was higher in group of patients after lower than upper lobectomy: 0,85 vs 0,73 at 6 months after resection.
Conclusion: In studied group mean value FEV1 measured in the postoperative follow-up at 3 and 6 months after resection shown good agreement with ppoFEV1, however better for patients who underwent lower lobectomy, poorer for upper resection.

P1205

Maximal inspiratory pressures, lung volumes and flows in young rowers

Jana Kivastik[1], Mati Arend[2], Raul Rämson[3], Jarek Mäestu[3]. *[1]Department of Physiology, University of Tartu, Tartu, Estonia; [2]Institute of Exercise Biology and Physiotherapy, University of Tartu, Tartu, Estonia; [3]Institute of Sport Pedagogy and Coaching, University of Tartu, Tartu, Estonia*

Respiratory muscle training has demonstrated improvement in exercise performance in both healthy adults and in patients with chronic respiratory illnesses. Such programs often ask to perform respiratory efforts against a pressure load equivalent to a certain percent of maximal respiratory pressures. Portable devices are available to measure those maximal pressures, but it can be highly dependent on participant effort.
Our aim was to find out whether maximal inspiratory pressure (MIP) correlates with different flow-volume loop parameters in a group of college level rowers and to compare the data from athletes with reference values.
We studied 19-33 year-old rowers (n=14, two of them female) with height 173-202 cm. Spirometry was performed to determine FVC, FEV_1, PEF and PIF. MIP was measured with a hand-held mouth pressure meter. All measured values were compared with reference data and correlations between MIP, lung function and anthropometric indices were found.
Compared to reference population values of FVC and FEV_1 from rowers were mostly above average (97-130% pred.), whereas PEF ranged from 85 to 120% of predicted. All 3 forced expiration indices correlated with height ($p<0.01$). When using MIP reference values depending on age only, we obtained values in a range of 88-212% pred (absolute values 98-234 cm H_2O). The only significant positive correlation was found between MIP and PIF ($p<0.05$).
Relatively high lung volumes and flows compared to the predicted values indicate the increased functional capacity of respiratory system in rowers. We found a wide between-individual variability of MIP in young subjects. MIP values did correlate with neither anthropometric nor spirometric indices (except for PIF).

P1206

Asthma diagnosis by the reversibility test of respiratory muscles power in asthmatics using the respiratory pressure meter

Omer Elbadri, Mohamed Elbagir Ali, Aamir Magzoub, Omer Musa. *Physiology, Faculty of Medicine, Nile Valley University, Atbara, Sudan Respiratory Medicine, Faculty of Medicine, National Ribat University, Khartoum, Sudan Physiology, Faculty of Medicine, National Ribat University, Khartoum, Sudan Physiology, Faculty of Medicine, National Ribat University, Khartoum, Sudan*

Introduction: Intermittent and mild asthma types are difficult to diagnose during the symptoms free period. The respiratory muscles perform extra work in asthma and expected to be stronger than normal subjects. The respiratory pressure meter measures the respiratory muscle power as a function of the air volume expired or inspired by effort. The hypothesis introduced was that if the bronchioles are dilated by a bronchodilator the expired volume of air and consequently the pressure it exerts is expected to increase.
Objective: To perform a pilot reversibility test in asthmatic patients by spirometry and respiratory pressure meter.
Methods: This is a cross-sectional hospital based study carried out in Lung function tests clinic in Police hospital in Khartoum in 2010 -2011 to determine the reversibility of the respiratory muscle power after salbutamol inhalation using the respiratory pressure meter. Following informed consent, PEFR, FEV_1/FVC, Maximum expiratory pressure (MEP) and Maximum inspiratory pressure (MIP) were measured in 20 patients with asthma and the tests were repeated 15 minutes after salbutamol inhalation. All patients were not during an acute attack.
Results: 20 patients were included. FEV1 reversibility was 10.8% and PEFR reversibility was 13.1%. The MEP increased from 81.2 cmH_2O to 91.2 cmH_2O, with a reversibility of 12.3% while the MIP increased from 60.8 to 69.95 cm H_2O, with a reversibility of 15%.
Conclusion: Respiratory muscles power reversibility could be a potentially sensitive diagnostic test for asthma.

P1207

Predicted spirometric values for Romanian adults – A preliminary study

Laura Lihatchi[1], Diana Ionita[2]. *[1]Clinical Pneumology, "Marius Nasta" Institute of Pneumology, Bucharest, Romania; [2]Respiratory Physiopathology, "Marius Nasta" Institute of Pneumology, Bucharest, Romania*

Background: No populational study was made in Romania to determine predicted spirometric values.
Aims: To analyze spirometric data measured in healthy volunteer adults. To compare spirometric values with predicted values calculated using European equations (Eur Respir J, 1983).
Subjects and methods: Spirometry was performed in conformity with ATS/ERS criteria (2005) in healthy, nonsmoker adults without thoracic deformities. The best values for FVC and FEV1 were analyzed and compared with the predicted values.
Results: 53 subjects (37 women) were enrolled, mean age 30.7 years (22-47).
FVC values were 6.9% larger than the predicted values in the whole group. For 39 subjects (73.6%) measured FVC values were outside the 95-105% interval of FVC predicted values, the majority of measured values being larger than the predicted values (in 33 subjects).

FEV1 values were 4.1% larger than the predicted values in the whole group. For 31 subjects (58.5%) measured FEV1 values were outside the 95-105% interval of FEV1 predicted values.
Conclusions: A significant number of healthy adults have had spirometric values outside the confidence interval of predicted values (European equations in use). A larger study is needed in subjects with different ages and heights to verify the data obtained in our study. The opportunity of determining specific predicted values in a large populational study is discussed, considering the necessary resources.

P1208
E-patient reported outcomes: Can you have reliance on compliance?
Aleck Harrison[1], Grant Sowman[2], Hardip KaurNagra[2], Richard Woodward[2]. *[1]Clinical Operations, AJH Partners, Wallingford, Oxon, United Kingdom; [2]Clinical Trials, Vitalograph Ltd, Maids Moreton, Buckingham, United Kingdom*

Introduction: Consistent evidence is required to confirm the value of electronic Patient Reported Outcomes (e-PROs) for compliance in Usage and Quality of PEF manoeuvres in large clinical trials where these data are used as critical end-points [1].
Method: In an international asthma trial requiring twice daily symptom scores and three PEF manoeuvres over 105 days e-PROs were recorded using the Vitalograph PEF/FEV e-diary within a protocol specific program.
Usage Compliance was assessed by the actual number of completed sessions made by patients as a percentage of the potential total. Quality Compliance assessed by Repeatability of the two highest manoeuvres of a session using the ATS/ERS standard of $\leq$40 L/min.
Results: From 519 asthmatic patients at 78 sites a total of 103,198 diary sessions were made. Compliance during screening was 93$\pm$7%, treatment 88$\pm$13%.and overall 89$\pm$8%.
Three manoeuvres were recorded in 99% of the sessions.
Repeatability Compliance of PEF for both screen and treatment periods was 88%. The difference in PEF between the two highest manoeuvres was 13.85$\pm$10.3L/min. There was no statistical difference between the morning and evening data.
Conclusion: These data concur with other previously published [2]. Thus e-PROs from asthmatic patients are consistent for both quantity and quality and have statistical reliance as the primary end-points for future trials.
References:
[1] Johnston N. et al. The promise of electronic data capture in respiratory medicine. Eur Respir J 2011; 37: 228
[2] Harrison AJ et al. E-diary compliance in two pharmaceutical trials. Eur Respir J 2009; 34: E1854
The sponsors of this trial are thanked for the anonymous use of their data.

P1209
Comparison of referral patterns between a respiratory laboratory in the Republic of Ireland and Western Australia
Elizabeth Salamon[1], Maria Stack[2], Kevin Gain[1]. *[1]Respiratory Medicine Department, Royal Perth Hospital, Perth, Western Australia, Australia; [2]Respiratory and Sleep Laboratory, Cork University Hospital, Cork, Ireland*

Background: Respiratory diseases account for 13% of deaths in the Republic of Ireland (ROI), and 8% in Western Australia (WA) each year.
County Cork has a population of 0.5 million and is serviced by Cork University Hospital (CUH), one other public, and one private hospital laboratory. CUH has 815 beds and is the principle teaching hospital.
Located in the city centre, Royal Perth Hospital (RPH) is the largest teaching hospital (855 beds) in WA, which has a population of 2.2 million. This area is also serviced by three other teaching hospitals, and numerous private laboratories.

Diagnosis	CUH	RPH
Asthma	12.8%	10.1%
COPD	16.9%	20.3%
ILD	22.7%	10.3%
CF	7.5%	0.8%
Cancer	5.5%	9.5%
Connective tissue	5.7%	6.4%
Other	27.4%	17.7%
Not specified	1.6%	24.9%

Test	CUH	RPH
Spirometry	2811	3034
DLCO	1380	1286
Lung volumes	1119	1208
Mouth pressures	39	41
CPET	5	35
Altitude simulation	Test not offered	53
Skin allergen	0	16
6 MWD	Physiotherapist role	88
Bronchial challenge	6	5
Total	5360	5766

Aim: To compare test request profiles of two public respiratory laboratories in ROI and WA.
Method: Referrals to each laboratory between 1st November 2009 and 31st October 2010, were reviewed.
Results: CUH performed 5360 tests on 2104 patients, aged 5-90 years. 9% were repeat visits within the time frame. RPH performed 5766 tests on 2336 patients, aged 13-98 years. 14% were repeat visits. The tests offered and diagnoses are presented.
Discussion: The number of patients seen, and number of tests per patient were comparable. Specialist nurses at CUH also perform spirometry which is reflected in the reduced number of COPD and cancer patients seen in the laboratory.

P1210
How to diagnose restrictive ventilatory defect by spirometry, and reduce the number of lung volumes measurements?
Stefan Wesolowski, Piotr Boros. *Lung Function Lab, Institute of TB & Lung Diseases, Warsaw, Poland*

Diagnosis of restrictive ventilatory defect by a low FVC on spirometry is not accurate, even in non-obstructive patients. On the other hand TLC measurements are time-consuming and expensive. So it would be convenient to be able to predict or rule out the possibility of restrictive defect by spirometry and reduce the number of unnecessary TLC measurements.
Aim of the study: We have looked for a FVC value above which reduced TLC is very unlikely, and other FVC value below which it is highly probable.
Material: Consisted of pulmonary test results obtained from adult patients, who had undergone spirometry and lung volumes measurements at the same visit.
Results: From the whole 6538 test results, 4898 patients (53.2% females, 46.8% males; mean age 47,5$\pm$14,9 years) without airway obstruction were included into analysis. Restrictive ventilatory defect (TLC <5th percentile) was found in 955 (19.5%) patients, and reduced FVC (FVC <5th percentile) was found in 655 (13.4%) patients. Setting arbitrary the lower limit on 70% of FVC% pred. to predict volume restriction had specificity 99%, and PPV 91%. Setting the upper limit at 95% of FVC% pred. to exclude volume restriction had NPV 99%. Performing TLC measurements only in patients with FVC between 70 and 95% of pred., would reduce number of tests by 2/3 to 1382.
Conclusions: Spirometry allows accurately rule out volume restriction in patients with FVC $\geq$95% of pred., and predict restrictive defect in patients with FVC <70%. of pred. Performing TLC measurements only in patients with FVC between 70 and 95% of pred. reduces the number of tests and costs of diagnosis of restrictive defect.

P1211
Non invasive assessment of pulmonary shunt in adults with liver disease
Georgia Spentzou[1], Sunil Sanka[1], Matt Rutter[2], Nick Fung[3], Robert Ross Russell[1]. *[1]Department of Paediatrics, Cambridge University Hospitals NHS Foundation Trust, Cambridge, United Kingdom; [2]Department of Respiratory Physiology, Cambridge University Hospitals NHS Foundation Trust, Cambridge, United Kingdom; [3]Department of Engineering, Cambridge University, Cambridge, United Kingdom*

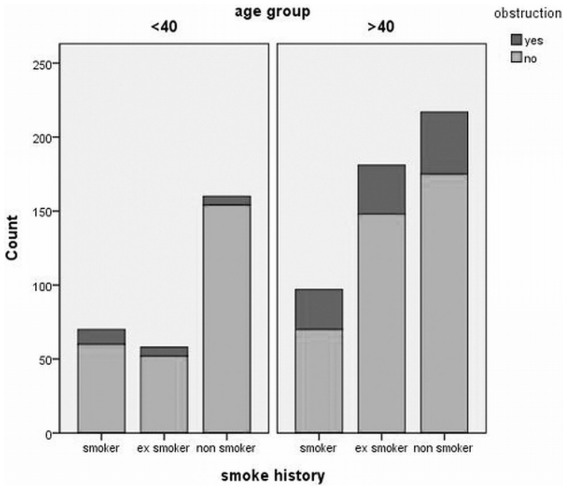
Introduction: The oxygen dissociation curve charts the relationship between haemoglobin saturation (SaO2) and arterial pO_2. Less well known is the relationship between the inspired oxygen (FiO2) and SaO2, which reflects aspects of the oxygen cascade that affect the transfer of oxygen into the blood.
A number of models describe this cascade and this allows reconstruction of the curve from a number of data points, allowing estimation of the shunt and whole lung VQ ratio. Its value lies in the simplicity with which both FiO_2 and SaO_2 can be measured.
We are undertaking a "proof of concept" study evaluating shunt in adults undergoing assessment for liver transplantation, where pulmonary shunt is an important clinical problem.
Methods: Adults breathe an O_2/N_2 mix with an FiO2 between 0.14 and 0.35. After equilibration, SaO_2 is recorded. At least 3 data points are collected, and analysed using previously validated methodology [1] recently adapted for MATLAB.
Results: To date (February 2011) we have studied 9 patients with this technique. All tolerated the procedure well. Studies were performed in our respiratory laboratory and took between 20 and 30 minutes to complete.
Shunt varied between 2% and 20% and VQ ratios between 0.78 and 1.5. Patients are also having shunt assessed by VQ scans, and these data will be compared.
Conclusions: This technique offers a very simple and well tolerated test that quantifies both shunt and VQ mismatch. It only requires an oximeter and a supply of nitrogen. Given that current methods for assessing these parameters require specialised equipment and are time consuming, it may provide an effective test for shunt or VQ matching in a wide range of patients.
Reference:
[1] Eur J Anaesthesiol 1995:12;375-386.

P1212

Is obstructive lung disease correlated to age and smoking habit or is there more?

Saeeda Lone, Remco Boksem, Reindert Van Steenwijk. *Lung Function, Academic Medical Center (AMC), Amsterdam, Netherlands*

Background: On World Spirometry Day lung function measurements were done to identify obstructive persons without a previous diagnose of an obstructive lung condition and to rise awareness on lung health and disease.
Aim: To establish the significance of the degree of obstruction in relation to reported symptoms and other characteristics.
Methods: 783 participants performed lung function and filled a standard questionnaire. The degree of obstruction in relation to smoking, shortness of breath, cough, age and BMI were investigated. Significance in relationships was measured with multivariate analysis with backward elimination.
Results:



In 15.8% an abnormal lungfunction was measured: 124 times obstruction based on FEV_1/FVC and another 43 cases with a FEV_1 below 80%.
In a linear regression model smoking ($\beta = 0.015$ $p < 0.005$) and age ($\beta = -0.02$ $p < 0.005$) were significant predictors in obstruction.
Conclusions: There was a positive correlation between age and smoking but no correlation with other characteristics. Amongst the older obstructive participants there is a large group of non-smokers who need further investigation.
Implications: In its current form the WSD cannot identify persons at risk for an obstructive lung disease. In case of a low FEV_1 and/or a low FEV_1/FVC the test should also be repeated after a bronchodilator.There has to be a good description of the target group and a questionnaire adapted to the group.

P1213

The correlation between lung function parameters, and level of activity in seropositive rheumatoid arthritis

Ghiulten Apti[1], Anamaria Trailescu[2]. [1]*Pneumology-Lung Function Testing Department, Hospital of Pneumology, Constanta, Romania;* [2]*Pneumology, Hospital of Infectious Diseases V.Babes, Bucharest, Romania*

Pulmonary involvement is one of the most frequent extra-articular manifestation of rheumatoid arthritis.
Aim: To assess the lung function (LFT) and diffusion capacity (DLCO) in non-smoker patients with rheumatoid arthritis (RA) and correlation with disease activity and rheumatoid factor positivity.
Method: 55 patients nonsmokers with a prior diagnosis of RA in rheumatology department, were subjected to lung function analysis. The various parameters-from spirometry, diffusion capacity, -were correlated with rheumatoid factor (RF) positivity (RA+/-) and disease activity score (DAS), C reactive protein (CRP) levels.
None of them had the diagnosis of lung interstitial disease prior the study.
Results: 30,9% had negative rheumatoid factor, and 69%positive;from them 12,7% were male;
FEV1, FVC,TLCwere lower in RA+ group than in RA-and FEV1/FVC was higher in RA+ group (81,4±12,6). Statistical significance was achieved for FEV1/FVC and TLC (4,6±1,6).
TLco was lower then predicted values in 36,4%; 29,4% in RA- and 39,8% in RA+;(OR=1,4);corrected TLco was 22,3±3,48 in RA+ and 20,1±3,6: p=0,03;regarding level of activity, decreased TLco was correlated (correlation factor=0,29) with RF positivity, CRP high levels (>3,9) and high DAS (>4,8).
Restrictive dysfunction had 23,6% RA+ (OR=2,3)and 11,7%RA-.Decreased TLco had 63,6% from those with restrictive dysfunction (71,4% in RA+ group).More than 50% from those with restrictive dysfunction and low TLco had a DAS>5.
Conclusions: Restrictive dysfunction and decreased TLco are correlated with RF positivity and with high level of disease activity in patients with RA.

P1214

Assessment of the suitability of filters for use in clinical studies with an HFA fluticasone propionate pressurized metered dose inhaler (pMDI) and a valved holding chamber (VHC)

Kurt Nikander[1], Lois Slator[2], Dirk von Hollen[1], Ross Hatley[2]. [1]*Philips Respironics, Respironics New Jersey, Inc., Parsippany, NJ, United States;* [2]*Respironics Respiratory Drug Delivery (UK) Ltd, Chichester, United Kingdom*

The assessment of delivered dose is an integral part of the development process for new aerosol delivery devices, especially in pediatric patients in which pharmacokinetic studies are difficult to perform.
The aim of this study was to evaluate the dose collection efficiency of a 3M Filtrete G-200 (G-200) filter in a low dead space filter holder for use in *ex vivo* tests using a preproduction OptiChamber Diamond VHC (Diamond; Philips Respironics).
Two preproduction Diamond VHCs were tested over 10 runs. Five fluticasone propionate (Flovent HFA 220 μg) pMDIs were primed before use. The mouthpiece of the VHC was sealed to a filter holder containing two 67mm G-200 filters. The pMDI was actuated into the VHC, followed by 20 s extraction (at 90 L/min), repeated 25 times. Filters and VHC deposits were analyzed using HPLC (Agilent 1100/1200). The percentage of total emitted dose deposited on the 2nd filters over 10 runs was calculated; where the amount of drug detected on the 2nd filter was below the Limit of Quantification (LOQ; 25μg) the LOQ was used to calculate the total, and where the amount detected was zero the Limit of Detection (LOD; 2.5μg) was used to calculate the total (overestimates the total amount on the 2nd filters significantly), the total was then divided by total recovered drug.
The amount of drug deposited on the 2nd filters was below the LOQ for all the filters and <0.645% of the total was calculated to have deposited on the 2nd filters. Recovered doses were within the expected range.
Less than 1% of the emitted dose was deposited on the 2nd filter and thus passed the 1st filter.

P1215

Feasibility and agreement in inspiratory capacity measured by spirometry and body plethysmography

Claudia Vargas, Juan Carlos Vazquez, Luis Torre. *Pulmonary Physiology, Instituto Nacional de Enfermedades Respiratorias, Mexico, Distrito Federal, Mexico Subdireccion de Enseñanza, Instituto Nacional de Enfermedades Respiratorias, Mexico, Distrito Federal, Mexico Pulmonary Physiology, Instituto Nacional de Enfermedades Respiratorias, Mexico, Distrito Federal, Mexico*

Inspiratory capacity (IC) is the maximum volume of air (measured in liters) that can be taken in a full inspirations and without hesitation from a point at the end of a normal expiration or respiratory tidal volume. Is quite sensitive for quantification of improvement after therapeutic interventions, predicts dynamic hyperinflation and exercise limitations. It can be measured by spirometry (the vital capacity maneuver or VC), or by body pletismography (BP). The aim of this study was to determine the feasibility and agreement in IC measured by spirometry or BP in a large sample of normal subjects and patients with different ventilatory patterns.
Methods and measurements: Healthy subjects, of 18 years of age and older, non-smokers and non-history of respiratory disease. A second sample of patients referred by their physicians for a routine pulmonary function testing. They were stable and had no symptoms of acute respiratory infection in the previous two months.
Results: A total of 58 healthy subjects and 163 were recruited for the study. Four subjects were not able to complete acceptable maneuvers. The final sample was 56 normal subjects (55.4% males) and 163 patients, 64% males. Mean age for normal subjects was 34while for patients was 56.8 years. In both groups, a high correlation ($r > 0.90$) was found comparing spirometry and plethysmography measurements. The agreement analysis showed an CCI = 0.90, although agreement limits were wide (600 mL).
Discusion: Despite the high correlation and agreement between two methods for measuring inspiratory capacity, they can have and significant variability within and between methods.

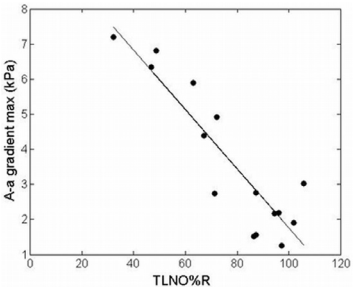
P1216

Can NO diffusion predict desaturation during maximal exercise?

Eline Oppersma[1,2], W.J.C. van Beurden[2], M. Brusse-Keizer[2], P.D.L.P.M. van der Valk[2], F.H.C. de Jongh[1,2]. [1]*Technical Medicine, Twente University, Enschede, Netherlands;* [2]*Pulmonary Department, Medisch Spectrum Twente, Enschede, Netherlands*

Introduction: Desaturation during maximal exercise can be caused by several problems; decreased diffusing capacity, leading to an increased Alveolar-arterial (A-a) oxygen gradient, or V/Q mismatch or a contact time problem. The present method to establish decreased diffusing capacity is the measurement of diffusing capacity for carbon monoxide (TLCO). We hypothesize that the diffusing capacity for nitric oxide (TLNO) is more accurate than TLCO.
Aim: The aim of this study is to find out whether diffusing capacity for NO, as a marker for the membrane component of diffusion, can be a more accurate predictor of the A-a gradient at maximal exercise, compared to diffusing capacity for CO, as a marker for the membrane and hemodynamic component of diffusion.
Methods: 15 patients with pulmonary complaints (mean age 58 years) performed a combined single breath TLNO/TLCO measurement and a maximal exercise test. We constructed a model to predict the A-a gradient at maximal exercise.

Results: The A-a gradient at maximal exercise can be predicted by TLCO%R, and resulted in an R^2 (coefficient of determination) of 0.64. TLNO%R predicted the A-a gradient at maximal exercise with an R^2 of 0.81 (see figure).



Conclusion: The diffusing capacity for NO is a more accurate predictor of the A-a gradient at maximal exercise than the diffusing capacity for CO, and thereby a more accurate predictor of desaturation during exercise.

Reference:

[1] Lee, I van der *Resp Med* 2007;101:1579-84.

P1217

DL,no; slave to a rhythm?

Antoinette Houtkooper, P.J.A.M. van Ooij, R.A. van Hulst. *MMEC - Diving Medical Center, Royal Netherlands Navy, Den Helder, NH, Netherlands*

Background: It is generally accepted that spirometry and diffusing capacity are subjected to a diurnal rhythm (CINKOTAI 1966, BORSBOOM 1999, MEDAROV 2008). Values for VC, for example, are lowest around noon and highest between 3.00 and 4.00 pm (MEDAROV 2008,) while DL,co is highest between 08.00 and 09.00 am and decreases during the day (CINKOTAI 1966, MEDAROV 2008).
Introduction: The aim of this study was to investigate the diurnal rhythm for DL,no. The DL,no is a relatively new method and for applying in studies it is important to know whether there is a diurnal rhythm or not.
Methods: Eleven male subjects were measured between 8 am and 10 pm. In this period DL,no was measured six times using a Masterscreen PFT-Pro (CareFusion), each time with a pause of at least two hours (max 4 hours).
Statistics: The Shapiro-Wilk test was used to test for normality. To determine diurnal variance, within-day variations were tested using the one-way Analysis of Variance (Anova). The Bonferroni correction was used to account for multiple comparisons. However, as diurnal variations can be curve shaped we also tested this index with a fractional polynomial regression model.
Results: The Anova test with Bonferroni correction showed no significant diurnal variation in DL,no (p=0.854). Also the fractional polynomial regression model to the 4th degree or lower did not show any significant relationship between time of the day and DL,no (p=0.526).
Conclusion: In our study DL,no does not have a diurnal rhythm. We would like to expand our group of subjects to confirm this statement. Further investigation is therefore necessary.

P1218

Intra- and intersession variability of the single-breath determination of carbon monoxide diffusing capacity

Kevin De Soomer, H. Vaerenberg, W. De Backer, E. Oostveen. *Dept. of Lung Function and Pulmonary Medicine, Antwerp University Hospital, Antwerp, Belgium*

Background: Some lung function laboratories perform 3 instead of 2 reproducible tests for the single-breath determination of the carbon monoxide diffusing capacity (DLCO) with the underlying assumption that the average of 3 values is more reliable than the average of 2. Recent ATS/ERS guidelines (Eur Respir J 2005) state that the actual number of tests that will provide the best estimate of DLCO is not yet determined.
Aim: To compare the within and between session variability of the DLCO estimate using 2 versus 3 values.
Methods: A DLCO measurement consisted of 3 acceptable tests that met the repeatability requirement according to the ATS/ERS guidelines. DLCO measurements were preferably performed twice a week on fixed, consecutive days just before lunchtime. A total of 10 DLCO measurements were collected in 12 nonsmoking, healthy adults (4M: 8F) during a 6 weeks period of time.
Results: The within and between session coefficients of variability (CoV) are listed in the table.

	Within session		Between sessions	
	2 tests	3 tests	2 tests	3 tests
CoV(%)	3.0	3.2	4.1	4.0

The determination of DLCO using 3 tests did not significantly reduce the within or between CoV compared to the use of only 2 tests. Although adding the third test to estimate DLCO significantly reduced the value of DLCO ($p < 0.001$), this reduction was not clinically relevant (~1% reduction in the value of DLCO). For the average healthy subject the DLCO varied as much as ±7% (2 tailed 95% confidence interval) during a 6 weeks period of time.
Conclusion: A DLCO determination based on 3 instead of 2 tests does not result in a more stable estimate of DLCO.

P1219

Comparison of two commercially available portable gas transfer devices

Lindsey Paddison, Maxine Jones, Brendan Cooper. *Lung Function & Sleep, Queen Elizabeth Hospital Birmingham, Birmingham, West Midlands, United Kingdom*

Introduction: We compared a novel portable gas transfer device which uses ultrasound and mass flow technology on healthy subjects and patients with suspected lung disease attending a routine lung function department.
Method: We measured single breath gas transfer (TLCO & KCO) on 34 subjects (20F:14M) using the EasyOnePro (EOP) (ndd, Zurich, Switzerland) with an established lung function device MasterScreen (Jaeger Ltd, Hochburg, Germany). Ten healthy subjects performed 2 tests on each device, whereas 24 patients performed only one measurement on the EOP as a part of their routine testing and we compared the results using t-tests with Bland & Altman analysis.
Results: The results (Table 1) show that the differences in TLCO, KCO and VAeff although statistically significant ($p<0.05$) were lower than the expected clinical repeatability. Analysis of patient and healthy subjects values showed similar results. The between device variation was greater than the within Jaeger device variation.

Table 1. Gas transfer results

	Easy One Pro	Jaeger	EOP – Jaeg Mean Diff	Jaeg 1 – Jaeg 2 Mean Diff
TLCO	6.43 (2.58)	6.03 (2.43)	0.40 (0.52)	0.15 (0.02)
KCO	1.36 (0.36)	1.29 (0.35)	0.07 (0.09)	-0.01 (0.06)
VA	4.69 (1.11)	4.64 (4.14)	0.05 (0.28)	0.10 (0.22)

Values shown as Mean (SD). TLCO in mmol/kPa/min; KCO in mmol/kPA/min/L; Vaeff in Litres.

Discussion: This comparison of gas transfer measurement between the EOP and Jaeger systems shows that across a wide range of values the differences between the 2 devices are within the normal repeatability (S.I units) for TLCO, KCO and VAeff of <1.00, <0.50 and <0.20 respectively.
Conclusion: The Easy One Pro gives values comparable with established gas transfer systems.

P1220

How long does it take for supine gas transfer to become stable after sitting upright?

Liam O'Reilly, Helen Ward, Brendan Cooper. *Lung Function & Sleep, Queen Elizabeth Hospital Birmingham, Birmingham, West Midlands, United Kingdom*

Introduction: We are interested in using the change in gas transfer from sitting to supine in patients with various lung diseases, but were unable to find any published studies showing how long a subject should be supine before a stable representative measurement could be made. We looked at this in healthy subjects first.
Method: We measured single breath gas transfer (TLCO & KCO) using a MasterScreen lung function system (Jaeger Ltd, Hochburg, Germany) 3 times sitting at rest and then after approximately 10, 15, 20, 25 & 30 minutes respectively, lying supine in 14 healthy subjects (11F:3M; Ages: 22-51 years).
Results: The results (Table 1) show that TLCO and KCO increase by about 9% and 15% respectively and VAeff decreases by 5% from sitting to supine. Stability is reached after 15 minutes.

Table 1. Supine gas transfer

	Time (mins)					
	Baseline	+10	+15	+20	+25	+30
TLCO	8.73 (2.71)	+1.16 (0.85)	+0.76 (1.06)	+0.78 (1.03)	+0.68 (1.14)	+0.74 (1.17)
% Change		+14%	+9%	+10%	+8%	+9%
KCO	1.57 (0.21)	+0.32 (0.17)	+0.24 (0.20)	+0.24 (0.17)	+0.23 (0.19)	+0.24 (0.19)
% Change		+21%	+15%	+15%	+14%	+15%
VAeff	5.55 (1.45)	–0.25 (0.17)	–0.29 (0.34)	–0.24 (20)	–0.27 (0.14)	–0.27 (0.12)
% Change		-6%	-6%	-5%	-5%	-6%

Values shown as Mean (SD). TLCO in mmol/kPa/min; KCO in mmol/kPA/min/L; VAeff in Litres.

Discussion: We have shown that changes in gas transfer when supine stabilise after 15 minutes. Unexpectedly, not all subjects showed an increase gas transfer, with 6 showing no increase or a slight decrease when supine. This result needs further explanation.
Conclusion: Supine gas transfer should be measured after 15minutes lying supine. Not all subjects produced an increase in gas tarnsfer when supine.

P1221

Effect of sample volume size on single-breath transfer factor for the lung

Eleanor Herring, Nigel Clayton. *Lung Function Unit, University Hospitals of South Manchester, Manchester, United Kingdom*

Background: ATS/ERS 2005 guidelines advise a standardised protocol for measuring Transfer factor for the lung (TL_{CO}) via a single breath-hold method. The volume of exhaled gas sampled limits the test in subjects with a vital capacity (VC) under 1.0L. A measure of TL_{CO} in this group would be clinically useful. This study aimed to see how reducing sample volume (V_{samp}) influenced TL_{CO}.
Methods: We randomly reviewed 125 (87 males, mean age 49-±8.8 years (± sd)) reproducible TL_{CO} tests from our database. Five subgroups (n=25) were included: 1) healthy 2) restrictive lung function, and 3) mild 4) moderate 5) severe obstructive lung disease. For each patient two real-time gas traces were analysed. Washout volume was maintained, whilst the V_{samp} was varied to give TL_{CO} readings for V_{samp} of 0.2L, 0.4L, 0.6L and 0.8L and 1.0L. The repeatability of TL_{CO} at each V_{samp} was investigated with repeatability coefficient. TL_{CO} at each V_{samp} was compared to the TL_{CO} at 1.0L V_{samp} and the difference illustrated using Bland & Altman plots.
Results: Repeatability was not affected by changing V_{samp} in any of the subgroups (repeatability coefficient: 0.42-0.64). Mean TL_{CO} increased as little as 3-5% with increasing $V_{samp,}$ with the largest difference between a 0.2L and 1.0L $V_{samp.}$ However the imprecision of the mean (limits of agreement up to 0.65mmol/min/kPa) indicated a fall in TL_{CO} equal to 15% was possible.
Conclusion: In this study changing V_{samp} does not compromise repeatability. A clinically significant variation in TL_{CO} of up to 15% is possible with a reduced V_{samp}. Further study is needed to confirm this observation and investigate the effect of changing V_{samp} on transfer coefficient and alveolar volume.