P2125

Minor local alveolar edema in an *in vivo* human model can be detected by changes in respiratory mechanics by impulse oscillometry (IOS)

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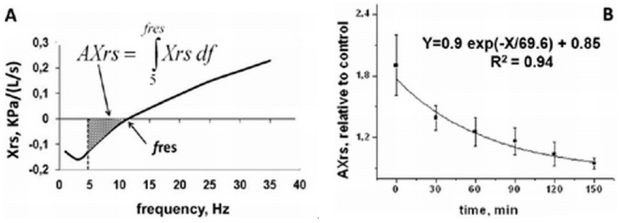
Aim: We assessed the sensitivity of the impulse oscillometry methods (IOS) to detect residual alveolar edema in a lung segment after broncho- alveolar lavage (BAL).

Methods: 15 patients of both sexes undergoing BAL in different lobes for diagnosis of interstitial lung disease were studied. IOS was applied before and after withdrawal of BAL fluid, leaving in the alveoli a volume (V_0) of 86.6ml ± 23.6 (mean ± DS), and continued up to 150 min. From IOS data we derived the corresponding values of respiratory resistance (*Rrs*) and reactance (*Xrs*) at frequencies from 5 to 35 Hz. We also estimated the "area of reactance" (*AXrs)* as defined in Fig. 1A.

Results: After withdrawal of BAL fluid, the remaining V_0 caused a 30% significant increase of *Rrs* at 5Hz; a significant increase in resonance frequency (*fres*) from 11.9 Hz ± 3.3 to 15.2 Hz ± 4.9; and minor changes in *Xrs*. The increase in *fres* led to a significant 90% increase in *AXrs*. *Rrs*, *fres* and *AXrs* returned towards baseline values through an exponential decay function within 150 min (data of *AXrs* and regression equation are shown in Fig. 1B).



Conclusion: IOS technique is sensible enough to detect minor localized increase in extravascular lung water.

P2126

253. Lung and airway function

P2124

Relationships between bronchial obstruction and differential NO parameters after methacholine challenge testing

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The aim of the study was to investigate whether methacholine-induced changes of FEV_1/FVC on the one hand, and of the alveolar NO concentration (C_{alv}) and the NO flux from the bronchial wall (J_{aw}) on the other hand, are associated.

Patients and methods: 65 patients (all non-smokers) with work-related symptoms underwent a methacholine challenge test. Bronchial hyperresponsiveness (NSBHR) was defined as a decrease of FEV_1 of 20% induced by ≤ 0.3 mg of methacholine. Measurements of FeNO were performed at five flow rates. C_{alv} and J_{aw} were calculated.

Results: There was a positive association between lung function changes after methacholine challenge and J_{aw} decrease with a stronger J_{aw} decrease in the NSBHR group: ΔJ_{aw}: -0.73±0.27 vs.-0.25±0.07 nL/s, p=0.1. Contrary to this, C_{alv} increased in the NSBHR group (n=22) and decreased in the group without NSBHR (n=43) (ΔC_{alv}:0.3±0.1 vs.- 0.2±0.07 ppb; p<0.001) with a significant negative correlation between the changes of FEV_1/FVC and of C_{alv} in the NSBHR group (r_{sp}= - 0.65, p<0.005), but no correlation in the group without NSBHR.

Conclusions: The increase of C_{alv} in the NSBHR group is related to the degree of bronchial obstruction and evidently due to mixing alveolar and bronchial NO. The stronger airways obstruction (ΔFEV_1/FVC), the more NO of bronchial source does not reach the alveoli and is exhaled delate during the alveolar phase. Our results confirm the thesis of Högman et al. (2002), who interpreted elevated C_{alv} of COPD as a poor ventilation-perfusion matching. Correspondently, elevated C_{alv} can be considered not only as a marker of alveolar inflammation but also as an indicator of peripheral airways obstruction.

WITHDRAWN

P2127

Distribution and determinants of restrictive functional pattern

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A restrictive functional pattern is a common finding when performing spirometry, even in the absence of signs of pulmonary fibrosis or other diagnoses. This EPI-SCAN sub-analysis (a population-based, cross-sectional study in eleven participating centres in Spain) aims to determine the frequency, geographic variation, individual consequences (respiratory symptoms, impact on activities of daily living, and quality of life), and "severity" of the restrictive functional pattern defined according to pre-BD spirometry as $FEV_1/FVC \geq 0.70$ and a predicted FVC <80% as per current ATS/ERS guidance. The prevalence of restrictive functional pattern was 12.7% (95% CI 9.7-15.7), with maximum in Seville (19.4%) and Burgos (18.5%) and minimum in Oviedo (5.2%) and Madrid-La Princesa (5.7%), $p < 0.05$. Although the vast majority (97.1%) of participants with a restrictive functional pattern are objectively considered "mild" by spirometry (%predicted FVC 50-80%), they reported more phlegm, dyspnea, and wheezing than healthy, control participants, and in all SGRQ domains of quality of life and LCADL activities of daily living they scored worse ($p < 0.05$); actually, they scored similarly to participants with COPD in both (p n.s.). In a multivariate analysis, only older age, male gender, lower education, and body mass index (BMI) ≥ 30.0 kg/m^2 were independently associated with having a restrictive functional pattern. We conclude that a restrictive functional pattern in spirometry is a common finding (12.7%), and with highly variable geographical distribution (range 3.7), whose population burden is important in terms of quality of life and activities of daily living and similar to that of an obstructive pattern compatible with COPD.

P2128

Effects of gastric bypass surgery compared to intensive lifestyle treatment on blood gases and lung function in morbidly obese subjects

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Objective: We aimed to compare the effect of Roux-en-Y gastric bypass surgery (RYGBP) with intensive lifestyle intervention (ILI) on blood gases and lung function in morbidly obese subjects.
Design: One year non-randomized controlled clinical trial (ClinicalTrials.gov identifier NCT00273104).
Methods: 139 morbidly obese subjects, (103 women); mean (SD) age 44 (11) years, mean (SD) body mass index 45.1 (5.6) kg/m^2, mean (SD) weight 131.8 (21.2) kg treated with either RYGBP (n=76) or ILI (n=63), were included. Blood gases and lung function tests were registered before and after treatment.
Results: Mean (SD) 1-year weight loss was 30 (8)% and 8 (9)%, and mean pO2 increased 1.4 (1.5) kPa and 0.8 (1.5) kPa in the RYGBP- and ILI-group, respectively (all P<0.001). Mean pCO2 decreased by 0.16 (0.4) kPa in the ILI-group (P=0.005), and 0.04 (0.5) kPa in the RYGBP-group (P=0.511).
Mean ERV increased from 44 (32)% to 89 (39)% of predicted value (P<0.001) in the RYGBP-group, while there was no significant change in the ILI- group. We also found significantly improved mean values for FVC, FEV1, DLCO/VA, TLC, IC and RV in the RYGB group (all P<0.001, data not shown). In the lifestyle group there were significant changes in mean TLC and RV (P<0.001), DLCO/VA (P=0.010) and FVC (P=0.049).There were no significant changes in mean DLCO in either group.
There were significant between-group changes for mean FVC, FEV1, DLCO/VA, IC and ERV (all P<0.001), TLC (P=0.007) and pO2 (P=0.032).
Conclusion: Blood gases and lung function improved in both treatment groups. However, the greatest effects were in the RYGP group.

P2129

Reproducibility and repeatability of tidal breathing parameters derived from structured light plethysmography when compared to spirometry

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Introduction: This study aimed to test the reproducibility and repeatability of data collected by Structured Light Plethysmography (SLP) when compared to pneumatach. SLP is a non invasive method of pulmonary function assessment. A grid of black and white squares is projected onto the thoraco-abdominal surface. 2 digital cameras image the grid's movement and enable a stereoscopic representation of thoracic volume change enables Volume -Time; Flow-Time and Flow-Volume to be derived.
Method: 120 datasets of 45 seconds were captured from 10 healthy adults. Spirometry data were taken simultaneously with SLP. Subjects took 5 tidal breaths. To assess reproducibility, 3 operators collected consecutive data. Data was collected in sitting and standing positions. Repeatability was assessed by collecting data a second time, after 40 mins.
Statistics: The inspiratory (TI), expiratory (TE) times and tidal volume (TV) were extracted. Data was analysed using the paired Student t-test. Reproducibility was tested by paired T-tests. Comparison was carried out for 3 pairs (1vs2, 1vs3 and 2vs3), and for position.
Results: Paired comparison of mean TI and TE did not reach significance, (p=0.85 and 0.72). Significance was not reached for posture or between the two measurement periods. No difference was found between operators, or position. Significant differences were found between TV results.
Conclusions: Measurements of TI and TE are repeatable and reproducible. They are operator independent. TV was not reproducible but dependant on wave-form scaling. Further work has been undertaken that has removed the need data scaling.

P2130

Abnormal vocal cord movement in asthma: Impact on the flow volume curve

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Traditionally the "gold standard" for detecting abnormal vocal cord movement has been laryngoscopy. Novel dynamic 320-slice CT larynx has made it possible to quantify vocal cord movement non-invasively during inspiration and expiration. While spirometry has been useful in observing upper airway obstruction, little is known of its utility in identifying patients with abnormal vocal cord movement.
Aims: To identify changes in the flow volume curve in patients with abnormal vocal cord movement (AVCM).
Methods: Two groups comprising controls and asthmatics were recruited. Vocal cord abnormality was evaluated using 320-slice CT larynx. All patients had spirometry immediately prior to CT and relevant parameters were compared.
Results: AVCM was not found in healthy control subjects. However, it was present in 11/23 asthmatics (50%).

Table 1

	n	Gender (M:F)	Age (μ±SD)	BMI (μ±SD)	FEV1 (μ±SD)	FIF50/FEF50 (μ±SD)
Control	15	7:8	52±9.5	30±5.1	3.1±1.00	1.8±0.78
Asthma without AVCM	11	5:6	56±10.2	29±4.5	2.0±0.66*	2.1±0.88
Asthma with AVCM	12	3:9	60±12.0	33±6.9	1.7±0.89*	3.0±1.84*

*P<0.05.

Discussion: While there was a significant difference in FEV1 between control and the two asthma groups, it identified obstruction alone. The only other discerning spirometric parameter was FIF50%/FEF50% which was significantly different between the control group and those with AVCM.
Conclusion: Spirometric parameters appear to be poor discriminators for detecting AVCM. It may be that more sensitive lung function measures, such a resistance measured with body plethysmograph or oscillometer will be required to further discriminate between obstruction of the upper and/or lower airways.

P2131

Compression artifact free flow-volume loops used to establish objective measurements in patient effort with spirometry

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Background: Flow-volume loops (FVL) measured by using pressure-compression volume plethysmography has been described in the literature and is commonly called compression artifact free flow-volume loops (FVLc). The utility of this technique has been to help demonstrate good patient effort and to help identify upper airway obstruction. There are no studies demonstrating measurable objective data to help confirm patient effort with FVLc.
Goal: Our study looks to identify the utility of FVLc by trying to establish a percentage cut off point for FVLc peak expiratory flow and what normal flow should be at 25, 50, and 75% intervals of the FVLc that can demonstrate good patient effort.
Methods: 76 patient's charts that had FVLc in our lab were randomly reviewed. We looked to see if the peak flow on the FVLc was 25% higher than the traditional FVL. We recorded the flow percentages at the 25, 50, and 75% intervals of each patient's FVLc. Patients were divided by having a peak flow greater than 25% (group A) or less than 25% (group B).
Results: 57 subjects peak flows on FVLc were greater than 25% and 19 patients were less than 25%. Comparing groups, the flow at the 25% interval in group A were statistically higher (mean 0.58 vs 0.35, P=0.0001). All patients with peak flow greater than 25% had higher flow rates at the 25% and 50% flow intervals (P=0.0001).
Conclusion: Evaluating patient effort with FVLc may be helpful if the peak flow is 25% greater than seen on traditional FVL and if the 25% interval flow is greater. Further study is needed to establish the validity of this technique.

P2132

Airway resistance during the methacholine challenge test: Comparison between impulse oscillometry and plethysmographic technique

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Background: Plethysmographic airway resistance (Raw) does not allow identification of bronchoconstriction sites. Conversely, respiratory system resistance (Rrs) measured by impulse oscillometry (IOS) can distinguish between changes in peripheral and central airways mechanics (< 5Hz for peripheral and 5-20 Hz for central airways).We wish to compare Raw to Rrs in response to methacholine challange (MCh).
Methods: 18 subjects underwent saline aerosol bolus (baseline) followed by increasing methacholine doses inhalation. At each dose, Raw and Rrs were measured respectively by body plethysmography and IOS. The measurements were repeated until reaching PD20 (estimated from FEV1) or the maximal dose (2400 μg). We considered subjects with PD20 < 800γ.
Results: Raw increased in all subjects during MCh. In 67% of subjects (group 1) Rrs increased at 1Hz only, while in 33% (group 2) an increase in Rrs was found at all frequencies. In group 1, unlike in group 2, the goodness of the regression between Rrs and Raw (as from R^2) was highest at 1Hz, waning progressively with increasing impulse frequency.

Rrs vs Raw

Imp. frequency	Group 1		Group 2	
	slope	R2	slope	R2
1 Hz	0.66	0.60	0.94	0.75
5 Hz	0.45	0.53	0.70	0.68
10 Hz	0.09	0.21	0.54	0.68
20 Hz	0.05	0.09	0.50	0.67

Conclusions: Measurements of Rrs in the range 1-20 Hz allow to identify different sites for MCh response. The significant correlation between Rrs at 1Hz and Raw in group 1 suggests that variation in Raw mostly reflects changes in small airways mechanics. In group 2 the significance of the regressions between Rrs at all frequencies and Raw suggests that changes in airways mechanics of various calipers impact on plethysmographic measurements.

P2133

Impulse oscillometry (IOS) vs plethismographic methods to detect PD20 in the methacholine challenge test

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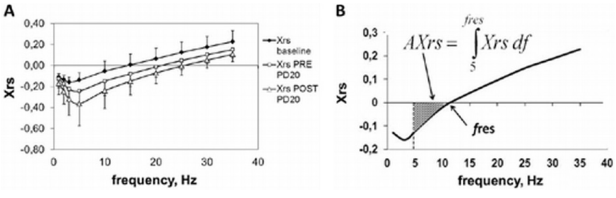
Background: Methacholine challenge (MCh) test is the standard method used to unravel bronchial hyperresponsiveness. Airways resistance (Raw) is commonly measured with body- plethysmograph in addition to FEV_1. The test is considered positive when a 20% decrease in FEV_1 (provocative dose, PD20) is reached. We aimed at investigating whether respiratory impedance (Zrs) provides more sensible indexes, compared to Raw in detecting changes in bronchomotor tone.
Methods: 20 subjects underwent saline aerosol bolus (baseline) followed by MCh (50 up to 2400 μg). After each dose we measured: 1) respiratory impedance (Zrs, at impulse frequency from 1 to 35 Hz) and corresponding values of respiratory resistance (Rrs) and reactance (Xrs); 2) Raw and FEV_1.
Results: Fig. 1A shows that Xrs decreased at all frequencies at the methacholine dose preceding PD20 and even more at a dose higher than PD20. Due to the change in Xrs at low frequencies and to the increase in resonance frequency (fres), we considered the so called area of reactance (AXrs) as defined in Fig. 1B. We found that AXrs correlates significantly with Raw through an exponential function ($Y= 0.1e^{3.4X}$), indicating that the growth in AXrs is larger than that of Raw, on increasing MCh.



Conclusion: Determination of AXrs through impulse oscillometry is more sensible than Raw and FEV_1 to assess the increase in airway resistance during MCh.

P2134

Variability of respiratory rhythm and pattern of breathing changes in patients with bronchial asthma and cold airway hyperresponsiveness

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The role of control of breathing in modulation of bronchomotor tonus has been studied very little. It is unknown if there is a correlation between cold airway hyperresponsiveness (CAHR) and changes of respiration regulation.
The aim of the study was to reveal the changes in respiratory rhythm and pattern of breathing and their correlation with bronchoconstrictor reaction to cold air hyperventilation in bronchial asthma (BA). 35 patients with BA and 6 healthy persons were examined. The group of BA patients was divided according to whether there was CAHR (14 patients) or there was not any (21 patients). CAHR was defined by 10% FEV_1 fall after 3-minute isocapnic cold air (-20°C) hyperventilation. Respiratory rhythm variability was evaluated by the value of mean-square deviation of respiration cycle duration during 15-minute interval. In result, a big variability of respiratory rhythm in BA patients with CAHR was revealed. Mean-square deviation was 0.86±0.13 vs. 0.56±0.06 in patients without CAHR ($p<0.05$). Significant changes in pattern of breathing in patients with CAHR were registered: inspiration shortening (0.37±0.01 s vs. 0.41±0.01 s in healthy persons, $p<0.01$), expiration lengthening (0.63±0.01 s vs. 0.59±0.01 s, $p<0.01$, respectively) at the absence of established differences in FEV_1 between the groups. There was a direct correlation between FEV_1 and tidal volume in healthy subjects and asthmatics without CAHR ($r=0.89$ and $r=0.75$, respectively, $p<0.05$). Patients with CAHR did not have such a correlation. The obtained data suggested a distinct interrelationship between the control of breating and cold airway hyperresponsiveness in BA patients.

P2135

Improved survival with increased IC/TLC ratio, DLCO and FEV1 in an analysis of a COPD pulmonary function database

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Introduction: COPD is the fourth leading cause of death worldwide. FEV1 is predictive of COPD mortality. The IC/TLC is a measure of static lung hyperinflation.
Aims: Analysis of a pulmonary function (PF) database evaluating the influence of FEV1, DLCO, IC/TLC and other variables on survival.
Design: Retrospective analysis of PF data base (31 year). 984 PF's with a reduced FEV1/FVC, increased TLC and reduced DLCO were analyzed. The date of initial PF test was used as the initiation of the survival analysis. 596 subjects had dates of death. Kaplan-Meier survival plots, in addition to Cox analysis was performed to evaluate the relationship of age, FEV1 (GOLD stage), DLCO and IC/TLC ratio on survival, in addition multivariate analyses was performed assessing the effects of age, FEV1, gender, DLCO and BMI with the IC/TLC ratio.
Results: Cox analysis for the risk of death, revealed that a reduced IC/TLC ratio (≤ 25%) [HR 1.69, p<0.0001]; low DLCO (<22% predicted) [HR 1.28, p0.043); increased age [HR 1.035 for 5 year increase, p <0.0001] predicted death. Female gender [HR 0.692, p0.692) and increased FEV1 (mild vs moderate) is predictive of survival [HR 0.69, p 0.0089]. Multivariate analysis revealed that age, gender, and IC/TLC (absolute ratio) remained the only statistically significant independent predictors of survival (HR= 1.04, 95% CI: 1.03-1.04; HR 0.69, 95% CI: 0.60-0.83; HR 1.69, 95% CI: 1.34-2.13, respectively).
Conclusion: Analysis of a PF database reveals statistically significant associations of a number of measured and demographic variables with survival. IC/TLC ratio > 25%, DLCO ≥ 22%, Mild FEV1, Female gender, and BMI >25 is associated with survival.

P2136

Role of facemask spirometry in motor neurone disease (MND)

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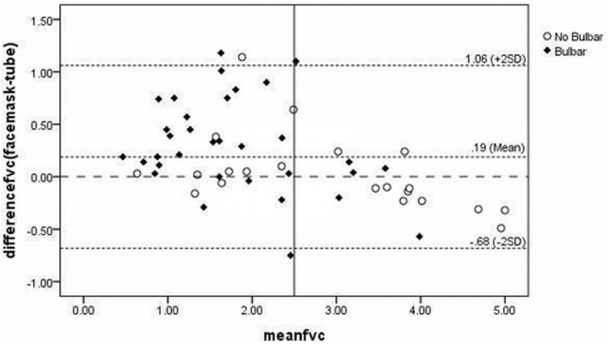
In MND, NICE (UK) recommend considering non-invasive ventilation (NIV) when FVC values fall below 50% predicted. Patients with bulbar/facial weakness often fail to achieve a seal using a mouthpiece (tube). Thus tube spirometry may not reflect the patient's true respiratory reserve. We have compared facemask (mask) to tube spirometry in 60 MND subjects recruited at a specialist clinic.
Methods: Spirometry was performed via mask and tube in random order. Since FVC is a maximal manoeuvre, a greater value was assumed to be more accurate. The Bland-Altman method of agreement between 2 measures was used. The bulbar component of ALSFRS r score was correlated to FVC values.
Results: The mean age was 64.6 (SD 10.45) years and M:F ratio was 1.5. Satisfactory FVC was obtained in all 60 subjects via mask, and 54 via tube.
When bulbar ALSFRS r score <8, mask FVC was greater than tube. No difference in FVC seen when score >8.
From the Bland-Altman plot, mask FVC was greater than tube in 86% subjects when FVC <2.5 L. Mask FVC was preferred by 73.3%. Of the 25 subjects with tube FVC <50% predicted, 32% had a mask FVC >50% predicted.
Conclusion: Mask spirometry provides a more accurate measure of respiratory

FVC: tube vs. mask

Bulbar ALSFRS r (normal=12)	N	Mean tube FVC	Mean facemask FVC	p value
All subjects	60	1.92	2.23	0.000
12	8	3.53	3.43	0.414
≥8	36	2.57	2.66	0.212
<8	24	0.94	1.58	0.000



reserve in selected patients with MND. Further work is planned to identify its prognostic value.

P2137

Impact of bronchodilator on pulmonary function and exercise tolerance in LAM

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Rationale: Reduced exercise capacity in LAM patients is still slightly understood. As many patients have airflow obstruction and dynamic hyperinflation (DH) (abstract 4576, ATS 2010), bronchodilator (Bd) might be a plausible option.
Objective: To evaluate the improvement with inhaled salbutamol in resting airflow obstruction, exercise tolerance and reversal of DH.
Methods: 37 LAM patients (mean age 41±10 years; FEV_1 79±24%pred; D_LCO 68±24%pred) performed incremental CPET (incCPET) on cycle; decrease ≥ 10% in IC defined DH. So, a randomized double-blind crossover study (inhaled salbutamol x placebo) was done. After each intervention, they performed lung function (PFT) and endurance CPET (endCPET) (75% max work-rate). Exercise duration, Borg scale and IC were compared at isotime in endCPET after Bd and placebo.
Results: 19 patients (51%) showed DH in incCPET, with max work-rate lower in DH group (93 × 115W, p=0.16) and higher values in Borg dyspnea (7 x 5, p=0.02). Compared to non-DH, DH group had lower D_LCO (56 x 81%pred, p=0.001), lower FEV_1 (76 x 89%pred, p=0.002) and greater RV/TLC (0.43 x 0.29, p<0.001). In general, Bd increased FEV_1 (2.39 to 2.46L, p<0.001), with no effects on exercise duration (325 x 329s, p=0.75), delta IC (-0.22 x -0.22L, p=0.99) or Borg dyspnea (5 x 5, p=0.99). In DH group, Bd reduced RV/TLC (p=0.006) and Borg dyspnea (-1 x 1, p=0.003) more significantly, with no effects in the variation of duration (4 x 2, p=0.82) and of IC during CPET (60 x 60 mL, p=0.99).
Conclusion: DH during exercise is frequent in LAM and is associated with resting airflow obstruction, reduced exercise capacity and higher breathlessness. Short-term Bd may exert a potential beneficial effect in DH patients.

P2138

A case of double aortic arch suggested by the analysis of the flow-volume curve

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A twenty-one year old female with a history of recurrent pneumonia and airway infections since infancy, chronic cough, gastroesophageal reflux symptoms, and persistent allergic rhinitis was referred to our asthmatic centre. She exhibited a normal sweat test, skin prick test positive to common allergens, and gastroscopy showing hiatal hernia and reflux esophagitis. We performed spirometry for the first time. The flow-volume curve showed a plateau of forced expiratory flow suggesting a variable intrathoracic airway obstruction. We then carried out bronchoscopy that showed a compression of the distal trachea. A computed tomography angiogram revealed a vascular ring consisting of a double aortic arch with right-arch dominance compressing the trachea and esophagus. Echocardiography confirmed the presence of the vascular ring. The patient has been referred for surgery. This report underscores the importance of spirometry and the analysis of the flow-volume curve morphology in the evaluation of patients with respiratory symptoms.

P2139

Pulmonary and liver injury after exposure to sublethal doses of microcystin-LR

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Rationale: Biological pollution caused by cyanotoxins leads to respiratory function impairment.
Aim: Study pulmonary mechanics, lung and liver histology in mice submitted to sublethal doses of microcystin-LR (MCLR) and evaluate whether the results depended on the doses.
Methods: Male Swiss mice were divided into 2 groups: CTRL (n=6) received distilled water intraperitoneally (ip, 100 mL) and TOX (n=30): injected with sublethal doses of MCLR (5, 10, 15, 20 and 25 μg/kg ip in 100 mL of distilled water). 24 h later pulmonary mechanics [static elastance (Est), viscoelastic component of elastance (ΔE), resistive (ΔP1), viscoelastic (ΔP2), and total (ΔPtot) pressures] were determined, and lungs and livers were prepared for histopathology. ANOVA was used to test differences among the groups.
Results: ΔP2, ΔE and ΔPtot were significantly higher than CTRL in all MCLR doses, but did not differ among them. Only TOX25 showed significantly higher Est and ΔP1 than CTRL. Alveolar collapse was higher in TOX10 (18.95%), TOX15 (17.56%), TOX20 (19.11%) and TOX25 (21.63%) than in CTRL (11.57%). The lung inflammatory cell content (cells/μm^2) gradually increased: TOX10=2.90×10^{-3}, TOX15=4.96×10^{-3}, TOX20=5.46×10^{-3} and TOX25=5.03×10^{-3} in relation to CTRL=1.41×10^{-3}. All TOX mice showed a complete loss of liver architecture with hyalinization, steatosis, dilated sinusoidal spaces and a high degree of binucleated hepatocytes. Necrosis began in TOX15, whereas only TOX 25 showed inflammation.
Conclusion: MCLR impaired pulmonary mechanics, lung and liver histology. These findings depended on the degree of exposure.
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P2140

Respiratory function in rats submitted to pharmacological hypothyroidism

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Hypothyroidism has been associated with hypoventilation, decreased respiratory muscle strength and fatigue. However, the impact of chronic hypothyroidism on respiratory mechanics has not been described so far. Male Wistar rats were divided in 3 groups: Control (C, n=3), hypothyroidism (H, n=5), and hypothyroidism + T4 replacement (HR, n=5). H and HR groups received 0.03% methimazole (MMI) in drinking water for 21 days, followed by saline or T4 (1 μg/100 g BW) injections daily during the last 10 experimental days, respectively. Then, respiratory mechanics was determined during spontaneous breathing [respiratory system (RS)] and under mechanical ventilation after muscle paralysis (RS, lung and chest wall). Total lipid content in broncoalveolar lavage fluid (BALF) and lung histology were assessed. During spontaneous breathing, RS elastic recoil and inspiratory muscle pressure (Pmus,i) were lower in H group than in C (p=0.016 and p=0.011, respectively). The time required for Pmus,i to decay to zero was higher in H animals than in C or HR groups (p<0.001). Under mechanical ventilation, H group showed a smaller lung viscoelastic component of elastance (p=0.050) and viscoelastic pressure dissipation (p=0.042) than HR, and lower lung resistive pressure (p=0.015) than C rats. Chest wall and RS parameters did not differ among groups. H rats also showed a 3-fold increase in lipid content in BALF in comparison to C and HR rats. Alveolar collapse was less important in H group than in HR (p=0.026). Hence, in rats pharmacological hypothyroidism diminished RS impedance possibly because of an increased lipid content in BALF, and hormonal reposition could revert these findings.Supported by: PRONEX/FAPERJ, FAPERJ, CNPq, MCT.

P2141

Exercise tolerance is related to lung density in patients with COPD

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In patients with COPD, the peak oxygen uptake ($peakVO_2$) measured during cardiopulmonary exercise test (CPET) has been associated with lung hyperinflation and survival. However, no study has compared exercise tolerance to quantitative CT measures of emphysema.
34 patients (10 females) with moderate to very severe COPD (FEV_1 53,3±8,5% pred., RV/TLC 53,6±10,5%) underwent measuring of pulmonary function tests (F-V curve, static lung volumes, transferfactor of the lung for carbon monoxide) and breath-by-breath measurement of flow, volumes and O_2 and CO_2 concentration during standard CPET. The extend of emphysema was assessed using the percentage of lung voxels with X-ray attenuation values less than -950 HU (%LAA).
Among pulmonary function tests the TL_{CO} had the closest relationship to%LAA (p=0,0017), followed by the RV (p=0,0044) and the ratio of FEV_1 to VC

(p=0,0124). PeakVO_2 (both in absolute values and%predicted) showed negative correlation to%LAA (p=0,0178, resp. p=0,0337). We also found significant correlation between%LAA and O_2 pulse (p=0,0017) and slope of VO_2 (p=0,0232), reflecting decreased left ventricular stroke volume and slower dynamic of cardiac output. Quantitative CT measures of emphysema seem to be closely related to exercise tolerance, namely to decreased left heart function during CPET.

P2142

Exhaled nitric oxide and lung function in winter sports elite athletes

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Background: Little is known about the role of nitric oxide (NO) in pathogenesis of exercise-induced bronchoconstriction and its association with lung function in athletes.
Aim: The aim of the study was to investigate whether airway NO is associated with lung function in elite athletes of winter sports.
Methods: A total of 86 elite athletes (biathlon, ski, ice hockey, snowboard) aged 14–35 were included in the study. FEV1, FVC, PEF (MasterScreen Pneumo, Viasys) were analyzed at the baseline and 1, 5, and 10 minutes after the exercise challenge test. NO was measured in the exhaled air (fractional exhaled NO (FeNO)) pre and between 1 and 5 min after the exercise using CLD 88 apparatus (EcoMedics). All tests were performed according to ATS/ERS recommendations before the competition phase.
Results: 21% of athletes had a post exercise decrease in FEV1 of $\geq$ 10%. Baseline and post exercise FeNO levels were 15.1 ppb and 14.5 ppb, respectively. Most athletes had a post exercise decrease in FeNO (63.6% in males and 72.7% females). In athletes with the decreased post exercise FeNO level, the mean change was -26.8% from the baseline, in contrast to +70% increase in those who had a post exercise FeNO level unchanged or increased ($p<0.01$). We found the following correlations between (i) baseline FeNO and baseline absolute FEV1 ($rs=0.41$; $p<0.01$); (ii) post exercise FeNO and ΔFEV1% 1 min post exercise ($rs=0.38$; $p=0.04$); (iii) post exercise FeNO and ΔFEV1% 5 min post exercise ($rs=0.58$; $p<0.01$); (iv) post exercise FeNO and PEF% 5 min post exercise ($rs= -0.56$; $p<0.01$).
Conclusion: The present data suggest a role of airway NO in lung function and in exercise induced bronchoconstriction in elite athletes.

P2143

Exercise-related perceptions do not affect exercise response in subjects with OSA

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Lean and obese subjects have similar exercise capacity and intensity of dyspnea and leg effort. Obese individuals with OSA have a reduced exercise capacity (Vanhecke 2008); if this depends on exercise-related perceptions needs to be defined. Sixteen subjects with OSA, 8 lean (BMI:25.6±2.5) and 8 obese (BMI:40.8±10.1) and 14 subjects without OSA, 8 obese (BMI 44.9±7.5) and 6 lean subjects (25.5±1.9) underwent spirometry, polysomnography, and incremental exercise test. FRC (% pv) was similar in obese with and without OSA (84.4±9.8 vs 88.6±24.2 respectively; p:ns). The severity of OSA (AHI:51.1±24 vs 30.3±10.5; p:ns) was the same in obese and lean subjects. At VO2Peak (l/min: 2.62±0.6; 2.4±0.7; 2.51±0.6; 2.25±0.5 in obese with OSA and non OSA, and lean with OSA and non OSA subjects, respectively; ANOVA: p:ns). VO2peak (ml/kg/min) was similar between obese subjects (OSA vs non OSA) and between lean subjects (OSA vs non OSA). End-expiratory-lung-volume (EELV) decreased in lean subjects with (290±420ml), and without OSA (330±184ml), while increased in Obese with (270±330ml) and without OSA subjects (304±330ml). Peak BORG was similar (ANOVA p:ns) in the four groups (7.5±1.6; 6.25±1.75; 5.9±2.4; 6.8±2.3 for obese OSA and non OSA, and lean OSA and non OSA subjects, respectively). Peak leg effort did not significantly differ in obese and lean subgroups: (8.63±1.69; 7±1.9; 7.1±2.1; 8.5±0.8 for obese with and without OSA, and lean with and without OSA, respectively; ANOVA p:ns). The qualitative difference in EELV response indicates respiratory mechanical limitation during exercise in obese subjects with and without OSA. Exercise-related perceptions do not affect exercise response in obese with OSA.