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P1221

Effect of sample volume size on single-breath transfer factor for the lung
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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_{sample}) 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_{sample} was varied to give TL_{CO} readings for V_{sample} of 0.2L, 0.4L, 0.6L and 0.8L and 1.0L. The repeatability of TL_{CO} at each V_{sample} was investigated with repeatability coefficient. TL_{CO} at each V_{sample} was compared to the TL_{CO} at 1.0L V_{sample} and the difference illustrated using Bland & Altman plots.

Results: Repeatability was not affected by changing V_{sample} in any of the subgroups (repeatability coefficient: 0.42-0.64). Mean TL_{CO} increased as little as 3-5% with increasing V_{sample}, with the largest difference between a 0.2L and 1.0L V_{sample}. 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_{sample} does not compromise repeatability. A clinically significant variation in TL_{CO} of up to 15% is possible with a reduced V_{sample}. Further study is needed to confirm this observation and investigate the effect of changing V_{sample} on transfer coefficient and alveolar volume.

115. Exercise tests and emerging outcomes: defining the impact of pulmonary rehabilitation

P1222

Effect of COPD severity on hemodynamic responses to exercise in patients with GOLD stages I-IV

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Introduction: Exercise-induced dynamic hyperinflation and large intrathoracic pressure swings can compromise the normal increase in cardiac output (Q) during exercise in COPD. Therefore, it is anticipated that the greater the disease severity, the greater would be the impairment in Q during exercise.

Aim: Thus, the aim of the study was to investigate whether the Q response is more severely impaired in the more advanced stages of COPD.

Method: We studied sixty COPD patients (15 patients at each stage, I to IV). Patients undertook a constant load test (75% WR_{peak}) and a six minute walking test (6MWT). Q at rest and during exercise protocols measured by bioimpedance (PhysioFlow, Enduro) to determine the kinetic response at the onset of exercise (On-transient) and during recovery (Off-transient).

Results: While Q kinetics (On & Off) was not different between the two exercise protocols, on-transient and off-transient time constants were slower the more severe the disease severity was (Table 1).

Table 1. Q Kinetics (On & Off)

GOLD Stages	On-transient Qt (sec)		Off-transient Qt (sec)	
	6MWT	Constant	6MWT	Constant
I	41.5±4.3*	45.2±1.5*	41.8±1.9*	41.9±2.1*
II	58.7±4.5*	64.7±2.8*	62.2±6.1*	68.1±3.1*
III	85.5±4.5*	89.8±2.5*	77.3±5.4*	87.3±2.9*
IV	105.7±4.5*	106.1±2.5*	102.5±3.6*	103.8±2.5*

Values are means ± SEM. *Significant difference among stages.

Conclusion: The more advanced the disease severity the more impaired was the hemodynamic response to the 6MWT and the constant load test, possibly reflecting greater cardiovascular impairment in COPD or greater physical deconditioning. The 6MWT reflects, equally well as the constant load test, the degree of impairment in the hemodynamic response to exercise.

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Electrocardiographic and echocardiographic abnormalities in COPD patients according to disease severity

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Epidemiological studies show high prevalence of cardiovascular disease (CVD) in COPD patients; however few studies have assessed the prevalence of cardiac abnormalities in different stages of COPD. The aim of this study was to assess the prevalence of electrocardiographic and echocardiographic changes in 50 mild/very severe COPD patients (62% male gender, age= 67±9 years, FEV1= 56±23%). All individuals underwent to medical history and physical examination, electrocardiographic and Doppler echocardiography evaluations. Changes suggestive of ischemic heart disease occurred in 10% and mild left ventricular diastolic dysfunction in 88% independently of COPD stage. Mild/moderate COPD patients showed higher prevalence of abnormalities in segmental contractility (p=0.01), while severe/very severe COPD patients showed higher prevalence of right ventricular overload (p=0.01) and increased right heart chambers (p=0.001). Age, male gender, systemic arterial blood pressure, C-reactive protein and BODE index were included in a multiple linear or logistic regression analysis with the left ventricular diastolic diameter/the size left atrium as dependent variables. Male gender and the BODE index were selected as predictors of left ventricular diastolic diameter (R²=0.12; p=0.03 and p=0.01, respectively); systemic arterial blood pressure was the only variable selected as predictor of enlarged left atrium (OR=3.85 (1.04 – 14.27); p=0.04). In conclusion, patients with COPD have high prevalence of electrocardiographic subclinical cardiac abnormalities, regardless of disease severity. Gender and the COPD severity are associated to cardiac structural changes. Research supported by FAPESP (2010/10312-1)

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Effects of pulmonary rehabilitation (PR) on arterial stiffness in patients with COPD: The CIROCO study

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Background: Arterial stiffness, a strong predictor of cardiovascular mortality, is increased in patients with COPD. The effects of PR on arterial stiffness have been studied scarcely.

Methods: Pulmonary function, 6MWD, BMI, SGRQ, mMRC dyspnea score, aortic pulse wave velocity (APWV), brachial pulse wave velocity (BPWV) and pulse wave analysis (SphygmoCor; AtCor Medical, Sydney, Australia) were determined in 102 patients (35 female; age: 64±7 years, FEV1%: 53±17) with clinically stable COPD, prior and subsequently to a 35-session PR program including high-intensity interval and resistance training.

Results: 6MWD (+31,3±55,4m; p<0.001), mMRC score (-0,5±0,9; p<0,001), SGRQ (-2,4±11,8, p=0.011) and BMI (+0.4±1.4 kg/m², p=0.006) all improved, compared to baseline. Overall there were no changes in APWV, BPWV, central blood pressure and augmentation index (AI), while central and peripheral pulse pressure (PP) increased slightly. Peripheral PP increased due to a modest but significant reduction in peripheral diastolic blood pressure (DP). Also a significant, but clinically irrelevant reduction in heart rate (HR) was seen.

	Baseline	After PR	P
APWV, m/s	11.0±3.1	11.0±2.5	0.835
BPWV, m/s	8.9±1.9	8.8±1.5	0.903
SP, mm Hg	137.9±20.9	137.7±21.1	0.868
DP, mm Hg	82.3±9.4	80.8±8.6	0.034
PP, mm Hg	54.0±16.1	57.4±15.3	0.017
Central SP, mm Hg	127.2±19.6	128.9±18.8	0.270
Central DP, mm Hg	82.3±9.4	80.8±8.6	0.176
Central PP, mm Hg	45.2±14.5	47.8±14.7	0.026
Central AI (75 bpm)	29.6±8.8	29.2±8.3	0.457
HR, bpm	68.8±11.8	67.3±10.4	0.027

Conclusion: On average, pulmonary rehabilitation does not reduce arterial stiffness in patients with COPD.

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Reduced six-minute walking distance is associated with endothelial dysfunction in COPD patients

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Background: Endothelial dysfunction represents a key step in the increase in cardiovascular risk. We prospectively investigated the determinants of endothelial function in patients with chronic obstructive pulmonary disease (COPD).

Methods: Digital pulse amplitude augmentation assessed by post-ischemic reactive hyperemia (RH-PAT) was measured in 47 consecutive COPD patients (41 men, BMI: 25±5 kg/m², age: 65±9 yrs, 35 patients in stable condition and 12 within exacerbation). RH-PAT was analyzed with the following clinical and biological covariates: body mass index (BMI), fat-free mass (FFM), pulmonary function tests, blood pressure, inflammatory and oxidative stress biomarkers, six-minute walking distance (6MWD) and peripheral muscle function, medications, diabetes and prevalent cardiovascular diseases.

Results: After adjustment for age and sex, RH-PAT was linked to FFM, heart rate, prevalent hypertension and myocardial infarction history, diastolic blood pressure, FEV₁, FEV₁/FVC, PaCO₂, IL6, and 6MWD. In multivariate analysis, walking distance, FFM and PaCO₂ were independent contributors of RH-PAT explaining 54% of the variance $p < 0.0001$. A higher FFM index was associated with higher grade of inflammation, increased oxidative stress and more severe endothelial dysfunction. RH-PAT was significantly lower in patients within exacerbation as compared with those in stable condition.

Conclusion: Six-minute walking distance which is a widely available marker of severity and functional capacity in COPD patients is a main predictor of endothelial dysfunction.

ClinicalTrials.gov Identifier: NCT00404430.

P1226

Reproducibility of a time trial cycle ergometer test protocol in comparison to a constant work rate test protocol in patients with COPD

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Introduction: In cardiopulmonary rehabilitation programs (CPR), constant-load cycle endurance tests (CLET) protocols are used to evaluate the response to specific interventions. In healthy subjects CLET protocols show a much lower reproducibility than time trial test (TTT) protocols. The purpose of this study was to evaluate the reproducibility of the CLET protocol and TTT protocol on a cycle ergometer in patients with COPD.

Methods: In 20 patients with COPD (GOLD II-IV, FEV₁ of 56±15%) exercise performance was measured. Patients were randomly allocated to a CLET protocol or TTT protocol. Patients performed the test protocol to which they were assigned, five times. Patients in the CLET group exercised to exhaustion at 120% of the actual individual training workload attained in the during CPR training sessions. Patients in the TTT group were asked to perform a certain amount of work (120% * Wtraining * 420) as fast as possible.

Results: TTT protocol showed a significantly lower coefficient of variation (CV) (6.6±3.6) than the CLET protocol (22.2±9.8) ($P < .001$). Individual CV (time to completion) ranged from 9.0% to 36.9% in the CWRT protocol and from 3.4% to 16.3% in the TTT protocol. There was a significant difference between the mean exercise time of the CLET (591±185 s) and the TTT (367±122 s) ($P < .005$). There were no differences in mean work ($p = .058$), power ($p = .463$), RPM ($p = .629$), subjective assessments of breathlessness ($P = .55$) and leg fatigue ($P = .15$) between the CLET and de TTT protocol.

Conclusions: The TTT protocol reproducibility was sign. higher than in the CLET protocol in patients with moderate-to-severe COPD.

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Estimation of peak work load based on 6-min walk distance and general demographics in patients with COPD: A new regression equation

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Background: Existing regression equations to estimate Wpeak using 6-min walk distance (6MWD) are not accurate enough to target training intensity during pulmonary rehabilitation (PR) in patients with COPD (Sillen et al ERS 2011). We

aimed to develop a new regression equation to estimate Wpeak using 6MWD and general demographics in COPD patients entering PR.

Methods: Measurements of lung function, body composition, and peak and functional exercise capacity were obtained in 3000 patients with COPD (53% men, age: 63.0±9.4 yrs; FEV₁: 44±18% pred.), referred to 4 PR centres in the Netherlands (all member of the *Vereniging Astmacentra Nederland*). A stepwise multiple regression analysis was performed to estimate Wpeak using 6MWD, gender, age, height, body weight, fat free mass and FEV₁.

Results: On average, patients had a normal body composition (BMI: 25.8±5.5 kg/m²; FFMI: 16.9±18.4 kg/m²), and a poor peak (59±33 Watts) and functional exercise capacity (6MWD: 399±120 metres). The VAN regression equation derived from the stepwise multiple regression analysis was as follows: Wpeak = -52.787+(0.319*gender, women=0 and men=1)-(0.229*age in yrs)+(0.108*height in cm) + (0.267*body weight in kg) + (0.182*FFM in kg)+(0.132*6MWD in m)+(23.528* FEV₁ in litres).

This regression equation explained 67% of the variation. The mean difference between the actual and the predicted Wpeak was 0.3±19 watts. 26% of the COPD patients had a predicted Wpeak which differed less than 5 watts (±) of the actual Wpeak.

Conclusion: The level of accuracy of this newly derived regression equation seems too low to be used in individuals with COPD to target training intensity during PR.

P1228

Inhibitory effect of SABA on exercise dynamic lung hyperinflation during 6-min walk test in stable COPD patients

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Aim: The purpose of this study was to evaluate the inhibitory effect of short acting β₂-receptor agonist (SABA) on exercise dynamic lung hyperinflation during the 6-minute walk test (6MWT) in stable COPD patients.

Subjects and methods: We examined 14 patients with stable COPD (mean age; 76yr, mean FEV₁: 57%pred) who were referred to our clinic between July 2008 and October 2009. 6MWT and lung function test were performed after the inhalation of SABA procaterol hydrochloride (20µg) or placebo.

Results: Compared to the baseline assessment, 6MWD increased by a mean of 20.5m when measured after inhalation of SABA (512.4±90.7m vs. 532.9±79.8m; $p < 0.05$). During the 6MWT, inspiratory capacity (IC) decreased significantly with time. The IC after inhalation of SABA was improved significantly compared with placebo. The Borg dyspnea score increased with time during 6MWT and was attenuated significantly after inhaling SABA.

Conclusions: In the present study, there was a significant attenuation in exercise dynamic lung hyperinflation, suggesting the important rescue role SABA in the management of COPD. It is therefore likely that most patients with COPD may derive considerable benefit from rescue bronchodilator therapy with SABA.

P1229

Energy economy of walking with a wheeled ambulatory aid (rollator) in patients with chronic obstructive pulmonary disease (COPD)

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Background: Probst et al. (Chest 126: 1102, 2004) reported that, when using a rollator, patients with COPD increased their distance walked in 6 min along with increased oxygen uptake and ventilation. It was difficult to appraise economy (mechanical work to total energy expenditure) because the main determinant of the energy demand, speed, varied between conditions; hence, the authors concluded that rollator use improved distance by increasing ventilatory capacity and/or economy.

Objective: To determine whether walking with a rollator improved the energy economy in patients with COPD. The hypothesis was that oxygen uptake, at the same speed, would be lower (improved economy) when walking with a rollator.

Methods: Subjects completed 2 walks, (with and without a rollator) at individually set and constant speeds. At least 24 h later they repeated the session for a total of 4 walks. Energy expenditure was estimated from measured oxygen uptake using a telemetric system. Since mechanical work was kept constant (speed) during each walk, differences in economy were reflected in differences in energy expenditure in metabolic equivalents (METS).

Results: Ten subjects completed the study. Attainment of a steady state was confirmed during every walk. There was no effect of day ($p = 0.23$) on energy expenditure. There was no significant difference (0.0 [-0.4 to 0.3] METS) in energy expenditure with (3.6 [2.9 to 4.3] METS) or without (3.6 [2.9 to 4.3] METS) the rollator.

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Conclusion: Rollator use does not acutely affect walking economy in patients with COPD. A better understanding of how people with COPD benefit from rollator use may facilitate their design and prescription.

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Characterization of balance impairments in individuals with COPD
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Background: Balance deficits are increasingly recognized as an important secondary impairment in COPD, however little is known regarding the specific components of balance that are impaired.

Objectives: 1) To determine the specific components of postural control that are impaired in individuals with COPD compared to age-matched healthy controls; 2) To determine if deficits in balance in COPD are related to muscle strength or physical activity.

Methods: Balance, physical activity and lower extremity muscle strength were assessed in 37 patients with COPD and 20 healthy controls using the Balance Evaluation Systems Test (BESTest), the Physical Activity Scale for the Elderly (PASE), and an isokinetic dynamometer, respectively. A subset of subjects (20 COPD and 20 controls) underwent a second testing session in which postural perturbations were delivered using a lean-and-release system. Center of pressure data were collected from three force plates mounted in the platform.

Results: Subjects with COPD (age 71±7 yrs; FEV₁ 39±16 percent predicted) exhibited significantly lower scores than controls (age 67±9 yrs) on all of the BESTest subscales (all p<0.0001). The largest detriments in postural control were evident in biomechanics, transitions and gait. The PASE was a significant predictor of BESTest score (p=0.034) in COPD. In response to anterior perturbations, subjects with COPD showed a longer time to foot-off (p=0.027) and foot-on (p=0.018) as well as a longer duration anticipatory phase (p=0.008) compared to controls.

Conclusions: Comprehensive balance assessment and management should be included in pulmonary rehabilitation. Deficits in balance in COPD appear to be related to decreased physical activity levels.

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Comparison of maximal exercise capacity between patients with COPD from Brazil and United Kingdom
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Background: Field exercise tests such as the incremental shuttle walking test (ISWT) have been used worldwide in order to assess exercise capacity of patients with chronic obstructive pulmonary disease (COPD). However, the responses to this test in patients from different world regions have not yet been compared.

Objectives: To compare the responses to the ISWT between patients with COPD from Brazil and United Kingdom (UK).

Methods: 20 patients with COPD from Brazil were matched to 20 patients from the UK concerning gender distribution, age, body mass index and FEV₁. All patients performed the ISWT during the baseline assessment for admission to a pulmonary rehabilitation program in their respective country. The total distance walked was recorded and heart rate (HR), oxygen saturation (SpO₂) and dyspnea score (Borg scale) were assessed before and after the test in both centers.

Results: In both groups, SpO₂ decreased and HR and dyspnea scores increased significantly after the test (p<0.05 for all). Brazilian patients walked farther and achieved higher% of their maximal predicted HR than patients from the UK (345±173 vs 209±116 meters [p=0.006] and 80±12 vs 64±10%pred [p<0.0001], respectively). The increase in dyspnea sensation after the test tended to be higher in the Brazilian group (4 [2-6] vs 2 [1-4], p=0.06).

Conclusions: Brazilian patients with COPD seem to walk more and achieve higher effort during the ISWT than patients from the United Kingdom. This is in line with previous data showing that patients from South America (especially Brazil) are more active in daily life and have better functional exercise capacity in comparison to patients from Europe and United States.

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The effect of pulmonary rehabilitation on the sit-to-stand test in COPD
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Background: The sit-to-stand (STS) test is a component of the Short Physical

Performance Battery (SPPB), it measures the fastest time to stand from a seated position 5 times with folded arms. We hypothesised the STS may be a useful outcome measure in COPD and that it would improve after an 8-week outpatient pulmonary rehabilitation (PR) program.

Methods: In 83 COPD patients (43M: 40F) referred to PR, the following were measured before and after PR: STS, incremental shuttle walk (ISW), MRC Dyspnoea score (MRC) and St George's Respiratory Questionnaire (SGRQ). Modified BODE (ISW as the exercise component) and ADO scores were calculated as composite mortality indices. Spearman's rank correlation was used to assess the relationship between STS and baseline characteristics and Wilcoxon signed rank test to assess the effect of PR on STS. We estimated minimal clinically important difference (MCID) using an anchor based approach against a 5-point Likert scale and the MCID of ISW.

Results: 18 patients were unable to complete STS either pre- or post-PR. 6 were unable to perform STS pre-PR but improved sufficiently to do so after PR. STS at baseline correlated significantly with ISW (r=-0.53), MRC (r=0.35), modified BODE (r=0.26) and ADO (r=0.35), but not with age, FEV₁%predicted, BMI or SGRQ. In 65 patients with full pre- and post-PR data, median STS time improved from 13.8s to 12.0s following PR (p<0.0001). Median improvement was -1.8s in those feeling "much better" after PR and -2.4s in those achieving the MCID of the ISW.

Conclusions: Not all COPD patients referred to PR can complete a STS. The STS is sensitive to change following PR. The MCID for the STS is probably a decrease of greater than 2 seconds.

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Age of loss of walking ability in patients with Duchenne muscular dystrophy: A marker for the elective use of mechanical ventilation?

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Introduction: In adolescence of Duchenne muscular dystrophy (DMD) comes the cardioventilatory restrictive impairment (hypoventilation, sleep breathing disorder and respiratory effort), marked by the loss of ambulation. At that time, the institution may be required ventilatory support (VS). VS improve lung function, reducing need for tracheostomy and increasing quality of life in DMD. Public Program (Ventilar-VP) in John Paul II Child Hospital/Hospitalar Foundation of Minas Gerais State (JPIICH/HFMGS) assist DMD patients.

Objective: To evaluate loss of ambulation and the need to VS in patients with DMD in VP/JPIICH/HFMGS.

Patients and methods: Cohort study, between 2002-2010 in VP. Group A: 16 (25.8) VS users and group B: 46 (74.2) nonusers of VS. Likelihood of VS was estimated by survival analysis of Kaplan-Meier.

Results: Medians for the entire sample (years): last visit: 15.6 (6.4 to 30.2), monitored by the VP: 4.5 (0 to 6.5). Median age (years) loss of ambulation: A 8.1 (5-13), B 10 (6.7 to 15) (p=0.05). Majority in A lost early ambulation. Significant difference between the two groups (p=0.05). Survival curve of cumulative probability of VS: age <11 years: no patient needed VS, 16 years: 20%, 23 years: 50%, and 26 years: 100%. Statistically significant difference in the cumulative probability (p<0.001) in need of SV among patients with loss of ambulation before 10 years (group C) and with loss of ambulation after that age (group D). 15 years of age, 12% of patients in C required SV. 100% needed to SV in C, in D only after 23 years.

Conclusion: Age of loss of ambulation at age 10 is a marker for estimating the need of early VS in patients with DMD.

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In which male patients with COPD participated in a pulmonary rehabilitation program should be evaluated for osteoporosis?

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Osteoporosis is common in patients with COPD and an important risk factor for the development of hip, vertebral or long bone fracture which could add further disability and incapacity.

The aim of the study was to analyze the utility of different measures (age, smoking habit, daily dose of inhaled steroids, anthropometric measures of body composition, stage of COPD, dyspnea, health related quality of life, exercise capacity, comorbidities) for detecting the need of osteoporosis evaluation in male COPD patients who were participated in a PR programme.

Methods: Patients who were in a pulmonary rehabilitation programme with confirmed stable COPD and not on long-term oral corticosteroids (n=57) performed spirometry. They underwent nutritional assessment by midarm circumference, calculation BMI and FFMI. Dyspnea sensation was assessed with the MRC, where health related quality of life was assessed with the SGRQ. Exercise capacity was measured using the SWT. All had DXA assessment of Bone Mineral Density.

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Results: A total of 57 COPD patients with the mean age of 62.07 ± 7.5 years. Osteoporosis was found in 22 patients (38.6%) at both the total hip and total lumbar spine region.

After adjusting for all covariates (age, FEV1, daily dose of inhaled steroids and smoking pack years) COPD patients with a lower BMI was found to be at an increased risk of hip region osteoporosis. The adjusted odds ratio for BMI: 0.51 (0.28-0.91), $P=0.023$.

The addition any of the other measurements was not found as a risk factor for osteoporosis.

Conclusion: Nutritional assessment, incorporating a calculation of their BMI may confer benefit detecting those at risk of osteoporosis in male COPD patients.

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The effectiveness of pulmonary rehabilitation in COPD outpatients with comorbidities

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Aim: Chronic obstructive pulmonary disease (COPD) is often associated with other chronic diseases. The aim of this study was to determine the frequency and prevalence of chronic comorbidities in patients with COPD and to assess their influence on the effects of pulmonary rehabilitation (PR).

Method: 183 patients were included multidisciplinary comprehensive PR program between July 2007 and September 2010 in our outpatient PR center. All patients were grouped according to the following comorbidity categories: 0 (absence of comorbidity), 1 and ≥ 2 (depending on the number of comorbidity). Incremental Shuttle Walking Test (ISWT) and Endurance Shuttle Walking Test (ESWT) was used to evaluate exercise capacity, Medical Research Council (MRC) for the perception of dyspnea, St. George's Respiratory Questionnaire (SGRQ) for quality of life, Hospital Anxiety and Depression Scale (HADS) for psychological evaluation and BMI, fat-free mass (FFM), fat-free mass index (FFMI) analyzing for body composition.

Results: 131 patients reported at least one chronic comorbidity added to COPD. Metabolic (systemic hypertension, diabetes, dyslipidaemia) and heart diseases (chronic heart failure, coronary heart disease) were the most frequently reported comorbid combinations (88 and 23, respectively). Statistically significant improvement was determined in ISWT and ESWT ($p < 0.01$); statistically significant decrease was determined in MRC, SGRQ and HADS ($p < 0.001$) for each comorbid categories.

Conclusion: Chronic comorbidities are very frequent in patients with COPD undergoing PR. Comorbidities does not preclude access to effectiveness of rehabilitation.

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Comorbidities in COPD patients are not associated to higher disease severity

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The influence of disease severity on the prevalence of comorbidities in COPD patients is unclear. The aim of this study was to assess the prevalence of comorbidities in 25 mild/moderate COPD patients (68% male gender, age= 65 ± 8 years, FEV1= $73 \pm 15\%$) and 25 severity/very severity COPD patients (56% male gender, age= 69 ± 9 years, FEV1= $40 \pm 18\%$). Comorbidities were registered based on medical charts diagnoses, on Charlson comorbidity index and on Hospital Anxiety and Depression Scale. Of the 50 patients evaluated, 70% had diagnosis of comorbidities, and 42% of these were cardiovascular diseases (40% hypertension, 10% coronary artery disease and 6% heart failure grade I). Depression was present in 20% of patients, dyslipidemia in 14% and diabetes mellitus in 14%. The prevalence of dyslipidemia ($p=0.02$), depression (0.008) and alcoholism ($p=0.06$) were higher in patients with mild to moderate disease. Charlson comorbidity index, systemic arterial blood pressure, diabetes mellitus, ischemic heart disease and chronic cardiac failure and the scores of the Hospital Anxiety and Depression Scale were similar between both groups. The majority of patients with diagnostic of dyslipidemia had concentrations of lipids (total cholesterol, HDL, LDL and triglycerides) within normal values and the lipid profile were similar between groups. In conclusion, comorbidities are highly prevalent in COPD patients regardless of the disease severity. Some diseases such as dyslipidemia, depression and alcoholism are even more prevalent in mild/moderate patients.

Research supported by FAPESP (2010/10312-1)

116. Exacerbations and severe chronic respiratory disease: oxygen, rehabilitation, admission to hospital and palliative care

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Late-breaking abstract: Effects of mucus clearance on the differences of rheological property, driving pressure and frequency during high frequency chest wall oscillation (HFCWO)

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Background: HFCWO is commonly used for airway clearance. However the effect of mucus clearance on the rheological property, driving pressure and frequency during HFCWO is not clear. The purpose of this study is to clarify differences of airway clearance efficacy.

Method: 24 normal subjects participated in the study 1. Mucus stimulants (MS) were prepared using thickener 1, 2, 3 and 4% and the pressure controls of SmartVest™ were driven 20, 40 and 60 on the frequency 13Hz. MS rheological studied were measured using Rheometer. They were quiet breathing into the endotracheal tubes having internal diameter of 7mm during SmartVest™. We measured migration velocity of each MS, PEFR, PEmax and effortless breathing. Another 26 normal subjects participated in the study 2. MS were prepared using similar thickener were driven frequency 9Hz, 13Hz and 17Hz on the driving pressure 40. Measurement methods and items were carried out in a similar manner of Study 1.

Results: The higher setting pressure and frequency controls proved, the more PEFR and PEmax increased ($p < 0.05$). In the rheology of MS, the lower viscoelasticity of 1% MS had, the faster clearance velocity moved ($p < 0.05$). However, the clearance velocity did not increase in the higher viscoelasticity of MS in spite of high driving pressure. The 13Hz oscillation was most reduced in viscoelasticity and yield value by comparison with 9Hz and 17Hz. The lower viscoelasticity of MS in the each frequency, the clearance velocity increased ($p < 0.05$). The subjects were not tolerable on 17Hz.

Conclusions: The oscillation of 13Hz and driving pressure 40 is the most effective for mucus clearance.

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Assessment of nocturnal hypoventilation in patients with chronic respiratory failure: Role of transcutaneous PCO2 monitoring. An observational study

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Patients with nocturnal hypoventilation are at risk of developing daytime ventilatory failure. As a result, this finding has therapeutic implications. Currently, assessment of nocturnal hypoventilation is performed using nocturnal oximetry (NO) coupled to diurnal arterial blood gases (ABG). Even if theoretically useful, transcutaneous PCO2 (TcPCO2) monitoring is not routinely used. Therefore, its role should be defined.

Objectives: To compare NO coupled to ABG versus TcPCO2 for detecting alveolar hypoventilation in a cohort of chronic respiratory failure patients.

Methods: We performed 153 NO coupled to a TcPCO2 recording (91 under non invasive ventilation and 62 during spontaneous breathing) in 98 patients. In addition, ABG were performed during spontaneous breathing. Aetiologies of respiratory failure were: neuromuscular disorder (97 traces), thoracic cage abnormalities (35 traces) and lung disease (21 traces). Nocturnal hypercapnia was defined by a nighttime mean PtcCO2 ≥ 50 mmHg, nocturnal hypoxemia as $\geq 30\%$ of the night spent with a SaO2 $< 90\%$ and diurnal hypercapnia as a PaCO2 > 45 mmHg.

Results: Combined normal NO and normal ABG underestimated nocturnal hypercapnia in $> 50\%$ of both spontaneously breathing and ventilated patients. Conversely, nocturnal hypoxemia was associated with nocturnal hypoventilation in 100% of non ventilated patients but only in 50% of ventilated ones.

Conclusion: Normal values of nocturnal oximetry and/or ABG do not allow to exclude nocturnal hypoventilation. Our results underline the interest of performing nocturnal TcPCO2 monitoring to evaluate patients at risk of nocturnal hypoventilation.