347. Clinical physiology

P3800

Bronchopulmonary dysplasia is associated with panacinar emphysema in young adults

Andrea N. Lees[1], Conor Murray[2], Jeanne Louw[2], Patrick M. Wong[3], Francis Y. Lee[3], Eli Gabbay[1], Noel French[4], Daniel C. Chambers[1], Andrew Wilson[1]. *[1]Advanced Lung Disease Unit, Royal Perth Hospital, Perth, Western Australia, Australia; [2]Radiology Department, Royal Perth Hospital, Perth, Western Australia, Australia; [3]School of Medicine and Pharmacology, University of Western Australia, Perth, Western Australia, Australia; [4]Neonatal Clinical Care Unit, King Edward Memorial Hospital, Perth, Western Australia, Australia*

Background: Improved survival following extreme premature birth is resulting in an increasing incidence of bronchopulmonary dysplasia (BPD). Although BPD improves in childhood and early adolescence, the pulmonary structural and functional consequences in adulthood are poorly defined.
Methods. In Western Australia, all babies with BPD (birthweight <1500g and oxygen dependence at 36 weeks post-menstrual age) are cared for at King Edward Memorial Hospital (KEMH). Subjects born prior to 1988 were identified and recruited via the KEMH neonatal database. The respiratory history and pulmonary function tests were obtained. Thin selective inspiratory and expiratory computerised tomographic (CT) images were acquired and scored by two independent radiologists.
Results. 8 adults (3 males, 5 females, aged 19-33) were studied. 3/8 (37.5%) had persistent respiratory symptoms, one was a smoker and 3/8 (37.5%) had abnormal pulmonary function. Seven (88%) of the 8 patients had abnormal CT findings. In 3 patients the only abnormality was airtrapping. 4 patients had areas of emphysema, and in 2 this was panacinar in type. Architectural distortion was present in 6 out of 8 patients, though distortion of fissures was the only sign of lung scarring in 2.
Conclusion. This is the largest CT study of adults with a history of BPD. Adult survivors of BPD may be left with residual functional and characteristic structural pulmonary abnormalities.

P3801

Changes of lung's surfactant system in patients with COPD in conditions of high altitude

Talant M. Sooronbaev, Gennadiy V. Belov, Erkin M. Mirrakhimov, Mirsaid M. Mirrakhimov. *Pulmonological, National Centre of Cardiology and Internal Medicine, Bishkek, Kyrgyzstan; Pulmonological, National Centre of Cardiology and Internal Medicine, Bishkek, Kyrgyzstan; Pulmonological, National Centre of Cardiology and Internal Medicine, Bishkek, Kyrgyzstan; Internal Medicine, National Centre of Cardiology and Internal Medicine, Bishkek, Kyrgyzstan*

Aim: to study of lung's surfactant system and endopulmonal cytogramm in healthy highlanders and patients with COPD constant highlanders.
Methods and materials: 60 patients with COPD in the age from 40 to 65 years (an average age 52,4±5,2) were examined. There are 30 lowlanders (from Bishkek, 720 m a.s.l.) and 30 highlanders (from Aksay, Tian-Shan, 3200-3600m a.s.l). Also 10 healthy lowlanders and 10 healthy highlanders were included into the control group. The condition of surfactant system was assessed by superficial activity (SA) of bronchoalveolaric lavage (BALG) fluid which was defined with method of monolayers with isopropil alcohol on modified scale Vilgelmi type. Superficial strain minimal (SSmin) and superficial strain maximal (SSmax) were measured. Index stability (IS) was calculated by Clements across SSmin and SSmax.
Results: SA parameters of BALG fluid in healthy highlanders realistically didn't differ by comparison with lowlanders. Opposite on the contrary, patients with COPD had reduction of SA of bronchoalveolaric lavage fluid. This changes depend on degree of disease and mostly expressive in patients with COPD, living in high altitude. So in patients with heavy form of COPD SSmin increased on 27,2% by comparison with 18,6% in low altitude and IS in high altitude increased till 29,9% by comparison with 20,5% in low altitude. Also in patients with heavy form of COPD in conditions of high altitude was found shifts on endopulmonal cytogramm.
Conclusion: so reserve ability of lung's surfactant system in patients with COPD significantly limited. Neithrophylic inflammation prevailed on cytogramm of BALG fluid.

P3802

The effect of spinal anesthesia level on pulmonary function tests in old patients

Mustafa Ogurlu[1], Selda Sen[1], Mehmet Polatli[2], Emine Sirthan[2], Erdal Gezer[1], Feray Gursoy[1], Orhan Cildag[2]. *[1]Department of Anesthesiology and Reanimation, Adnan Menderes University School of Medicine, Aydin, Turkey; [2]Department of Pulmonology, Adnan Menderes University School of Medicine, Aydin, Turkey*

Pulmonary function test (PFT) results are mainly dependent on age, sex, height, weight, pulmonary mechanics disturbances and cooperation of the subjects. The position and anesthesia type may also influence the PFT results. In this study we aimed to evaluate spirometric changes in old patients performed spinal anesthesia with respect to young patients. Fifty patients applied spinal anesthesia were randomized in 2 groups: Group 1 (n: 25) aged 60-85 years old and Group 2 (n: 25) aged 20-59 years old. Premedication with midazolam (0.04 mg/kg) was performed to all patients. After ECG, noninvasive blood pressure and peripheral O_2 saturation (SpO_2) monitorization, spinal anesthesia using % 0.5 hyperbaric bupivacain from L3-4 intervertebral space was applied. Pulmonary function test was performed before and after spinal anesthesia in 10^{th}, 40^{th} and 100^{th} minutes in supine and 30^{o} head position using hand type spirometry. FVC, FEV_1 and FEF_{25-75} decrease with respect to basal values in 40^{th} minutes was significant in old patients but in young patients the changes were not significant. Th6 sensorial level designates for the neurologic innervation of respiratory muscles and parasympathetic dominance for bronchial innervation in spinal blockage circumstances. In old patients whom spinal anesthesia is over Th6 level, FVC, FEV_1, FEF_{25-75} decreased in 40^{th} minutes according to basal measurements compared to lower spinal anesthesia levels. Mean arterial blood pressure levels were also found to be decreased in 40^{th} minutes. We conclude that PFT decrement probabilities should be taken in account in old patients supposing for spinal anesthesia and be paid attention for high level spinal blocks in risk group patients.

P3803

Emphysema contribution to the progression of chronic obstructive pulmonary disease

P. Boschetto[1], S. Quintavalle[1], S. Leprotti[2], L. Ballerin[3], A. Potena[3], E. Zeni[1], D. Miotto[1], E. De Rosa[1], A. Papi[1], M. Fabbri[4], E. Mapp[1]. *[1]Clin. and Exp. Med, University of Ferrara, Ferrara, Italy; [2]Surg. Anesth. and Rad, University-Hospital of Ferrara, Ferrara, Italy; [3]Respir. Physiopathol, University-Hospital of Ferrara, Ferrara, Italy; [4]Respir. Dis, University of Modena & Reggio Emilia, Modena, Italy*

The severity of chronic obstructive pulmonary disease (COPD) is defined by a five-stage classification (GOLD Stages) based on measurements of airflow limitation during forced expiration. To evaluate the relationship between the progression of COPD and the extent of emphysema, documented by high resolution computed tomography (HRCT), we examined 43 patients, all smokers or ex-smokers. Patients underwent pulmonary function tests and HRCT-density mask scan of the chest. The progression of COPD was strongly associated with an increase in the extent of the relative area of lung, expressed as percentage, occupied by emphysema (A'/A, $r = -0.67$; $p < 0.0001$). An increase in FRC ($r = -0.61$; $p < 0.0001$) and in VR ($r = -0.55$; $p < 0.0005$), and a reduction in the diffusion constant (Kco, $r = 0.50$; $p < 0.005$) were also observed as COPD progressed.

Table. Characteristics of the patients according to the GOLD Stage of COPD

Characteristic	GOLD Stage 0	GOLD Stage 1	GOLD Stage 2	GOLD Stage 3	GOLD Stage 4
No. of patients	6	3	14	14	6
Age (yr)	64±3	61±1	69±3	71±2	75±3
A'/A (%)	2.6±0.9	3.7±1.7	10.3±2.8	17.5±3.7	28.4±3.1
FRC, % pred.	87.5±6.4	104.3±8.9	114.8±6.9	126.1±7.4	143.8±12.3
RV, % pred	96.5±6.8	119.0±1.1	125.7±9.9	144.2±7.3	154.7±14.7
Kco, % pred.	54.0±3.4	50.7±3.8	51.6±4.8	36.9±3.8	30.8±7.5

Values are mean ± SEM. % pred. = % predicted.

Progression of COPD is associated with an increase in the extent of HRCT-documented emphysema and with an increased severity of lung hyperinflation, gas trapping and of reduction in lung diffusing capacity.
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P3804

Inhomogeneity of ventilation in asthma correlates with large and small airways indices

Eva Polverino, Erika Garbella, Piera Fazzi, Roberto Albertelli, Cristina Spanu, Antonella Di Franco, Pierluigi Paggiaro. *Respiratory Pathophysiology, Università di Pisa, Pisa, Italy*

The study of small airways involvement in asthma and the choice of specific indices are still unresolved issues. Along with spirometric parameters, we studied pulmonary ventilation distribution through the inhalation of TC99-labelled micro-particles. Eleven mild-to-moderate asthmatics (FEV1: 53-112% pred.), under regular ICS and LABA therapy, were studied on 2 different days, after 24hrs of treatment withdrawal, after placebo or 200mcg of inhaled salbutamol. Measurements included: 1) FVC, FEV1, FEF50; 2) closing volume (CV), closing capacity (CC), slope of N2 washout (N2slope); 3) ventilation scan. Two indices of ventilation inhomogeneity, excluding 30% (InI30%) or 10% (InI10%) of total pixel counts measured in the lung area, representing inhomogeneity due to large and small airways respectively, were considered. CV was measurable in only 3 patients after placebo and in 8 patients after salbutamol, likely as effect of bronchodilatation, as shown by significant increases in FVC (by 10%), FEV1 (by 21%) and FEF50 (by 53%). After salbutamol we also observed an increasing trend of CC and N2slope, significant increases in InI10% (by 46%) and InI30% (by 143%). After placebo FEV1 and FEF50 correlated with InI10% and InI30%, while FVC correlated with InI10% only. Similar correlations were found by considering their respective changes after salbutamol. CC after placebo correlated with InI10%,

FVC and FEF50. Similarly, the CC change after salbutamol significantly correlated with InI10% change. Our results suggest that large airways calibre is dominant on the distribution of pulmonary ventilation, even though a correlation has been observed among small airways indices (FVC, FEF50, CC, InI10%).

P3805

Does thyroxin replacement therapy improve dyspnea and diaphragmatic thickness in hypothyroid patients?

Aliae A.R. Mohamed-Hussein, Nabila F. Amin. *Chest Department, Assiut University Hospital, Assiut, Egypt; Internal Medicine, Assiut University Hospital, Assiut, Egypt*

Rationale: Hypothyroidism is a disease of multi-system affection and respiratory system can be affected by different mechanisms. Dyspnea is an important complaint among hypothyroid patients and there are many theories to explain its causes.
Objectives: to evaluate the prevalence of dyspnea in hypothyroid patients and improvement of dyspnea and diaphragmatic strength after thyroxin therapy.
Patients and methods: 42 subjects were recruited in this study, 30 had clinical and laboratory confirmed hypothyroidism. After history taking and clinical examination, plain x-ray chest, 6 minutes walking test (6MWT), and chest ultrasonography for assessment of diaphragmatic thickness (tdi), excursion (e_{di}), change of tdi during inspiration (Δ tdi) were done. Follow- up was done after 3 months of eltroxin (100 microgram/day).
Results: the studied group included 27 females and 3 males, 12 controls, mean age 43± 13.9 years. Dyspnea was recorded in 66.7% of patients before therapy and improved after treatment. Baseline (6MW) distance was 144.5± 36 meters in patients and 188.3±10 meters in controls (P<0.0001). After therapy, walking distance increased up to 165.4± 19 (P< 0.001), with positive correlation between improvement of walking distance and T3, T4. Diaphragmatic US revealed increase in tdi in patients compared to controls (4.17±1.7 versus 2.0± 0.3 mm, P<0.000), with diminished Δ tdi during inspiration, and decrease excursion (e_{di}). After therapy, tdi was 2.78±1.2 mm (p<0.00), with significant improvement in Δ tdi and e_{di}.
Conclusions: dyspnea is common in hypothyroid patients. Thyroid replacement therapy can improve dyspnea, decrease the tdi of the diaphragm, improve Δ tdi and e_{di}.

P3806

The impact of work duration and smoking on lung function decline at high altitude

Denis V. Vinnikov, Nurlan N. Brimkulov, Hans LeRoux. *Internal Diseases, Kyrgyz Asthma Centre, Bishkek, Kyrgyzstan*

Aim. The issue of harmful effect of high altitude on respiratory system is still discussable. The aim was to estimate if working duration in this condition leads to reduction in lung function indices.
Material and methods. Within annual medical examinations 777 workers aged 38.8±8.6 years of which 83.9% men, were subjected to clinical examination, work and smoking history, and office spirometry performed by trained personnel. All subjects worked on intermittent basis (15+15 days) at altitude 4000 meters above sea level. Logistic regression was used to assess impact of ages of work at altitude and smoking on probability of bronchial obstruction.
Results. The mean work duration was 6.4±5.4 years, ranging from 0 to 32 years. When low-quality curves (low PEF, poor maneuvers, low reproducibility) were excluded, 87% of subjects were analyzed (N=665). FEV_1/FVC less than 70% was found in 9%, and its odds ratio (OR) in never smokers for work duration was 1.13 (p=0.01), in smokers – 1.05 (p=0.08). The OR of FEV_1 less than 80% was 1.14 (p=0.07) and 1.05 (p=0.34) respectively, and same for MEF_{50} less than 63%. However, OR of FEV_1/FVC for current smoking was 1.59 (p=0.12), FEV_1 less than 80% - 2.11 (p=0.01), and MEF_{50} less than 63% - 1.11 (p=0.59).
Conclusions. The work duration at high altitude, probably, does not lead to bronchial obstruction, however, smoking does, and more sensitive of that is FEV_1 rather than FEV_1/FVC.

P3807

The effects of wood dust of beech tree and smoking habit on lung function and bronchial reactivity in wood workers

Tomislav D. Djokic, Mirjana M. Miric, Nebojsa Mitic, Dragana T. Sumrak, Ljiljana Popovic, Ljiljana T. Djokic, Jugoslav Gasic. *Institute of Clinical Physiology, Faculty of Medicine, Kosovska Mitrovica, Kosovo, Serbia & Montenegro*

The prevalence of bronchial hyperreactivity and ventilatory impairment were studied in 235 wood workers and 145 control subjects from industrie with similar income, hausing, education and medical care. The aim of this study was to examine the prevalence of bronchial hypersensitivity and hyperreactivity and bronchial asthma in wood workers. At attempt was made to distinguish the effect of wood dust from the smoking noxious factors. The question of the role of bronchial hyperreactibility in pathogenesis of occupational asthma also was studied. In subjects with respiratory symptoms resembling asthma, the site of airway obstruction during induced bronchoconstriction and the role of bronchial hyperreactivity were observed.The results of this study showed that workers exposed to wood dust of beech-tree prove to have a significantly higher prevalence of bronchial asthma and ventilatory impairment than did control group. The interaction between smoking habits and the effect of occupational factors was demonstrated. The inhalation of extract of wood dust was followed by marked increases in specific airway resistance. The effect of breathing helium on maximal expiratory flow at 50 per cent of vital capacity during induced bronchoconstriction, due to inhalation of wood dust, occur mostly in large airways. The reaction was inhibited by prior inhalation of 20 mg disodium cromoglicate. The data of our study showed that subjects who had positive response to wood dust extract, demonstrate an abnormal degree of bronchial reactivity to histamine and propranolol, similar to that found in patients with “non-occupational” asthma.

P3808

Decreased diffusion capacity in patients with diabetes microangiopathy

Yongseon Cho, Yang Deok Lee, Dong Jib Na, Min Soo Han. *Internal Medicine, Eulji University Hospital, Daejon, South Korea*

Previous studies have dealt that pulmonary diffusing capacity, as determined by %DLCO, was found to correlate negatively with the duration of diabetes. Some studies have reported that as the duration of diabetes is increased, the pulmonary diffusing capacity is decreased. Furthermore, %DLCO was reduced in patients with diabetic microangiopathy. These results indicate that, as one manifestastion of diabetic microangiopathy, %DLCO is reduced by microangiopathic involvement of pulmonary vessels leading to ventilation-perfusion inequalities. To examine the possible association between diabetic microangiopathy and changes in %DLCO, we performed pulmonary function tests including assessment of the diffusing capacity in 41 patients with diabetes mellitus (19 males and 35 females) and also examined proteinuria, diabetic retinopathy,and diabetic neuropathy.
The mean age of the subjects was 53 years and the mean duration of diabetes was 7.9 years. The mean %DLCO in diabetes patients was within normal range(92.9%). The reduction in %DLCO decreased was greater in patients with proliferative diabetic retinopathy and in those protein excretion rate was over 300 mg/24h.

Relationships between diabetic microangiopathy and pulmonary function test

	DLCO/VA(%)	FVC(%)	FEV1(%)
with retinopathy(n=24)	108.8±21.9	90.0±12.8	97.3±18.6
without retinopathy(n=17)	111.3±19.5	91.1±12.8	99.8±13.5
with nephropathy(n=35)	108.7±19.9	97.1±9.8	96.6±16.9
without nephropathy(n=6)	116.3±26.2	89.3±12.3	108.5±10.3
with neuropathy(n=27)	105.6±21.9	90±12.5	97.5±17.1
without neuropathy(n=14)	118.0±15.9	91±12.1	99.9±17.1

This results suggest that diabetic microangiopathy may play important role in the decrease of %DLCO.

P3809

Bronchial resistance of community acquired pneumonia patients

Fedor F. Tetenev[1], Tatyana S. Ageeva[2], Vyacheslav Y. Danilenko[2], Alexey V. Dubakov[1]. *[1]Department of Internal Medicine Propedeutics, Siberian State Medical University, Tomsk, Russia; [2]Therapy Department for Postgraduate Medicine, Tomsk Military Medical Institute, Tomsk, Russia*

Aim: to study the state of general bronchial resistance (Raw) of community acquired pneumonia (CAP) patients.
Methods: the patients were examined in order to determine Raw, structure of total lung capacity, dynamic indicators of lung ventilation by means of “Masterlab pro” apparatus produced by E.Jaeger Company (Germany). We examined 40 CAP patients in the course of disease acuity (2-3 days of hospitalisation) at the age of 16-56 (the average age was 32,1± 2,0 years), 33 males and 7 females.
Results: the average Raw value amounted to 0,22±0,09 kPa·l/s, i.e. 77,91%±3,87% of due value (the average Raw due value is 0,29±0,01 kPa·l/s). The majority of patients (24) had Raw value less than 80% of the due value, whereas Raw value of 6 of them amounted to less than 50%. Only 2 patients’ Raw insignificantly exceeded the upper norm limit. However, this was observed under the conditions of increased pulmonary minute volume, and as a result the stated Raw values was not interpreted as pathological.
Conclusions: the research findings demonstrated that bronchial resistance of community acquired pneumonia patients was within the due value range.

P3811

Relationship of airway dimensions with lung volumes in chronic obstrucive pulmonary disease (COPD)

Masaru Hasegawa[1], Yasuyuki Nasuhara[1], Yuya Onodera[2], Hironi Makita[1], Tomoko Betsuyaku[1], Masaharu Nishimura[1]. *Hokkaido COPD Cohort Study Group; [1]First Department of Medicine, [2]Department of Radiology, Hokkaido University School of Medicine, Sapporo, Japan*

We have recently developed new software to obtain longitudinal images and accurate short axis images of airways with an inner diameter > 2 mm located

anywhere in the lung, using curved multiplanar reconstruction. Using this software, we demonstrated in patients with COPD that FEV_1 (%predicted) was highly correlated with airway dimensions and the correlation coefficients (r) improved as the airway became smaller in size (2005ATS). In this study, we examined the relationship of airway dimensions with lung volumes in 52 patients with COPD (stage I, 14; stage II, 22; stage III, 14; stage IV, 2). We analyzed the airway dimensions from the 3rd to the 6th generations of the apical bronchus (B1) of the right upper lobe and the anterior basal bronchus (B8) of the right lower lobe. Lung volumes were measured by the helium closed circuit method. Both airway luminal area (Ai) and wall area percent (WA%) of all the generations, except a few, from the two bronchi were significantly correlated with RV and RV/TLC, but not with TLC or FRC. More importantly, the correlation coefficients (r) between airway dimensions and RV/TLC improved as the airways became smaller in size from the 3rd to 6th generations in both bronchi (r= -0.481, -0529, -0.571, -0.655 for Ai of B8; r=0.303, 0.374, 0.460, 0.545 for WA% of B8). These findings provide further evidence that distal (small) airways rather than proximal (large) airways are the determinants for airflow limitation in COPD.

P3812

Analysis of the mucus properties in smokers with lung cancer or extra-pulmonary cancer and non smokers with pulmonary metastasis

Areta A.R. Souza, Maria L. Gutierrez, Geraldo L. Filho, Paulo H.N. Saldiva, Elnara M. Negri. *Laboratório de Poluição Atmosférica Experimental, Universidade de São Paulo, São Paulo, Brazil*

The present study has analyzed the rheological properties and transportability of respiratory mucus from 23 smokers with lung cancer, 23 smokers with extra pulmonary cancer (esophagus and head-neck) and 16 non-smokers with metastasis that underwent diagnostic bronchoscopy. Previous study (Zayas 1990) has suggested the existence of a rheological advantage in the respiratory mucus of smokers who did not present lung cancer in comparison to lung cancer patients smoking similar packages/year. Our aim was to verify this hypothesis. Respiratory mucus samples were collected during bronchoscopy. Mucus transportability in frog palate, contact angle (wettability), transportability by cough and viscosity (cone-plate) were performed. No statistical differences were found between smoking patients (lung and extra pulmonary cancer). In the same way, no difference was found in the analysis of mucus samples collected from the tumor side compared to contra lateral samples. Nevertheless, contact angle values (29,0±3,055 extra pulmonary; 26,7500±3,149 pulmonary and 41,8333±3,767 metastasis/non smoking), were different between smoking and non-smoking patients ($p<0,05$) what is in accordance with previous studies and viscosity also showed a different pattern (p=0,07) between smoking and no smoking patients (243,14±12,6 pulmonary; 250,00±10,1 extra pulmonary and 277,13±5,1 metastasis/non smoking). We speculate that composition of secreted mucin may be equally affected by cigarette smoking in pulmonary and extra pulmonary cancer patients and conclude that there is no rheological advantage in the extra pulmonary cancer group.

P3813

The effects of nutritional status on pulmonary function, exercise tolerance and degree of dyspnea in patients with chronic obstructive pulmonary disease

Tatjana V. Vujic, Vesna Bosnjak Petrovic. *Department for COPD, Institute of Pulmonary Diseases and Tuberculosis, CCS, Belgrade, Serbia & Montenegro*

The aim of the study was to investigate the relationship between the nutritional status, pulmonary function, exercise capacity and degree of dyspnea in patients with chronic obstructive pulmonary disease (COPD).
Nutritional status was assessed by body mass index-BMI. Pulmonary function was estimated by spirometry parameters (FEV1 and FEV1/FVC). Exercise capacity was measured by six-minute walking test-6MWT and degree of dyspnea by Borg scale. Seventy seven stable COPD patients (52 males-67.5% and 25 females-32.5%) with mean age 63.4±10.6 years (range 39-82) and mean BMI 24.9±5.8 kg/m2 (range l5.6-41.3) were included in the study. In our patients, mean FEV1 (% predicted) was 35.1±10.0% (range 15-56%) and mean FEV1/FVC was 40.0±12.2 (range 20-76). The average value of 6MWD was 291.7±18.5 m (range 96-626) and mean Borg score was 3.4±1.6 (range 0.5-8). A significant positive correlations were identified between MBI and FEV1 (r=0.268, p=0.018) and FEV1/FVC (r=0.363, p=0.001). Positive correlations between BMI and 6MWT (r=0.181, p=0.116) and negative with Borg score (r=-0089, p=0.422) were found.
In conclusion, the results of this study suggest that COPD patients with nutritional depletion show impaired pulmonary function, lower exercise tolerance and higher level of dyspnea.

P3814

In obese healthy womens; body mass index, waist circumference, spirometry and diffusion

Bahar Ulubas[1], Ramazan Gen[2], Munir Tumkaya[1], Esen Akkaya[2], Mukkader Calikoglu[1]. *[1]Chest Disease, Mersin Univ, Fac of Medicine, Mersin, Turkey; [2]Internal Medicine, Mersin Univ, Fac of Medicine, Mersin, Turkey*

Obesity prevalence has been increasing all over the world. Before studies were found out, correlation between BMI and pulmonary function tests, especially, expiratory flow volume.
Waist circumference measures show abdominal fat mass, more sensitive than BMI. The aim of the study was to compare with waist circumference, BMI and pulmonary function tests in healthy obese women.
Between 2000-2005 years, following in obesity outpatient room, 59 obese, non-smoker women were evaluated respect to waist circumference, BMI (kg/m2) and pulmonary function tests (Sensor Medics Vmax 22). Results were shown in Table. According to statistically analyses; we were found correlation between age, BMI, waist circumference (p=0,027, p=0,001) and DLCO/VA, waist circumference (p=0,001).

	n	min	max	sd (±)
Age	59	31	75	9,4
FVC	59	69	131	15,4
FEV1	59	53	120	17,8
FEV/FVC	59	54	118	9,1
FIVC	57	46	100	16,3
FIV1/FIVC	52	39	93	11,1
FEF/FIF50	58	0,3	2	0,4
DLCO	52	72	90	19,6
DLCO/VA	47	70	123	13,9
Chest expansion	42	1	3	0,5
Waist circum	40	98	138	9
BMI	47	30,4	54,6	4,7

These results indicate that waist circumference, apart from BMI, effects DLCO/VA in healthy obese nonsmoker women.

P3815

Activity of the respiratory muscles, respiratory pressure and saturation of oxygen in patients with sarcoidosis

Elisaveta A. Vizel, Alexander A. Vizel, Lilia V. Islamova. *Phtisiopulmonology, Kazan Medical University, Kazan, Tatarstan, Russia*

We examined 230 patients with sarcoidosis (132 hystologicaly proven). The analyser Vmax 229 ("Sensor Medics") was used. We determined P_{100}, SpO_2, $PetCO_2$, Pimax, Pemax, and recorded flow-volume curve of forced exhalation with this instrument.

P100, PetCO2, SpO2, Pimax and Pemax in patients with various X-ray stages

Parameters	Stage 0 (n=2)	Stage I (n=93)	Stage II (n=114)	Stage III (n=15)	Stage IV (n=6)
P100, kPa	0,25±0,5	0,21±0,08	0,25±1,1	0,24±0,2	0,39±0,1
SpO2, %	95±1,0	94,9±0,1	94,8±0,1	94,1±0,9	91,3±2,4
PetCO2, kPa	4,5±0,1	4,5±0,1	4,4±0,1	4,4±0,2	4,2±0,2
Pimax % pred.	95,5±5,5	104,4±4,0	96,1±3,6	80,9±6,3	61±10,4
Pemax % pred.	59,0±1,9	78,9±2,5	73,04±2,4	63,6±6,9	61,5±4,7
FVC% pred.	93,7±0,3	105,5±1,5	100,9±1,4	97,1±3,2	62,9±9,5
FEV1% pred.	95,8±1,1	107,5±1,8	96,6±1,9	99,3±4,7	59,4±7,5
PEF% pred.	104±23,8	115,1±2,6	108,9±2,5	108,6±5,5	67,1±14,1

Pimax level was less than 80% of the proper value at the X-ray stage I in 25.8% of patients, stage II – 33.3%, stage III – 40%, stage IV – 83.3%. Pemax level was less than 80% of the proper value at the sarcoidosis X-ray stage 0 in all patients, stage I – 45.2%, stage II – 58.8%, stage III – 66.7%, and in all patients with stage IV. It was determined that according to X-ray stages Pimax and Pemax decreased, while all other indices were appreciably decreased only in sarcoidosis stage IV.