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CLINICAL JUDGEMENT IN PULMONARY FUNCTION TESTING.

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In this study we sought to test the hypothesis that the ATS standards of reproducibility and acceptability facilitate the pulmonary clinician's judgement of validity of pulmonary function tests. Ten pulmonary specialists rated the validity of the flow volume curves of 100 consecutive outpatients.Their judgements were analyzed in comparison to the ATS reproducibility criteria (1987). The median number of tests rated valid was 79 out of 100 (range 25-93). Eight of the 10 clinicians judged 73 of the 100 tests as valid. Agreement was low, however, among the judges. Their ratings varied with the acceptability standard and with selected PFT parameters. Neither professional experience, nor level of pulmonary dysfunction, influenced the result. Using the ATS standard of reproducibility, the rate was 62%. The rates of the ATS components were 73% for FEV_1, 75%-80% for FVC. The ATS measure of reproducibility varied predictably with the acceptability standard, but not with the measure of pulmonary dysfunction. When the number of maneuvers was at an acceptable level (3 or more), the rate was significantly higher: 71% vs 29%. The rate of reproducibility was higher than expected for normal function, lower than expected for marginal function, and at the expected level for the dysfunctional level. Agreement of judges was much higher with the reproducibility standard than with the nonreproducibility standard (medians 84% vs 32%). Agreement of the judges was also greater when the spirograms had 3 rather than 2 trials (medians 87% vs 58%), consistent with the judges adhering to the acceptability standard. In conclusion, we have found that there is a lack of agreement among pulmonary specialists in their interpretation of the validity of PFTs. The data support the need to establish standardized strategies to facilitate uniform interpretation.

DYNAMIC BTPS CORRECTION FOR NON-HEATED CERAMIC FLOW SENSORS.

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Several spirometer manufacturers use non-heated ceramic flow sensors to derermine flow and calculate volume. Although some cooling of the air does occur as the air passes through the sensor, cooling is usually not complete. Therefore the usual technique is to apply a factor approximately equal to 30 percent of the full BTPS correction factor (CF). To determine the effectiveness of this approach, we tested several ceramic flow sensors with a mechanical pump using both room air and air heated to 37°C and saturated with water vapor. The volume signals used to test the sensors were volume ramps and the first four ATS standard waveforms. Estimated BTPS CF for FVC and FEV1 were calculated by dividing the volume measured with room air by the volume measured with heated and humidified air. Our results using room air showed a considerable variability in the linearity of these flow sensors with one sensor showing a 400 ml difference (6.7%) in a 6 L volume ramp and flow rates of between 0.6 and 8 L/s. Using heated and humidified air, the estimated BTPS CF with the sensor initially at 20°C ranged from 1.06 to 1.00 compared to a calculated value of 1.102. The estimated BTPS CF also varied with the number of curves previously performed, the time between curves, the volume of the current and previous curves, and the temperature of the sensor. Monitoring of the temperature of the air as it left the sensor (exit temperature) showed a steady rise in temperature with each successive curve. However, both the exit temperature and the estimated BTPS CF stabilized after approximately 5 curves using waveform 1 (FVC = 6L), provided there was only a short pause between curves. Use of exit air temperature alone proved to provide a effective means of estimating a dynamic BTPS CF. The use of a linear model - based on exit temperature - to estimate a dynamic BTPS CF, reduced the error in FEV1 to less than ± 3 percent for exit temperatures from 5 to 28°C. These results suggest that both linearization and dynamic BTPS CFs are needed for this type of flow sensor to operate within the ATS accuracy recommendations of ± 3 percent for FVC and FEV1, particularly at lower operating temperatures.

A SCORE FOR THE PREDICTION OF PULMONARY FUNCTION IN SURVIVORS OF ADULT RESPIRATORY DISTRESS SYNDROME

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Varying degrees of impairment in pulmonary function in survivors of adult respiratory distress syndrome (ARDS) have been reported. Physiologic indices of severity of disease have been associated with impaired pulmonary function after ARDS, including the duration of FiO_2 >0.6, $AaDO_2$, mean maximum pulmonary artery pressure, total lowest static thoracic compliance and peak airway pressures. Prediction of pulmonary function following ARDS is difficult because clinical features may reflect the severity of reversible lung injury more than the success of repair processes. The purpose of this study was to develop a score to predict impairment of pulmonary function in survivors of ARDS. We analyzed pulmonary function studies and clinical parameters of 51 ARDS survivors. Correlations, t-testing and multiple linear regression equations were performed using the following variables: 1) predisposing factor of ARDS, 2) age, 3) gender, 4) severity of hypoxemia, 5) smoking history, 6) number of days of positive pressure ventilation, 7) lowest total thoracic compliance, 8) mean maximum pulmonary artery pressure, and 9) the presence of barotrauma. A simplified score was developed using the above analyses: SCORE = NUMBER OF DAYS POSITIVE PRESSURE VENTILATION minus LOWEST TOTAL THORACIC COMPLIANCE. Linear regressions of the percent predicted FEV1, FVC, TLC and DLCO (measured more than one year after the ARDS event) were performed against the score. The score was found to be significantly correlated with all of the variables ($p<0.001$). Further division of the score into groups of <-20, -20 to 20 and >20 yielded predictive values, with a score of >20 predicting an 80% probability of abnormal spirometry and TLC (defined as <80% of predicted normal) and 100% probability of an abnormal DLCO. We conclude that the score we developed for ARDS survivors predicts abnormal pulmonary function studies more than one year after ARDS.

THE I/E RATIO OF AIRWAY RESISTANCE AS A NEW PARAMETER FOR DIAGNOSIS OF OBSTRUCTIVE AIRWAY DISEASES.

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Airway Resistance (Raw) has been known as a useful parameter of airway obstruction. However, there are no specific meaning of absolute Raw value in differential diagnosis of obstructive airway diseases.

We tried to evaluate the relationship between ratio of Raw during inspiratory and expiratory phase (I/E ratio) and clinical diagnosis from hospital records, retrospectively. We have calculated I/E ratio in 90 patients with various diseases with Raw over 4.0 cmH2O/L/sec. Three groups of respiratory diseases chosen according to clinical diagnosis in hospital records. Thirty five patient with Emphysema, 27 patients with Bronchial asthma and 28 patients with various lung condition including of undiagnosed emphysema and asthma. There are no correlation between I/E ratio and FVC,FEV1.0, FEV1.0%, height, weight, and gender of the patients. There are no specific I/E ratio distribution in the group of miscellaneous lung condition (Fig.1). In contrast, I/E ratio have calculated less than 0.7 in 34 of 35 (97.14%) patients with Emphysema, over 0.7 in 22 of 27 (81.48%) with Bronchial Asthma. The mean SD value of I/E ratio is 0.59±0.10 for emphysema, 0.79±0.10 for bronchial asthma. There is a significant ($p<0.0001$) statistical difference between values of I/E ratio in emphysema and bronchial asthma (Fig.2). Physiological meanings of I/E ratio is still unclear. However, we suspected I/E ratio represented a compliance of central airways.

In conclusion, I/E ratio of airway resistance will be a useful new parameter for differential diagnosis of obstructive airway diseases.

Fig. 1

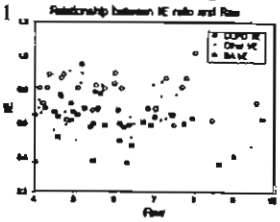
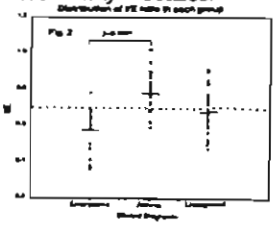


Fig. 2



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ABSTRACTS

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This special supplement of the *American Review of Respiratory Disease* contains abstracts of the scientific papers to be presented at the 1992 International Conference, which is sponsored by the American Lung Association and the American Thoracic Society. The abstracts appear in order of presentation, from Sunday, May 17 through Wednesday, May 20 and are identified by session code numbers. To assist in planning a personal schedule at the Conference, the time and place of each presentation is also provided.