

Aviation Physiology: Teaching Series

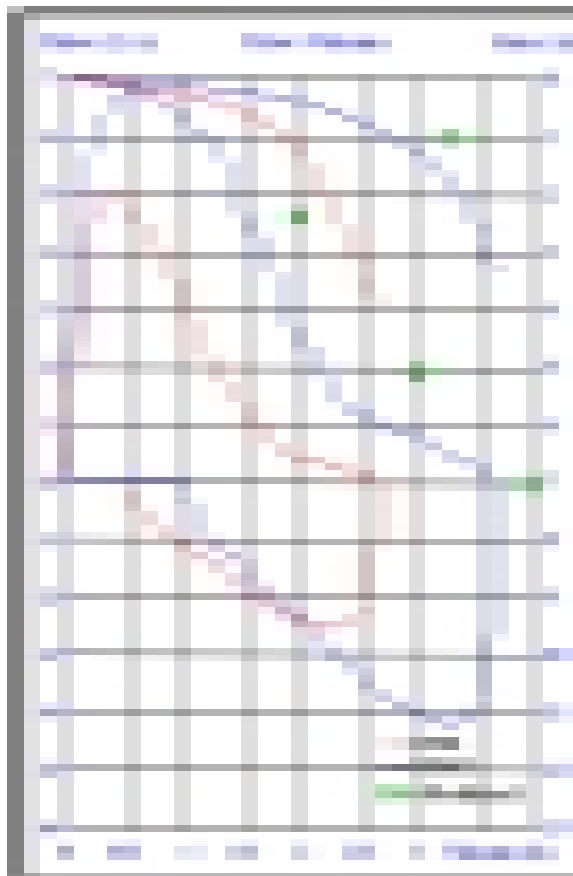
Pulmonary Function Test

Brief case history

A 35 year old male presented with history of cough and breathlessness on exertion of 6 months duration. He was referred for spirometry as part of the medical evaluation. The test was carried out and the report is placed below. Comment on the findings.

- (iii) FVC 68.9% of predicted value
- (iv) PEF 58.8% of predicted
- (v) Forced Expiratory flows substantially reduced.

The reduced FEV1% suggests an obstructive impairment. This is supported by an FEV1, which is 59% of the predicted value. The FVC, which is 68.9% of predicted, may indicate a borderline restrictive impairment.



Test Data							
Drug Administered at	Bronchodilator not defined						
Predicted Source	07/18/2005 12:57:43	Tot. Qty	1				
	Knudson						
Par.(BTPS)	Pred	Best	PRE	%Pred.	POST	%Pred.	%PRE
FVC	3.92	3.48	2.70	68.9	3.75	95.7	+38.9
FEV1	3.27	2.28	1.93	59.0	2.91	88.9	+50.8
FEV1%	83.0	71.5	71.5	86.1	77.6	93.5	+8.5
PEF	8.57	5.04	5.04	58.8	6.84	79.8	+35.7
FEF25	7.94	4.28	4.28	53.9	6.34	79.8	+48.1
FEF50	4.67	1.69	1.69	36.2	2.82	60.4	+66.9
FEF75	1.92	0.39	0.39	20.3	0.87	45.3	+123.1
EEF25-75	3.94	1.26	1.26	32.0	2.50	63.5	+98.4
FET		3.94	3.94		3.40		-13.7
FIVC	3.92	2.14	2.14	54.6	2.82	72.0	+31.8
FIV1	3.27	1.85	1.85	56.5	2.60	79.5	+40.5
PIF	8.57	2.48	2.48	28.9	4.17	48.6	+68.1
ELA		35	86	245.7			

Findings and interpretation

The test has been carried out before and after administering an inhaled bronchodilator.

(a) The pre-bronchodilator results revealed:-

- (i) FEV1% of 71.5
- (ii) FEV1 59% of predicted value

(b) The post-bronchodilator results revealed:-

- (i) FEV1 88.9% of predicted value – an improvement of 50.8% (980 ml)
- (ii) FVC 95.7% of predicted value – an improvement of 38.9% (1050 ml)
- (iii) FEV1% of 77.6
- (iv) PEF 79.8% of predicted
- (v) Forced Expiratory flows improved

The improvement in the FEV1 and FVC is more than 12.5% of the pre-bronchodilator values as well as greater than 200 ml. This signifies

reversible obstructive impairment. The fact that the FVC improved after bronchodilator administration rules out the presence of a restrictive impairment.

Lessons

1. Reduced FVC values do not necessarily signify restrictive impairment. A reduced FVC may be seen in obstructive diseases as well. Response to an inhaled bronchodilator can help differentiating the two. FVC reductions due to an underlying restriction will not improve with bronchodilators.
2. Post-bronchodilator test should be carried out 20 minutes after the inhalation of the drug in case a beta agonist drug is used. For anti-cholinergic drugs, this time period increases to 45 minutes. Failure to ensure this may lead to inaccurate comments on the nature of obstruction present in the lungs.
3. Reversibility of obstruction is commented based on the magnitude of improvement in the FEV1 and or FVC only. There should be an improvement of at least 12.5% as well as an increase of at

least 200 ml volume. Both the criteria must be fulfilled to label an obstruction as reversible.

4. PEF is not a parameter that should be used to determine the presence of or the reversibility of an airway obstruction. This parameter is highly effort dependent as well as poorly reproducible.

Further reading

1. Standardization of Spirometry. 1994 update. *J Respir Crit Care Med* 1995;152:1107-36.
2. Guidelines for the measurement of respiratory function. Recommendations of the British Thoracic Society and Association of Respiratory Technicians and Physiologists. *Respiratory Medicine* 1994; 88: 165-94.

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