

In the name of GOD

Cases on PFT

Case 1

- A 52-year-old female, Caucasian. Heavy smoker. History of chronic dyspnea.

1. Spirometry (Figure 7.1)

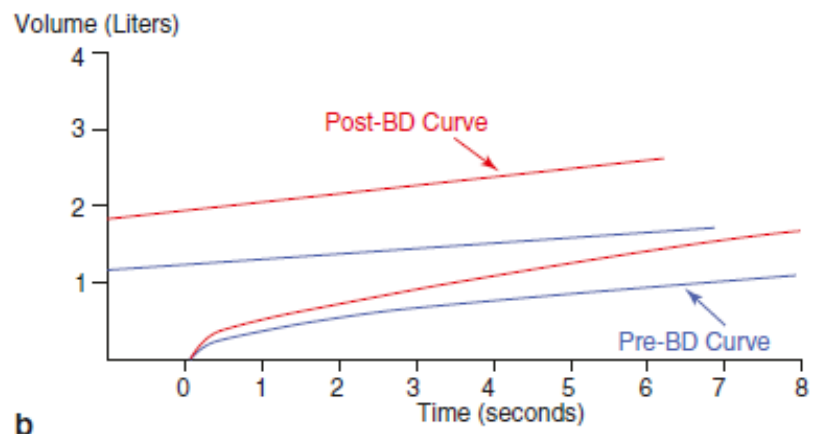
	Pred.	Pre	% Pred.	LLN	Post	%Chg
FVC	3.34	1.53	46	2.54	2.31	50
FEV ₁	2.70	0.41	15	2.02	0.53	30
FEV ₁ /FVC		0.27		0.69	0.23	
FEF ₂₅₋₇₅	2.82	0.11	4	1.41	0.17	

2. Lung Volumes

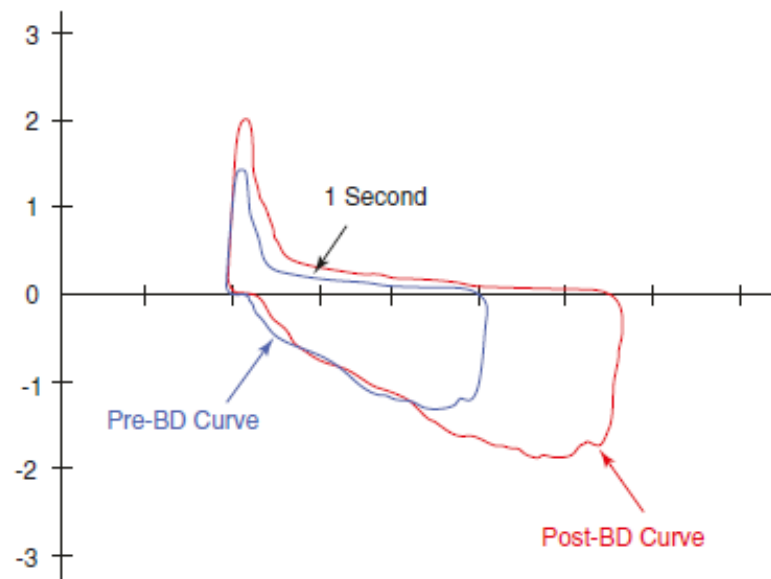
	Pred.	Pre	% Pred.	LLN
TLC	5.14	7.15	139	4.07
RV	1.86	5.20	280	1.8
RV/TLC	36%	73%		32%

3. Diffusing Capacity

	Pred.	Pre	% Pred.	LLN
DL _{co}	22.9	3.4	15	15.6
DL _{co} /V _A	4.52	1.47	32	3.3
V _A	5.23	2.31	44	3.8



b



Questions

Q1: Interpret this PFT.

Q2: What are the most likely diagnoses?

Q3: How can you estimate the volume of trapped air?

Answers

Spirometry is obstructive:

– VT curve:

- (a) Is flattened, suggesting obstructive defect. Notice that the FET (16 seconds) is prolonged which supports the obstructive nature of the disorder.
- (b) The post bronchodilator curve shows a better morphology indicating a degree of bronchodilator response that needs to be defined numerically.

- Lung volume study is obstructive
 - TLC and RV are $\uparrow$ with a very $\uparrow$ RV/TLC ratio suggesting emphysema with hyperinflation and air-trapping (in asthma TLC is usually normal)
- (Based on spirometry and lung volumes, both support obstruction, but COPD (emphysema) is the most likely as in asthma TLC is usually normal. DLCO will be of help)
- DLCO
 - DLCO is extremely low suggesting a gas exchange abnormality, favoring emphysema.
- Conclusion: very severe obstructive disorder with significant reversibility and impaired gas exchange suggesting emphysema.

Case 2

A 54-year-old male, Caucasian

1. Spirometry (Figure 7.5)

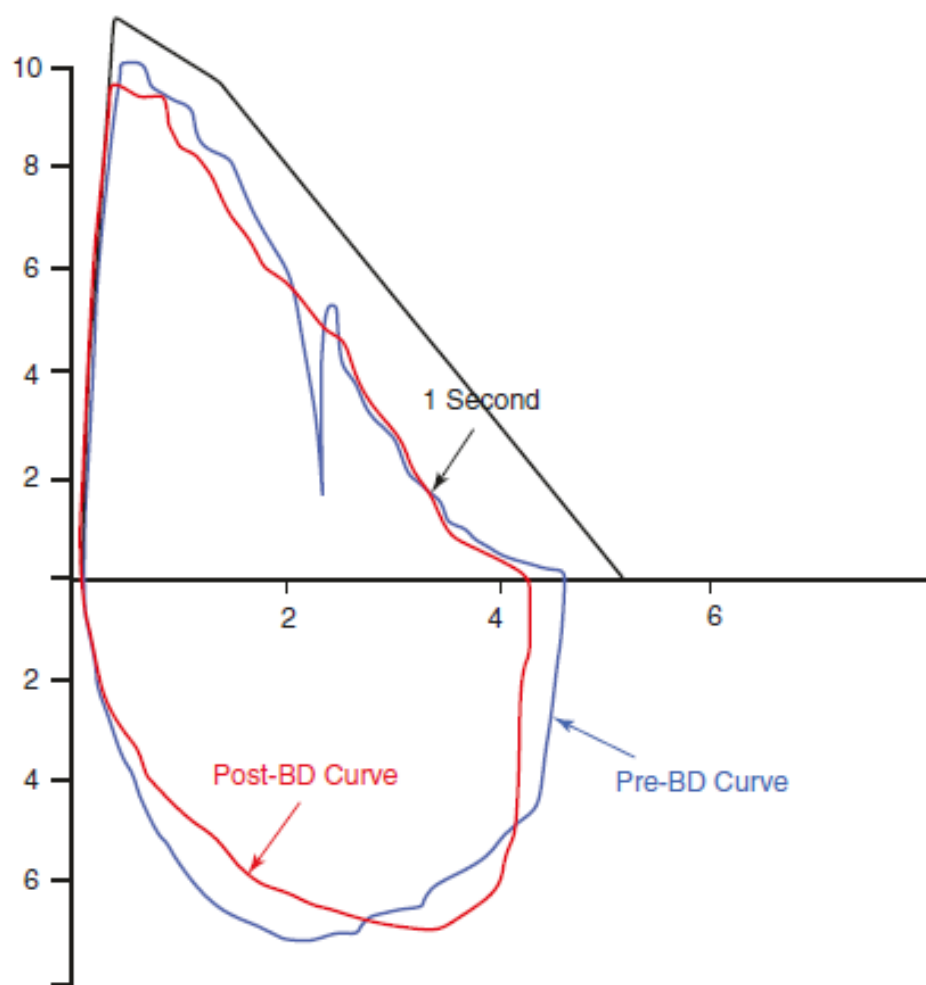
	Pred.	Pre	% Pred.	LLN	Post	% Chg.
FVC	5.11	4.70	90	3.76	4.61	-2
FEV ₁	4.03	3.64	89	2.92	3.58	-1
FEV ₁ /FVC		78		67	77	
FEF ₂₅₋₇₅	1.92	0.94	49	1.73		

2. Lung Volumes

	Pred.	Pre	% Pred.	LLN
TLC	7.31	7.63	104	6.06
RV	2.21	2.58	117	1.48
RV/TLC	31	34	110	29
ERV	1.58	0.78	50	0.87

3. Diffusing Capacity

	Pred.	Pre	% Pred.	LLN
DL _{CO}	30.50	27.99	92	21.9
DL _{CO} /V _A	4.34	4.19	96	3.23
V _A	7.02	6.68	95	5.5



Questions

Q1: Interpret this PFT.

Q2: What is the most likely diagnosis?

Answers

Spirometry is normal:

– FV loop:

- (a) The pre-BD curve is interrupted by a cough in its 1st second. The study is not reproducible.
- (b) The curve looks normal and slightly smaller than the predicted one. FVC and the ratio look normal.
- (c) Post-BD curve is smaller than the pre-BD curve indicating lack of response to BDs.

- Spirometric data:
 - (a) FVC, FEV1 and the ratio are normal with no response to BD.
 - (b) ↓ FEF75 (nonspecific and may be seen in obesity)
- Lung volume study is normal except for an isolated reduction in ERV suggesting obesity.
- DLCO and DLCO/VA are normal indicating that there is no gas exchange abnormality.
- Conclusion: Normal PFT with isolated reduction in ERV suggestive of obesity. The patient's weight at the time of the test was 108 kg.

Case 3

- A 48-year-old female with chronic dyspnea.

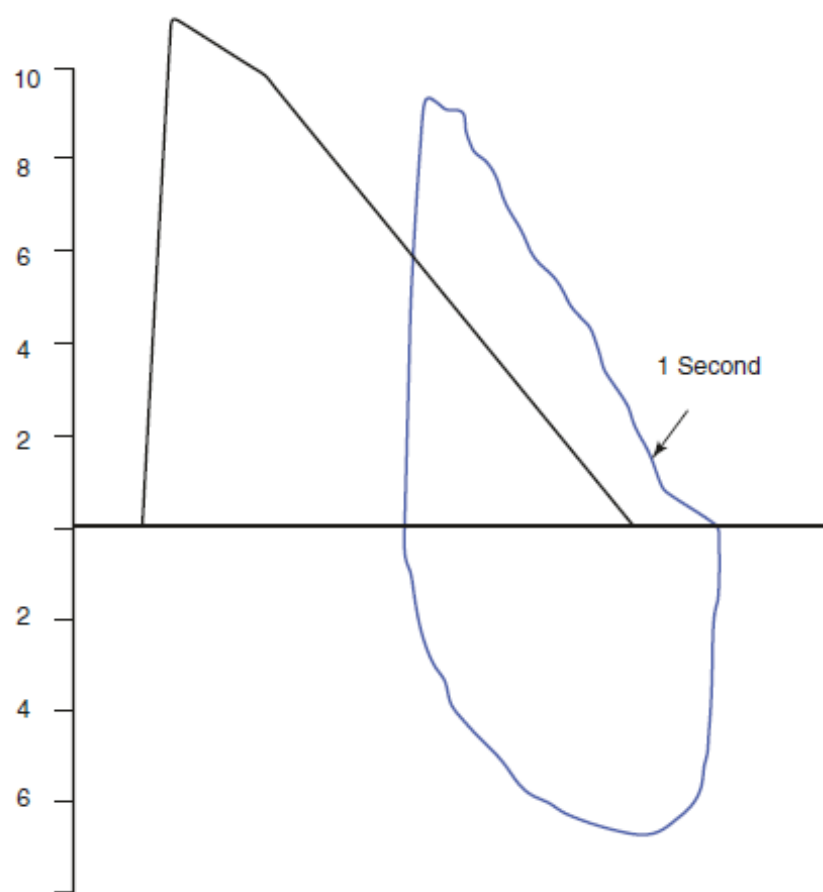


FIGURE 7.6 FV loop

Question

- Q1: Interpret this FV loop

Answer

- FV loop morphology looks acceptable.
- It is small and has a steep slope (witch's hat)
- Its width (FVC) is low with normal ratio suggesting restriction.
- It is shifted to the right compared to the predicted indicating decreased TLC and RV which is consistent with a restrictive defect secondary to a lung disease with reduced

Case 4

- A 61-year-old female, Caucasian. Unexplained SOB.

1. Spirometry

	Pred.	Pre	% Pred.	LLN	Post	%Chg
FVC	2.85	2.47	87	2.27	2.55	3
FEV ₁	2.27	2.13	94	1.79	2.17	2
FEV ₁ /FVC		86		67	85	
FEF ₂₅₋₇₅	2.31	2.23	140	1.1	3.06	-5

2. Lung Volumes

	Pred.	Pre	% Pred.	LLN
TLC	4.78	4.18	87	4.01
RV	1.92	1.71	89	1.18
RV/TLC	40	41		36

3. Diffusing Capacity

	Pred.	Pre	% Pred.	LLN
DL_{CO}	20.7	10.1	48.8	14.6
DL_{CO}/V_A	4.52	2.42	53.5	3.2
V_A	4.52	4.17	88	3.8

Questions

- Q1: Interpret this PFT.
- Q2: What are the most likely diagnoses?

Answers

- Spirometry is normal with no response to bronchodilators.
- Lung volume study is normal.
- DLCO is extremely low suggesting a gas exchange abnormality.
- Conclusion: Isolated reduction in the diffusing capacity indicating an early parenchymal lung disease, pulmonary vascular disease or anemia.

Case 5

- A 55-year-old male, Caucasian, weight 84 kg; history of shortness of breath.

1. Spirometry (Figure 7.8)

	Pred.	Pre	% Pred.	LLN
FVC	4.73	5.00	106	3.72
FEV ₁	3.75	3.25	87	2.88
FEV ₁ /FVC		79		67
FEF ₂₅₋₇₅	4.35	1.80	41	1.88
FIF ₅₀		0.58		–
FEF ₅₀		2.42		–

2. Lung Volumes

	Pred.	Pre	% Pred.	LLN
TLC	6.91	6.73	97	6.06
RV	2.19	1.44	66	1.50
RV/TLC	0.31	0.21	68	0.29

3. Diffusing Capacity

	Pred.	Pre	% Pred.	LLN
DL _{co}	24.79	26.42	107	21.6
DL _{co} /V _A	3.72	3.73	100	3.2

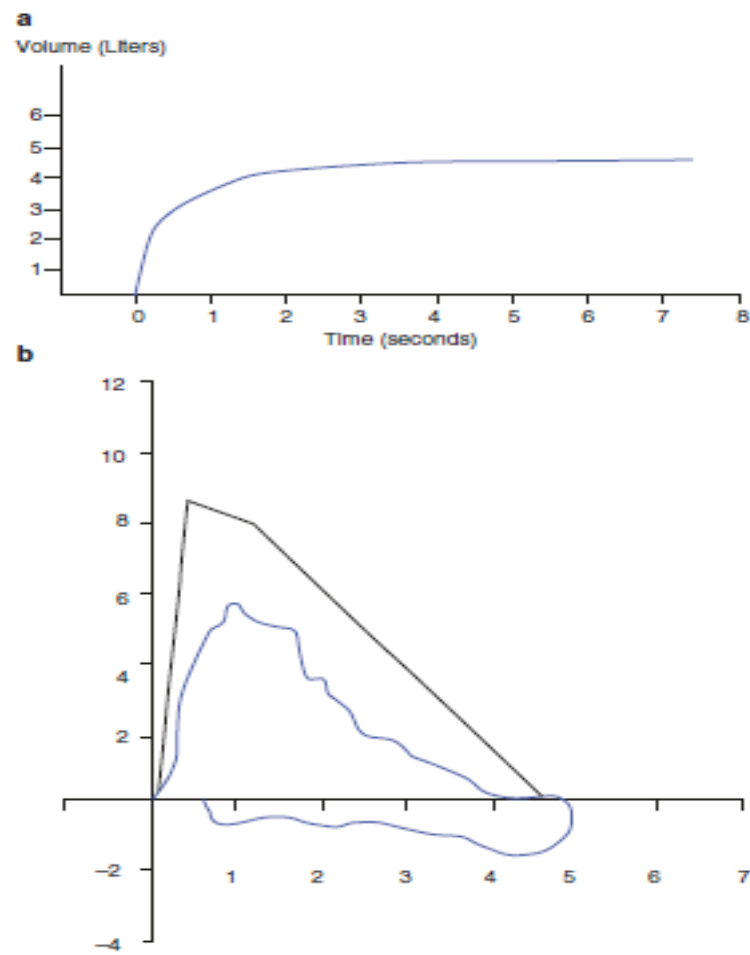


FIGURE 7.8 (a) VT curve; (b) FV loop

Question

- Q1: Interpret this PFT.

Answer

- VT curve looks normal (no predicted curve to compare with).
- FV loop:
 - Curve quality looks suboptimal which could be due to a disease state.
 - Curve is small with a flat inspiratory component. This suggests a variable extrathoracic upper airway obstruction.
 - The expiratory component of the curve is not significantly abnormal.
- Spirometric data:
 - Normal FVC, FEV1 and FEV1/FVC ratio.
 - ↓ FEF25–75 is nonspecific.
 - FIF50/FEF50 is much less than 1 indicating a variable extrathoracic upper airway obstruction.
- Lung volume study:
 - Normal TLC with low RV.
- DLCO and DLCO/VA are normal.
- Conclusion: The only significant abnormality is the flattened inspiratory component of FV loop and a very low FIF50/FEF50 ratio indicating a variable extrathoracic upper airway obstruction. This patient has laryngeal stenosis.

Case 6

- A 22-year-old male, Caucasian, weight 81 kg; history of shortness of breath.

1. Spirometry (Figure 7.10)

	Pred.	Pre	% Pred.	LLN
FVC	5.38	1.97	36	4.50
FEV ₁	4.52	1.37	30	3.79
FEV ₁ /FVC		72		71
FEF ₂₅₋₇₅	4.99	1.14	23	3.20
PEF	9.24	1.68	18	4.90
FEF _{50%}	5.73	1.51	26	–
FIF _{50%}	5.38	1.80	33	–

2. Lung Volumes

	Pred.	Pre	% Pred.	LLN
TLC	6.73	2.44	36	6.06
RV	1.47	0.23	16	0.81
RV/TLC	0.21	0.09	43	0.20

3. Diffusing Capacity

	Pred.	Pre	% Pred.	LLN
DL _{co}	36.67	20.34	55	29.2
DL _{co} /V _A	5.46	7.82	143	4.21

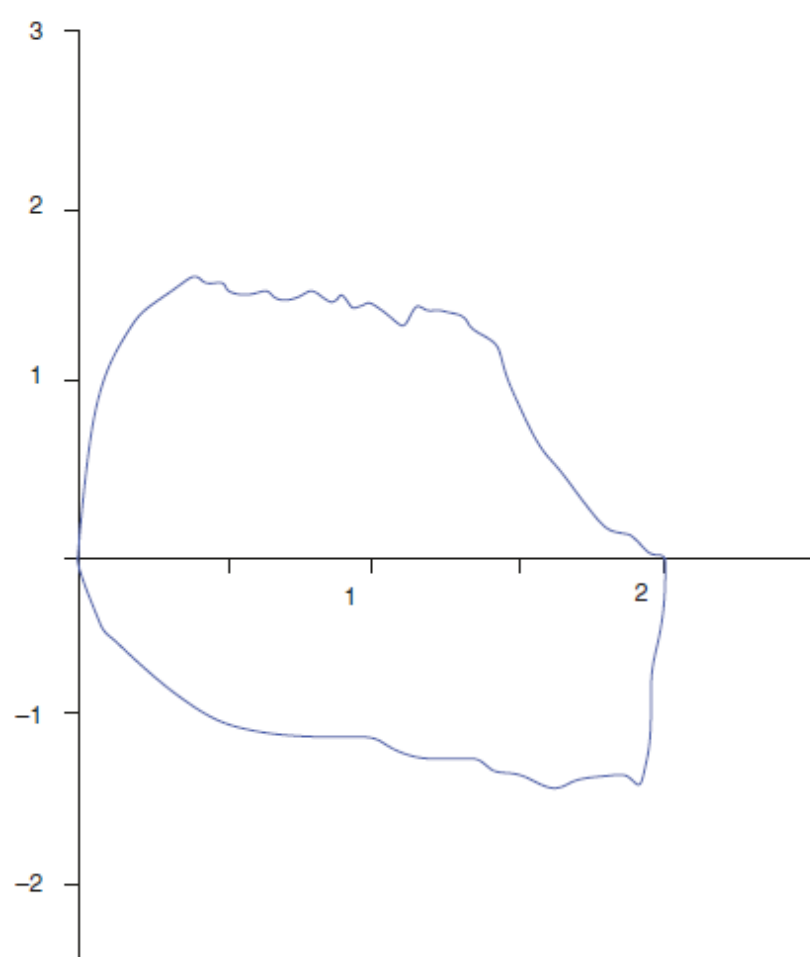


FIGURE 7.10 FV loop

Question

- Q1: Interpret this PFT.

Answer

- FV loop:
 - Is small and flat at both inspiratory and expiratory components, suggesting fixed upper airway obstruction.
- Spirometric data:
 - Reduced FVC and FEV1 with a normal FEV1/FVC ratio suggesting a restrictive disease.
 - Reduced PEF, FEF50 and FIF50. FIF50/FEF50 ratio is around 1 which is indicating a fixed upper airway obstruction.
- Lung volume study:
 - Lung volumes are all significantly reduced confirming severe restriction.
- DLCO is also low which overcorrects when VA is taken into consideration, which possibly indicates that there is no significant parenchymal abnormality.
- Conclusion: fixed upper airway obstruction with severe restriction.

This patient has lymphoma with significant paratracheal lymphadenopathy compressing the trachea. He was also found to have significant bilateral pleural effusions related to his lymphoma causing this significant restriction.

Case 7

- A 78-year-old male, Caucasian, weight 80 kg.

1. Spirometry (Figure 7.12)

	Pred.	Pre	% Pred.	LLN
FVC	4.06	2.46	61	2.86
FEV ₁	3.07	1.33	43	2.05
FEV ₁ /FVC		54		60
FEF ₂₅₋₇₅	2.70	0.44	16	0.81
PEF	7.54	4.88	65	4.13

2. Lung Volumes

	Pred.	Pre	% Pred.	LLN
TLC	6.67	5.00	75	6.06
RV	2.51	2.42	97	1.98
RV/TLC	38	48	127	36

3. Diffusing Capacity

	Pred.	Pre	% Pred.	LLN
DL _{CO}	23.52	10.82	46	16.4
DL _{CO} /V _A	3.80	2.64	69	2.5

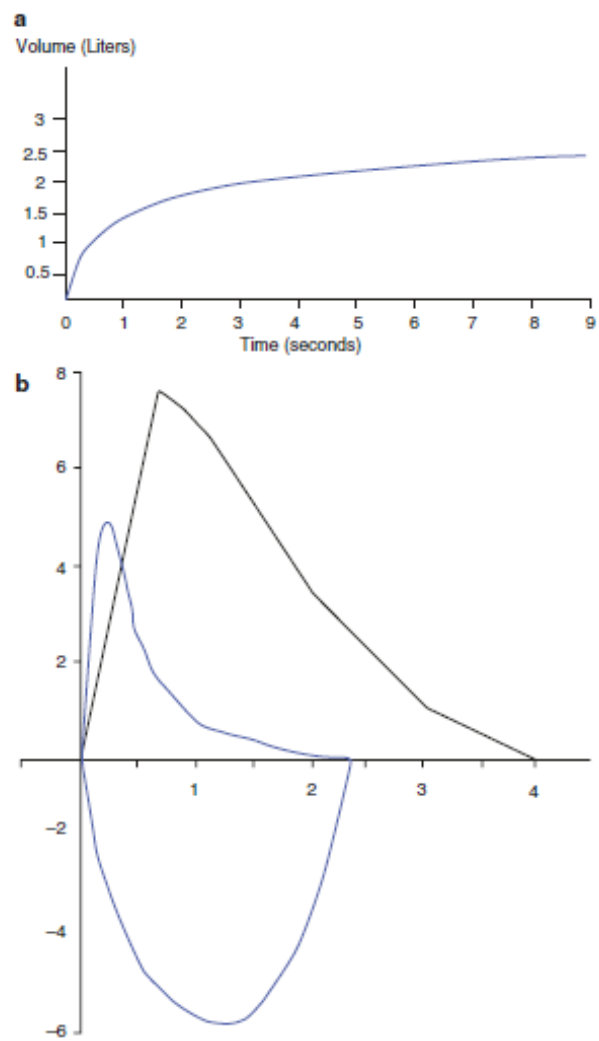


FIGURE 7.12 (a) VT curve; (b) FV loop

Question

- Q1: Interpret this PFT.

Answer

- Spirometry is obstructive:
 - VT curve looks flat. FET is 9 seconds.
 - FV loop:
 - (a) The expiratory curve is small and scooped out, suggesting an obstructive disorder.
- Spirometric data:
 - Reduced FVC and FEV1 with a reduced FEV1/FVC ratio , suggesting a severe obstructive disorder. FEF25–75 is reduced going with an obstructive disorder.

- Lung volume study is restrictive:
 - Mildly reduced TLC with a normal RV and increased RV/TLC ratio. The reduced TLC indicates a restrictive disorder.
- DLCO is reduced which may be seen in restrictive or pulmonaryvascular disorders.
- Conclusion: Severe obstructive disorder with a mild restriction.

This patient has COPD (emphysema) and lung resection.