Obstructive Lung Disease: COPD

This patient has COPD. Note the concave ("scooped out") nature to the expiratory limb of the flow-volume loop.

Obstructive Lung Disease: Asthma

Obstructive Lung Disease
Obstructive Lung Disease

This patient has asthma. Note the less steep slope of the expiratory limb of the flow-volume loop. The expiratory limb is irregular indicating he had difficulty exhaling with force.

Causes Of Obstruction

- Chronic obstructive pulmonary disease
  - Emphysema
  - Chronic bronchitis
- Asthma
- Bronchiectasis
- Bronchiolitis & bronchiolitis obliterans

Obstructive Pattern

<table>
<thead>
<tr>
<th>Results</th>
<th>Pred</th>
<th>Best</th>
<th>%Pred</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (L)</td>
<td>4.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV1 (L)</td>
<td>3.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEF25-75% (L/s)</td>
<td>2.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEFR (L/s)</td>
<td>8.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vavd (%)</td>
<td></td>
<td>2.13</td>
<td></td>
</tr>
</tbody>
</table>
In this case, the FEV1/FVC is low (0.52 or 52%) and the computer has identified it as low by the square mark to the left of the value. Therefore, this patient is obstructed. To determine how obstructed, we next look at the FEV1.

There are two commonly used scales of obstruction severity:

<table>
<thead>
<tr>
<th>FEV1 (% predicted)</th>
<th>Obstruction</th>
<th>ATS Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 70%</td>
<td>Mild</td>
<td>&gt;80% Mild</td>
</tr>
<tr>
<td>40-69%</td>
<td>Moderate</td>
<td>50-79% Moderate</td>
</tr>
<tr>
<td>30-39%</td>
<td>Severe</td>
<td>&lt; 30% Very Severe</td>
</tr>
<tr>
<td>&lt; 30%</td>
<td>Very Severe</td>
<td></td>
</tr>
</tbody>
</table>

Remember, the ATS defines obstruction as an FEV1/FVC ratio of less than the predicted for that patient’s age and this number will vary from patient to patient. The GOLD defines obstruction as anyone with an FEV1/FVC ratio of less than 70% regardless of age.

In this case, the FEV1 is 49% of predicted so the patient would be defined as having severe obstruction by either the ATS or the GOLD criteria.
In this case, the FEV1 is 69% of predicted so the patient would be defined as having moderate obstruction by either the ATS or the GOLD criteria.

In this case, the FEV1/FVC ratio is low at 0.49 (49% of predicted). It is marked as abnormal by the computer with the square mark to the left of the value. The FEV1 is 29% of predicted which makes this very severe obstruction by either the ATS or GOLD criteria. The computer interpreted this as mild obstruction, however.

In this case, the FEV1/FVC ratio is low at 0.59 (59% of predicted). It is marked as abnormal by the computer with the square mark to the left of the value. The FEV1 is 1.13 L (59% of predicted) which makes this moderate obstruction by GOLD criteria but moderately severe obstruction by ATS criteria. The computer interpreted this as mild obstruction.
Obstructive Pattern

<table>
<thead>
<tr>
<th>Result</th>
<th>Pred</th>
<th>Value</th>
<th>%Pred</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (L)</td>
<td>3.03</td>
<td>1.62</td>
<td>54%</td>
</tr>
<tr>
<td>FEV1 (L)</td>
<td>2.04</td>
<td>0.87</td>
<td>43%</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>0.74</td>
<td>0.54</td>
<td>72%</td>
</tr>
<tr>
<td>FEF25-75% (L/s)</td>
<td>2.22</td>
<td>0.44</td>
<td>22%</td>
</tr>
<tr>
<td>PEF (L/s)</td>
<td>7.56</td>
<td>1.01</td>
<td>21%</td>
</tr>
</tbody>
</table>

In this case, the FEV1/FVC ratio is low at 0.54 (54% of predicted). It is marked as abnormal by the computer with the square mark to the left of the value. The FEV1 is 0.87 L (33% of predicted) which makes this severe obstruction by GOLD criteria but very severe obstruction by ATS criteria. The computer interpretation was mild obstruction.

Tracheostenosis
Tracheostenosis

This patient has granulomatosis with angiitis (Wegener's granulomatosis) with subglottic stenosis. Note the flattening of both the inspiratory and expiratory limbs.

Tracheostenosis

This patient also has granulomatosis with angiitis (Wegener's granulomatosis) with subglottic stenosis. The inspiratory and expiratory limbs are somewhat flattened but more subtle than the previous case.

Vocal Cord Paralysis

These images show vocal cord paralysis. The images depict a clear view of the vocal cords with a possible deviation or paralysis.
**Paralyzed Vocal Cords**

This patient has a history of recurrent laryngeal nerve damage during a mediastinoscopy. The computer interpretation was normal. The flow-volume loop shows severe inspiratory flattening indicating variable upper airway obstruction.

**Vocal Cord Dysfunction**

- Fully Abducted
- Constricted Respiration

**Vocal Cord Dysfunction**
Vocal Cord Dysfunction

Note the "notching" on the inspiratory limb

Reversible obstruction

<table>
<thead>
<tr>
<th>Pre-Bronch</th>
<th>Post-Bronch</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEF (L/min)</td>
<td>3.55</td>
</tr>
<tr>
<td>FVC (L)</td>
<td>59.29</td>
</tr>
<tr>
<td>FEV1 (L)</td>
<td>2.39</td>
</tr>
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Reversible obstruction

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### Reversible obstruction after a bronchodilator is defined as:

A. Greater than 5% increase in the FEV1/FVC ratio  
B. Greater than 12% increase in the FEV1  
C. Greater than 12% increase in the FEF 25-75%  
D. Greater than 5% decrease in the FEV1/FVC ratio
Question #2

60 year-old man with dyspnea. The most likely cause suggested by the spirometry is:
A. Moderate obstruction
B. Tracheostenosis
C. Poor effort
D. Vocal cord dysfunction

Question #3

46 year-old man with dyspnea on exertion. The most likely cause is:
A. Very severe asthma
B. Tracheostenosis
C. Vocal cord dysfunction
D. Pulmonary fibrosis

Question #4

The most likely cause of this finding is:
A. Coughing during exhalation
B. Tracheostenosis
C. Vocal cord dysfunction
D. Chronic obstructive pulmonary disease
Question #5

65 year-old woman with dyspnea after open-heart surgery. The most likely cause is:

A. Asthma  
B. Tracheostenosis  
C. Vocal cord paralysis  
D. Bronchiectasis

Question #6

50 year-old man with dyspnea requesting disability. The spirometry shows:

A. Moderate obstruction  
B. Poor effort  
C. Vocal cord paralysis  
D. Normal results

Question #7

34 year-old woman with cough and dyspnea. The spirometry suggests:

A. Mild obstruction  
B. Tracheostenosis  
C. Vocal cord dysfunction  
D. Normal results
Question #8
42 year-old man with cough and dyspnea. The spirometry suggests:
A. Mild obstruction
B. Tracheostenosis
C. Vocal cord dysfunction
D. Normal results

Question #9
A normal FEV1 and FVC can vary based on:
A. Age
B. Race
C. Height
D. All of the above

Question #10
An office spirometry report indicates that the FEV1/FVC ratio is 82% (normal), the FVC is 240% of predicted and the FEV1 is 232% of predicted. The most likely cause of these results is:
A. Patient did not take a deep breath
B. Patient received albuterol prior to the test
C. The patient’s height was incorrectly entered as 63 centimeters rather than 63 inches
D. Patient is a marathon runner
Question #11

- 20-year-old college student
- Dyspnea and cough since classes started
- Moved from a dorm to an apartment this year
Question # 11

• 20-year-old college student
• Dyspnea and cough since classes started
• Moved from a dorm to an apartment this year
• Asthma
Question # 12

• 50-year-old man
• History of ALS
• Dyspnea for 2 years
**Question #12**

- 50-year-old man
- History of ALS
- Dyspnea for 2 years
- Neuromuscular weakness

**Question #13**

- 65-year-old woman
- Dyspnea for 3 years
- Frequent bronchitis
- Daily sputum production
- Non-smoker
- Moist crackles on exam
Question # 13
- 65-year-old woman
- Dyspnea for 3 years
- Frequent bronchitis
- Daily sputum production
- Non-smoker
- Moist crackles on exam
Question #13

- 65-year-old woman
- Dyspnea for 3 years
- Frequent bronchitis
- Daily sputum production
- Non-smoker
- Moist crackles on exam

Bronchiectasis
Question # 14

- 55-year-old man
- Dyspnea for 5 years
- Smokes 1 pack a day
Question # 14

- 55-year-old man
- Dyspnea for 5 years
- Smokes 1 pack a day
Question # 14

- 55-year-old man
- Dyspnea for 5 years
- Smokes 1 pack a day
- **Emphysema**

Question # 15

- 70-year-old woman
- Dyspnea for 6 months
- Non-smoker
- Dry crackles on exam

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Question #15

- 70-year-old woman
- Dyspnea for 6 months
- Non-smoker
- Dry crackles on exam

Idiopathic pulmonary fibrosis