What is dyspnea and what can be done about it?

Dan Culver DO
Outline

• What is dyspnea?
• What tests do we use for it?
• Questions
What is dyspnea?
What is dyspnea?

“Difficulty in breathing or in catching the breath”

- Central
- Airways narrowing
- Lung blood vessels
- Muscle weakness
- Restriction of lung motion
- Low oxygen delivery
- Acid build-up
The main role of the lungs is gas exchange.
Sarcoidosis likes to involve the airways too

“Pebbly mural” appearance
Bronchoscopy results

LUL

LLL

RUL

Upper division

lingula
Pulmonary hypertension in sarcoidosis

All patients

Only Dyspneic Patients
Muscle weakness in sarcoidosis
Muscle weakness relates to other variables affecting QOL

<table>
<thead>
<tr>
<th></th>
<th>6MWD</th>
<th>Hand grip</th>
<th>Extensor ps PT</th>
<th>Quadriceps PT</th>
<th>HPT</th>
<th>Pi_{max}</th>
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<tbody>
<tr>
<td>Men</td>
<td>-0.25</td>
<td>-0.25</td>
<td>-0.29</td>
<td>-0.17</td>
<td>-0.36</td>
<td>0.24</td>
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<tr>
<td>Women</td>
<td>-0.12</td>
<td>-0.21</td>
<td>-0.30</td>
<td>-0.04</td>
<td>-0.043</td>
<td>0.051</td>
</tr>
</tbody>
</table>

Marcellis RG. ERJ 2011
Outline

- What is dyspnea?
- What tests do we use for it?
- Questions
“Well, at least it went for a good cause.”
Spirometry

Flow-volume loop showing obstruction
Data at the time of evaluation

<table>
<thead>
<tr>
<th>Date</th>
<th>Pred</th>
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<tbody>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td>030510</td>
<td>12:48PM</td>
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<td></td>
<td>[L]</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>FVC</td>
<td>4.08</td>
<td>3.33</td>
<td>2.12</td>
<td>52</td>
</tr>
<tr>
<td>FEV 1</td>
<td>3.34</td>
<td>2.70</td>
<td>0.65</td>
<td>19</td>
</tr>
<tr>
<td>FEV 1 % FVC</td>
<td>82.73</td>
<td>72.94</td>
<td>30.67</td>
<td>37</td>
</tr>
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</table>
Lung Volumes in Obstructive vs. Interstitial Lung Disease

Interstitial Disease

- VC: 3.4 L
- TLC: 4.0 L
- RV: 0.6 L

Normal

- VC: 3.4 L
- TLC: 5.0 L
- RV: 1.0 L

COPD (emphysema)

- VC: 3.4 L
- TLC: 5.4 L
- RV: 2.0 L
The main role of the lungs is gas exchange.
| Name: SUSAN | ID: | BSA: 2.25 | Date: 2/25/00 |
| Doctor: BOHDAN PICHURKO | Height: 63.0 in | Age: 47 | Room: PARK |
| Tech: CHRIS RUBNER | Weight: 285.0 lbs | Sex: Female | Race: Caucasian |

Dyspnea: <None>  
Cough: <None>  
Wheeze: <None>  
Yrs Quit: 0  
Pk Yrs: 0  
Pks/Day: 0  
Yrs Smk: 0  
Tbc0 Prod: <None>  

Post-Test Comments: GOOD PT EFFORT

<table>
<thead>
<tr>
<th>PRE-BRONCH</th>
<th>POST-BRONCH</th>
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<tbody>
<tr>
<td>Actual</td>
<td>Pred.</td>
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<tr>
<td>FVC (L)</td>
<td>2.23</td>
</tr>
<tr>
<td>FEV1 (L)</td>
<td>1.90</td>
</tr>
<tr>
<td>FEV1/FVC (%)</td>
<td>85</td>
</tr>
<tr>
<td>FEF 50% (L/sec)</td>
<td>3.12</td>
</tr>
<tr>
<td>FEF 25-75% (L/sec)</td>
<td>2.40</td>
</tr>
<tr>
<td>FEF Max (L/sec)</td>
<td>5.49</td>
</tr>
<tr>
<td>FIVC (L)</td>
<td>2.25</td>
</tr>
<tr>
<td>FIF 50% (L/sec)</td>
<td>2.07</td>
</tr>
<tr>
<td>FIF Max (L/sec)</td>
<td>2.07</td>
</tr>
<tr>
<td>MVV (L/min)</td>
<td>72</td>
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| LUNG VOLUMES |           |           |           |           |           |           |
|--------------|------------|------------|------------|------------|------------|
| SVC (L)      | 2.27       | 3.23       | 70         | 2.30       | 71         | 2         |
| IC (L)       | 1.84       | 2.18       | 84         | 1.61       | 74         | -12        |
| ERV (L)      | 0.43       | 1.05       | 41         | 0.69       | 66         | 62         |
| TGV (L)      | 2.34       | 2.72       | 86         | 2.20       | 81         | -6         |
| RV (Pleth) (L)| 1.91 | 1.68       | 114        |           |            |            |
| TLC (Pleth) (L)| 4.18| 4.90       | 85         |           |            |            |
| RV/TLC (Pleth) (%)| 46  | 34         |            |           |            |            |

| DIFFUSION |           |           |           |           |           |
| DLCOunc (ml/min/mmHg) | 10.29 | 22.91 | 45        |           |           |
| DL/VA (ml/min/mmHg/L) | 2.83  | 4.67  |           |           |           |
| VA (L)     | 3.64      | 4.90     | 74        |           |           |

| AIRWAYS RESISTANCE |           |           |           |           |           |
| Raw (cmH2O/L/s)    | 1.80      | 1.86      | 97        | 1.33      | 71        | -26       |
| Gaw (L/s/cmH2O)    | 0.56      | 1.03      | 54        | 0.76      | 73        | 36        |
| sRaw (cmH2O*s)     | 4.62      |           |           | 3.48      |           | -25       |
| sGaw (L/cmH2O*s)   | 0.22      | 0.20      | 106       | 0.29      | 140       | 33        |
Scadding X-ray stages

Stage I: 85-90%
Stage II: 50-65%
Stage III: 20-30%
Stage IV: 0%
Which patient has worse pulmonary function tests?

69 year-old male

46 year-old male
Some potential causes of shortness of breath in sarcoidosis

- Involvement of the lung tissue
- Airways involvement (usually asthma-like)
- Deconditioning (out of shape)
- Anemia (low blood counts)
- Airways involvement with stenosis
- Poor heart function
- Muscle inflammation
- High blood pressures in the lungs (pulmonary hypertension)
Chest x-ray is not a very good marker of disease activity
What about chest CT scan?
Does ACE help?

Correlation with respiratory functional impairment in 144 non-smoking patients
Correlation of biomarkers with outcome

Acute sarcoidosis

AUC 0.89 (0.79-1) sIL2R

Chronic sarcoidosis

AUC 0.72 (0.52-0.92) for ACE

Rothkrantz-Kos S. Clin Chem 2003
It’s a Fan!

It’s a Wall!

It’s a Spear!

It’s a Snake!

It’s a Tree!

It’s a Rope!
Pulmonary sarcoid with bulky adenopathy
Overdosing steroids?

- 36 acute exacerbations
- Mean steroid dose 19 mg
- FVC improved from 68% to 82%
- Median assessment at 21 days
Predictors of requirement for therapy at 2 years in ACCESS

Independent predictors

Initial treatment
O.R. 3.6 (1.8-7.2)

Dyspnea
O.R. 2-4

Baughman RP. QJM 2006
“Say ... what's a mountain goat doing way up here in a cloud bank?”
Data at the time of evaluation

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Making the diagnosis: Bronchoscopy

Overall diagnostic yield 70-97%
Yield in non-chest diseases

Sensitivity
TBBx: 43-96%
EBBx: 40-75%
TBNA: 46-66%
Combination: 91%

“Pebbly mural” appearance
Treatment

- Treat the disease
  - Immunosuppressives
  - TNF antagonists variably successful
- Cognitive behavioral therapy
- Aerobic and strength training
- Stimulants

Hoving JL. Scand J Rheumatol 2009
Chauffier K. Rheumatology 2011
Lower EE. Chest 2008
White PD Lancet 2011
Endobronchial stenosis requiring lung transplant