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Science Internship Program: Respiratory Care

Civic Education
Office of Government and Community Relations
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Science Internship Program: Respiratory Care
Assessing the Predictive Value of FEV3/FVC, MMEF and AEX in Detecting Bronchiolitis Obliterans Syndrome (BOS) in Lung Transplant Recipients

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Abstract

• Bronchiolitis Obliterans Syndrome (BOS) is a form of chronic rejection characterized by airway obstruction and submucosal fibrosis of the bronchioles. Spirometry is used to detect the start of rejection by looking at certain markers, specifically FEV1 (Forced Expiratory Volume in the first second).

• Three other parameters have been suggested as being useful in detecting rejection in lung transplant patients: FEV3/FVC (Forced Expiratory Volume in third second), AEX (Area Under Expiratory Flow-volume Loop), and MMEF (average flow rate during middle 50% of forced expiratory volume).

• This experiment analyzes data from post lung transplant patients in 2009 to assess the utility of these parameters in detecting lung rejection.
Background

- BOS is a chronic form of rejection
- Rejection occurs when immune system attacks organ
- Affects 50% of lung transplant patients
- Can begin any time after transplant
- Spirometry is an important surveillance tool for detecting BOS
Background

- Spirometry measures lung volumes and flow rates during a forced expiratory maneuver
  - FEV1 is forced expiratory volume in 1st second
  - MMEF is the average flow rate during the middle 50% of the forced expiratory volume
  - FEV3 is forced expiratory volume in 3rd second
  - AEX is the area under expiratory flow-volume loop
Problem/Purpose

- **Problem:**
  - Even though the FEV1 is the best spirometric surveillance parameter, it often fails to give much advanced warning of BOS.

- **Purpose:**
  - Assess the surveillance performance of three other potential spirometric parameters; FEV3/FVC, MMEF, AEX.
Hypothesis

• The FEV3/FVC, MMEF or AEX will reflect small airway dysfunction and provide an earlier alert to the presence of BOS than the FEV1.
Methodology

- A convenience sample of 22 patients whose spirometry data contained all four parameters being studied.
- Absolute and percent change from baseline were calculated and plotted.
- Plots were individually examined to assess concordance/ discordance of new parameters with FEV1.
<table>
<thead>
<tr>
<th></th>
<th>When N =</th>
<th>%</th>
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<tbody>
<tr>
<td>All Concordant with Eachother</td>
<td>13</td>
<td>56.5</td>
</tr>
<tr>
<td>One or More Discordant</td>
<td>9</td>
<td>43.5</td>
</tr>
</tbody>
</table>
Description of Findings

Concordant Example
Description of Findings (cont.)

Discordant Example

Patient 1 abs

-12 -10 -8 -6 -4 -2 0 2 1 2 3 4 5 6

FEV1_abs AEX_abs MMEF_abs FEV3_abs
Patient with BOS Event
Results

• This study was limited by a small convenience sample where all four parameters were available for study.

• Further limitation was that only one patient in our sample had a documented BOS event.

• In the patient with the BOS event, there was a significant fall in AEX while the other 3 parameters were stable.
Conclusions

- Utility of the FEV3/FVC, AEX and MMEF in surveillance of BOS in the transplant population remains unknown, requires further study.
- In majority of subjects, 3 new parameters demonstrated concordance with the FEV1.
- Significant percentage demonstrated heterogeneous discordance, significance of which remains unknown.
- AEX shows promise; demonstrating a significant change before other parameters in patient with BOS.
Recommendations

- Larger pool of patients
- More patients with documented BOS events
- AEX to be closely observed and graphed in comparison to the FEV1


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