CT measurements of expiratory central airway collapse in COPD patients with suspected tracheobronchomalacia: comparison between standard and MPR images

D.M. Tridente, B.H. Heidinger, D.C. DaBreo, A.A. Bankier, D.E. Litmanovich
Disclosures

NHLBI R01 HL084331

Activities related to the presentation: all authors disclose no conflict of interest

Activities not related to the present article: institution receives royalties from Elsevier; A.A.B. is a paid consultant for Daiichi;
COPD and Tracheobronchomalacia

- TBM = 80% luminal reduction during expiration
  
  *(Eur J Radiology 2011, 80(3):531-535)*

- CT definable subtype of COPD
- Associated finding - 20% of COPD patients
  
  *(Radiology 2015, 277(1):192-205)*

- Bronchoscopy: diagnostic gold standard
- MDCT: reliable and comparable method
  
  *(Chest 2005, 127:984-1005)*
Trachea and bronchi are oblique to the MDCT transverse plane

Are we accurately estimating airway collapse?

- Similar studies: no significant difference in measurements in healthy volunteers

(Clinical Radiology 2016, 71:49-55)
Purpose

To compare standard and MPR measurements from the airways in COPD patients with suspected tracheobronchomalacia.
Methods: Imaging Protocol

Active respiratory coaching and spirometric monitoring of 2 sequential CT acquisitions:

- 64 MDCT scanner
- kVp 120
- mAs 40
- collimation 0.625
- gantry rotation 0.5"
- pitch 1.375
Methods: Post Processing

STANDARD

MEASUREMENTS AT THE SAME LEVEL

MPR
Methods: Measurements

- Cross sectional areas (CSA): electronic calipers, manually traced
- Statistical analysis: paired t and McNemar tests

**LUNG WINDOW SETTINGS**

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>-650 HU</th>
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<tbody>
<tr>
<td>WIDTH</td>
<td>1500 HU</td>
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collapse (%): 100 x (1 - CSA forced expiration / CSA inspiration)
Results: Population

Cohort: 97 patients
- GOLD criteria for COPD
- 35-75 years old range
- Age mean: 65 ± 7 years
- Gender: 47F / 50M

Additional time per case:
- Trachea - 4 minutes
- Both bronchi - 8 minutes
Results: Mean CSA (mm$^2$)

**END-INSPIRATORY**

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<thead>
<tr>
<th></th>
<th>TRACHEA</th>
<th>RMB</th>
<th>LMB</th>
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<tbody>
<tr>
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<td>300</td>
<td>225</td>
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</tr>
<tr>
<td>MPR</td>
<td>250</td>
<td>175</td>
<td>100</td>
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**DYNAMIC EXPIRATION**

<table>
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<th>RMB</th>
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<tbody>
<tr>
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<td>75</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>MPR</td>
<td>50</td>
<td>25</td>
<td>12.5</td>
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</tbody>
</table>
Results: Collapse (%)
Results: Diagnosis (# of patients)

TRACHEOMALACIA

- 19% for MPR
- 11% for Standard

TRACHEA
Conclusion

**MPR versus standard transverse images**

- Cross sectional area: smaller in trachea, right and left main bronchi;
- Airway collapse: larger only in the trachea;
- Tracheomalacia: 7 more patients diagnosed.