Beth Israel Deaconess Medical Center - Harvard Medical School, Boston, MA

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

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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)

TRACHEOMALACIA

Need for Standardized Data

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)

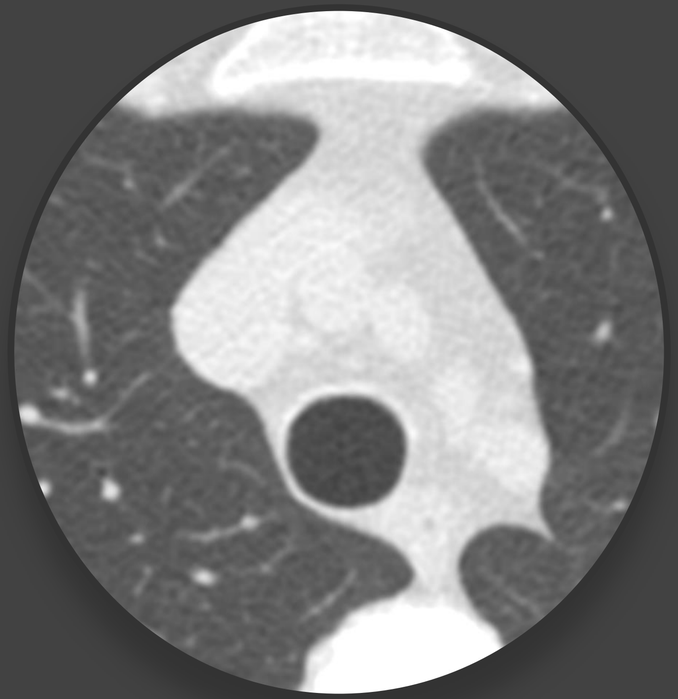
Purpose

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

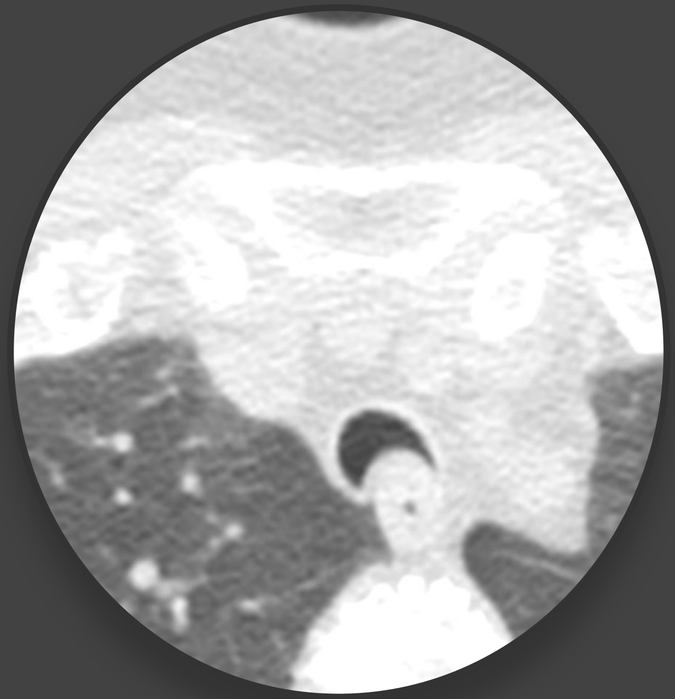
Methods: Imaging Protocol

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

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

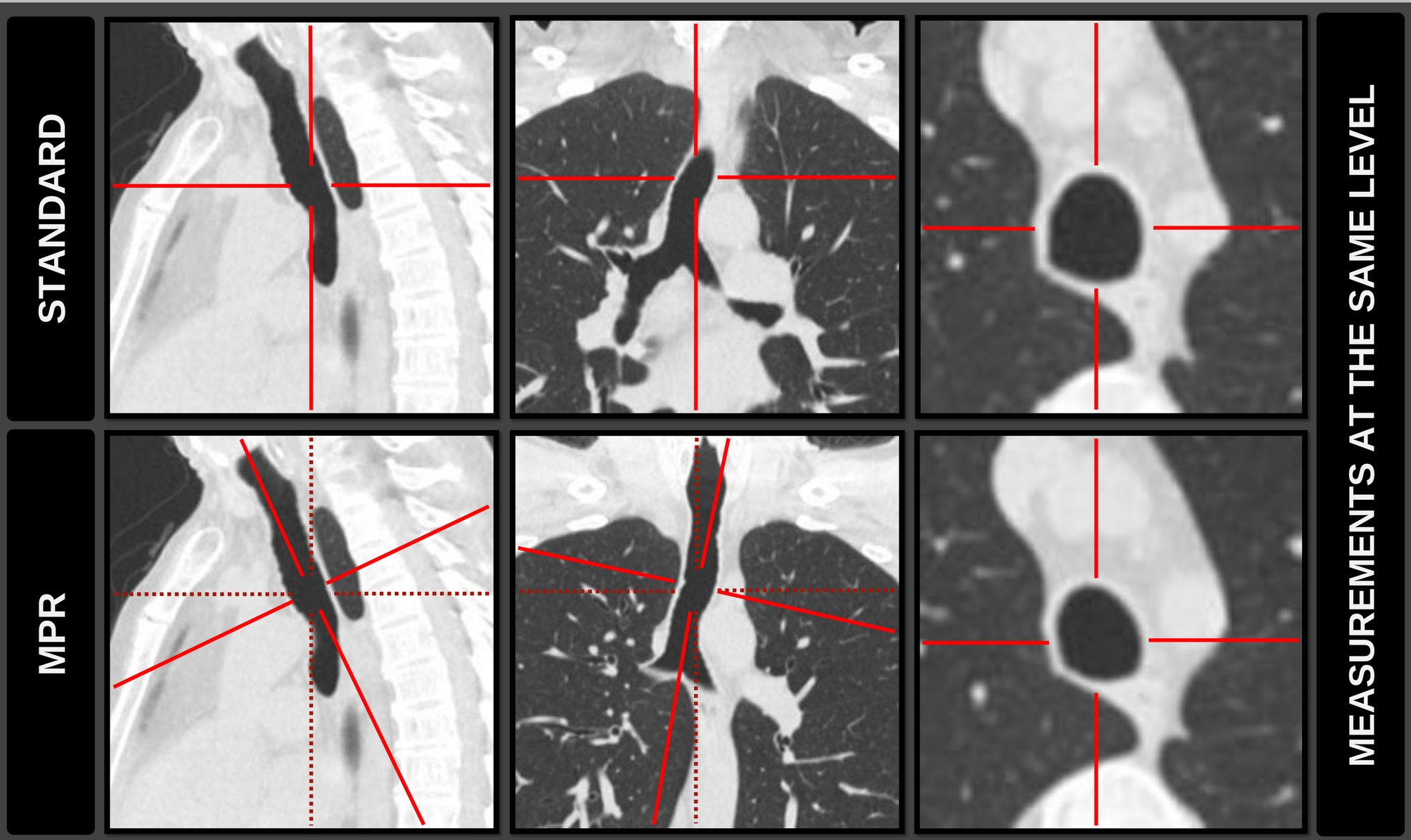


END-INSPIRATORY



DYNAMIC EXPIRATION

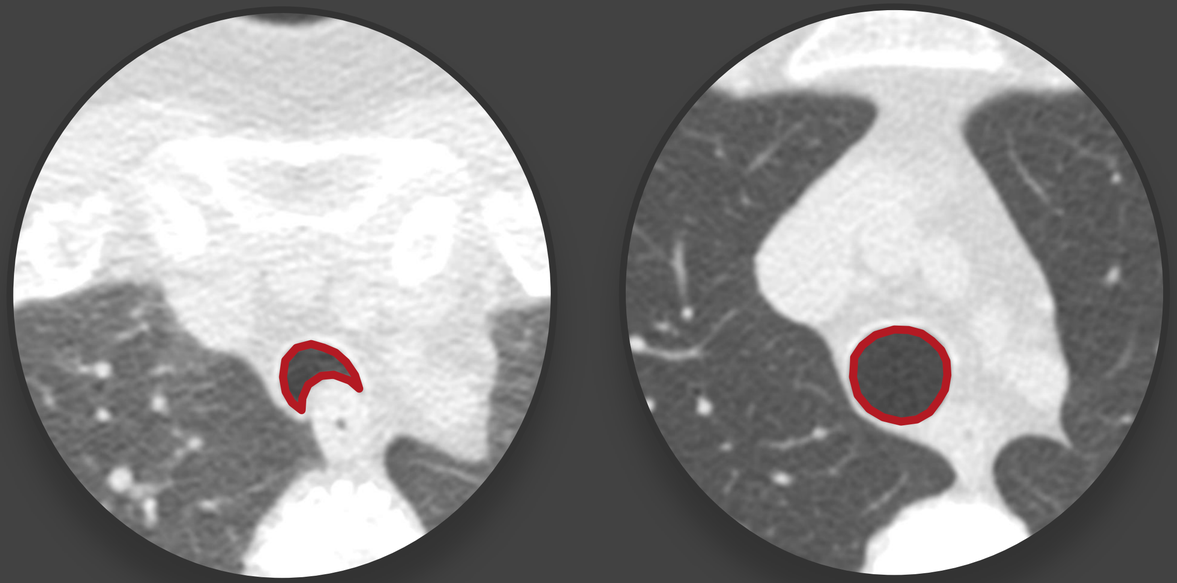
Methods: Post Processing



Methods: Measurements

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

LUNG WINDOW SETTINGS	
LEVEL	-650 HU
WIDTH	1500 HU



collapse (%): 100 x (1- CSA *forced expiration* / CSA *inspiration*)

Results: Population

Cohort: 97 patients

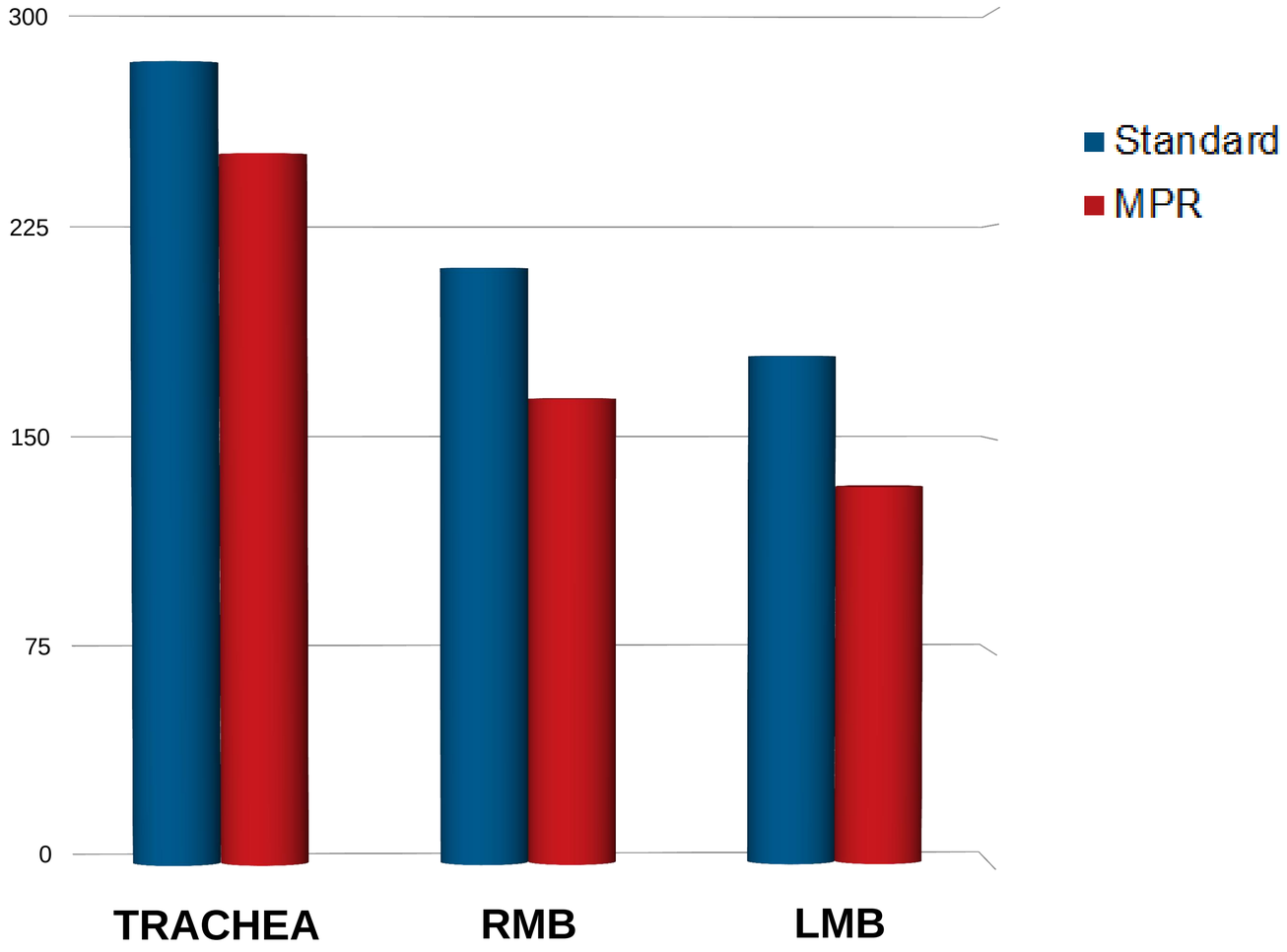
- GOLD criteria for COPD
- 35-75 years old range
- Age mean: 65 ± 7 years
- Gender: 47F / 50M

Additional time per case:

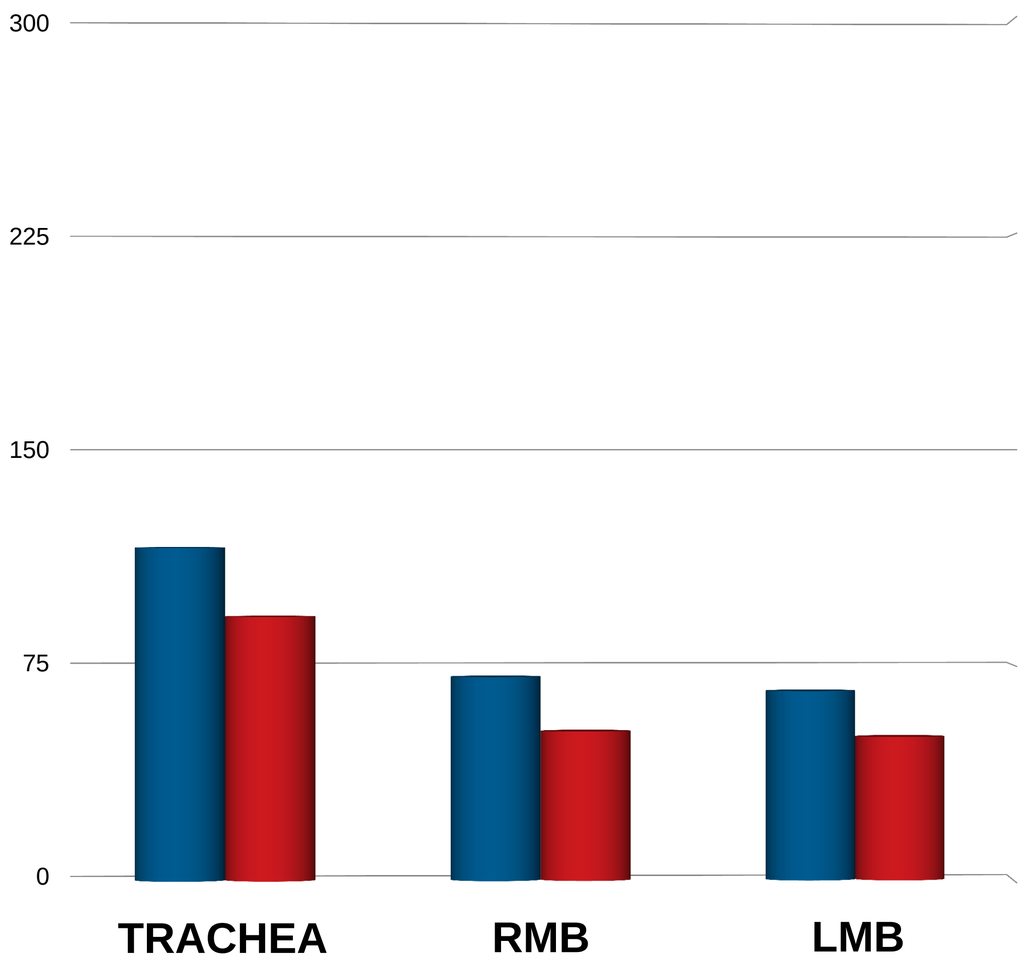
- Trachea – 4 minutes
- Both bronchi – 8 minutes

Results: Mean CSA (mm^2)

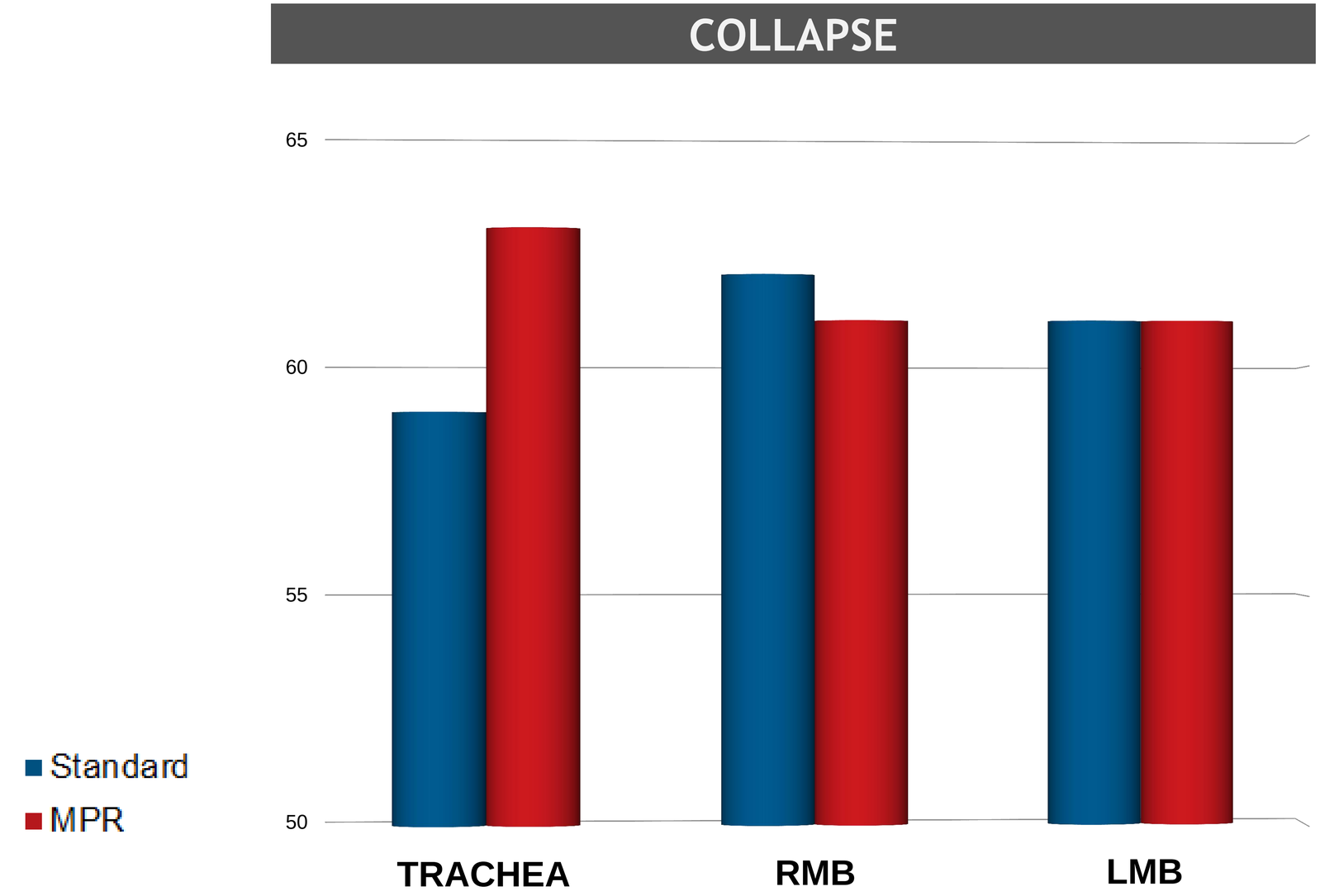
END-INSPIRATORY



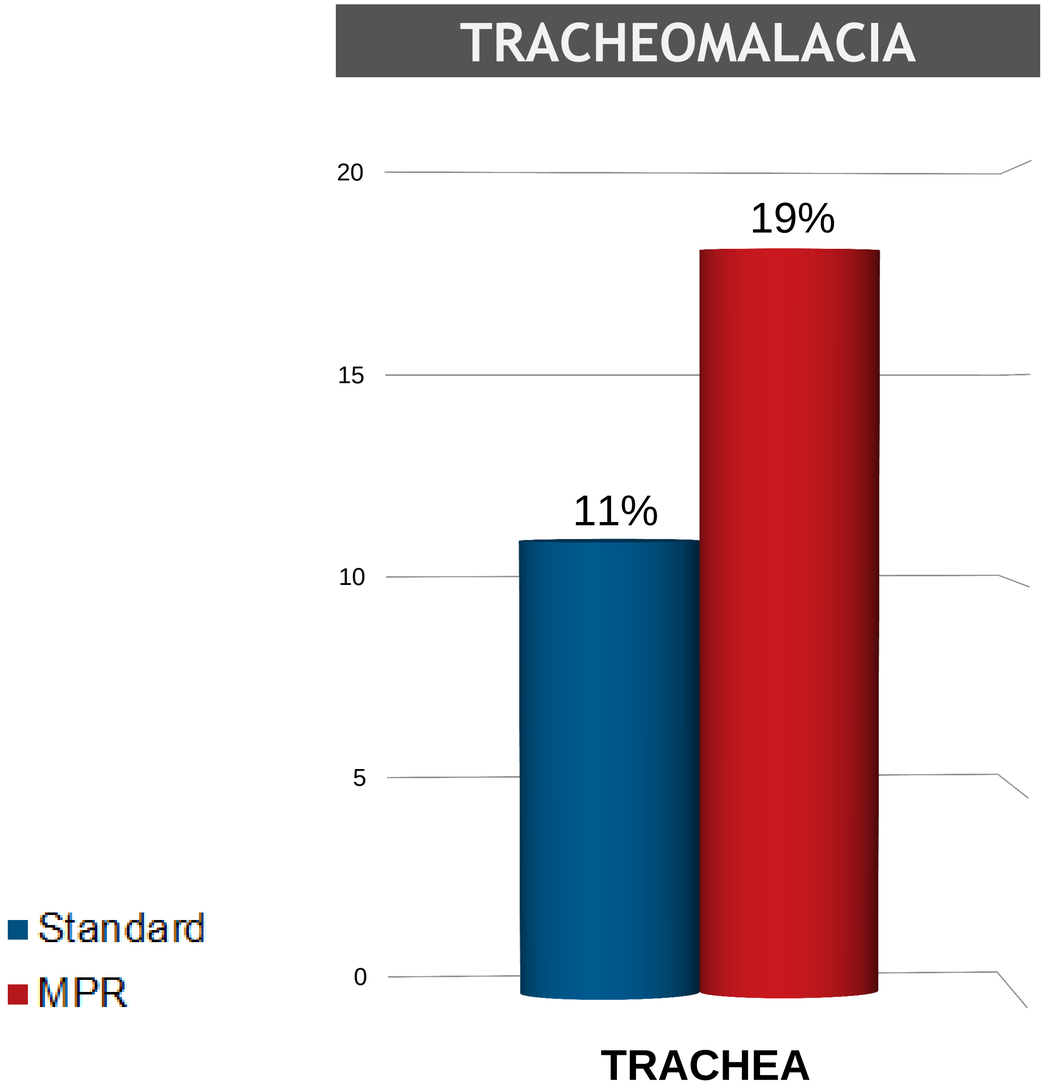
DYNAMIC EXPIRATION



Results: Collapse (%)



Results: Diagnosis (# of patients)



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.

dtrident@bidmc.harvard.edu